# Local Mitigation Strategy 2020

**Palm Beach County**
**Public Safety Department**
**Division of Emergency Management**

**20 South Military Trail**
**West Palm Beach, FL 33415**
**561-712-6400**

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## RECORD OF CHANGES

This Record of Changes is used to record all published changes. All major changes will be routed to plan holders within 90 days of the promulgation of the change. In addition, *SOG PL-002 – Review and Maintenance of DEM Plans*, establishes a policy and procedures for the review and maintenance of all Division of Emergency Management Plans.

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# PROMULGATION STATEMENT

With this notice, we are pleased to promulgate the 2020 Palm Beach County (PBC) Unified Local Mitigation Strategy (LMS). This is one of the many documents published by PBC Public Safety Department's Division of Emergency Management (DEM). The LMS is the basis for countywide hazards, vulnerabilities, and mitigation strategy activities. It is the intent of the LMS to provide a structure for identifying hazards and vulnerabilities, assist municipalities and the County in planning for those hazards and vulnerabilities, and mitigating those hazards through the use of local, state, and federal funding sources, making our county more resilient.

Palm Beach County DEM shall be responsible for coordinating the preparation and updating of the LMS through the work of the LMS Working Group, Steering Committee, and other subcommittees, and will ensure that this document is consistent with similar federal, state, and municipal plans. The LMS 2020 will become effective upon official adoption by the PBC Board of County Commissioners (BCC) and effective for municipalities upon their individual adoption.

Ralph R. Wall Jr.

Ralph Wall,
Chairperson
PBC LMS

Bill Johnson RN

Bill Johnson, RN
Director
Division of Emergency Management

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# SECTION 1: PLANNING PROCESS

## 1.1 Introduction

The LMS was formally adopted by the County, municipalities, and the LMS Steering Committee in 1999. Initial development of the LMS was funded, in part, by the Florida Department of Community Affairs/Florida Division of Emergency Management (FDCA/FDEM) with Federal Emergency Management Agency (FEMA) funds earmarked for the development of comprehensive hazard mitigation planning.

The LMS was established and continues to operate in accordance with prevailing federal, state, and local guidelines and requirements. In 2004, the plan and program were substantially modified to enhance operational effectiveness and to comply with new federal guidelines established in response to the Disaster Mitigation Act of 2000.

In 2016, DEM was accredited by the Emergency Management Accreditation Program (EMAP), demonstrating excellence and accountability in emergency management through a peer-reviewed standards, assessment, and accreditation process, including standards on mitigation practices.

## 1.2 Purpose

The purpose of the LMS is to develop and execute an ongoing strategy for reducing the community's vulnerability to identified natural, technological, and human caused hazards. The strategy provides a rational, managed basis for considering and prioritizing hazard-specific mitigation options and for developing and executing sound, cost-effective mitigation projects. The LMS also provides a basis for justifying the solicitation and use of local, state, federal, and other funding to support hazard mitigation projects and initiatives.

## 1.3 Program Organization

This section addresses, in part, the following FEMA requirements:

**Requirement: §201.6(c)(1)** Documentation of how the plan was prepared must include the schedule or timeframe and activities that made up the plan's development as well as who was involved. **(Element A1)**

**Requirement: §201.6(c)(4)(i)** The plan must identify how, when, and by whom the plan will be monitored. The plan must identify how, when, and by whom the plan will be evaluated. The plan must identify how, when, and by whom the plan will be updated. The plan must include the title of the individual or name of the department/agency responsible for leading each of these efforts. **(Element A6)**

### 1.3.1 LMS Structure

The current structure meets federal guidelines and criteria established in response to the Disaster Mitigation Act of 2000 and Title 44 Code of Federal Regulations (See figure 1.1).

**Local Mitigation Strategy Coordinator**

The LMS Coordinator is a staff member within the DEM and serves as the coordinator for all mitigation projects, committees, and mitigation funding designated for the County. The LMS Coordinator facilitates committee and sub-committee meetings and represents the County on these committees. Specifically, the LMS Coordinator supervises revision and updates to the Local Mitigation Strategy every five (5) years. The LMS Coordinator will be responsible for including minor changes and additions to the LMS during interim periods. Those changes will be documented in the Record of Changes, which can be found in page 3. The LMS Coordinator monitors changes in federal, state, and local laws in the area of mitigation that may affect the County. The LMS Coordinator readies the LMS for approval to the FDEM, the LMS Steering Committee, the BCC, and local municipalities. The LMS Coordinator is responsible for the continued maintenance of the LMS as well as the storing and filing of all documents pertaining to mitigation issues. In addition, the LMS Coordinator is responsible for the coordination of the Project Prioritization List that scores and ranks projects in the County that are eligible for Federal monies. This process is conducted through the LMS Evaluation Panel. Panelists are solicited by the LMS Coordinator on behalf of the LMS Steering Committee based on LMS member recommendations and are subject to approval by the LMS Steering Committee. The LMS Coordinator interfaces with appropriate governmental and non-governmental agencies and offices to ensure LMS goals, objectives, and priorities are consistent with and cross-referenced with those articulated in other existing plans, namely the County's Comprehensive Emergency Management Plan (CEMP). In addition, the LMS Coordinator seeks opportunities at the regional, county, and municipal levels to:

- Update plans, policies, regulations, and other directives to include hazard mitigation priorities
- Encourage the adoption of mitigation priorities within capital and operational budgets and grant applications
- Share information on grant funding opportunities
- Offer guidance for carrying out mitigation actions
- Explore opportunities for collaborative mitigation projects and initiatives
- Facilitate and coordinate the application process and serve as a primary communications link with funding agencies

**LMS Working Group**

The LMS Working Group represents a broad cross-section of public sector and private sector organizations and individuals, including the general public, regional universities, neighboring emergency management departments, and state coordinators. The LMS Working Group serves as an umbrella organization for coordinating all mitigation programs and activities, supplies the staffing for all committees of the LMS, and is the primary mechanism and forum for exchanging information and mobilizing the vast expertise and resources of the community. The LMS Working Group also provides suggested updates to various portions of the LMS to be analyzed and considered for inclusion by the LMS Revisions Committee into the next LMS. The LMS Working Group is the overarching group that all other committees are derived from, and provides guidance, suggestions, research, and input into all aspects of the LMS program. The LMS Working Group is currently led by the Chairperson, a Management Analyst for the City of West Palm Beach, and is coordinated by the LMS Coordinator for DEM.

**LMS Steering Committee**

The LMS Steering Committee consists of 15 members composed of seven (7) municipal representatives, two (2) county/local government representatives, one (1) state/federal government representative, one (1) university/college representative, one (1) healthcare industry representative, one (1) non-profit representative, and two (2) representatives from the private sector. The LMS Steering Committee serves as the LMS program board of directors. As such, it is the primary decision and policy body for LMS sponsored mitigation activity. Members of the committee are replaced as needed with coordination of the committee and the committee chairperson. Each January an updated list is sent to FDEM to be compliant with Florida Statute 27P-22.004. The LMS Steering Committee provides the needed attention to ensure mitigation projects are more cost-effective and focused on threat-specific mitigation priorities and strategies. The LMS Steering Committee also monitors the implementation of the LMS annually, and makes recommendations to jurisdictions and other LMS members regarding how to implement LMS strategies within their jurisdictions. The LMS Steering Committee is led by the Chairperson, a Management Analyst for the City of West Palm Beach, and is coordinated by the LMS Coordinator for DEM.

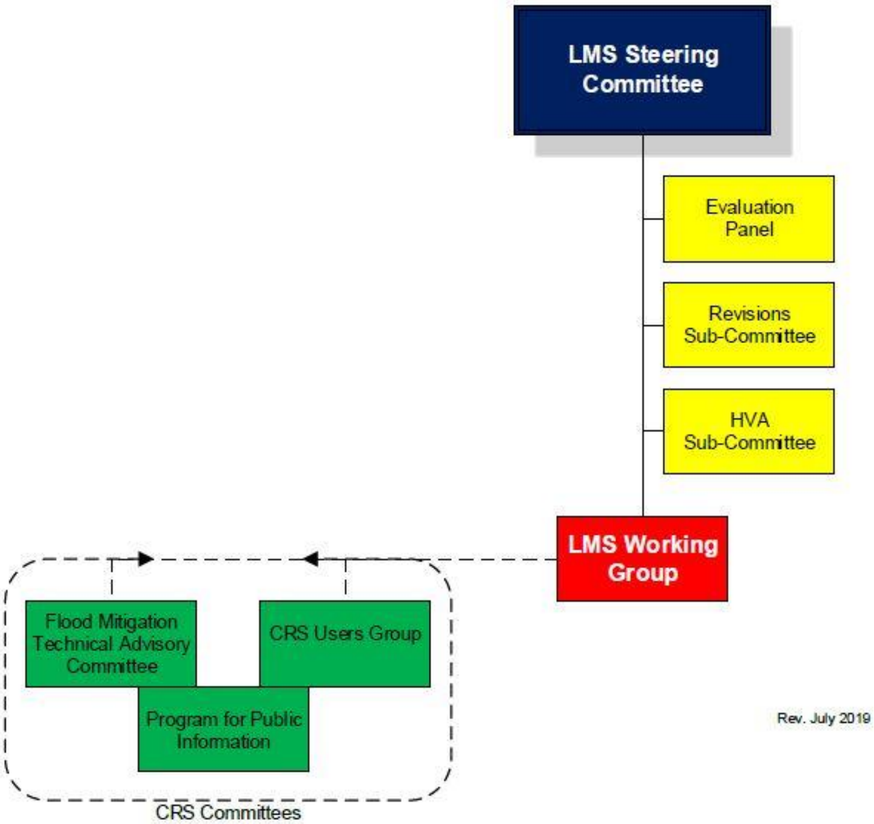


*Figure 1.1:* PBC LMS Structure

### 1.3.2 Standing Committees

- LMS Evaluation Panel - Designated to review, evaluate, score, and rank mitigation projects applying established local, state, and federal prioritization processes and criteria. The LMS Evaluation Panel is led by the Public Works Director for the City of Greenacres, and coordinated by the LMS Coordinator for DEM.

- LMS Revisions Sub-Committee - Designated to review/monitor, update/evaluate, and verify/revise that subsequent LMS plans meet all federal guidelines and criteria. In addition, the revisions committee meets quarterly either in-person or via teleconference to evaluate the effectiveness of the plan, as well as to monitor and update the plan during the five (5) year cycle. The revisions committee has a standing meeting once per quarter. If no issues or concerns with the plan are proposed or presented, the committee instead holds a teleconference. Eighteen to twenty-four months before the plan is due for revisions, in person meetings are held regardless of whether changes need to be made. Biweekly and monthly meetings of the committee are held at least 24 months before the plan expires to ensure all address with the revision are being met and to review the document and present suggested changes, updates, and revisions to the LMS Steering

Committee. The LMS Revisions Subcommittee is led by a Management Analyst for the City of West Palm Beach, and is coordinated by the LMS Coordinator for DEM.

- LMS Hazard and Vulnerability Analysis (HVA) Sub-Committee - Provides a detailed assessment of hazards that may affect PBC and provides mitigation recommendations. Reviews research studies, reports, and technical information regarding possible changes in hazards within PBC and makes recommendations for revision. This subcommittee meets as needed within the revision cycle to provide input to the LMS Revisions Subcommittee relating to hazards and vulnerabilities that may have changed since the last revision. The LMS HVA Subcommittee is led by a Battalion Chief for the City of West Palm Beach, and is coordinated by the LMS Coordinator for DEM.

### 1.3.3 Community Rating System (CRS) Cooperating Committees

- Flood Mitigation Technical Advisory Committee - Comprised of flood mitigation engineers and experts from public and private sector organizations, is charged with assessing County-wide flood risks and vulnerabilities without regard to jurisdictional boundaries, and recommending flood mitigation priorities, strategies, plans, and projects for LMS consideration and action that optimally benefit to the greater community. CRS Committees are led and coordinated by the CRS Coordinator for DEM.

- Program for Public Information - Comprised of representatives from the county's active CRS communities, local business leaders, and members of the public, this group collaborates on a full range of Outreach Projects Strategy (OPS) initiatives and promote CRS participation. This CRS Committee is led and coordinated by the CRS Coordinator for DEM.

- CRS Users Group – Comprised of representatitves of the county's CRS Communities, this group meets quarterly to discuss issues of the day regarding CRS updates, collaborates on best practices for achieving higher levels within various CRS activities, and shares information regarding CRS-related training.

While there is no regulation that requires the CRS committees to meet or coordinate, PBC has a very involved CRS user group that passes information and best practices and meets quarterly. Out of the 39 municipalities in PBC, 28 are involved in the CRS user group. A chart in Appendix J shows the number of Repetitive Loss Properties, the number of insured homes in each municipality, and their CRS rating. Table 3.1 also shows number of repetitive loss properties, total loss claims, CRS ratings, and insurance discounts for PBC and each jurisdiction.

## 1.4 Participation Requirements

Since the LMS is written using input from all stakeholders, it is important to make sure that the entire PBC community is represented. Each group has different participation requirements; however, all groups are strongly encouraged to participate in the process.

Jurisdictions

Municipal and County participation is critical to the success of the LMS. In order to retain LMS voting rights, qualify for federal mitigation assistance consideration, and otherwise remain a member in good standing, the County and all municipal jurisdictions are expected to conform to the following standards:

- Participation of the representative or alternate in the four (4) annual LMS Working Group meetings; or
- Participation of the representative or officially designated alternate(s) in a majority of the LMS Steering Committee meetings, and
- Participation in a majority of subcommittee meetings; or
- Participation in special conference call meetings of the LMS Steering Committee or subcommittees; and
- Have an officially executed resolution adopting the revised LMS plan on file with the County. In order for a jurisdiction to be eligible for Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance Program (FMAP), and Pre-Disaster Mitigation (PDM) funding programs, they must have an officially adopted resolution and a fully executed interlocal agreement.

More than two (2) absences of the LMS Working Group meeting will be cause for disqualification from the LMS, subject to appeal and review by the LMS Chair. All rights and privileges will be terminated during a period of disqualification and formal reapplication. All jurisdictions will be notified of meetings via email at least one (1) week in advance, and will be updated with meeting summaries thereafter.

Non-Governmental Organizations (NGO) and other Governmental Entities

In order to qualify for LMS grant sponsorship, NGOs and other governmental entities must:

- Have a duly executed letter of commitment to the LMS on file with the County; and
- In the judgment of the LMS Steering Committee, actively participate in, and otherwise support LMS activities.

The Public and Private Sector

The LMS membership believes broad community support, including ongoing public and private sector involvement, is very important to the success of the program. While participation by private organizations and the public is strictly voluntary, their attendance, comments, contributions, and support are actively invited, sought, monitored, and fully documented.

In order to promote the opportunity for broad participation, at a minimum, notices and agendas for all general meetings of the LMS are posted through some combination of newspaper ads or public service announcements; social media, postings on county and municipal websites, announcements in the county and municipal newsletters and calendars, and blast e-mailings to all previous participants. Additionally, the LMS Coordinator actively solicits new LMS members by reaching out to at least 30 private sector and/or non-profit organizations annually to encourage their participation in the LMS.

## 1.5 Jurisdictional Adoption

All jurisdictions wishing to participate in and share in the benefits deriving from the LMS program must complete and file a fully executed resolution which conforms to the adoption standards jointly established and amended by the PBC BCC and the LMS Steering Committee.

## 1.6 New Jurisdictions/Entities

In the event municipal jurisdictions are added, deleted, or merged within the County, the LMS will appropriately adjust its membership rolls as necessary and require any newly defined jurisdictions to provide documentation necessary for participation in the program.

## 1.7 Jurisdictional Participation

The County has 39 municipalities. In addition to jurisdictions being encouraged to participate, each member is provided minutes from the previous LMS Working Group or LMS Steering Committee meeting within one week following the meeting. Participation is also monitored with sign-in sheets. This information along with a roster of the primary LMS representative from each municipality can be found in Appendix L. Also located in Appendix L are the minutes and sign-in sheets of the LMS Working Group, Steering Committee, HVA Subcommittee, and Revisions Subcommittee meetings.

The following jurisdictions currently have LMS members. Details (such as names and titles) can be found in Appendix L:

Atlantis, Belle Glade, Boca Raton, Boynton Beach, Briny Breezes, Cloud Lake, Delray Beach, Glenn Ridge, Golf, Greenacres, Gulf Stream, Haverhill, Highland Beach, Hypoluxo, Juno Beach, Jupiter, Jupiter Inlet Colony, Lake Clarke Shores, Lake Park, Lake Worth Beach, Lantana, Loxahatchee Groves, Manalapan, Mangonia Park, North Palm Beach, Ocean Ridge, Pahokee, Palm Beach, Palm Beach Gardens, Palm Beach Shores, Palm Springs, Riviera Beach, Royal Palm Beach, South Bay, South Palm Beach, Tequesta, Wellington, West Palm Beach, and unincorporated Palm Beach County.

## 1.8 Guiding Principles

The LMS guiding principles are an expression of the community's vision of hazard mitigation and the mechanisms through which it is striving to achieve that vision. The principles address concerns of the community relative to natural, technological, and human caused hazards. The

County's LMS prides itself on working to reduce hazards and vulnerability through well-designed and effective mitigation projects and activities.

## 1.9 Process

As part of the process, a survey was distributed to each jurisdiction to understand their local issues. The LMS Steering Committee, along with the LMS Working Group, assessed existing plans, studies, and strategies. Using state and federal guidance on how an LMS update should be constructed, the LMS Steering Committee and LMS Working group developed a comprehensive list of hazards of concern. From these defined hazards, the LMS Working Group identified areas of concern from existing plans and future considerations.

These areas of concern include:

- Loss of life
- Loss of property
- Community sustainability
- Health/medical needs
- Sheltering
- Adverse impacts to natural resources (e.g., beaches, water quality)
- Damage to public infrastructure (e.g., roads, water systems, sewer systems, stormwater systems)
- Economic disruption
- Fiscal impact
- Recurring damage
- Redevelopment/reconstruction
- Development practices/land use
- Intergovernmental coordination
- Public participation
- Repetitive flood loss properties
- Historical structures

## 1.10 Strategy

The strategy used for the development and revision process of the LMS, consisted of the following tasks:

1) Public involvement to ensure a representative plan
2) Coordination with other agencies or organizations
3) Hazard area inventory
4) Risk and Vulnerability Assessment
5) Incorporating existing plans, reports, best practices, and technical information into the LMS
6) Review and analysis of possible mitigation activities

7) Evaluation of effectiveness of current LMS
8) Local adoption following a public hearing
9) Periodic review and update

## 1.11 Benefits

Adoption of this strategy will provide the following benefits to both County and municipal governmental entities:

- Compliance with Administrative Rules 9G-6 and 9G-7, Florida Administrative Code (FAC), requirements for local Comprehensive Emergency Management Plans to identify problem areas and planning deficiencies relative to severe and repetitive weather phenomenon, and to identify pre and post-disaster strategies for rectifying identified programs
- Universal points from the National Flood Insurance Program's (NFIP) CRS Program for developing a Floodplain Management Program, which may help further reduce flood insurance premium rates for property owners
- Access to FEMA's Federal grant programs
- Compliance with the Disaster Mitigation Act of 2000
- Set forth the guiding principles with which both the County and municipal governmental entities of PBC will address the issue of all hazard mitigation
- Identify the known hazards to which the County is exposed, discuss their range of impacts, and delineate the individual vulnerabilities of the various jurisdictions and population centers within the County (**Section 2, Hazard Identification and Vulnerability Analysis**)
- Develop a detailed method by which PBC (municipalities and County government) can evaluate and prioritize proposed mitigation projects along with new federal requirements
- Develop the process and schedule by which this entire LMS will be reviewed and updated to include public participation

## 1.12 Criteria and Procedures for Revision

This section partially addresses the following FEMA requirements:

**Requirement: §201.6(b)(1)** The plan must document how the public was given the opportunity to be involved in the planning process and how their feedback was incorporated in the plan. The opportunity for participation must occur during the plan development, which is prior to the comment period on the final plan and prior to the plan approval/adoption. **(Element A1 and A3)**

**Requirement: §201.6(c)(1)** Documentation of how the plan was prepared must include the schedule or timeframe and activities that made up the plan's development as well as who was involved. **(Element A3)**

This document will be updated a minimum of every five (5) years by the LMS Coordinator with the assistance and input of the LMS Revision Subcommittee, LMS Steering Committee, LMS Working Group, and approval of the LMS Steering Committee.

As many items have changed in the past five (5) years for PBC communities, the following is a description of the review process to show changes the development of several of the sections and priorities from the previous plan:

- Planning Introduction Section: This section includes an overview of the plan, an introduction, a discussion on the scope and purpose of the document, along with goals and objectives, and the participants in the planning process. This section was revised to reflect the most current approaches taken by the PBC LMS Working Group and standing committees.

- Hazard Identification and Vulnerability Analysis: All hazards received a new review and identified as potential or emerging trends with other hazards classified as "threats" and not "hazards." Most of the historical occurrences were updated to include current events, facts, or figures since the previous update. Other methodologies for a hazard and vulnerability tool were assessed. Sea Level Rise and flooding objectives received new emphasis and heavily incorporated to a new section within the LMS.

- Development of Mitigation Initiatives: Several LMS Committee meetings and Working Group meetings were devoted to enhancing project submissions and revisions to the Project Priority List and Project Submission Form in order to more accurately rank older projects and receive information on new projects. Much of this section was revised to reflect the changes discussed. However, some of the information on funding sources and benefit cost ratios remains unchanged from its source information and remains a subject of detailed education efforts to stakeholder members in order to form well detailed project submissions.

- Implementation and Maintenance of the LMS: This remains important due to continuing turnover from the membership of the Working Group. New members have been identified and continue to act as stakeholders to the whole community.

- Appendices These sections were updated accordingly based on newer and relevant information. As PBC supports many LMS Committees, we utilized sample document outcomes from each Group to detail actions taken to implement the LMS.

The public is given an opportunity to review this document and provide comments through the County website, public meetings held both prior to and after revisions have been made to actively solicit public input into the LMS, online surveys, as well as committee meetings. Ongoing maintenance revisions may also be made based upon experience from any significant events such as a hurricane, tornado, sea level rise, hazardous materials spill, or any other occurrence where mitigation could benefit the community. Changes in federal, state, and local laws will also be reflected in the updated version of this document. The revisions will then be distributed to all affected parties by the LMS Coordinator. The Record of Changes, located at the front of this document, will be used to record ongoing maintenance of the plan during interim periods between complete revision cycles.

- The evaluation criteria which are used include:
    - New mandates from federal, state, or local agencies that require changes to the Local Mitigation Strategy, including new or changing laws, policies or regulations.
    - Societal developments or significant changes in the community that must be added to the current LMS.
    - Changes in the Comprehensive Plan or any other form of standard operating procedure.
    - The mitigation opportunities implemented. The priorities for implementation are the same.
    - Recommendations or lessons learned from any major incidents that have occurred since last adoption.

During the revision process, each criterion is addressed to determine if they are still valid and adjustments are made as necessary. All existing mitigation opportunities that are determined to still be viable projects will be left standing. All those that are determined to be no longer workable will be set aside for further review and revision, or dropped as no longer feasible.

Once revisions are approved by the LMS Steering Committee, the LMS Coordinator provides the copy to all members, on the website, and to the State of Florida's Mitigation Bureau for approval. After approval by the State, the LMS Steering Committee and LMS Coordinator hold a public showcase to allow a final chance for public input. Once the LMS Revisions Subcommittee reviews public comment for possible inclusion, and makes any final revisions required by the State, the LMS Coordinator distributes to members for final adoption by governing bodies. Communities will then present the LMS to the public after adoption through the same public meetings/websites/etc. process used in the update cycle.

The following graphic shows the current LMS2020 Timeline, detailing the schedule and timeframe adopted by the LMS Steering Committee in 2016 for the 2020 revision cycle.

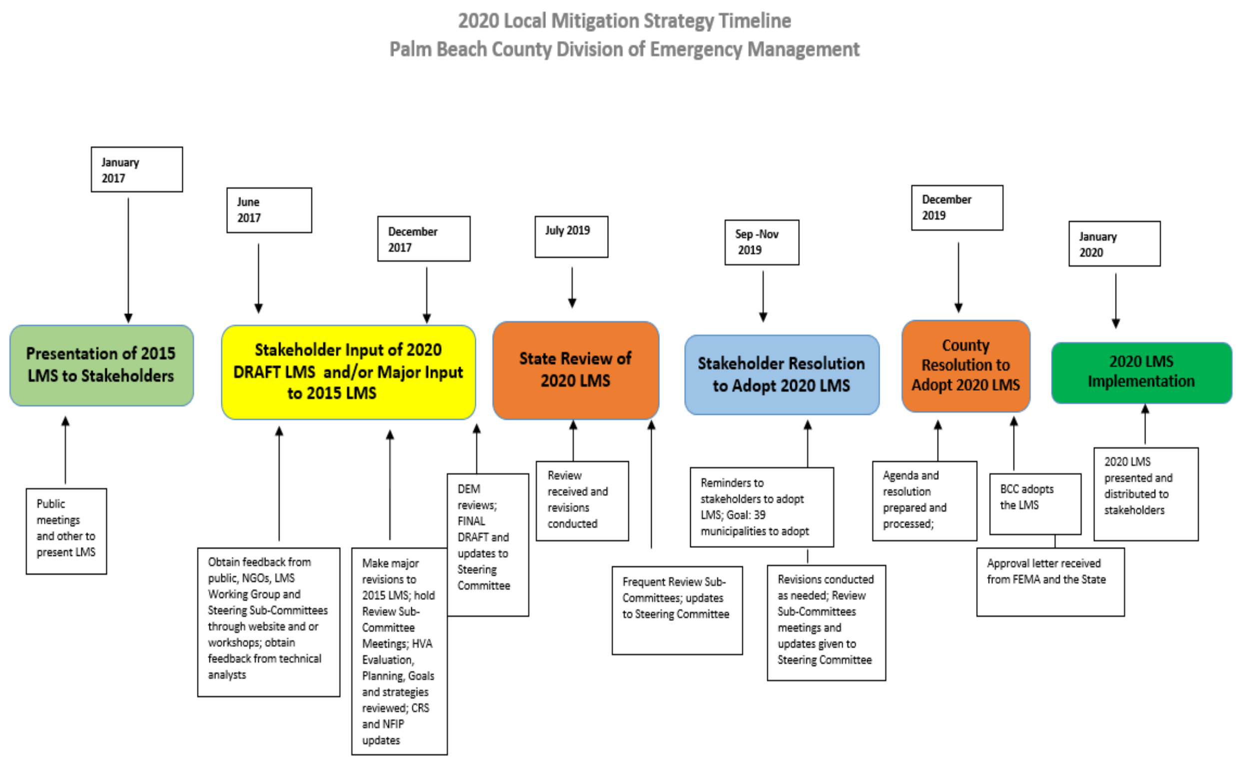


*Figure 1.2:* LMS2020 Timeline for PBC

## 1.13 Goals

1. Reduce the loss of life, property, and repetitive damage from the effects of natural, human caused, and technological hazards from all sources but especially hurricanes, tornadoes, major rainfall, and other severe weather events.

2. Achieve safe and fiscally sound, sustainable communities through thoughtful long-range planning of the natural and man-made environment.

3. Take preventative actions to reduce the number of repetitive loss properties published annually by FEMA on the list of "Repetitive Loss Properties."

4. Qualify the county and jurisdictions for incremental improvements on the CRS classification in relation to flood insurance under the NFIP and to reduce flood hazard risk.

5. Optimize the effective use of all available resources by establishing public/private partnerships, and encouraging intergovernmental coordination and cooperation.

6. Promote awareness and preparedness through the distribution of information on hazards and measures to mitigate them.

7. Increase the level of coordination of mitigation management concerns, plans and activities at the municipal, county, state, and federal levels of government in relation to all hazards.

8. Establish a program that facilitates orderly recovery and redevelopment, and minimizes economic disruption following a disaster.

9. Ensure an enforceable commitment for the implementation of the local hazard mitigation strategy.

## 1.14 Objectives

The ultimate objectives of the LMS are to:

1. Improve the community's resistance to damage from known natural, human caused, and environmental hazards.

2. Place PBC in a position to compete effectively and productively for pre- and post-disaster mitigation funding assistance.

3. Encourage strong jurisdictional, nongovernmental, and public participation and support of LMS activities.

4. Reduce the cost of disasters at all levels.

5. Facilitate community recovery when disasters occur.

6. Minimize recurrence of damage by incorporating mitigation into post-disaster rebuilding.

7. Promote intelligent development.

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# SECTION 2: HAZARD IDENTIFICATION AND VULNERABILITY ANALYSIS

This section represents a hazard and vulnerability analysis, through a comprehensive HVA assessment commissioned by the County done in 2013. As part of the LMS2020 Update, the LMS HVA Subcommittee reviewed the following plans, studies, reports, and technical information, and provided updated information to be added to Section 2:

- Florida State Hazard Mitigation Plan Drafts (2017)
- *2016 Palm Beach County Supplemental Summary*, Statewide Regional Evacuation Study, Palm Beach County Appendix (technical data update report on demographics, regional hazard analysis, and regional vulnerability and population analysis)
- *The Favorability of Florida's Geology to Sinkhole Formation* (June 2017)
- State of Florida Mitigation Goals and Capabilities (2018 draft)
- Florida Repetitive Loss Strategy (2017 draft)

All other documents used in the creation of the comprehensive HVA assessment in 2013 are listed in Appendix A.

This section addresses, in part, the following FEMA requirements:

**Requirement: §201.6(b)(3):** The plan must document what existing plans, studies, reports, and technical information were reviewed.

**Requirement: §201.6(c)(2):** The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

**Requirement §201.6(c)(2)(i):** The risk assessment shall include a description of the type of all natural hazards that can affect the jurisdiction.

**Requirement §201.6(c)(2)(i):** The risk assessment shall include a description of the 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.

**Requirement §201.6(c)(2)(ii):** The risk assessment must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Requirement §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. This description shall include an overall summary of each hazard and its impact on the community.

## 2.1 Hazard Identification

**Section 2.1 and Table 2.1** list the general hazards to which PBC is vulnerable and indicates their projected impact potential across the entire spectrum of community exposure and services. **Section 2.1, Hazard Identification**, describes these hazards in detail and discusses countywide exposures; **Section 2.2, Vulnerability Assessment**, discusses specific vulnerabilities faced by the individual governmental entities, County and municipal, forming the PBC community. Vulnerability, probability, and risk assessments for the County and municipal jurisdictions, and a countywide impact analysis are contained in Appendix A**.** **Section 2.3, Risk Assessment**, describes the elements considered in the risk assessment process. Hazard & Risk Assessment Maps and potential loss values for PBC and each jurisdiction are located in Appendix G and Section 2B. The majority of hazards in PBC affect most areas of the county equally. However, there are a few that maybe more concentrated in one (1) area of the county. For example, a Herbert Hoover Dike Breach would cause more severe damage to the western communities. For the purpose of this document, the County has been divided into four (4) geographical areas: Northern Palm Beach, Southern Palm Beach, Western Palm Beach, and Coastal PBC.

In each of the hazards identified and defined, the latest occurrence of that event hazard is listed. For example the last major hurricane to PBC was in 2017.

In addition, the charts will show probability of occurrence and impact. These are rated as low, under 5% chance of occurring, medium, 5% - 15% chances of occurring, or High, greater than 15% chance. These rating correspond with the information in the charts.

Each disaster affects PBC differently based on the severity and scope of the disaster and where it occurred in the County. While impacts to structures, infrastructure, people, and the environment will be addressed within each individual hazard, in most cases unless the disaster is significant, (major or catastrophic), in duration and destruction, impact will be minimal and can be handled with resources within the County. If not specifically discussed in the hazard, it is assumed that there would be no or minimal impact to the to the County.

The charts in Appendix A will provide additional information on impacts.

Disasters are classified by the magnitude of their effect. The recognized classification system is as follows:

- Minor Disaster - Any disaster that is likely to be within the response capabilities of local government and results in only minimal need for state or federal assistance. The damage level to life and property is minimal and can be controlled and contained with resources within the municipality, or county in which they occurred.
- Major Disaster - As defined under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C 5122) a major disaster is any natural catastrophe (earthquakes, explosion, fire, flood, high water, hostile actions, hurricanes, landslide, mudslide, storms, tidal wave, tornado, wind-driven water, snowstorms, or drought), or, regardless of cause, any fire, flood, or explosion, in any part of the United States, which in the determination

of the President causes damage of sufficient severity and magnitude to warrant disaster assistance under this Act to supplement the effort and available resources of States, tribes, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby.

- Catastrophic Disaster – A disaster event that results in large numbers of deaths and injuries; causes extreme damage or destruction of facilities that provide and sustain human needs; produces an overwhelming demand on the state and local response resources and mechanisms: causes a severe long-term effect on general economic activity; and severely affects state; local, and private sector capabilities to begin and sustain response activities.

The hazards identified in **Table 2.1** and discussed in **Section 2.1** are organized based on their maximum projected impact potential. This means that hazards capable of producing the maximum community-wide impact, such as hurricanes and floods, are discussed first. This does not mean other identified hazards are less important or less worthy of mitigation, it simply means that their potential to affect the total community is lower.

Table 2.1

*Identification and projected impact potential for hazards*

| **Hazard Category** | **Projected Impact Potential** | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Excessive Wind** | **Excessive Water** | **Damaging hail** | **Soil/beach erosion** | **Electric power outage** | **Surface and air transportation** | **Navigable waterway impairment** | **Potable water system loss or disruption** | **Sewer system outage** | **Telecommunications system outage** | **Human health and safety** | **Psychological hardship** | **Economic disruption** | **Disruption of community services** | **Agricultural/fisheries damages** | **Damage to critical environmental resources** | **Damage to identified historical resources** | **Fire** | **Toxic releases** | **Stormwater drainage impairment** |
| NATURAL | | | | | | | | | | | | | | | | | | | | |
| Flood | | √ | | √ | √ | √ | √ | √ | √ | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Hurricane/Tropical storm | √ | √ | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| Tornado | √ | | | | √ | √ | | | | √ | √ | √ | √ | | | | | | | |
| Severe thunderstorm | √ | √ | √ | | √ | √ | | | | √ | √ | √ | √ | | | | | √ | | √ |
| Drought | | | | | | | | | | | | | √ | | √ | √ | | √ | | |
| Temperature extremes | | | | | √ | | | | | | √ | √ | √ | | √ | √ | | √ | | |
| Agricultural pest/disease | | | | | | | | | | | √ | √ | √ | | √ | √ | | | | |
| Wildfire | | | | | √ | √ | | | | √ | √ | √ | √ | √ | √ | √ | | √ | √ | |
| Muck Fire | | | | | | √ | | | | | √ | | √ | | √ | √ | | √ | √ | |
| Soil/beach erosion | | | | √ | | | √ | | | | | | √ | | | √ | | | | √ |
| Seismic hazards | | | | | | √ | | | | | | | | | | | | | √ | |
| Sea Level Rise | | √ | | √ | | √ | √ | √ | | | | | √ | √ | √ | √ | √ | | | √ |
| Geologic | | | | | | √ | √ | √ | | | | | √ | | | | | | √ | |
| Pandemic | | | | | | | | | | | √ | √ | √ | √ | | | | | | |

| Hazard Category | Projected Impact Potential | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Excessive Wind** | **Excessive Water** | **Damaging hail** | **Soil/beach erosion** | **Electric power outage** | **Surface and air transportation** | **Navigable waterway impairment** | **Potable water system loss or disruption** | **Sewer system outage** | **Telecommunications system outage** | **Human health and safety** | **Psychological hardship** | **Economic disruption** | **Disruption of community services** | **Agricultural/fisheries damages** | **Damage to critical environmental resources** | **Damage to identified historical resources** | **Fire** | **Toxic releases** | **Stormwater drainage impairment** |
| TECHNOLOGICAL | | | | | | | | | | | | | | | | | | | | |
| Herbert Hoover Dike Breach | | √ | | | | | √ | | √ | | √ | √ | √ | √ | √ | √ | | | | √ |
| Hazardous material accident | | | | | | √ | | | | | √ | √ | √ | | | | | √ | √ | |
| Radiological accidents (nuclear power plant) | | | | | | √ | √ | | | | √ | √ | √ | √ | √ | | √ | | | √ |
| Communications failure | | | | | | | | | | | √ | | | √ | √ | | | | | |
| Hazardous material release | | | | | | √ | | | | | √ | √ | √ | √ | | | | √ | √ | |
| Transportation accident | | | | | | √ | √ | | | | √ | | √ | √ | | | | √ | | |
| Wellfield contamination | | | | | | | | √ | √ | | √ | √ | √ | √ | | | | | | |
| Power failure (outage) | | | | | √ | √ | | √ | √ | √ | √ | √ | √ | √ | | | | | | |
| HUMAN CAUSED | | | | | | | | | | | | | | | | | | | | |
| Civil disturbance | | | | | | √ | | | | | √ | √ | √ | √ | | | √ | | | |
| Domestic Security: Terrorism, sabotage, and cyber attacks | | | | | √ | √ | | √ | | √ | √ | √ | √ | | | √ | √ | √ | √ | |
| Mass migration | | | | | | | | | | | √ | √ | √ | √ | | | | | | |
| Workplace/ school violence | | | | | | | | | | | √ | √ | √ | √ | | | | | | |

### 2.1.1 Natural Hazards

#### 2.1.1.1 Flooding

Frequencies from flooding associated with rain events other than tropical storms and hurricanes are more difficult to estimate. Eastern Florida shows an annual dry cycle stretching from early November through mid-May. During this part of the year, monthly rainfall rarely exceeds 2.5 to 4.0 inches per month. The wet season, beginning in mid-May and running through late October, shows monthly rainfall levels in the area to be 6.0 to 8.5 inches. Heaviest rainfall usually occurs in June and September. In PBC, the eastern or coastal section of the County receives more rain than the western section, however, all of PBC can be affected by flooding. This rainfall pattern coupled with the hurricane season (June through November) makes PBC particularly vulnerable to flooding associated with late season tropical storms and hurricanes because they typically occur when the water table is high and the ground is saturated. Based strictly on the historical flooding events presented below, the probability of even a minor flooding event somewhere in PBC over the past 10 years tends to lean towards at least once annually. More information is available through the DEM webpage accessible at: [http://pbcgov.com/flood](http://pbcgov.com/flood).

**Historical Flooding Events**

*Flood of fall 1947*. This flood is generally considered to be the most severe flood recorded in southern Florida. Heavy rainfall, including the rains from two (2) hurricanes, occurred over a period of five (5) months. Many parts of PBC were flooded for months and there was extensive damage to dairy pastures and agriculture in general. Such a flooding event would be much more significant today because of the increase in land development.

*Flood of October 1952*. As occurred in 1947, this flood was preceded by five (5) months of heavier than normal rainfall, which included a tropical storm in October. June through October rainfall was approximately 48 inches. Damage was heaviest in the beef cattle industry, with extensive losses of improved pasture land that required supplemental feeding of cattle. Vegetable growers and dairy farmers also suffered significant losses as a result of this flood.

*Rains of January 1957*. On January 21, 1957, PBC received nine (9) to 21 inches of rainfall within a 24-hour period. There was severe flooding in the vegetable garden areas of the County and much crop damage. Some fields had to be pumped out. Local crop damage was estimated at $1,000,000.

*Flood of June 1959*. Heavy rains fell across most of central Florida from June 17 to 21. These rains were associated with and followed a tropical depression, and caused extensive flooding in poorly drained, low-lying agricultural areas and some residential sections. Considerable pasture land and some citrus land in PBC were inundated. Some highways also sustained damage from these flood waters.

*Rains of October 1966*. On October 22, 1966, heavy rains ranging from eight (8) to ten (10) inches over a 24-hour period destroyed approximately 4,200 acres of vegetable crops.

*Rains of March 1982*. On March 28-29, 1982, PBC was subjected to a severe coastal storm with heavy rains and high winds. Lantana measured 16 inches of rain over a 24-hour period. High seas sunk a Haitian freighter and a total of 11 people were drowned.

*The Great Thanksgiving Holiday East Coast Storm of 1984*. A strong low-pressure system developed east of Florida and coupled with a high-pressure system to produce an extremely strong pressure gradient leading to gale force winds and high seas along the entire Florida east coast. Heavy rains fell over most of central Florida, and this surface runoff, coupled with the wind packing of seawater along the coast resulted in extensive coastal erosion and flooding. Many coastal structures were damaged or destroyed, including several in PBC.

*Flood of January 1989.* On January 21 - 22 1989, PBC experienced a gale with subtropical storm characteristics that caused extensive beach erosion and dropped four (4) to six (6) inches of rain across the County. This caused ponding of water in low-lying areas. Several homes and a motel were damaged. Road flooding caused several accidents.

*The Unnamed Storm of October 1995*. Almost exactly one (1) year after the Hurricane Gordon flooding incident in 1994, a stalled frontal system dropped over 15 inches of rain on PBC over a period of 29 hours. In the intervening year between these two (2) events, some communities in PBC had conducted a number of mitigation projects and initiatives designed to improve drainage and prevent flooding in known flood prone areas. These mitigation projects and initiatives undoubtedly reduced the extent of flooding and flood related damages during the 1995 flooding event, nevertheless, the County did experience significant flooding again in 1995.

*Unnamed Storm of January 1999*. On Saturday, January 2, 1999, a cold front stalled over the northern part of PBC. Warm, moist air from the Bahamas became entrained in this frontal system and produced a localized, intense rain event in northern PBC. Initial reports indicated 21 inches of rain in a 12-hour period. This later turned out to be an erroneous reading from the recording instrument involved; however, it is generally recognized that between 18 and 22 inches of rain fell in the northern third of the County over a 12 to 18 hour period. Flooding was even more extensive than in the 1995 event, but it is interesting to note that many areas where flooding mitigation projects had been implemented remained dry, or showed a minimum of damage compared to areas where planned mitigation had not yet been implemented. Hardest hit were the Riviera Beach and Lake Park jurisdictions with a total of over $6,000,000 damage between them. Flooding was extensive along Northlake Boulevard. Erosion caused the collapse of a portion of I-95 that was under construction. **Table 2.2** shows the final damage assessment in PBC from this storm.

*Record Rainfall June - July 2002.* On July 14, 2002, a record 27 consecutive days of rain concluded. The combined June - July rainfall total was six (6) inches below the all-time record. June rainfall was 20.16" (12.5% above normal). The County experienced five (5) days of one (1) inch or more rain. The water level in Lake Okeechobee rose to 12.57 feet. Because this rainy period was preceded by an extended dry period and rains were spread over several days, flooding was limited to street flooding.

*Hurricane Frances September 4, 2004*. A maximum storm-total rainfall amount of 12.56 inches was measured at West Palm Beach International Airport with 10.26 inches occurring in a 24-hour period. Unofficial storm-total rainfalls included 9.56 inches at Boynton Beach, eight (8) inches at Deerfield Beach and 7.18 inches at the Hillsboro Canal. Widespread storm-total amounts of three (3) to five (5) inches occurred in southeast and interior south Florida with southwest Florida averaging one (1) to three (3) inches. Rainfall flooding was mostly minor except for a few locations in PBC, which had up to three (3) feet of standing water. A section of I-95 in PBC was closed due to a large sinkhole. Within the confines of the Herbert Hoover Dike, water levels on Lake Okeechobee fluctuated up to five (5) feet above and below normal.

*Hurricane Jeanne September 25, 2004.* A South Florida Water Management District (SFWMD) gauge measured a maximum storm-total rainfall amount of 10.22 inches over the eastern portion of Lake Okeechobee. A SFWMD gauge about four (4) miles west of West Palm Beach International Airport measured 9.10 inches with 8.79 inches of that occurring in a 24-hour period. At Moore Haven, 5.99 inches of rain was measured. Widespread storm-total amounts of one (1) to four (4) inches occurred in most of southeast and interior south Florida with Miami-Dade County and Collier County averaging one-half (1/2) to one (1) inch. Mostly minor rainfall flooding was observed except locally in Palm Beach Gardens, Jupiter and in the farmlands of western PBC where it was more severe. Within the confines of the Herbert Hoover Dike, water levels on Lake Okeechobee fluctuated up to seven (7) feet above and below normal causing severe flooding of some marinas.

*Flood of June 5, 2005.* Eight (8) inches of rain in three (3) hours caused flooding in streets and businesses in Boca Raton and in Highland Beach. Cars were stalled and Federal Highway was closed for a nine-block section from NE 20 to NE 29 Street.

*Hurricane Wilma October 24, 2005.* Rainfall amounts across South Florida generally ranged from two (2) to four (4) inches across southern sections of the peninsula to four (4) to six (6) inches across western Collier County and around Lake Okeechobee, with a maximum amount of 7.21 inches in Clewiston. There was scattered street flooding.

*Flood of December 14, 2006.* A slow-moving low-pressure trough caused very heavy rains and significant flooding over parts of PBC. West Palm Beach International Airport received a total of 8.21 inches of rain ending at 7 PM on December 15. Other locations in Central and Southern PBC received between six (6) and eight (8) inches of rain. Northern Broward County received lesser amounts in the two (2) to three (3) inch range. Several streets and roads were closed in the city of West Palm Beach, with water reaching up to three (3) feet deep in some areas. Hardest hit was the neighborhood of Pineapple Park. Many vehicles were stranded in the deep water, with local police receiving about 120 calls for assistance. No significant damage was reported to property despite water entering homes and businesses. Florida Power and Light reported 20,000 customers without power during the afternoon and early evening hours. Shelters were opened for people left homeless by the floods, but only five (5) people arrived as of 8:20 PM.

*Flood of January 22, 2008.* Intense rains affected Boynton Beach and the northwest section of Delray Beach during the late afternoon and evening hours of January 22. Maximum observed rainfall amounts were between four (4) and six (6) inches in Boynton Beach, although Doppler radar estimated as much as ten inches of rain fell in just over three (3) hours. Numerous reports of flooding were reported. A trained spotter reported water getting into houses in the corridor west of Federal Highway and east of Congress Avenue between Boynton Beach Boulevard and Woolbright Road. Water rose to as high as two (2) feet along sections of Congress Avenue. Significant flooding was reported at the parking lot of Boynton Beach mall. The I-95 on-ramp at Gateway Boulevard was closed due to the water depth, as were sections of Boynton Beach Boulevard. Dozens of vehicles stalled and 40 traffic accidents were reported due to the rain and standing water. The combination of a mid and upper level trough moving east across South Florida and a developing warm frontal boundary provided the necessary atmospheric conditions for intense rains and flooding in the Boynton Beach area on January 22.

*March 22, 2008.* Heavy rain across the Wellington area produced multiple reports of knee-deep water in yards and across roadways. Heavy rain across central portions of PBC including the Wellington area produced flooded roads and water approaching a structure.

*May 24, 2008.* Flooding reported at the intersection of Linton Boulevard and Congress Avenue making the intersection impassable. Flooding also reported along Nassau Street with water intruding into some homes. Flood waters were near two (2) feet deep at some locations. A shortwave moved across South Florida during the afternoon hours allowing multiple severe thunderstorms to develop across southeast Florida. A total of 8,200 customers lost power due to the severe thunderstorms in the three-county area of Palm Beach, Broward and Miami-Dade counties.

*March 21, 2009*. A warm front lifted north through South Florida during the day of March 21. Unstable air south of the front combined with warm temperatures to produce strong and severe thunderstorms over PBC. About 5,000 customers lost power. Significant flooding was reported in the Palm Beach Gardens and North Palm Beach areas. Flooding was most severe in the area of Pearl Street and Riverside Drive, and along US 1 near PGA Boulevard. Water reached the windows of cars in some cases. The flooding along US 1 was exacerbated by construction on the highway.

*August 14, 2010*. Strong and slow-moving thunderstorms produced flooding in the Jupiter area due to light atmospheric flow and copious moisture. A spotter reported severe street flooding in Jupiter and the closing of Central Boulevard and Indian Creek Parkway. Rainfall of 2.75 inches reported within 45 minutes.

*October 28, 2011*. A weak frontal boundary across South Florida, in combination with a flow of deep tropical moisture from the western Caribbean Sea associated with the remnant of Hurricane Rina, led to periods of very heavy rain and significant flooding lasting the better part of four (4) days. An estimated 2,000 customers lost power across South Florida due to the rain. Rainfall amounts of six (6) to nine (9) inches fell over southeastern PBC in less than six (6) hours, leading to numerous reports of flooded streets and some road closures. No reports were received of water entering structures.

*August 26, 2012*. Tropical Storm Isaac moved west-northwest across the Florida Straits south of the Florida Keys on August 26. The northern edge of the wind and rain area associated with Isaac affected the South Florida peninsula throughout the day on the 26th. Isaac continued on a west-northwest track into the Gulf of Mexico on the 27th with winds, rain and flooding continuing over parts of South Florida. Moderate to severe flooding affected a large portion of metro PBC west of the Florida Turnpike. Hardest hit communities include The Acreage, Royal Palm Beach, Loxahatchee and Wellington. Canals were overtopped and communities were stranded by high water for several days after the rains stopped. Few homes suffered water damage, but major damage was sustained to infrastructure, including roads and water management structures. Rainfall amounts as high as 16 inches were measured in Royal Palm Beach and Loxahatchee, with estimates in excess of 18 inches in a two-day period.

*August 27, 2012*. Flooding persisted over the western communities of PBC through the end of August as a result of torrential rains from Tropical Storm Isaac, which occurred on August 26 and 27.

It is important to note that many of the areas that experienced heavy flooding in both the 1994, 1995, and 2012 rainfall events were not in designated flood zones. For those areas where the Flood Insurance Rate Maps (FIRM) did indicate a flooding hazard, these two events both exceeded the 100-year storm levels and occurred back-to-back. The 1999 event was extremely localized, but rainfall exceeded all previous records in specific areas, and was beyond the design capacity of virtually all drainage systems in the County.

Often when these types of intense rainfall events occur, streams and drainage ditches tend to reach peak flood flow concurrently with tidal water conditions associated with coastal storm surge. This greatly increases the probability of flooding in the low-lying areas of the coastal zone. Areas along the Intracoastal Waterway are particularly susceptible to flooding under these conditions. The most flood prone areas in the eastern portion of PBC poorly drained soils, a high water table, and relatively flat terrain; all of which contribute to their flooding problems. Flat terrain and heavily wooded areas aggravate flood problems by preventing rapid drainage in some areas.

*January 9, 2014*. During the night of Thursday, January 9, 2014, several mesoscale meteorological factors combined to produce torrential rainfall across portions of coastal PBC over a rather short period. From roughly 8:00 p.m. until midnight, several locations received over 12 inches of rain in just those few hours, with one (1) mesonet site just west-southwest of Hypoluxo receiving an astonishing 22.21 inches during the same time frame according to National Oceanic and Atmospheric Administration (NOAA).

In addition, heavy rains continue for 12 hours causing major flooding in the Kings Point area, at Atlantic Avenue and Jog Road in suburban Delray Beach.

Estimated rainfall totals in that area were almost 12 inches, according to the SFWMD. A number of homes sustained minor damages and a presidential declaration was sought but not granted due to the damage not meeting federal threshold guidelines.

*October 21, 2014.* During the afternoon hours, portions of coastal PBC were inundated with flooding rains for the second time this year. Although this event was not near to the magnitude of the flood event in January, it did produce copious amounts of rainfall over a short period. Many roads were blocked which left motorists stranded. Portions of metro PBC received anywhere from one (1) to three (3) inches of rainfall while some coastal locales received nearly 10 inches. The worst impacted areas were between downtown West Palm Beach and Riviera Beach where many roads became flooded and impassable.

*March 24, 2016.* A combination of daytime heating, deep moisture, and a passing upper level system lead to numerous afternoon showers and thunderstorms across South Florida, especially across the east coast metro areas. Heavy rainfall from training storms also brought flooding across southern PBC. Heavy rainfall fell across northern Broward and southern Palm Beach counties during the afternoon hours. Flooded roadways were reported in Boca Raton, including portions of US1//Federal Highway. Numerous cars were stalled along flooded roadways. Flood damages were sustained to several buildings including the library on the camps of Florida Atlantic University in Boca Raton. Flood damages were also sustained to the Boca Raton city hall where water came in through damages to the roof during the heavy rainfall and lead to a couple of inches of water in the first floor main hallway. Water damage was also reported in the Town Center at Boca Raton. Rainfall amounts measured around five (5) to six (6) inches of rain in six (6) hours across the region.

*June 3-9, 2017.* A disturbance meandered across the Gulf of Mexico and led to nearly a week of heavy rainfall across South Florida. The storm set a record rainfall in PBC, breaking the 1904 record set in West Palm Beach with 4.18 inches of rain. During the entire week, over 8.54 inches of rain fell, but only caused street flooding. The county did not experience flooding inside houses, as the flood control measures were successful in handling the rain amounts, although street flooding was common during this time.

*Hurricane Irma September 10-11, 2017.* Hurricane Irma, while causing millions of dollars of damage to the State of Florida as it tracked through the Florida Keys, north across the Gulf coast, and then across the state towards Jacksonville, surprisingly did not cause an issue with flooding damage in PBC. It is acknowledged that mitigation efforts over the years are likely reducing the amount of flooding during these fast-moving rain events, and only wind damage was sustained.

**Flood Water Sources and Frequency of Occurrence**

Sources of flood waters in PBC include:

- The Atlantic Ocean
- The Intracoastal Waterway
- Lake Okeechobee
- The West Palm Beach Canal

- The Hillsboro Canal
- The North New River Canal
- The Miami Canal

Major water retention areas include:
- Corbett Wildlife Management Area
- Loxahatchee Wildlife Refuge and WCA No. 2
- The Rotenberger/Holey Land Area

Floodplains designated on the FIRM are based on the 1% annual flood chance or the 100-year flood event. The 500-year flood event with a 0.2 % annual chance of occurrence is used to designate other areas of the community, which may have some vulnerability to flooding. Additional flood information is addressed in **Section 2.2.1.2**. The PBC Flood Insurance Rate Maps are were updated and went into effect October of 2017.

Table 2.2

*Final damage assessment from the January 1999 storm.**

| Jurisdiction or Geographic Area | Number of Structures Damaged | Residential and Business Loss | Public Infrastructure Loss | Total Jurisdiction Loss |
|---|---|---|---|---|
| Unincorporated Palm Beach County | 94 | $884,000 | $119,655 | $1,002,655 |
| Lake Park | 2 | $2,008,200 | $67,000 | $2,075, 200 |
| Riviera Beach | 201 | $2,927,075 | $28,000 | $2,965,075 |
| Palm Beach Gardens | 126 | $675,400 | $12,000 | $688,400 |
| North Palm Beach | 25 | $40,000 | B | $40,000 |
| North Jupiter | 1 | B | B | -- |
| Northern Palm Beach Improvement District | B | B | $51,000 | $51,000 |
| Total County Losses | 460 | $7,524,675 | $288,655 | $7,822,220 |

* Data from DEM.

As a relatively flat, low lying, heavily developed coastal county that experiences frequent intense rain events and periodic tropical storms, PBC is especially susceptible to flooding. Flooding in the County has historically taken one (1) of the following forms:

1. Flash flooding resulting in the rapid buildup of flood waters from intense localized precipitation that exceeds drainage capacities
2. General flooding resulting from a buildup of water levels over time
3. Water body overflows resulting from excessive rainfall or water management actions
4. Coastal surge flooding driven by storm-force winds
5. Dike breaches or overtopping related to major rain and tropical storm events

Causes of Local Flooding

Significant factors contributing to inland flooding include rainfall intensity, rainfall frequency, rainfall duration, surface conditions, topography, and inadequate natural drainage.

The County's torrential rains, low and flat terrain, and large number of inland water bodies, conspire to create a significant probability for inland flooding. An additional, increasingly significant, contributing factor is rapid water runoff associated with the vast areas of impervious surfaces created by new development, creating flood prone areas where they did not previously exist.

In urban areas, grates and drains can become overtaxed or blocked with debris, leaving no space for excess water to enter drainage and sewer systems. According to the SFWMD, "Many new residents to PBC are alarmed when they see standing water in streets or driveway swales. In other places, that could be a cause for concern, but in our region, it's something you can expect to see after a soaking summer shower."

The County averages over 60 inches of rain a year and more than 130 rain days, with most of it coming between the months of June and November. Most developed areas are clustered along the coasts or near large waterways. Virtually flat, with most areas at or only slightly above sea level, even moderate rains can accumulate quickly.

The Water Management Challenge

Rainfall has been critical to South Florida's history, feeding its natural wetlands and refreshing surface-water and groundwater reservoirs. Its water management issues differ from those of most other areas in the country. Where most areas are concerned with protecting "scarce" water resources, South Florida's challenge is managing an overabundance of surface water. In order to drain and manage the excess water, hundreds of miles of canals, dikes, and levees have been built. Water management policies have created agricultural, tourism, and real estate industries whose success has fueled the state's population growth and taxed the seemingly abundant water supply. Now choices must be made between further population growth, environmental protection, and an adequate, safe water supply.

The area's high hydrologic variation, low physical relief, and limited storage and conveyance capacities, make water management challenging. A delicate balance must be struck, dealing with extremes: flooding versus drought and open land versus crowded urban areas. Actions range from enforcing water restrictions during dry periods to precautionary or emergency flood management during wet periods and storm events. With annual rainfall averaging over 60 inches (but varying widely), and more than 50% occurring in four (4) months (June to September) and with the rainy season necessitating the movement of water away from populated areas for flood control and the storage of excess water necessary to meet population needs and demands during dry periods, water management is a complex challenge.

County Elevations

Terrain throughout the County is relatively level. The mean elevation is 15 feet above sea level. Ocean coastal beachfront gradually slopes up to a dune line with top elevations of 12 to 23 feet. From the dune line there is a gradual downward slope to lake and inland waterway frontage with a width of from a few hundred feet to a half mile. From there, land slopes upward to a coastal ridge then downward to elevations of five (5) to twelve feet in a drainage valley. Further inland, elevations remain relatively stable.

Primary Surface Water Areas

Lake Okeechobee, the largest fresh water lake after the great lakes, is South Florida's primary water reservoir. Approximately 250 square miles of the lake are within the geographical boundaries of PBC. Other sizeable bodies of water include Lake Mangonia (540 acres) and Clear Lake (401 acres) in West Palm Beach and Lake Osborne (356 acres) in southern Lake Worth Beach and northern Lantana. The West Palm Beach Canal connects Lake Okeechobee and Lake Worth Beach. A vast network of canals is interconnected with the West Palm Beach Canal. A system of lakes runs north and south within eight (8) miles of the east coast. The Loxahatchee River system is located in the northern section of the county and is interconnected with the Loxahatchee Slough.

The map on the following page shows the relative distribution of primary surface water areas within PBC.

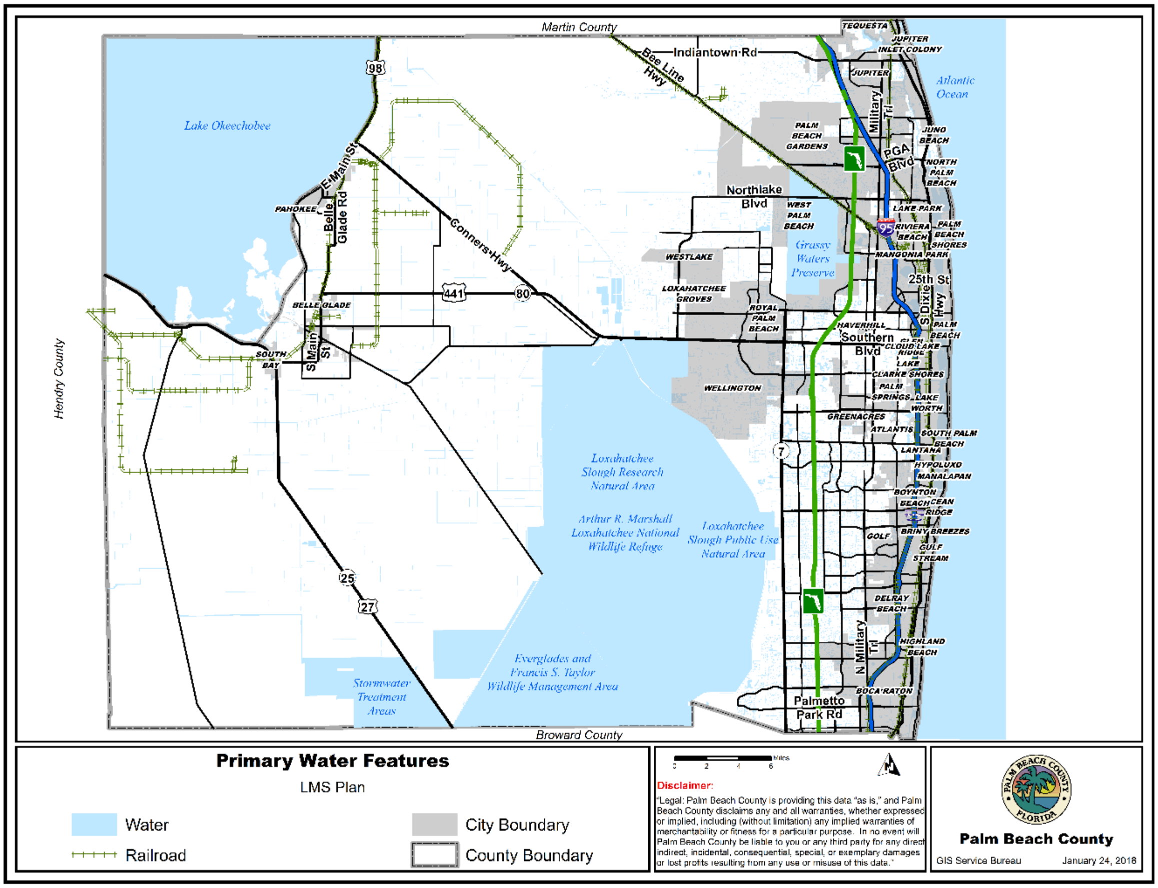



*Figure 2.1*: Surface water areas in PBC

Natural & Beneficial Flood Water Storage Areas

The following areas, designated as "Environmentally Sensitive lands" are undisturbed natural areas of PBC that act as natural storage areas for flood waters, reduce the possibility of flooding nearby residences, and help to recharge the groundwater aquifer.

Table 2.3

*Environmentally Sensitive Lands/Natural Water Storage Areas in PBC*

| NAME | TOTAL ACRES |
|---|---|
| Acreage Pines Natural Area | 115.61 |
| Arthur R. Marshall Loxahatchee National Wildlife Refuge | 143953.77 |
| Blazing Star Preserve | 24.14 |
| C-18 Triangle Natural Area | 138.7 |
| C-51 and L-8 Reservoir | 1263.73 |

| | |
|---|---|
| Carlin Park | 120.31 |
| Coral Cove Park | 31.42 |
| Cypress Creek Natural Area | 2083.12 |
| Cypress Creek/Loxahatchee | 3547 |
| Cypress Knee Slough Preserve | 29.31 |
| Delaware Scrub Natural Area | 15.8 |
| Delray Oaks Natural Area | 24.5 |
| DuBois Park | 18.69 |
| Dupuis Reserve | 21891.61 |
| East Coast Buffer | 20757.95 |
| East Conservation Area | 195.93 |
| Everglades Agricultural Area | 52125.5 |
| Everglades and Francis S. Taylor Wildlife Management Area | 671831 |
| Florida Atlantic University Ecological Site | 91.6 |
| Frenchman's Forest | 173.15 |
| Gentle Ben Flowage Easement | 334.81 |
| Gopher Tortoise Preserve (City of Boca Raton) | 8.8 |
| Grassy Waters Preserve | 12800 |
| Green Cay Nature Center and Wetlands | 100 |
| Gumbo Limbo Environmental Complex | 20 |
| Herbert Hoover Dike | 774.8 |
| High Ridge Scrub Natural Area | 39.26 |
| Holey Land Wildlife Management Area | 35350 |
| Hungryland Slough Natural Area | 2895.29 |
| Hungryland/SFWMD Parcels | 7859.99 |
| Hypoluxo Scrub Natural Area | 96.71 |
| Indian Mounds | 436.25 |
| J. W. Corbett to Loxahatchee NWR Connector | 35 |
| J. W. Corbett Wildlife Management Area | 60348 |
| Jackson Riverfront Pines Natural Area | 3.01 |
| John C.& Mariana Jones/Hungryland Wildlife & Environmental Area | 12735 |
| John D. MacArthur Beach State Park | 437.57 |
| Jonathan Dickinson State Park | 11458.68 |
| Juno Dunes Natural Area | 577.7 |
| Juno Park | 18.2 |
| Jupiter Beach Park | 46.49 |
| Jupiter Inlet Lighthouse Outstanding Natural Area | 126.28 |
| Jupiter Mangroves Natural Area | 0.92 |
| Jupiter Ridge Natural Area | 271.32 |

| | |
|---|---|
| Lake Harbor Tract | 632 |
| Lake Okeechobee Connector | 7.73 |
| Lake Park Scrub Natural Area | 54.93 |
| Leon M. Weekes Environmental Preserve | 12 |
| Limestone Creek Natural Area | 51.62 |
| Loggerhead Park | 17.26 |
| Loxahatchee Slough Natural Area | 12838.32 |
| Loxahatchee Slough Public Use Natural Area | 640 |
| Loxahatchee Slough Research Natural Area | 2560 |
| Lynn University Scrub | 11.46 |
| Morikami Museum and Japanese Gardens | 188.53 |
| North Jupiter Flatwoods Natural Area | 146 |
| North Ocean Ridge Mangroves Natural Area | 8.69 |
| Ocean Ridge Hammock Park | 8.54 |
| Ocean Ridge Natural Area | 12.35 |
| Okeeheelee Park North | 900 |
| Okeeheelee Park South | 812 |
| Pahokee Marina and Campground | 30 |
| Paw-Paw Preserve | 3 |
| Pine Glades Natural Area | 6641.98 |
| Pine Jog Environmental Education Center | 150 |
| Pond Cypress Natural Area | 1736.18 |
| Pondhawk Natural Area | 78.7 |
| Radnor | 153.7 |
| Red Reef Park | 67 |
| Riverbend Park | 680 |
| Rosemary Ridge Preserve | 7.29 |
| Rosemary Scrub Natural Area | 13.59 |
| Rotenberger Wildlife Management Area | 29297 |
| Royal Palm Beach Pines Natural Area | 773.23 |
| Seacrest Scrub Natural Area | 53.69 |
| Serenoa Glade Preserve | 9 |
| Snook Islands Natural Area | 117.65 |
| South Beach Park | 24.77 |
| South County Regional Park | 314.46 |
| South Inlet Park | 11.1 |
| Spanish River Park | 94.4 |
| Stormwater Treatment Areas | 47605.32 |
| Strazzulla Tract | 2701 |
| Sweetbay Natural Area | 1094 |

| | |
|---|---:|
| Wellington/Acme Marsh | 363.61 |
| Winding Waters Natural Area | 550.01 |
| Yamato Scrub Natural Area | 216.7 |
| TOTAL AREA (in acres) | 1,176,895.73 |

The map below shows these natural and beneficial flood water storage areas:

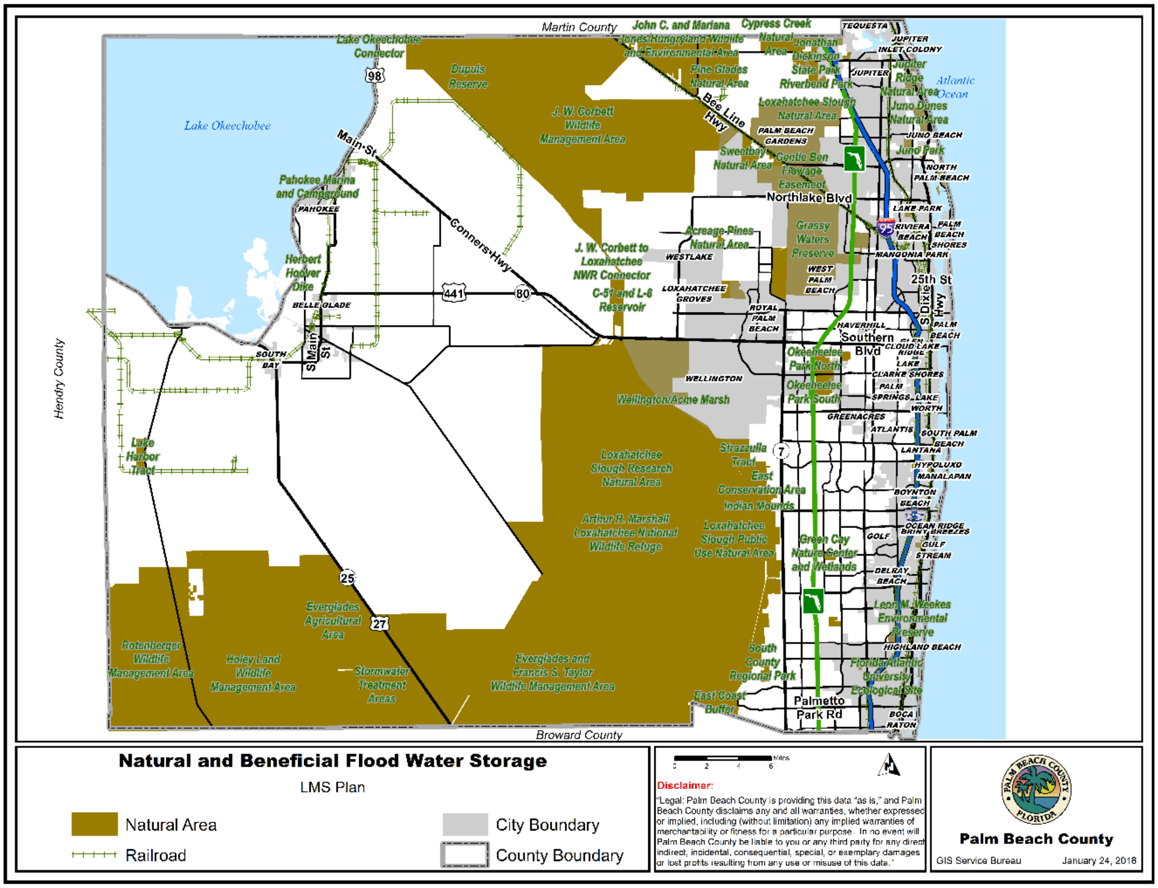



*Figure 2.2*: Natural and Beneficial Flood Water Storage

Flood Prone Areas

Flood prone areas are widely scattered throughout the county. Areas close to inland bodies of water and lower elevation areas in the northern and southern sections of the county are particularly susceptible to inland flooding.

The map below depicts Special Flood Hazard Areas within the county designated by FEMA as having a 1% chance of inundation in any given year. While some areas of the county might believe they are immune from flooding based on recent history, published elevations, and/or designations on FIRMS, virtually the whole county has proven to be susceptible to short term localized flooding when extraordinary rain events have exceeded the capacity of natural runoff and absorption.

A review of recent flood events suggests that PBC significantly surpasses the national average of 25% of flooding occurring outside of Special Flood Hazard Areas (SFHA). Even a significant number of county properties designated as "repetitive flood loss list" by the NFIP lie outside SFHAs. The map below shows the SFHAs in PBC.

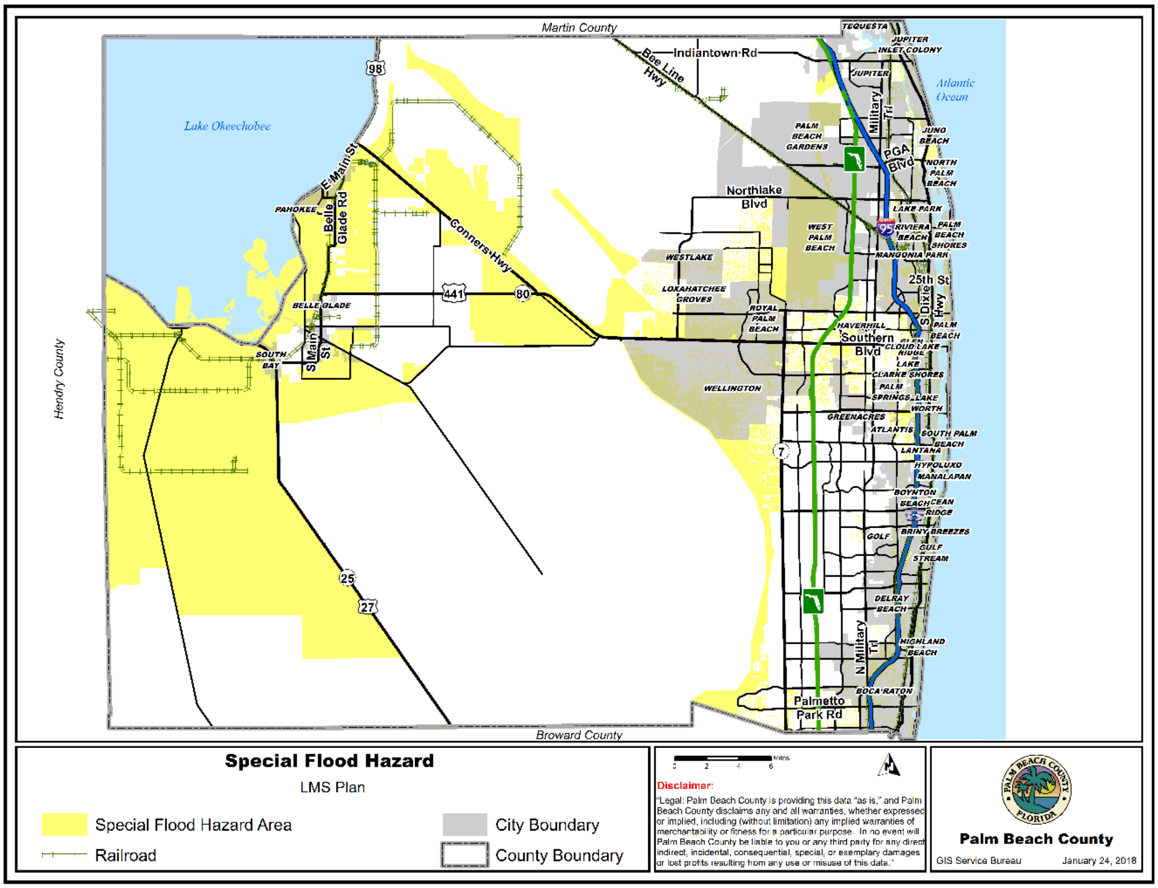



*Figure 2.3*: Special Flood Hazard Areas

Historically, the PBC rainfall area has the highest annual rainfall in South Florida, followed by Broward County and Miami-Dade rainfall areas. The county's east coast communities receive higher rainfall levels than the inland and western areas. Even during drought years, there have been instances where the coastal rainfall in eastern areas of the county were close to the average. Because there are no large impoundments in the eastern coastal rainfall areas, runoff has to be discharged into the Atlantic Ocean.

Flood Control

Flood control in PBC is dependent on a complex, integrated system of canals, waterways and flood control devices operated by the South Florida Water Management District, 20 drainage districts, and thousands of privately owned canals, retention/detention lakes and ponds.

The county's drainage system is designed to handle excess surface water in three (3) stages. The "neighborhood or tertiary drainage systems" (made up of community lakes, ponds, street and yard drainage grates or culverts, ditches, and canals) flow into the "local or secondary drainage system" (made up canals, structures, pumping stations, and storage areas) and then into the "primary flood control system" (consisting of South Florida Water Management District canals and natural waterways and rivers), ultimately reaching the Atlantic Ocean.

The Water Control Districts serving PBC include the following:

| South Florida Water Management District | |
|---|---|
| Acme Improvement District | Pahokee Drainage District |
| East Beach Water Control District | Pelican Lake WCD |
| East Shore Water Control District | Pine Tree WCD |
| Gladeview Drainage District | Ritta WCD |
| Highland Glades Drainage District | Seminole WCD |
| Indian Trail Improvement District | Shawano Drainage District |
| Lake Worth Drainage District | South Florida Conservancy District |
| Loxahatchee Groves WCD | South Indian River WCD |
| North Palm Beach Heights WCD | South Shore Drainage District |
| Northern PBC Improvement District | WPB Water Catchment Area |

South Florida Water Management District (an LMS member) has identified “areas of interest” within PBC, which are those places where frequent flash flooding and minor flooding events have been known to occur based on reports they have received and logged into a database over many years. The map below illustrates these “areas of interest”.

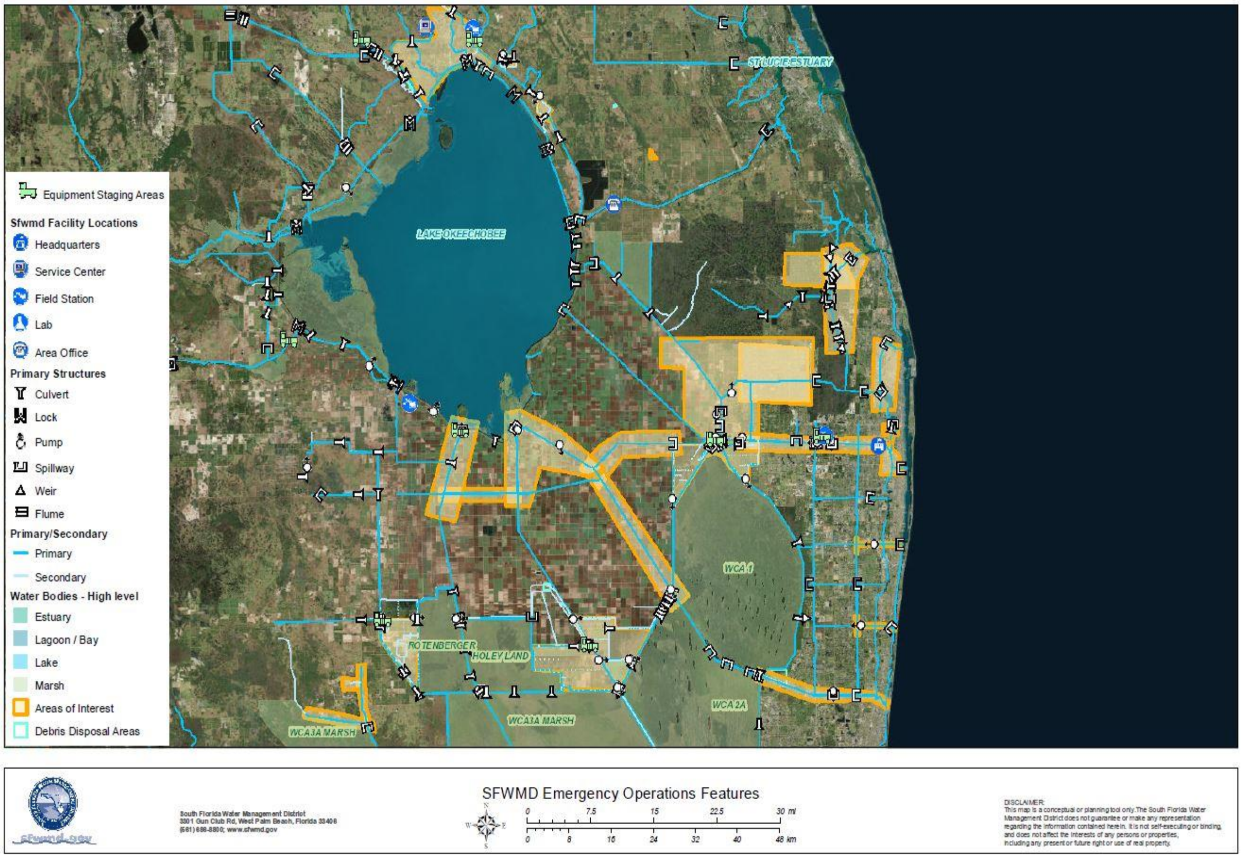



*Figure 2.4*: SFWMD Areas of Interest related to flood concerns

Drainage System Maintenance

The County's drainage systems consist of a combination of natural drainageways and channels, engineered channels, storm sewers and ditches, and detention/retention basins contiguous to drainage systems. These systems can easily lose their carrying capacity with debris accumulation, sedimentation buildup and/or vegetation growth, becoming ineffective for flood prevention. Extensive maintenance is necessary to ensure flood preparedness.

Responsibility for inspection and maintenance of drainage systems falls to a variety of organizations depending on the type of system involved:

- SFWMD and the various water control districts provide oversight for the routine inspection of the drainage systems under their purview, and for debris clearance and other maintenance activities.
- Storm drain maintenance falls within the purview of the County's Road & Bridge Division, municipal public works departments, and the State Department of Transportation.
- Inspection, clearance, and maintenance of privately owned systems are the responsibilities of property owners and associations.

In rare instances, environmental regulations may prohibit removing natural debris and new growth from some drainageways.

Maintenance activities most commonly include ongoing monitoring, debris and sediment removal, and the correction of problem sites and damaged systems by field crews. Quite often, maintenance actions are prompted by citizen complaints and reports. Given the sheer size of the County, the vigilance of citizens is a critical element in identifying potential drainage problems. The County has ongoing programs for structural and permanent changes to channels or basins (e.g. enlargement of openings, installation of grates to catch debris, installation of hard bank protection, construction of new retention basins, etc.) to reduce flooding and maintenance problems. Coastal communities commonly undertake a variety of maintenance measures including dune and mangrove preservation, bluff stabilization, and beach nourishment to protect coastal buildings, property, and coastal water bodies from flooding and erosion.

The county and municipalities work continuously to improve and maintain their stormwater management systems. Some of these projects are self-funded and others depend on grant support. Drainage improvement projects are among the most prevalent flood mitigation strategies reflected on the County's Local Mitigation Strategy prioritized project list.

<u>Vulnerability</u>

While damages caused by storm surge and dike failure can be extensive and costly, historically physical damages from inland structural flooding have been relatively minor and isolated. As a predominantly localized event, inland flooding does not pose a significant threat to the ability of the county, municipalities, and businesses to carry on normal operations.

People, structures, and infrastructure located within floodplains and areas with poor drainage are most susceptible to inland flooding, particularly to flash flooding. However, flash flooding can and does affect all areas of the county. Continued development will certainly contribute to an increased frequency of runoff flooding.

For the most part, flooding depths are not sufficient to inundate large residential and commercial areas. Developed parcels tend to be elevated to a level that limits significant water intrusion from water build-up. Where water does intrude structures, damage can be costly for individual property owners. Beyond physical water damage, perhaps the greater issue is potential for mold infestation, which can create health problems for occupants and costly cleanup and repairs.

Flooding can cause damage to cars and outdoor equipment, contaminate water systems, and interrupt water treatment. Sewage overflow raises health concerns.

Significant expanses of street flooding are common, can be costly in terms of loss of function for extended periods, and can create dangerous, even potentially deadly, driving conditions.

Post storm accidents, especially electrocutions, are not uncommon, when people wander into flood waters where live wires or generators are present.

### 2.1.1.2 Hurricane/Tropical Storm

For many years, the risk of significant loss of life and property due to hurricanes seemed small. Many, if not the majority, of existing homes and businesses along the U.S. Atlantic and Gulf Coasts were constructed during the 1970s and 1980s, a period of relatively inactive hurricane formation. Most of the people currently living and working in coastal areas have never experienced the impact of a major hurricane. Hurricanes that affected Florida during the 1970s and 80s were infrequent and of relatively low intensity. Homeowners, business interests, and government officials grew to regard hurricane risk as manageable by private insurance supplemented occasionally by federal disaster funding and subsidized flood insurance. The hurricane risk did not seem sufficient to warrant increased investment in mitigation. Two (2) major hurricanes, Hugo in 1989 and Andrew in 1992, forced a reevaluation of this risk assessment. While experts sometimes disagree on the annual cost of hurricane damage, many sources agree that hurricane Andrew was one of the most costly hurricane events ever to affect the U.S. Insured losses from hurricane Andrew topped $17 billion and most sources agree that the total cost of hurricane Andrew exceeded $25 billion.

Florida is the most vulnerable state in the nation to the impacts of hurricanes and tropical storms. Southcentral Florida is particularly exposed to the dangers presented by hurricanes, due to its topography. The region is largely a flat, low-lying plain. The potential for property damage and human casualties in PBC has been increased by the rapid growth over the last few decades, particularly along the coastline. Population risk has also been exacerbated by some complacency due to the recent period of reduced hurricane frequency. With Hurricanes Matthew (2016) and Irma (2017) striking close to PBC, renewed interest in hurricane safety and mitigation has been produced, as hurricanes may affect any jurisdiction within PBC.

Hurricanes are tropical cyclones with winds that exceed 74 mph and blow counter-clockwise around their centers in the Northern Hemisphere. They are essentially heat pumping mechanisms that transfer the sun's heat energy from the tropical to the temperate and polar regions. Hurricanes are formed from thunderstorms that form over tropical oceans with surface temperatures warmer than 81° Fahrenheit (26.5° Celsius). The ambient heat in the sea's surface and moisture in the rising air column set up a low pressure center and convective conditions that allow formation of self-sustaining circular wind patterns. Under the right conditions, these winds may continue to intensify until they reach hurricane strength. This heat and moisture from the warm ocean water is the energy source of a hurricane. Hurricanes weaken rapidly when deprived of their energy source by traveling over land or entering cooler waters.

Since 1886, 57 storms of hurricane intensity have passed within 125 miles of PBC. This represents an average of one (1) hurricane every two years. The number of direct hits on the southeastern Florida coastline between 1899 and 2019 has been as follows:

- Category 1 Storms: (winds 74 to 95 mph) = 9 storms
- Category 2 Storms: (winds 96 to 110 mph) = 3 storms
- Category 3 Storms: (winds 111 to 129 mph) = 17 storms

- Category 4 Storms: (winds 130 to 156 mph) = 16 storms
- Category 5 Storms: (> 157 mph) = 9 storms

A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four (4) to five (5) feet in a Category 1 hurricane up to 20 feet in a Category 5 storm. The storm surge arrives ahead of the storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Water rise can be very rapid, posing a serious threat to those who have waited to evacuate flood prone areas. A storm surge is a wave that has outrun its generating source and become a long period swell. The surge is always highest in the right-front quadrant of the direction the hurricane is moving in. As the storm approaches shore, the greatest storm surge will be to the north of the hurricane eye.

Such a surge of high water topped by waves driven by hurricane force winds can be devastating to coastal regions. The stronger the hurricane and the shallower the offshore water, the higher the surge will be. In addition, if the storm surge arrives at the same time as the high tide, the water height will be even greater. The storm tide is the combination of the storm surge and the normal astronomical tide.

Damage during hurricanes may also result from tornadoes, inland flooding, and heavy rainfall that usually accompany these storms. Hurricane Andrew, a relatively "dry" hurricane, dumped ten inches of rain on south Florida and left many buildings extensively water damaged. Rain water may seep into gaps in roof sheathing and saturate insulation and ceiling drywall, in some cases causing ceilings to collapse.

Aside from direct property damage, the potential for crop damage and economic disruption from hurricanes and tropical storms is significant. Tropical Storm Mitch dropped as much as ten inches of rain in some south Florida areas, which resulted in approximately $20 million in direct crop damage in PBC. The largest monetary loss, however, was sustained by the sugar cane mills in the western part of the County, where contracted part-time help and union workers must be paid whether or not the mills run. The six (6) mills in PBC and the one (1) in Hendry combined lost about $500,000 a day in wages. The mills remained down until the fields dried out.

There are 671 listed farm proprietors with approximately 8,000 employees and a total annual payroll of $12,894,000 in PBC. It also has approximately 627,924 acres of farmland currently valued at $2,417,525.

**Historical Hurricane/Tropical Storm Events**

*Hurricane of September 1902*. This hurricane made landfall near West Palm Beach on September 11, 1902, and exited the state near Tampa Bay the next day. Maximum-recorded winds were only 78 mph, however 14 deaths were attributed to this storm and one (1) ship was wrecked near Jupiter. Damages specific to PBC are not recorded.

*Hurricane of July 1926*. A Category 1 hurricane with winds of 90 mph made landfall near Jupiter on the morning of July 27, 1926. This hurricane circled inland along Florida's east coast and exited the state at the Florida/Georgia border on July 28. By that time, it had been downgraded to a tropical storm. The County experienced high winds and flooding.

*Hurricane of September 1928*. This hurricane made Florida landfall near the Town of Palm Beach as a strong Category 4 hurricane with one of the lowest barometric pressures ever recorded in this area (928.9 millibars/27.42 in). This was the 5th most intense hurricane ever to make landfall in U.S. territory. It reached Lake Okeechobee with very little diminished intensity and moved across the northern shoreline. This sent a massive storm surge southward flooding lower areas on the southern and western edge of the lake. In excess of, 2,500 people were killed during this storm's passage. Nearly all the loss of life was in the Okeechobee area and was caused by overflowing of the lake along its southwestern shore. While all of central Florida was affected by this killer storm, PBC mainly experienced wind damage and flooding from the associated rains.

*Hurricane of September 1922*. This major, Category 2 hurricane passed over Jupiter Island with a barometric pressure of 947.5 millibars (27.98 in). Maximum winds recorded were 127 mph. There was considerable property damage all along the Florida east coast, mostly in the area between Jupiter and Fort Pierce. Severe waterfront damage was reported in Stuart. Minimal damage was reported from PBC, although there was some flooding in the lower areas of the County.

*Hurricane of August 1929*. A weak hurricane made landfall near Fort Pierce on the morning of August 11, 1929, and crossed the state in a northwesterly direction exiting to the Gulf of Mexico near Crystal River the next day. Minimal damage and flooding was experienced in PBC.

*Hurricane of June 1945*. This hurricane entered Florida from the Gulf of Mexico making landfall near Cedar Key and moving east-northeast to exit the state near St. Augustine. The County received heavy rains and high winds from this storm.

*Hurricane of August 1949*. This Category 2/Category 4 hurricane made landfall in Florida between Delray Beach and Palm Beach with winds of 120 mph and a barometric pressure of 954.0 millibars (28.17 in). As it moved inland, its center passed over the northern part of Lake Okeechobee, but the levees in that area held and no major flooding occurred. Damages were estimated at $45 million. Tides of 11.2 ft. at Fort Pierce, 8.5 ft. at Stuart, and 6.9 ft. at Lake Worth Beach were reported. Stuart sustained severe damages from this storm. Statewide, over 500 people lost their homes as a result of this storm.

*Hurricane Donna of September 1960.* Hurricane Donna was the sixth most intense U.S. Hurricane at landfall. This storm crossed the Florida Keys into the Gulf of Mexico then turned back toward the northeast and struck the Florida mainland just south of Naples. It then turned north moved across Ft. Myers, where it turned again to the northeast, moved across the state, and exited Florida at just north of Daytona Beach. Rainfall ranged from five (5) to ten inches in an 80 to 100-mile wide belt following this storm's track. Lakes and streams overflowed their banks and forced the evacuation of many homes throughout central Florida. The high water closed many roads and inundated considerable agricultural land. At least 12 people were killed statewide and more than 1,794 were injured.

*Hurricane Cleo of August 1964*. This small but destructive storm moved northward into Biscayne Bay on August 27, 1964. The County received three (3) to five (5) inches of rain associated with this storm, mostly in the eastern portion of the County. Most sustained damage was associated with wind rather than flooding.

*Hurricane Agnes of June 1972.* Hurricane Agnes moved through the Gulf of Mexico off Florida's west coast. While it never struck central Florida mainland, it spawned the worst severe weather outbreak in Florida history. The outer rain bands covered virtually the entire peninsula and spawned numerous tornadoes. There were six (6) people killed and 40 injured in Okeechobee, one (1) killed and seven (7) injured in La Belle, 40 injured at Big Coppit Key, two (2) injured at Bassinger, three (3) injured in Haines City, four (4) at Crystal Springs, 11 in Malabar, and 12 in Cape Canaveral. Most of those injured lived in manufactured housing. Damage estimates totaled $5 million to public property and $26 million to private property.

*Hurricane David of September 1979*. Hurricane David moved over the Dominican Republic with winds of 165 mph, but weakened drastically before reaching Florida's east coast. David raked the eastern coastline of Florida from PBC northward. Officially classed as a minimal hurricane, its strongest winds were offshore when it officially made landfall approximately 20 miles south of Melbourne. Tides were three (3) to five (5) feet above normal along the eye track and one (1) to two (2) feet above normal elsewhere along the Florida's east coast. Light to moderate erosion was reported along the PBC coastline. Storm rainfall was quite variable from location to location. Totals generally ranged from six (6) to nine (9) inches, but some stations reported as much as 11 inches during the storm's passage.

*Tropical Storm Isidore of September 1984*. Tropical Storm Isidore made landfall near West Palm Beach on September 27, 1984, and moved inland toward Orlando. Highest winds were 72 mph and rainfall was reported to be five (5) to seven (7) inches over a 24-hour period. There was some flooding, but this occurred mostly in northern Florida.

*Tropical Storm Bob of June 1985*. On 22 June 1985, Tropical Storm Bob moved across south Florida in a northeasterly direction from Fort Myers to just north of Palm Beach. Rainfall from this event did minor damage, mostly along Florida's west coast. The County suffered moderate agricultural losses.

*Tropical Storm Gordon of October 1994*. Following a similar track to hurricane Donna of 1960, tropical storm Gordon crossed the Florida Keys into the Gulf of Mexico then turned back to the northeast and struck the mainland Florida Peninsula near Fort Myers on October 12, 1994. It moved across the state and exited Florida into the Atlantic just north of Vero Beach on October 16. Although the maximum sustained winds reported from Gordon were only 52 mph, the storm caused eight (8) deaths and 42 injuries.
The County had experienced a period of extensive growth during the 1970s and 1980s. Most of this growth took place in the form of residential and commercial land development in the eastern

portion of PBC close to the Intracoastal Waterway and the beaches. The rain event associated with Tropical Storm Gordon in October of 1994 was the most significant rain event to occur after this period of development. Essentially, the County received 17+ inches of rain over a 2-day period. Rainfall was not evenly disbursed over the whole County.

Statewide damages associated with Gordon totaled over $400 million. Agricultural interests sustained $275 million in damages primarily from the widespread flooding. Vegetable and citrus crops were hit particularly hard. Exacerbating the flooding associated with Tropical Storm Gordon was the fact that prior to October 1994 had been a very wet year for PBC. Rainfall recorded through September of that year had reached 74 inches before the Gordon event occurred. Altogether, PBC received approximately 100 inches of rain in 1994, making that year the wettest year since 1912.

*Hurricane Erin of August 1995.* Hurricane Erin made landfall near Sebastian Inlet on August 2, 1995. Brevard County bore the brunt of this storm with sustained winds of approximately 100 mph. While PBC was spared most of the damages associated with Erin's wind field, heavy rains of up to 8 inches in two (2) hours were associated with the backside of this storm and flooding occurred in low-lying areas along the PBC's northern edge.

*Tropical Storm Mitch of October 1998*. Hurricane Mitch was one of the deadliest storms in Atlantic history. By the time, it reached Florida on November 4 and 5, 1998, it had been downgraded to a tropical storm. The County received minimal rains from this storm, which passed to the north of the County. Extensive agricultural damage was reported throughout South Florida.

*Hurricane Irene of October 1999.* Hurricane Irene weakened to Tropical Storm force winds by the time it tracked north through the Everglades, but it menaced South Florida and PBC with incessant rains and its sluggish pace. In the end, it dropped 10-20 inches of rain throughout the County, causing extensive flooding in some areas. By Friday evening (October 15), 125,000 homes in PBC were without power.

*Hurricane Frances of September 4, 2004*. Hurricane Frances formed from a tropical depression in the deep tropical Atlantic on August 25, about 1400 miles east of the Lesser Antilles and reached hurricane strength on August 26. Frances became a Category 4 Hurricane on August 28, while about 700 miles east of the Lesser Antilles. Frances then moved generally west-northwest and weakened to a Category 2 hurricane while crossing the northwest Bahamas. After stalling for about 12 hours on September 4 in the Florida Straits between Grand Bahama Island and the southeast Florida coast, the center of the nearly 70-mile diameter eye crossed the Florida coast near Sewalls Point at 1 A.M. EDT September 5, with the southern eyewall affecting the extreme northeast portion of PBC. Frances moved farther inland just north of Lake Okeechobee and weakened to a tropical storm before crossing the entire Florida Peninsula and exiting into the Gulf of Mexico just north of Tampa. It made a second landfall as a tropical storm in the eastern Florida Panhandle.
Sustained tropical storm-force winds likely occurred in all six (6) south Florida counties. Although no sustained hurricane-force winds were officially observed in any of the six (6) south

Florida counties, a National Weather Service (NWS) instrument on the eastern shore of Lake Okeechobee at Port Mayaca, just across the PBC border, measured a sustained wind of 85 mph. At West Palm Beach International Airport, the highest sustained wind was 64 mph with a peak gust of 82 mph and the lowest observed barometric pressure was 972 millibars. A SFWMD instrument measured a peak wind gust of 92 mph over the eastern portion of Lake Okeechobee. The estimated peak wind gust in the Palm Beach metro area was 91 mph at Jupiter Inlet with a peak wind gust of 87 mph measured by a Coastal-Marine Automated Network (C-MAN) station at Lake Worth Beach Pier. In Glades County near the western shore of Lake Okeechobee, the highest measured sustained wind was 60 mph with a peak gust of 90 mph. In Clewiston, a sustained wind of 60 mph with a gust of 80 mph was estimated.

A maximum storm-total rainfall amount of 12.56 inches was measured at Palm Beach International Airport with 10.26 inches of that occurring in a 24-hour period. Unofficial storm-total rainfalls included 9.56 inches at Boynton Beach, eight (8) inches at Deerfield Beach and 7.18 inches at Hillsboro Canal. Widespread storm-total amounts of three (3) to five (5) inches occurred in southeast and interior south Florida with southwest Florida averaging one (1) to three (3) inches. Rainfall flooding was mostly minor except for a few locations in PBC, which had up to three (3) feet of standing water. A section of I-95 in PBC was closed due to a large sinkhole. The maximum storm surge was estimated to have ranged from two (2) to four (4) feet along the northeast Palm Beach Coast to one (1) to two (2) feet along the northeast Broward Coast.

Within the confines of the Herbert Hoover Dike, water levels on Lake Okeechobee fluctuated up to five (5) feet above and below normal. Coastal beach erosion was moderate in Palm Beach and portions of Broward counties.

There were no confirmed tornadoes. There were no known direct deaths, but at least nine (9) people died in the aftermath. Six (6) of these deaths occurred in PBC, mainly as the result of vehicle-related accidents or from drowning. An unknown number of injuries occurred. Property damage at the coast occurred mainly to marinas, piers, seawalls, bridges and docks, as well as to boats. Inland structure damage included 15,000 houses and 2,400 businesses in PBC. Wind damage to house roofs, mobile homes, trees, power lines, signs, screened enclosures and outbuildings occurred over much of southeast Florida including areas near Lake Okeechobee, but was greatest in PBC. A preliminary damage estimate for Frances in south Florida was $620 million, including $500 million in Palm Beach, $80 million in Broward, and $24 million in Miami-Dade. Crop damage in PBC was estimated at an additional $70 million to sugar cane and vegetables and additional heavy losses occurred to nurseries. Florida Power and Light reported power outages for 659,000 customers in Palm Beach, 590,000 in Broward, 422,000 in Miami-Dade, 29,200 in Collier, 2,500 in Hendry and 1,700 in Collier. An estimated 17,000 persons sought refuge in public shelters in PBC and nearly 7,000 in Broward County.

*Hurricane Jeanne of September 25, 2004*. Just three (3) weeks after Hurricane Frances, Hurricane Jeanne struck the same area of southeast Florida. Hurricane Jeanne formed from a tropical depression just east of the Leeward Islands on September 12. She moved across Puerto Rico and Hispaniola then turned north into the Atlantic and became a hurricane on September 20. Jeanne made a clockwise loop for three (3) days in the Atlantic north of Hispaniola before moving west-northwest. It strengthened to a Category 2 Hurricane while over the northwest Bahamas and then made landfall around 11 P.M., September 25 near the south end of Hutchinson Island, nearly coincident with the landfall point of Hurricane Frances just three (3) weeks before. The 40-mile diameter eye was not quite as large as Frances, but the southern eyewall again affected northeast PBC. After landfall, Jeanne initially moved along a track similar to Frances, just north of Lake Okeechobee as it weakened to a tropical storm then turned to the northwest and moved over the northwest Florida Peninsula.

Although slightly smaller and stronger then Hurricane Frances, winds and pressures over southeast Florida were remarkably similar to Frances. Unfortunately, the Automated Surface Observing System (ASOS) at Palm Beach International Airport stopped sending data during the height of the hurricane. Sustained tropical storm-force winds likely occurred over most of Palm Beach and northeast Glades counties and portions of Broward, Hendry, and Collier counties. Although no sustained hurricane-force winds were officially observed in any of the six (6) south Florida counties, portions of northern PBC mostly likely experienced them. A SFWMD instrument in the Martin County portion of Lake Okeechobee measured a 15-minute sustained wind of 79 mph with a peak gust of 105 mph. In metropolitan Palm Beach, the highest official sustained wind speed was 60 mph with a peak gust of 94 mph from the C-MAN station at Lake Worth Beach Pier. An unofficial peak wind gust of 125 mph was measured in West Palm Beach at the Solid Waste Treatment Plant. Near Clewiston, the highest measured sustained wind was 21 mph with a peak wind gust of 72 mph from a SFWMD instrument. The lowest barometric pressure of 960.4 millibars was measured at a SFWMD site in the Martin County portion of Lake Okeechobee.

A SFWMD gauge measured a maximum storm-total rainfall amount of 10.22 inches over the eastern portion of Lake Okeechobee. A SFWMD gauge about four (4) miles west of West Palm Beach International Airport measured 9.10 inches with 8.79 inches of that occurring in a 24-hour period. At Moore Haven, 5.99 inches of rain was measured. Mostly minor rainfall flooding was observed except in Palm Beach Gardens, Jupiter and in the farmlands of western PBC where it was more severe.

The estimated maximum storm surge ranged from two (2) to four (4) feet along the northeast Palm Beach Coast to one (1) to two (2) feet along the northeast Broward Coast. Within the confines of the Herbert Hoover Dike, water levels on Lake Okeechobee fluctuated up to seven (7) feet above and below normal causing severe flooding of some marinas. Beach erosion was moderate in Palm Beach.

There were no confirmed tornadoes. There were no known direct deaths but four (4) persons died in the aftermath. An unknown number of injuries occurred. Storm surge and winds at the coast caused damage to condominiums, marinas, piers, seawalls, bridges and docks, as well as to boats and a few coastal roadways. Inland wind damage to building roofs, mobile homes, trees, power lines, signs, and outbuildings occurred mainly over PBC and portions of eastern Glades and Hendry counties. Preliminary damage estimates for Jeanne in southeast Florida were $220 million, including $260 million in PBC, $50 million in Broward and $10 million in Miami-Dade. Agricultural Damage in PBC was estimated at $20 million. Florida Power and Light reported outages occurred to 591,200 customers in PBC, 165,900 in Broward, 25,100 in Miami-Dade, 5,200 in Collier, 2,000 in Hendry and 1,500 in Glades. An estimated 12,524 persons sought refuge in public shelters in PBC.

*Hurricane Wilma October 24, 2005*. Wilma was a classic October hurricane, which struck South Florida as a Category 2 hurricane on October 24, 2005. Wilma developed from a tropical depression near Jamaica, a typical source region for October tropical cyclones, on the afternoon of October 15. It became the 21st named storm of the season during the morning hours of October 17, which tied the record for the most named storms in one (1) season originally set back in 1922. Wilma underwent a rapid intensification cycle, which began on October 18 and ended in the early morning hours of October 19, with a central pressure decrease of 88 millibars in only 12 hours. The central pressure reached 882 millibars, making Wilma the most intense hurricane ever in the Atlantic Basin, lower than Hurricane Gilbert in September 1988. Wilma went on to make landfall on Cozumel Island just off the Yucatan Peninsula as a strong Category 4 hurricane on October 21, then drifted erratically over the Yucatan Peninsula through the evening October 22. Wilma began to move off the northeast coast of the Yucatan Peninsula on the night of the 22nd, then gradually accelerated northeast over the southern Gulf of Mexico toward South Florida as a strong mid and upper-level trough over the central United States moved south and forced a southwesterly steering flow.

The hurricane made landfall as a Category 2 storm shortly before 7:00 a.m. Monday October 24 on the southwest Florida coast between Everglades City and Cape Romano with maximum sustained winds of 125 mph and an estimated minimum central pressure of 950 millibars. Wilma exhibited a very large 55 to 65 mile-wide eye while crossing the state, and the eye covered large portions of South Florida, including the eastern two-thirds of Collier County, extreme northwestern Miami-Dade County, the southern and eastern third of Hendry County, most of Broward County, and all of PBC. The eye also clipped the southeastern shore of Lake Okeechobee. The eye wall affected virtually all of South Florida. Around 10:20 a.m., a SFWMD meteorological station located at the south end of Lake Okeechobee reported sustained winds of 102 mph. The highest recorded gusts were in the 100-120 mph range. The winds on the back (south/west) side of the eye wall were as strong, if not stronger, than those on the front (north/east) side. This goes against the common, but sometimes erroneous, belief that the strongest winds in a hurricane are always in the right-front quadrant of the storm. This occurred over much of South Florida, except for central and southern Miami-Dade County, which barely missed the southwestern portion of the eye wall and likely contributed to the heavier damage across Broward and Palm Beach counties compared to slightly lesser damage across much of Miami-Dade and Collier counties.

Wilma moved rapidly northeast across the state, with an average forward speed of 25 mph. Wilma exited the east coast over northeastern PBC near Palm Beach Gardens around 11:00 a.m. Monday October 24 as a Category 2 hurricane with maximum sustained winds of around 105 mph. It traversed the southern peninsula in about four (4) hours. Rainfall amounts across South Florida generally ranged from two (2) to four (4) inches across southern sections of the peninsula to four (4) to six (6) inches across western Collier County and around Lake Okeechobee, with a maximum amount of 7.21 inches in Clewiston, Downtown Miami and Northeast Miami.

In Collier, Miami-Dade, Broward, and Palm Beach Counties, the winds killed five (5) people. Total damage estimates from all the effects ranged from $9 to $12 billion. Extensive damage to crops was reported, with an estimated $222 million in crop damage for Miami-Dade County alone. Damage was widespread, with large trees and power lines down virtually everywhere, causing over two (2) million customers to lose power. Structural damage was heaviest in Broward and Palm Beach counties where roof damage and downed or split power poles were noted in some areas. High-rise buildings suffered considerable damage, mainly in the form of broken windows. This was observed mainly along the southeast metro areas. An F1 tornado caused snapped power poles, uprooted large trees, and significant damage to mobile homes. Small swaths of greater damage elsewhere in South Florida have not been attributed to tornadoes, but were instead likely caused by "mini-swirls", small vortices within the eye wall.

*Tropical Storm Noel of October 20-21, 2007.* Tropical Storm Noel moved north from eastern Cuba across the western Bahamas Islands from October 20-21. The interaction of Noel with a strong high-pressure area located over the Mid-Atlantic States produced strong winds over southeast Florida and the adjacent waters well before Noel made its closest passage to the area early on November 1. Damage was minor and mainly confined to a few downed power lines. Around 5,000 customers lost power in the three-county area of Palm Beach, Broward, and Miami-Dade. Rainfall amounts were light, ranging from a half-inch (0.5) to nearly two (2) inches. A strong pressure gradient between high pressure over the Mid-Atlantic States and Tropical Storm Noel over Hispaniola and eastern Cuba caused a prolonged period of strong east winds over Southeast Florida and the adjacent waters. As Noel moved north across the western Bahamas, the strong winds continued across southeast Florida. The event caused severe beach erosion, coastal flooding, and minor wind damage. The event lasted into the first few days of November.

*Tropical Storm Fay of August 15-22, 2008.* The center of Tropical Storm Fay moved across Key West early in the evening of August 18, and into the mainland of South Florida at Cape Romano shortly before 5:00 a.m. the next day. Minimum central pressure was 989 millibars at landfall, but continued to decrease after landfall to 986 millibars at Moore Haven on the southwest shore of Lake Okeechobee.

Maximum sustained winds were estimated to be around 60 mph at landfall, however as the storm tracked across the western Everglades and Southwest Florida the radar presentation continued to organize and winds increased to around 65 mph around Moore Haven. A maximum wind gust of 79 mph was recorded on a South Florida Water Management gauge on Lake Okeechobee as the storm passed. Wind gusts of tropical storm force were felt area-wide, with sustained tropical storm force winds experienced over portions of mainland Monroe, Collier, Hendry and Glades counties as well as the immediate coastal sections of Miami-Dade, Broward, and Palm Beach Counties. Wind damage was most significant in the areas affected by tropical storm force sustained winds, primarily around Lake Okeechobee and interior sections of southwest Florida, with only minor wind damage elsewhere.

The storm caused over $10 million in beach erosion along PBC's coastline. A maximum rainfall total of 16.17 inches was reported with this event at Moore Haven in Glades County. Flooding from these rains produced total damage estimates of $280,000, primarily in Glades and Hendry counties. Rainfall elsewhere ranged from three (3) to six (6) inches in southeast Florida, and six (6) to eight (8) inches in southwest Florida, with isolated amounts up to ten inches in coastal PBC. All the associated effects of Tropical Storm Fay in South Florida resulted in one (1) fatality, four (4) injured, and $2.949 million in property damage. Two (2) tornadoes produced $1.25 million in damage, but caused no injuries or fatalities. The one (1) fatality and three (3) of the injuries were indirectly caused by Fay, with a traffic accident in PBC. The direct injury occurred when a kite surfer on Fort Lauderdale Beach lost control during a squall and was slammed into a building along A1A. Fay caused tropical storm force winds, significant rainfall flooding in some areas and two (2) confirmed tornadoes.

*Hurricane Irene of August 25–26, 2011*. Hurricane Irene passed over the western Bahamas about 170 miles east of the Florida coast. The western fringes of Irene affected southeast Florida with high surf and winds bordering on tropical storm force. Winds to marginal tropical storm force and high surf affected the PBC coast as the outer fringes of Hurricane Irene passed over the area. Sustained winds to 26 knots with gusts to 46 knots were measured near the coast from Jupiter through Boynton Beach associated with intermittent squalls. Wind damage was limited to a few uprooted trees and knocked down tree branches, causing minor power outages. High surf pounded the coast during the day, causing damage to Lake Worth Beach Pier totaling $2,000 and injuring eight (8) people at Boynton Inlet when a large wave crashed onto the jetty while onlookers were present. Maximum storm surge at Lake Worth Beach Pier was 1.28 feet with a maximum tide of 1.55 feet.

*Tropical Storm Debby of June 22-27, 2012*. The outer bands from Tropical Storm Debby located in the Northeast Gulf of Mexico continued to move over South Florida. Severe thunderstorms developed during the late morning into the afternoon with severe wind gusts and eight (8) tornadoes occurring over a span of four (4) hours in Lake Worth Beach, Okeechobee Boulevard and east of I-95, a warehouse district just south of Okeechobee Boulevard, Tamarind Avenue, and Banyan Boulevard. Additional details related to the tornadoes is discussed below.

*Hurricane Isaac of August 26, 2012*. The center of Tropical Storm Isaac moved over the Florida Straits south of the Florida Keys on Sunday, August 26, passing just south of Key West. Rain bands and winds on the north side of the circulation of Isaac affected Southeast Florida throughout the day of the 26th and part of the 27th. Highest winds over land were recorded along and near the southeast Florida coast where the highest sustained winds ranged from 40-45 mph, with 25-30 mph sustained winds over most inland areas as well as over southwest Florida. Highest wind gusts ranged from 50-60 mph over most land areas to as high as 65 mph along the Atlantic coast and just offshore. Three-day rainfall totals ending at 8:00 a.m. August 28 ranged from five (5) to seven (7) inches across southeast Florida to two (2) to five (5) inches over interior and southwest Florida. The primary exception was over northern metro Broward County and much of PBC where eight (8) to twelve (12) inches fell, with maximum amounts up to 15-18 inches from west of Boynton Beach to Wellington, The Acreage, Royal Palm Beach, and Loxahatchee. These areas of highest rainfall amounts experienced severe flooding with communities cut off for several days after the storm. Maximum storm tide values were observed at 4.9 feet at Naples, with estimates of five (5) to seven (7) feet along the southern Collier County coast from Goodland to Everglades City. Highest estimated inundation values of up to two (2) feet above ground level were noted in Goodland and Everglades City. Major beach erosion was also observed along the Collier County beaches, with moderate beach erosion along the Atlantic beaches. All of the associated effects of Isaac in south Florida resulted in about $17.2 million in property damage. Specifically, Isaac's inland floodwaters resulted in about $10 million in damages, mostly in Palm Beach and Broward counties. Flooding caused by storm tides along the coast in Collier County resulted in about $400 thousand in damage. Damage from beach erosion in Collier and Broward counties was estimated at $6 million. Wind damage was estimated at $750,000. Approximately 112,000 customers lost power during the storm in South Florida.

*Hurricane Sandy of October 25-26 2012*. Hurricane Sandy began to affect the PBC coast and its adjacent Atlantic waters with tropical storm force winds during the evening of October 25 as it moved slowly north across the northwest Bahamas. Tropical storm force wind gusts were first observed along the coastal PBC region by early in the evening of October 25. Several Weather Flow sensors along and near the PBC coast recorded Tropical Storm Force wind gusts during the evening of October 25, with a peak wind gust of 67 mph observed at Jupiter. However, as Hurricane Sandy continued to move slowly north and then northeast over the Atlantic waters north of the Bahamas through October 28, the main effect along the PBC coast were large northeast swells generated by the storm, which pummeled the Southeast Florida coast with significant beach erosion and coastal flooding. Large breaking waves of possibly over 20 feet were estimated along the coast. As a result, major coastal flooding occurred with the most significant impacts experienced from central Palm Beach north, including the Manalapan area where beachfront structures were threatened by water intrusion. In all, there was an estimated $14 million in damage sustained in PBC. A total of 44,270 customers lost power. A maximum storm tide of 5.2 feet above mean lower low water (MLLW) was observed at Lake Worth Beach Pier on October 28 at 7:12 a.m. along with a maximum storm surge of 2.28 feet on October 28 at 2:26 a.m.. Similar tide and surge levels were measured at the highest daily high tide during this period, generally between 7:00 and 9:00 a.m.

*Tropical Storm Andrea of June 5-7, 2013*. During the early evening of June 5, 2013, Tropical Storm Andrea formed in the east-central Gulf of Mexico becoming the first named storm of the 2013 tropical season, and over the next 48 hours, Andrea would pummel portions of south Florida with heavy rainfall and major flooding. Andrea even spawned three (3) tornadoes including an EF-1 tornado that tore through portions of northeast PBC. Although Andrea never made landfall in south Florida, it had far-reaching impacts that mainly affected the east coastal areas. During the early morning hours of June 6, convective rain bands well to the southeast of the storm center streamed across the south Florida area spawning three (3) tornadoes. The first occurred just after 3:00 a.m. and affected the town of Belle Glade in PBC. Only minor damage to trees and power lines was sustained from this tornado and was rated as an EF-0. Just a few hours later, another tornado ripped through The Acreage community in north central PBC.

*Hurricane Matthew of October 7, 2016*. Hurricane Matthew moved north along the east coast, previously hitting Cuba and Haiti, it moved into Florida as a much weaker hurricane than before. Matthew never made landfall, as the eye barely missed Cape Canaveral. Matthew killed twelve people in the state, produced flooding and high winds, and knocked out power to 1.1 million people. Despite significant preparations, PBC was not directly impacted.

*Hurricane Irma of September 10-11, 2017*. Tropical Storm Irma formed on August 30 and intensified into a Category 5 cyclone on September 5. Irma attained its peak intensity with winds of 185 mph later that day and maintained Category 5 intensity when it made landfall on Cuba on September 9. Land interaction disrupted the storm temporarily, but once again it strengthened to a Category 4 storm with winds of 130 mph when it made landfall in Cudjoe Key of the Florida Keys early on September 10. A few hours later, it struck Marco Island, Florida, with winds of 115 mph. Irma steadily weakened as it continued north and west. It was the strongest hurricane in terms of windspeed to hit Florida since Charley in 2004, and the most intense in terms of pressure since Andrew in 1992. Irma killed at least 82 people in Florida. Preliminary damage estimates for PBC were over 145 million dollars in damage. According to Florida Power and Light, 680,799 PBC customers lost power, and more than 20% of the County's customers remained without power four (4) days after the storm.

With peak winds of 185 mph, Irma was the strongest Atlantic storm outside of the Gulf of Mexico or Caribbean Sea on record, and is the 11th most intense hurricane on record in the Atlantic basin. Maintaining peak intensity for 37 consecutive hours, Irma is the only tropical cyclone on record worldwide to have had winds that intense for such a long duration. Surprisingly, very little flood damage was reported, and almost all damage was wind-related.

*Tropical Storm Philippe of October 22, 2017*. Philippe made landfall over the Everglades in southwest Florida with winds of 45 mph. Effects were relatively minor in Florida, although Philippe brought moderate rain and spawned a few weak tornadoes, including one (1) in West Palm Beach. Some localized flooding was reported, mostly on streets with very few homes affected.

### 2.1.1.3 Tornado

According to NOAA, Florida ranks third in the United States in the average number of tornado strikes, and first in number of tornadoes per square mile according to Florida State University's Florida Climate Center. However, Florida tornadoes are generally weaker than those striking the Plains and other southern states.

Tornadoes are classified using the Enhanced Fujita (EF) Scale as follows:

| Scale | Wind speed | | Relative frequency | Potential damage | |
|---|---|---|---|---|---|
| | mph | km/h | | | |
| EF0 | 65–85 | 105–137 | 53.5% | Minor damage.<br>Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.<br>Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0. |  |
| EF1 | 86–110 | 138–178 | 31.6% | Moderate damage.<br>Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken. |  |
| EF2 | 111–135 | 179–218 | 10.7% | Considerable damage.<br>Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground. |  |
| EF3 | 136–165 | 219–266 | 3.4% | Severe damage.<br>Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance. |  |
| EF4 | 166–200 | 267–322 | 0.7% | Extreme damage to near-total destruction.<br>Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated. |  |
| EF5 | >200 | >322 | <0.1% | Massive Damage.<br>Strong frame houses leveled off foundations and swept away; steel-reinforced concrete structures critically damaged; high-rise buildings have severe structural deformation. Incredible phenomena will occur. |  |

*Figure 2.5:* Enhanced Fujita Scale

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is generated by a thunderstorm (or sometimes as a result of a hurricane) and produced when cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado is a result of the high wind velocity and wind-blown debris. The most common type of tornado, the relatively weak and short-lived type, occurs in the warm season with June being the peak month. The strongest, most deadly tornadoes occur in the cool season, from December through April. All of PBC is can be affected by a tornado.

According to the Tornado History Project, of the 169 tornadoes seen in PBC between 1950 and January 2016, 113 were classified as F0 tornadoes (67%), 46 (27%) were classified as F1, nine (5%) were classified as F2, and one (0.6%) was classified as an F3 tornado. One (1) death and 102 injuries have been attributed to tornadoes in the County in this period, with total estimated damages of more than 150 million dollars.

When a tornado threatens, only a short amount of time is available for life-or-death decisions. The NWS issues two (2) types of alerts:

- A Tornado Watch means that conditions are favorable for tornadoes to develop
- A Tornado Warning means that a tornado has actually been sighted

**Historical Tornado Events**

*August 7, 2002*. On August 7, 2002, there was a Tornado Watch issued by the NWS. Two (2) tornadoes touched down later that evening in the northern part of PBC. Jupiter suffered damage to a shopping plaza. No injuries were reported. A second tornado touched down in unincorporated PBC in a mobile home park causing major damage in some areas. The tornado moved in the direction of east southeast toward Interstate 95. The tornado caused considerable damage to an industrial park located in unincorporated PBC/Riviera Beach. The tornado continued in the same direction damaging several neighborhoods in Riviera Beach. It continued through additional neighborhoods in Riviera Beach just north of Blue Heron Boulevard. The damage path was narrower until it lifted or dissipated near the intersection of Blue Heron Boulevard and Old Dixie Highway.

From all of the evidence considered, including some damage that was very close to F2 damage, National Weather Service Weather Forecast Office (WFO) Miami classified the unincorporated PBC-Riviera Beach tornado as F1 on the Fujita scale, meaning that winds were approximately 72 to 112 mph. The worst damage was apparently caused by winds near the upper end of that range. Miami WFO meteorologists determined that the main path of the tornado was approximately 1/6 mile (200 yards) wide at its widest point and about four (4) miles long. There were no deaths, but 28 individuals suffered minor injuries. There were 22 dwellings destroyed and 226 suffered damage. The damage has been estimated to be $70 to $80 million dollars.

*June 12, 2008*. A small waterspout briefly moved onshore at Delray Beach just north of Atlantic Avenue. The waterspout stirred up some beach umbrellas and blankets, and dissipated shortly after touching land.

*August 19, 2008 Wellington Tornado*. At about 1:20 a.m. on August 19, a tornado associated with a spiral band of strong thunderstorms rotating around the circulation of Tropical Storm Fay moved through the Village of Wellington. The tornado began near Polo Mark Middle School near the intersection of Lake Worth Road and Isles View Drive and ended just southwest of Wellington High School. The tornado had an approximate damage path of 2.75 miles from the southeast to the northwest and was around 100 yards wide at its widest point, but averaged 70 to 80 yards in width.

The tornado moved through a number of equine farms and polo grounds as well as two (2) subdivisions in Wellington. The most significant damage was to Palm Beach Equine Clinic, where stables were de-roofed, power poles snapped, and many trees fell in crisscrossing patterns. The Equine Veterinary lost more than 95% of its roof tiles; a heavy trailer was tossed about 40 yards from its previous location northwest of the International Polo Club; and an apartment home near Folkstone Circle lost about 70% of its roof tiles. There were no deaths or injuries to people or animals.

*March 21, 2009 Palm Beach Gardens Tornado*. A warm front lifted north through South Florida during the day of March 21. Unstable air south of the front combined with warm temperatures produced strong and severe thunderstorms over PBC. A total of about 5,000 customers lost power. A tornado touched down in Palm Beach Gardens in the Ballenisles Golf Country Club near Holly and Seagrape Drives. The tornado moved southeast, across Military Trail and Lilac Street, and lifted near Palm Beach Gardens High School. Minor roof damage was noted to a few residential buildings, as well as, uprooted trees and a damaged fence near Palm Beach Gardens High School. Final tornado rating was EF0 based on an Emergency Management survey and analysis of damage photos.

*March 21, 2009 Glen Ridge Tornado*. A second tornado touchdown occurred in West Palm Beach near Palm Beach Lakes Boulevard and Australian Avenue. This is the same storm that produced the tornado in Palm Beach Gardens, but eyewitness reports and photographs indicate a likely second tornado touchdown in the West Palm Beach area. Damage was minor (EF0) consisting of downed traffic signals, broken tree branches, and a flipped bus bench.

*April 12, 2010*. A brief tornado occurred two (2) miles northeast of Belle Glade. The PBC Sheriff's office reported a tornado two (2) miles northeast of the PBC Sheriff's Office substation along state road 80; however, no damages or injuries occurred.

*August 7, 2010*. A small and short-lived tornado moved through the West Boca area, with numerous reports received of trees down, overturned patio furniture, street lights knocked down, some roofing shingles blown off houses, and downed power lines from around the intersection of Powerline Road and SW 18th Street to the Boca Point Golf Course. No major structural damage was reported. No damage assessment was performed by PBC officials, due to the minor nature of the damage.

*January 25, 2011*. A small and brief tornado touched down in the Cameo Woods development of Boca Raton near the intersection of Camino Real and Military Trail. Damage was exclusively to vegetation, including an uprooted large avocado tree and several large branches snapped off or broken. About 20 trees in total were damaged by the tornado. Estimated wind speeds were in the 70-75 mph range, indicative of an EF0 tornado.

*June 24, 2012*. The outer bands from Tropical Storm Debby included severe thunderstorms with severe wind gusts and eight (8) tornadoes occurring over a span of four (4) hours. This event spawned the most number of tornadoes in one day over the southern Florida peninsula since October 14, 1964 when Hurricane Isbell also spawned eight (8) tornadoes. All of the tornadoes were of EF0 intensity.

A brief tornado in Lake Worth Beach touched down and damage was confined to a few homes on North A Street and 15th Avenue, between US 1 and I-95. Damage was minor and consisted primarily of vegetation and debris from a nearby park.

The first report of damage was to a carport south of Okeechobee Boulevard and east of I-95. The tornado traveled through a warehouse district just south of Okeechobee Boulevard and east of Australian Avenue, damaging roofs and doors to a warehouse building. The tornado then crossed Okeechobee Boulevard and traveled between Australian and Tamarind Avenues, damaging trees and knocking down a large metal gate at the West Palm Beach train station. A railroad-crossing arm was broken at Tamarind Avenue and Banyan Boulevard. The tornado followed a discontinuous path of 1.2 miles and its width of probably no more than 20 yards. Maximum winds were likely in the upper end of EF0 scale (75-85 mph), with most areas along the path probably experiencing low end EF0 winds (65-75 mph).

*June 6, 2013*. Convective rain bands associated with Tropical Storm Andrea streamed across South Florida spawning three (3) tornadoes that affected PBC. The first (EF-0) affected the town of Belle Glade with minor damage to trees and power lines. Another tornado (EF-1 with maximum sustained winds of 100 mph) ripped through The Acreage community damaging several homes and snapped trees and power lines as it tracked across a residential area just west of 130th Avenue between 69th Street and 87th Street. Most damage was to roofs; the garage door of one (1) home was damaged leading to the roof being completely punctured above the garage. A few vehicles were also moved from their original locations and a 30-foot boat was flipped on its side. There was one (1) serious injury from this tornado when an 85 year-old woman was struck by flying debris from a large oak tree that broke through her bedroom window. A third (EF-0) tornado touched down across inland Broward County just east of U.S. Highway 27 about six (6) miles north of Alligator Alley and tracked north, likely crossing over into southern PBC.

*January 28, 2016*. A line of strong storms moved onto the Gulf Coast just after 5:00 a.m. and moved across the South Central Florida peninsula. A small area of rotation quickly developed at the northern end of the line as it approached the PBC coast. A brief EF-0 tornado touched down in Delray Beach and Boynton Beach.

*January 23, 2017.* A strong squall line intensified well ahead of a cold front over the eastern Gulf of Mexico during the early morning hours of January 23. The line produced tornadoes in Palm Beach and Miami-Dade counties. Tornado damage was first noted in the Mirabella neighborhood of Palm Beach Gardens west of the Florida Turnpike between PGA Boulevard and Donald Ross Road, then followed a somewhat discontinuous path ENE across Palm Beach Gardens to Juno Beach where it moved offshore at the Juno Beach Pier.

At Dwyer High School, the tornadic winds as well as flying debris broke windows, damaged a softball field and caused a small hole in the ceiling over a classroom in the school's main building. It continued into Juno Beach Condo mobile home park where eight (8) units sustained damage. The tornado moved offshore at the Juno Beach Pier around 1:49 a.m. where a wind gust of 87 mph was recorded at Juno Beach Pier at 1:50 a.m. The roof was lifted off of one (1) lifeguard stand near the pier, and wood railings were damaged at the north side of the pier.

### 2.1.1.4 Severe Thunderstorms/Lightning

A severe thunderstorm is defined as a thunderstorm containing one or more of the following phenomena: hail 2/4" or greater, winds gusting in excess of 57.5 mph, and/or a tornado. Severe weather can include lightning, tornadoes, damaging straight-line winds, and large hail. Most individual thunderstorms only last several minutes, however some can last several hours.

Long-lived thunderstorms are called supercell thunderstorms. A supercell is a thunderstorm that has a persistent rotating updraft. This rotation maintains the energy release of the thunderstorm over a much longer time than typical, pulse-type thunderstorms, which occur in the summer months. Supercell thunderstorms are responsible for producing the majority of severe weather, such as large hail and tornadoes (NOAA). Downbursts are also occasionally associated with severe thunderstorms. A downburst is a strong downdraft resulting in an outward burst of damaging winds on or near the ground. Downburst winds can produce damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can even occur with showers too weak to produce thunder (NOAA). Strong squall lines can also produce widespread severe weather, primarily very strong winds and/or microbursts.

Florida has more thunderstorm activity than any other US state. PBC residents are quite familiar with thunderstorms and the severe weather they can bring. When a severe thunderstorm approaches, the NWS will issue alerts. Two (2) possible alerts are:

- Severe Thunderstorm Watch - Conditions are favorable for the development of severe thunderstorms
- Severe Thunderstorm Warning - Severe weather is imminent or occurring in the area

The most dangerous and costly effect of thunderstorms is lightning. As a thunderstorm grows, electrical charges build up within the cloud, and oppositely charged particles gather at the ground below. The attraction between positive and negative charges quickly grows strong enough to overcome the air's resistance to electrical flow. Racing toward each other, they connect and complete the electrical circuit. Charges from the ground then surge upward at nearly one-third the speed of light and produce a bright flash of lightning (Cappella, 1997).

On average, more people are killed by lightning than any other weather event. According to NOAA, Florida leads in the nation in lightning related deaths and injuries, with 51 deaths statewide from 2007 – 2018. Florida also has the most strikes, about 12 strikes per square kilometer per year in some places, according to the National Lightning Safety Institute. The peak months for lightning strikes in Florida are June, July, and August, but no month is safe from lightning danger, and all of PBC is equally vulnerable to this hazard.

According to NOAA’s storm events database, from January 2007 – September 2018, PBC experienced 96 thunderstorm events with winds gust over 50 miles per hour. These events cumulatively caused $93,500 in property damage and $5,000 in crop damage. The highest wind gust in this time was 70 miles per hour on April 4, 2013 in the Town of Ocean Ridge. There was only one (1) recorded injury that occurred on February 26, 2008 when thunderstorm winds produced damage at the Moroso Motor Sports Park on Beeline Highway in North Central PBC. An awning was blown off a trailer, and a man was injured when a 400-500 pound water barrel struck him.

#### 2.1.1.5 Drought

Drought is a normal, recurrent feature of climate, although many perceive it as a rare and random event. In fact, each year some part of the U.S. has severe or extreme drought. Even in Florida, where annual rainfall averages about 60 inches, drought is a regular part of the climate. Although it has many definitions, drought typically means a deficit of precipitation from normal values over an extended period, usually a season or more (National Drought Mitigation Center, 1998). Drought produces a complex web of impacts that spans many sectors of the economy, and reaches well beyond the area producing physical drought. This complexity exists because water is essential to our ability to produce goods and provide services (National Drought Mitigation Center, 1998).

A few examples of direct impacts of drought are: reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitats. Social impacts include public safety; health issues; conflicts between water users; reduced quality of life; and inequities in the distribution of impacts and disaster relief. Income loss is another indicator used in assessing the impacts of drought; reduced income for farmers has a ripple effect throughout the region's economy (National Drought Mitigation Center, 1998).

The impact is so diffuse that it is difficult to come up with financial estimates of damages. However, FEMA estimates $6-8 billion in losses as the annual average. The worst drought in recent history occurred in 1987-1989, and the National Climatic Data Center reports the estimated cost as $40 billion (National Drought Mitigation Center, 1998).

In PBC, the primary sources of water are Lake Okeechobee, watershed areas, and the County’s wellfields. Normally, excess water from an interconnected series of lakes, rivers, canals, and marshes flows into Lake Okeechobee via the Kissimmee River. When this cycle is disrupted by periods of drought, one of the potentially most damaging effects is substantial crop loss in the western agriculture areas of the County. In addition to obvious losses in yields in both crop and livestock production, drought in PBC is associated with increases in insect infestations, plant disease, and wind erosion. The incidence of wild fires increases substantially during extended droughts, which in turn places both human and wildlife populations at higher levels of risk.

The county averages between 50 and 60 inches of rain per year, with annual rainfall varying up to 20 inches above or below the annual average. The SFWMD and County staff manage the County's water resources. A countywide, uniform, forceful, contingency plan is in place to effectively restrict the use of water that complements the District's water management efforts during periods of critical water shortage.

The worst drought on record for PBC was from November 2000 to February 2001. Lake Okeechobee dropped from 18 feet after Hurricane Irene in October of 1999 to nine (9) feet by May of 2001. Lake Okeechobee's average is about 12 feet. The year 2000 was also the driest year on record for the State of Florida.

The graph below shows periods of drought for PBC from January 2000 through January 2018. The y-axis is the percentage of PBC covered by drought conditions, and the colors indicate the drought levels as defined by the US Drought Monitor in the legend below the graph. According to this data, exceptional drought occurred in the County in the winters of 2001 and 2011, with extreme drought conditions occurring in 2007 and 2009.

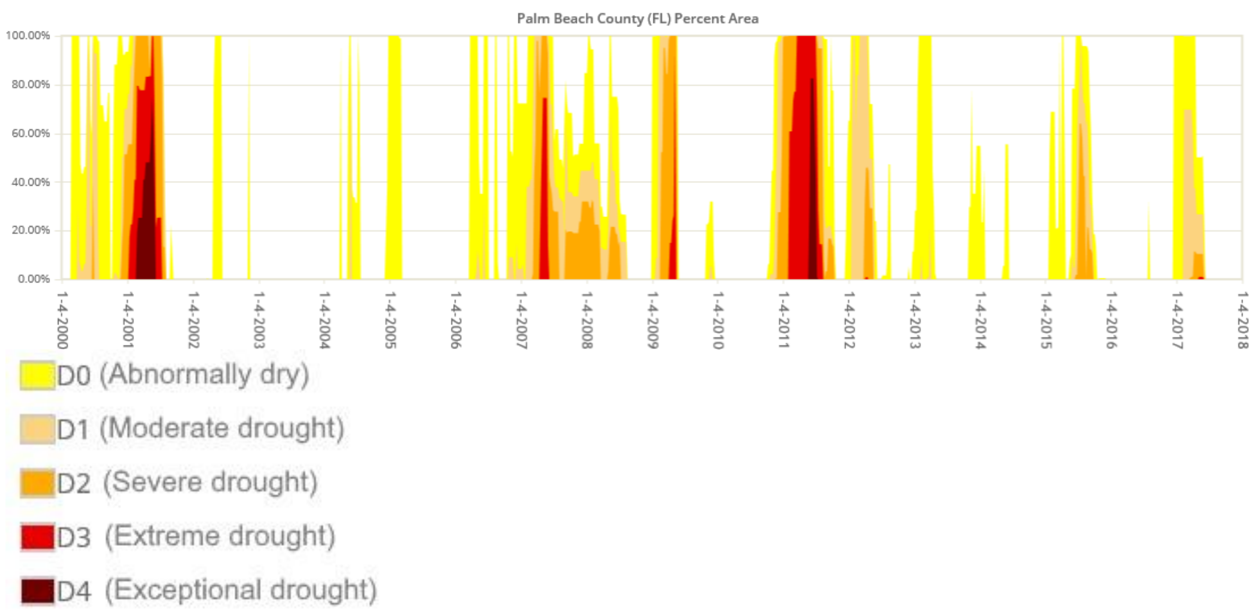



*Figure 2.6:* PBC droughts January 2000 through January 2018.

The following are significant droughts that have affected PBC since 1970, but none have resulted in major negative impacts to the county:

*1970 - 1971 Drought.* Lake Okeechobee reached a minimum stage of 10.29 feet National Geodetic Vertical Datum (NGVD) on June 7, 1971. A rainfall deficit of 42% was reported as average for Lake Okeechobee and the Northern, Central, and Southern Everglades for the eight-month period from October 1970 to May 1971.

*1972 – 1974 Drought.* The 1972–1974 Drought was comparable to the 1971–1972 drought. The rainfall deficit during this period was 47%. The minimum lake stage of 10.98 feet NGVD was reached on May 21, 1974.

*1980 – 1982 Drought.* The 1980–1982 Drought was one of the most severe droughts ever in South Florida. A more than 20-inch rainfall deficit over two (2) years resulted in the decline of the Lake Okeechobee stage from 17.46 feet NGVD on January 1, 1980 to 9.79 feet NGVD on

July 21, 1981. The 7.7-foot drop in water level was attributed to a decrease in rainfall and increases in evaporation and water use. The drought for the Lower East Coast and Water Conservation Areas was relieved in 1981 by Tropical Storm Dennis.

*1985 Drought.* The 1984 wet season and the 1984–1985 dry season had rainfall deficiencies that resulted in the 1985 drought. The upper Kissimmee, lower Kissimmee, and Lake Okeechobee rain areas had an average deficit of 14 inches. The Lake Okeechobee water level declined from 15.14 feet NGVD to 11.82 feet NGVD between January 1, 1985 and June 12, 1985. The South Florida Water Management District had to initiate back pumping to increase water supply. A water shortage plan was also implemented.

*1988 – 1989 Drought.* South Florida experienced a severe drought from September 1988 to August 1989, during which there was a 21-inch rainfall deficit in the Everglades Agricultural Area and the Lower East Coast. The Lake Okeechobee water level declined from 15.95 feet NGVD on September 1, 1988 to 11.06 feet NGVD on August 8, 1989. During the same period, record storage depletion was reported for Lake Okeechobee and the Water Conservation Area.

*1990 Drought.* The 1990 drought was a continuation of the 1988–1989 drought. From June 1989 through May 1990, a nine-inch rainfall deficit occurred District-wide and was most severe in Everglades National Park. Lake Okeechobee supply-side management and water restrictions were implemented to conserve lake water. The Lake Okeechobee water level declined from 12.25 feet NGVD on January 1, 1990 to 10.47 feet NGVD on June 21, 1990.

*2000 - 2001 Drought.* A new low water level record of 8.97 feet NGVD was set for Lake Okeechobee on May 24, 2001 during the 2000–2001 drought in South Florida. This is considered the worst drought on record for PBC, and also the driest year on record for the State of Florida.

*2007 Drought.* A severe drought affected the region from late 2006 through 2007, following back-to-back years of unprecedented hurricane activity and higher-than-normal rainfall. On July 2, 2007, water levels in Lake Okeechobee reached an all-time record low of 8.82 feet, eclipsing the mark of 8.97 feet set during the 2001 drought. Rainfall directly over the lake was low enough to qualify the 2007 drought as a 1-in-100-year event. Only 40 inches of rain fell on the region in an 18-month period, about half the average. More than 200 days passed without water flowing from the Kissimmee River into Lake Okeechobee. This also marked the first time SFWMD experienced a situation where all three (3) major water storage areas of the system – the Upper Kissimmee Chain of Lakes, Lake Okeechobee, and the Water Conservation Areas – simultaneously had substantially below normal water levels approaching record lows.

A combination of voluntary and mandatory water use restrictions were enacted by the SFWMD in early 2007. Widespread drought conditions continued into late 2007, particularly in the Lake Okeechobee watershed.

A wetter than normal spring and summer of 2008 finally interrupted the extended drought. Water use restrictions continued into 2009 and beyond, in order to balance longer-term regional water availability and supply needs.

*August 2011 Drought*. Rainfall amounts in August ranged from four (4) to six (6) inches over parts of interior southwest Florida to over ten (10) inches over parts of southeast Florida. Overall, rainfall averaged near to above average over most areas, leading to gradually improving drought conditions. Lake Okeechobee remained over two (2) feet below the normal level for this time of year. Underground water levels remained below normal over much of south Florida, especially over the metro east coast sections.

#### 2.1.1.6 Extreme Temperatures

**Freezing Temperatures**

According to the Florida Department of Agriculture and Consumer Services, a moderate freeze may be expected in the state every one (1) to two (2) years on average, and severe freezes every 15 to 20 years. Florida has experienced a number of severe or disastrous freezes, when the majority of the winter crops are lost. According to the Florida Climate Center, there have been 12 significant "impact freezes" in the state since 1894, the most recent being in 1996, when a Presidential Disaster Declaration was issued for crop losses exceeding $90 billion dollars. During this event, there was an extensive loss of citrus trees and the majority were not replanted. Freezes pose a major hazard to the agriculture industry in PBC on a recurring basis, and are a significant threat to the economic vitality of the County's agriculture industry. The county has experienced seven (7) significant freezes between 1970 and the present.

Freezing conditions primarily affect agriculture and homeless people in PBC. While PBC enjoys warm weather throughout the year, freezing does occur, primarily in the months late December and January. During the nighttime hours, temperatures can dip to as low as 35 degrees, but this normally is not sustained for more than three (3) hours before the temperatures rises above 40 degrees. The County's *Cold Weather Shelter Plan* calls for shelters to be open if there is a sustained temperature of 40 degrees or below or wind-chill factor of 35 degrees or below for four (4) consecutive hours. In the past five (5) years, the shelters have only been activated three (3) times for one (1) day each. When conditions are predicted to fall below thresholds, the Duty Officer is alerted by the County Warning Point. In the winter of 2017 - 2018, the shelters were opened four (4) times and closed the next morning.

Significant freezes since 1977 include:

*The 1977 Freeze.* Climaxing one of the coldest winters ever recorded in the eastern United States, a severe cold outbreak of arctic air swept into Florida January 18 through 21, 1977. Snow was reported as far south as Homestead and a severe freeze affected all of the State's citrus and vegetable crops.

In South Florida agricultural areas, the freeze was one of the most severe of this century. Temperatures were below freezing for l0 to l4 hours, and 28°F or colder for four (4) to eight (8) hours. An unusually heavy frost accompanied these freezing temperatures and extended to the coast. West Palm Beach recorded an all-time low of 27°F. Some farmers in the area reported temperatures near 20°F.

A U. S. Department of Agriculture report indicated the following crop loss statewide: Citrus 25%, vegetables 95-l00%, commercial flowers 50-75%, permanent pastureland 50%, sugar cane 40%. It is estimated the 1977 freeze cost the Florida economy $2 billion (1977 dollars).

*The 1989 freeze*. Tens of millions of dollars, if not hundreds of millions of dollars, in losses are possible. A second freeze occurred two (2) weeks later causing some additional crop damage, but was not as severe.

*The 2009 Freeze.* Agricultural damages from a January 2009 freeze were assessed. Seventy million citrus trees and tens of thousands of acres of fresh fruits and vegetables were in regions where temperatures remained below 20°F for several hours for two (2) consecutive days. In the Glades area, freezing temperatures lasted as long as 12 hours. Early estimates indicated that the bean crop was destroyed and as much as 85% of the corn crop was lost. Sugar cane also took a hit, but damage was not known until harvest time. This event was the most destructive since the 1989 freeze. Tens of millions of dollars, if not hundreds of millions of dollars, in losses are possible. A second freeze occurred two (2) weeks later causing some additional crop damage, but was not as severe.

*Historic freeze of January 2010*. A historic cold snap of both duration and magnitude began on New Year's Night when the first of two (2) arctic cold fronts moved through south Florida. After a brief warm-up on Friday, January 8, a stronger arctic front moved through during the pre-dawn hours of Saturday, January 9. Several daily low and low maximum temperature records were either tied or broken during this period. West Palm Beach had an average 12-day temperature of 49.9 degrees between Jan 2 and Jan 13, the lowest on record for any 12-day period (previous record 50.9 degrees set from January 16-27, 1977). Impacts were significant, particularly to the agricultural industry with statewide estimated crop losses in the $500 million range. Heavily agricultural areas west and southwest of Lake Okeechobee, primarily over Glades, Hendry, and inland Collier counties, registered anywhere from five (5) to seven (7) days of freezing temperatures.

*March 2014 Freeze*. A cold late-season air mass settled over South Florida, causing temperatures to drop to near or slightly below freezing on the morning of March 4th across the Lake Okeechobee and interior areas of southern Florida. Temperatures in the low to mid 30s in western PBC led to frost formation during the early morning hours of March 4, leading to some crop damage. Damage was mainly to corn, with less than 20% of the crop damaged. Crop damage is estimated and based on total number of acres damaged which was approximately 3,000-4,000 acres. Unofficial temperature readings in some of the fields were as low as the mid-20s, but these values were likely not representative of the larger area. PBC estimated crop losses were over $3 million dollars.

**Extreme Heat**

Temperatures that remain 10°F or more above the average high temperature for a region and last for several weeks are defined as extreme heat (FEMA, 1996). Humid conditions, which add to the discomfort of high temperatures, occur when an area of high atmospheric pressure traps hazy, damp air near the ground. In a normal year, approximately 175 Americans die from extreme heat. However, in 1995 the national death toll was 1,021 (NWS, 1997).

Human bodies dissipate heat in one of three ways: by varying the rate and depth of blood circulation; by losing water through the skin and sweat glands; and by panting. As the blood is heated to above 98.6°F, the heart begins to pump more blood, blood vessels dilate to accommodate the increased flow, and the bundles of tiny capillaries penetrating through the upper layers of skin are put into operation. The body's blood is circulated closer to the surface, and excess heat is released into the cooler atmosphere. Water diffuses through the skin as perspiration. The skin handles about 90% of the body's heat dissipating function.

Heat disorders generally have to do with a reduction or collapse of the body's ability to cool itself by circulatory changes and sweating, or a chemical (salt) imbalance caused by too much sweating. When the body cannot cool itself, or when it cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop. Studies indicate that, other factors being equal, the severity of heat disorders tend to increase with age. Heat cramps in a 17-year-old may be heat exhaustion in someone 40 and heat stroke in a person over 60.

When the temperature gets extremely high, the NWS has increased its efforts to alert the public as well as the appropriate authorities by issuing Special Weather Statements. Residents should heed these warnings to prevent heat related medical complications. As a result of the latest research findings, the NWS has devised the "Heat Index" (HI). The HI, given in degrees Fahrenheit, is an accurate measure of how hot it feels when relative humidity is added to the actual air temperature. The NWS will initiate alert procedures when the HI is expected to exceed 105°F for at least two (2) consecutive days. Possible heat disorders related to the corresponding HI are listed below.

Data from the Palm Beach International Airport weather station, acquired from the Florida Climate Center, indicate that between July 1938 and December 2016, there were 130 days with maximum temperatures above 95 degrees Fahrenheit, of which 18 were above 97 degrees. The highest temperature ever recorded at the station was on July 21, 1942 at 101 degrees Fahrenheit.

In most cases, extreme heat affects those who do not have the ability to stay inside during extreme heat. The county does not have a significant population of people that experience heat related injuries. Although the County does have a sheltering program, shelters have never activated shelters due to heat.

| Heat Index | Effects of Exposure |
|---|---|
| 80°F -90°F | Fatigue possible with prolonged exposure and physical activity |
| 90°F -105°F | Sunstroke, heat cramps with prolonged exposure |
| 105°F -120°F | Sunstroke, heat cramps, and heat exhaustion likely and heatstroke possible with prolonged physical activity |
| 120°F or Higher | Heatstroke/Sunstroke; exposure for people in higher risk groups |

*Figure 2.7:* Heat Index Effects of Exposure

This chart represents the averages and potential extreme temperatures of South Florida.

**South FL Monthly Averages (Degrees Fahrenheit)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Avg Temp** | 66° | 68° | 71° | 74° | 79° | 82° | 82° | 82° | 82° | 79° | 74° | 69° |
| **Record High** | 88° '79 | 94° '64 | 92° '77 | 99° '71 | 98° '02 | 98° '09 | 99° '82 | 98° '64 | 98° '77 | 98° '00 | 91° '02 | 89° '09 |
| **Record Low** | 28° '77 | 22° '89 | 20° '80 | 40° '50 | 51° '92 | 60° '66 | 64° '75 | 66° '81 | 61° '65 | 47° '76 | 25° '50 | 20° '89 |
| **Avg Rain** | 2.6" | 2.2" | 2.5" | 2.5" | 6.2" | 9.8" | 7.4" | 8.0" | 9.4" | 6.4" | 2.9" | 2.2" |

*Figure 2.8:* Averages and Record Temperatures in South Florida.

### 2.1.1.7 Agricultural Pests and Diseases

Florida agriculture generates farm cash receipts of nearly $8 billion annually. The state ranks 18th nationally in total farm cash receipts, second in vegetable and melon cash receipts, 11th in crop cash receipts, and generates more than 50% of total U.S. citrus production. The industry is susceptible to many hazards including freezes, droughts, and exotic pests or diseases. Agricultural crops grown throughout the state and every region are vulnerable to the effects of an exotic pest or disease infestation.

According to PBC Cooperative Extension, the county is one of the 10 largest agricultural counties in the United States, and leads the state of Florida in total agricultural sales with an estimated $1.42 billion in 2016-2017. Agricultural wages and salaries are also first in the state at more than $316 million. The county's 452,242 acres dedicated to agriculture represent 36% of its total land area. The main threats to the PBC agriculture industry are Citrus Canker, HLB (greening disease), the Mediterranean Fruit Fly (Medfly), and sugarcane pests.

However, as it relates to PBC, we have not experienced or had any issues as it relates to Agricultural Pest and Disease over the past 20 years.

**Citrus Canker**

Citrus Canker was found in PBC in numerous locations in 2002. The Florida Department of Agriculture and Consumer Services (FDACS) reported cases of orange and grapefruit trees infected in the southern and northern parts of the County. Citrus Canker is a bacterial disease that causes premature leaf and fruit drop. It affects all types of citrus, including oranges, sour oranges, grapefruit, tangerines, lemons, and limes. Symptoms found on leaves and fruit are brown, raised lesions surrounded by an oily, water-soaked area and a yellow ring or halo.

There is no known chemical compound that will destroy the Citrus Canker bacteria. In order to eradicate the disease, infected trees must be cut down and disposed of properly. In 2002, legal cases over the cutting down of infected and exposed trees began when citrus canker was discovered in PBC. The FDACS wanted to search a 70-square-mile area of PBC for diseased trees. It is a highly contagious disease that can be spread rapidly by windborne rain, lawnmowers and other landscaping equipment, animals and birds, people carrying the infection on their hands or clothing, and moving infected or exposed plants or plant parts. There is great potential to affect Florida's $9.1 billion citrus industry.

**Huanglongbing (HLB)/Citrus Greening Disease**

Huanglongbing (HLB), also known as citrus greening or yellow dragon disease, is one of the most serious citrus diseases in the world. It is widespread in Asia, Africa, and the Saudi Arabian Peninsula. In July 2004 it was reported in Brazil, and in August 2005 it was found for the first time in the U.S. in south Miami-Dade County. Huanglongbing is a bacterial disease that attacks the vascular system of plants. Once infected, there is no cure for the disease, and in areas where the disease is endemic, citrus trees decline and die within a few years. There are three (3) known forms: Asian, African and Brazilian. The HLB bacteria is transmitted primarily by insect vectors (Asian citrus psyllids), but can also be spread through plant grafting and movement of infected plant material. Even though the pathogens are bacteria, the disease does not spread by casual contamination of personnel and tools or by wind and rain. Though citrus is the primary plant host for HLB, other citrus relatives can also get the disease. Common HLB host plants include the Chinese box orange (Severinia buxifolia) and the curry leaf (Murraya koenigii). While HLB disease and the Asian psyllid share many of the same host plants, some host plants are specific to the disease and others to the psyllid.

The entire State is under Federal quarantine for citrus greening and Asian citrus psyllid. Federal law restricts the movement of live citrus plants, plant parts, budwood, or cuttings outside of Florida. Subsequent U.S. detections of the disease have occurred in numerous citrus-producing States and U.S. Territories.

The map on the following page from FDACS indicates instances of citris canker and citris greening in South Florida, including PBC.

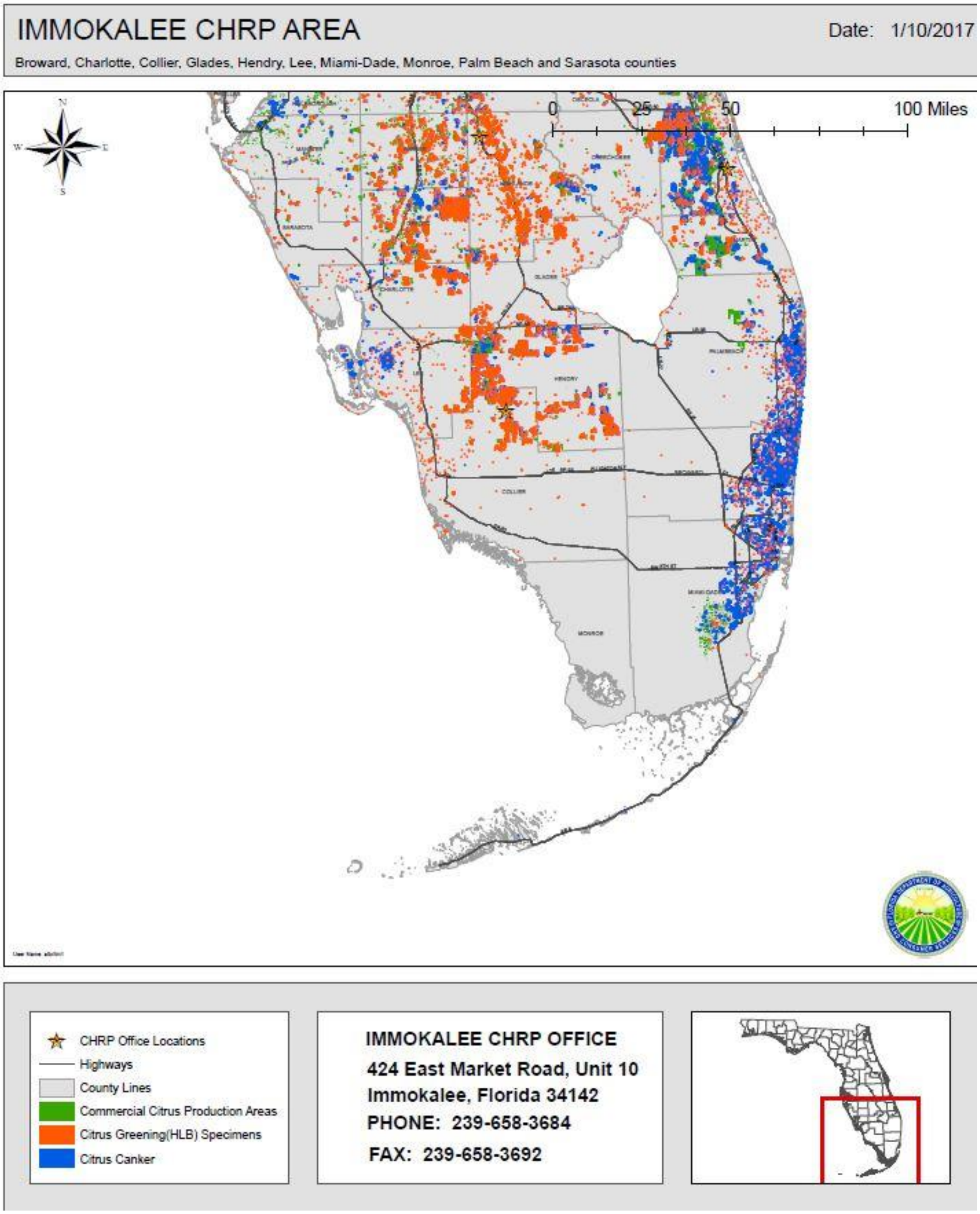



*Figure 2.9:* Citrus Canker and Citrus Greening in South Florida

**Mediterranean Fruit Fly (Medfly)**

Another possible threat to PBC's agriculture industry has been the Medfly. It is one of the world's most destructive pests and infests more than 250 different plants that are important for U.S. food producers, homeowners, and wildlife. It had been considered one of the greatest pest threats to Florida's $1.5 billion citrus crop, as well as endangering many other economically significant crops. For example, a Medfly outbreak in 1997 cost an estimated $26 million to eradicate. Florida growers were not permitted to ship numerous fruit and vegetable crops to many foreign and domestic markets. The movement of fruits and vegetables, even within the state if affected, would be disrupted, which could lead to higher prices in the supermarket.

Adult Medflies are up to 1/4 inch long, black with yellow abdomens, and have yellow marks on their thoraxes. Their wings are banded with yellow. The female Medfly damages produce by laying eggs in the host fruit or vegetable. The resulting larvae feed on the pulp, rendering the produce unfit for human consumption. In addition to citrus, Medflies will feed on hundreds of other commercial, backyard fruit, and vegetable crops.

Because Medflies are not strong fliers, the pest is spread by the transport of larval-infested fruit. The major threats come from travelers, the U.S. mail, and commercial fruit smugglers. Several steps had been taken to prevent new infestations. State and federal officials working with postal authorities, continue to inspect packages suspected of potentially carrying infested fruit.

Eradication efforts and close inspections have allowed the USDA to report no known Medfly infestations in PBC nor Florida in over 20 years. https://www.invasivespeciesinfo.gov/profile/mediterranean-fruit-fly
The USDA continues to apply Integrated Pest Management to determine the magnitude of pest infestations and crop diseases. It applies an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties.

The PBC LMS Committees have tried to provide the most comprehensive information possible for each potential hazard. In some instances the information was incomplete or there was only partially available data. Our Committees will continue its research, seek out further analytical tools or databases, and include new information in the LMS whenever possible as part of its annual monitoring.

We based the Medfly hazard on a probability scale of occurence. This scale takes into effect the likelihood that PBC will be impacted by the hazard within a given period of time or the return rate of a hazard, and is based on the historical data, estimated return periods, recurrence, or chance of occurrence.

- Very Low – Although the hazard is noted, no previous occurrence has been recorded; or less than a 0.1% chance of occurrence; or a 100-year event or greater.
- Low – The hazard has occurred 10 years or more ago; or greater than 0.1% to 1.0% chance of occurrence; or a 100-year event.

- Medium – The hazard has occurred in the past 6 to 10 years; or greater than 1.0% to 2.0% chance of occurrence; or a 50-year event.
- High – The hazard to occurred in the past 1-5 years; or greater than 2.0% chance of occurrence; or less than a 50-year event.

**Sugarcane Pests and Diseases**

Florida leads the nation in production and value of sugarcane, accounting for 52 percent of the total U.S. value for sugarcane for sugar and seed. Most of the commercial sugarcane industry is located in South Florida around the southern tip of Lake Okeechobee. Palm Beach County accounts for approximately 70 percent of the commercial sugarcane acreage. The remainder is grown in the adjacent counties of Hendry, Glades, and Martin. The crop is harvested from late-October through mid-April.

As a tropical grass, sugarcane has evolved to resist many pests that are common in semi-tropical environments, but there are still key pests for the crop. These pests include: sugarcane borer, white grubs, wireworms, yellow sugarcane aphid, and lesser cornstalk borer on the sugarcane grown on sand. Insect problems vary during the growing season and from one season to the next because of varying factors such as the weather and cultural practices.

There are a number of sugarcane diseases known throughout the world. However, very few have affected Florida sugarcane historically. Until 2008, no fungicides were used in this crop and varietal resistance to brown rust kept this disease under economic thresholds. However, orange rust has was found in Florida in 2007, and again, varietal adjustments and several cultivars use fungicides to maintain economically acceptable yields.

We also based the Sugarcane Pests and Diseases hazard on a similar probabity scale of occurance as the Medfly. This scale takes into effect the likelihood that PBC will be impacted by the hazard within a given period of time or the return rate of a hazard and is based on the historical data, estimated return periods, recurrence, or chance of occurrence.

- Very Low – Although the hazard is noted, no previous occurrence has been recorded; or less than a 0.1% chance of occurrence; or a 100-year event or greater.
- Low – The hazard has occurred 10 years or more ago; or greater than 0.1% to 1.0% chance of occurrence; or a 100-year event.
- Medium – The hazard has occurred in the past 6 to 10 years; or greater than 1.0% to 2.0% chance of occurrence; or a 50-year event.
- High – The hazard to occurred in the past 1-5 years; or greater than 2.0% chance of occurrence; or less than a 50-year event.

There have been no measureable outbreaks recorded for PBC or surrounding counties.

### 2.1.1.8 Wildfire/Urban Interface Zone

The Wildland/Urban Interface is defined as the area where structures and other human development meet with undeveloped wildland or vegetative fuels (FEMA, 1996). As residential areas expand into relatively untouched wildlands, people living in these communities are increasingly threatened by wildfires.

There are three (3) different classes of wildland fires. A surface fire is the most common type and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire is usually started by lightning 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 identified by dense smoke that fills the area for miles around.

Rural and large tracts of unimproved lands are susceptible to brush and forest fires capable of threatening life, safety, and property loss in adjacent developed areas if not effectively controlled. Wildfires are caused by numerous sources including arson, carelessness by smokers, individuals burning debris, operating equipment that throws sparks, and children playing with matches. However, the largest number of fires is caused by lightning strikes, which coincides with the height of the thunderstorm season. A major wildland fire can leave a large amount of scorched and barren land, and these areas may not return to pre-fire conditions for decades. If the wildland fire destroys the ground cover, other potential hazards, such as erosion, may develop (FEMA, 1998).

Structures in the wildland/urban interface zone are vulnerable to ignition in three (3) different ways: radiation, convection, and firebrands (National Wildland/Urban Interface Fire Protection Program). Radiating heat from a wildfire can cause ignition by exposure to the structure. The chances of ignition increase as the size of the flames increases, surface area exposed to flames increases, length of exposure time increases, and distance between the structure and the flames decreases. Another source of ignition by wildfire is convection. Ignition of a structure by convection requires the flame to come in contact with the structure. Contact with the convection column is generally not hot enough to ignite a structure. Clearing to prevent flame contact with the structure must include any materials capable of producing even small flames. Wind and steep slopes will tilt the flame and the convection column uphill increasing the chance of igniting a structure. Structures extending out over a slope have the greatest likelihood of ignition from convection.

Firebrands also pose a threat to structures in the wildland/urban interface. A firebrand is a piece of burning material that detaches from a fire due to strong convection drafts in the burning zone. They can be carried a long distance (approximately one (1) mile) by fire drafts and winds. The chance of these firebrands igniting a structure depends on the size of the firebrand, how long it burns after contact, and the materials, design, and construction of the structure.

The LMC Committees based Wildfire (above) and Muckfire (below) impacts on a severity scale based on the magnitude of the hazard and the on-going mitigation measures in place to counteract those hazards. The severity describes how intense a hazard may be felt and comprised of its impacts, as well as any mitigation actions to offset the impacts.

- Magnitude – the degree to which impacts may be felt or a measured intensity: Human Impacts – Possibility of death or injury to the population
    - Very Low – Minimal possibility of death or injury
    - Low – Less than 2 deaths or 10 injuries reported or expected
    - Medium – Between 2 – 5 deaths or 10 – 25 injuries reported or expected
    - High – More than 5 deaths or 25 injuries reported or expected

- Property Impacts – Physical losses and damages to property, buildings, or other critical infrastructure
    - Very Low – Minimal possibility of physical loss and/or damage
    - Low – Physical losses and/or damages are reported or expected to be less than $10,000
    - Medium – Physical losses and/or damages are reported or expected to be between $10,000 and $1,000,000
    - High – Physical losses and/or damages are reported or expected to be greater than $1,000,000

- Spatial Impacts – Amount of geographic area affected
    - Very Low – Minimal geographic area affected
    - Low – Up to 25% of total area or jurisdiction affected
    - Medium – 26%-50% of total area or jurisdiction affected
    - High – 50% or more of total area or jurisdiction affected

- Economic Impacts (Interruption of businesses, infrastructure, or government services)
    - Very Low – Minimal interruption of services or no more than 12 hours
    - Low – Interruption of services between 1 – 3 days
    - Medium – Interruption of services between 3 – 7 days
    - High – Interruption of services greater than 7 days

On April 15, 1999, just north of PBC in Port St. Lucie, a wildfire consumed 42 homes in 24 hours. Every fire unit in St. Lucie County and assistance from Indian River, Martin, Palm Beach, Broward, and Okeechobee Counties and units from two (2) Division of Forestry Districts, two (2) helicopters, and a Type 1 Air Tanker contained the fire after 26 hours. Due to the near perfect wildfire conditions, the fire suppression units were unable to keep up with these rapidly moving fires. The estimated damage was $4.2 million. Over 5,000 people were evacuated, most self-evacuated from the area.

On Thursday, April 10, 2002, a brush fire occurred in a heavily wooded area just east of the Acreage on the north side of Northlake Boulevard. Fueled by high winds, and low humidity, the fire eventually burned approximately 450 acres, destroyed a number of vehicles and trailers stored on the property, and required several days to fully extinguish. A helicopter was called in to aid in extinguishing the wildfire. The helicopter made a total of 58 water drops. A loss of $250,000 of timber was lost in relation to the wildfire.

The five (5) federal agency managing forest fire response and planning for almost 10 million acres in Florida are the United States Forest Service, the Bureau of Land Management, Bureau of Indian Affairs, the National Park Service, and the United States Fish and Wildlife Services. There are other State agencies that have a significant number of wildfires but conduct a lot of prescribed fires, namely the Florida Forest Service. They determine the magnitude of size, intensity, acreage, and potential for evacuations. The county has over 587,649 acres of vegetation and trees that could be potentially destroyed or damaged in an uncontrolled muck or wildfire. The majority of these areas are in the western and southwestern part portion of county. These acres are under contract with the Florida Department of Agriculture to be protected in case of fire in coordination with Palm Beach Country Fire Rescue.

#### 2.1.1.9 Muck Fire

A muck fire is a fire that consumes all the organic material of the forest floor, and also burns into the underlying soil. It differs from a surface fire by being invulnerable to wind. If the fire gets deep into the ground, it could smolder for several years. In a surface fire, the flames are visible and burning is accelerated by wind, whereas in a muck fire, wind is not generally a serious factor (Canadian Soil Information System, 1996). Another extraordinary fact about muck fires has to do with their release of carbon dioxide. A peat bog that is on fire can release more carbon dioxide into the atmosphere than all the power stations and car engines emit in Western Europe in one year (New Scientist, 1997). This type of fire could have a significant impact on the overall climate. Much like wildfires, we based this hazard on a severity scale as indicated above.

Muck fires are not a frequent threat to Florida. However, during a drought in the 1980s, fires in the Everglades consumed the rich, dried out muck that had once been the bottom of the swamp. These fires burned deep into the ground and required specialized, non-traditional firefighting techniques.

A muck fire occurred in June of 1999. There were about 20,000 acres of muck, brush, and sawgrass on fire in the Rotenberger Wildlife Management Area located in Southwestern PBC.

In May 2008, a muck fire, spawned by an extended drought, scorched the dried up edges of Lake Okeechobee between Moore Haven and Clewiston covering an area of over 5,800 acres.

In PBC, most of the muck area is owned by the sugar cane industry and not owned by the county. The corporation conducts controlled burns each year to over 300,000 acres of muck area to prepare the land for seasonal growth. These areas are monitored very closely. The National Park Service or the Florida Forest Service may determine the magnitude of size, intensity, acreage, and potential for evacuations. If a muck fired occurred that required Country resources, they would be provided with coordination.

### 2.1.1.10 Soil/Beach Erosion

#### Soil Erosion

Soil erosion is the deterioration of soil by the physical movement of soil particles from a given site. Wind, water, animals, and the use of tools by humans may all be reasons for erosion. The two (2) most powerful erosion agents are wind and water; but in most cases these are damaging only after humans, animals, insects, diseases, or fire have removed or depleted natural vegetation. Accelerated erosion caused by human activity is the most serious form of soil erosion because the rate is so rapid that surface soil may sometimes be blown or washed away right down to the bedrock. While there is no scale of determination, magnitude of soil erosion affect may be determined by economic impact given to the an area, agriculture type, or land development.

Undisturbed by humans, soil is usually covered by shrubs and trees, by dead and decaying leaves or by a thick mat of grass. Whatever the vegetation, it protects the soil when the rain falls or the wind blows. Root systems of plants hold the soil together. Even in drought, the roots of native grasses, which extend several feet into the ground, help tie down the soil and keep it from blowing away. With its covering of vegetation stripped away, soil is vulnerable to damage. Whether the plant cover is disturbed by cultivation, grazing, deforestation, burning, or bulldozing, once the soil is bare to the erosive action of wind and water, the slow rate of natural erosion is greatly increased. Losses of soil take place much faster than new soil can be created, and a kind of deficit spending of topsoil begins. With the destruction of soil structure, eroded land is possibly susceptible to erosion.

Beyond coastal PBC, soil erosion has become less prevalent as sustained land zoning ordinances, regulated land development, wildfire mitigation efforts, university agricultural extension information practices, and long matured agricultural conservation efforts contribute greatly a diminished hazard.

#### Beach Erosion

Wind, waves, and longshore currents are the driving forces behind coastal erosion. This removal and deposition of sand permanently changes beach shape and structure. Most beaches, if left alone to natural processes, experience natural shoreline retreat. As houses, highways, seawalls, and other structures are constructed upon or close to the beach, the natural shoreline retreat processes are interrupted. The beach jams up against these man-made obstacles and narrows considerably as the built-up structures prevent the beach from moving naturally inland. When buildings are constructed close to the shoreline, coastal property soon becomes threatened by erosion. The need for shore protection often results in "hardening" the coast with a structure such as a seawall or revetment.

A seawall is a large, concrete wall designed to protect buildings or other man-made structures from beach erosion. A revetment is a cheaper option constructed with "rip rap" such as large boulders, concrete rubble, or even old tires. Although these structures may serve to protect beachfront property for a while, the resulting disruption of the natural coastal processes has consequences for all beaches in the area. Seawalls inhibit the natural ability of the beach to adjust its slope to the ever changing ocean wave conditions. Large waves wash up against the seawall and rebound back out to sea carrying large quantities of beach sand with them. With each storm the beach narrows, sand is lost to deeper water, and the longshore current scours the base of the wall. Eventually large waves impact the seawall with such force that a bigger structure becomes necessary to continue to resist the forces of the ocean (Pilkey and Dixon, 1996).

The County, under the Department of Environmental Resources Management, has a shoreline enhancement and restoration program that anticipates the magnitude of beach soil erosion and shoreline areas and takes pro-active measures to protect the coastal areas. The plan is also adaptable to respond to disasters that may cause an effect to the shoreline.

The County's 46 miles of ocean shoreline has been subjected to coastal erosion for many years due to the stabilization of inlets, residential and commercial development, and natural forces. The coastal strand ecosystem is one of the most threatened natural systems in Florida due to over-development.

Presently, 33.6 of the County's 46 miles are listed as critically eroded by Florida's Department of Environmental Protection as of December 2017. They also list two (2) non-critically eroded areas (0.9 mile) and one (1) critically eroded inlet shoreline area (0.8 mile). While there is no one solution to beach erosion, several methods are utilized by PBC - each with its own merits and drawbacks. The first approach is to facilitate sand transfer at the inlets in order to restore the natural flow of sand. The second approach includes protecting the existing dunes and beaches and restoring the portions of shoreline that are already degraded. The last approach includes evaluating erosion control structures for use along beaches that may not qualify for a traditional beach fill project or may experience an erosional hot spot.

All approaches include environmental monitoring of the resources to ensure that our effort to restore sand is accomplished in a manner that protects the natural environment to the greatest extent possible. Through the Shoreline Enhancement & Restoration Program, the County is able to provide publicly accessible beaches, support the tourist-based economy, restore beach habitat and protect upland property. Funding for this capital improvement program is derived from a portion of "bed tax" fees administered through the Tourist Development Council, as well as funds from the state, the federal government and municipal partners. Modifications to natural tidal inlets and the creation and stabilization of artificial inlets affect the natural littoral transport of sediments. Therefore, efforts to maintain the natural sediment movement in and around all four (4) inlets in PBC are encouraged. Transfer of material from the north side of an inlet to the south prevents beach quality sand from being lost to the interior of an inlet or from becoming impounded within near shore shoals.

In 2011, the County constructed a new sand transfer plant (STP) and rehabilitated the north and south jetties. The STP is operated by the County and transfers approximately 70,000 cubic yards of material per year to the beaches south of the Inlet. The County also dredges the Inlet's interior sand trap approximately every six (6) years. Sand from the trap is pumped into the nearshore along the beach south of the Inlet.

Since the dissolution of the South Lake Worth Inlet District in 1996, the County has been responsible for the management of the South Lake Worth Inlet (Boynton Inlet) and the development of the Inlet's Management Plan.

PBC utilized a spatial impact for a hazard analysis by which the amount of geographic area is affected by either or both soil and beach erosion vulnerabilities and offset impacts may be felt by the municipality stakeholders.

- Very Low – Minimal geographic area affected
- Low – Up to 25% of total area or jurisdiction affected
- Medium – 26%-50% of total area or jurisdiction affected
- High – 51% or more of total area or jurisdiction affected

Recent erosion events include:

*Hurricanes Frances & Jeanne (September 2004).* Both Hurricanes Frances and Jeanne in 2004 equaled or exceeded the 100 year return period for storm surge in St Lucie, Indian River and southern Brevard Counties when they made landfall on the Martin County shoreline. The highest measured surge level for Category 2 Hurricane Frances was 11.8' (NGVD). The highest surge level for Category 2 Hurricane Jeanne was 10.8' (NGVD). Surge levels in PBC were significantly lower. Both storms caused significant beach erosion along the coastline of PBC.

*Tropical Storm Noel November 2007.* Between November 1 and November 4, 2007, high surf associated with Tropical Storm Noel battered the PBC coast. Hardest hit spots were beaches in Jupiter, Singer Island, and South Palm Beach/Lantana, where severe to locally extreme beach erosion occurred. A steel sea wall protecting the Condado condominium complex in Singer Island collapsed, causing cracks to form in the outer walls of the building. In some areas, the dune line was completely eroded, leaving oceanfront buildings sitting precariously on top of 15-foot cliffs looking straight down to the water. A sea wall at the Imperial House condominiums in South Palm Beach collapsed from the pounding surf, and the east portion of the building was evacuated. South of Lantana to Boca Raton, erosion was reported as moderate to severe. Total damage for the County (minus beach restoration costs) was estimated at $4 million. No tide measurements were available from PBC, but storm tide was estimated to have been as high as two (2) to three (3) feet over northern PBC. A strong pressure gradient between high pressure over the Mid-Atlantic States and Tropical Storm Noel over Hispaniola and eastern Cuba caused a prolonged period of strong easterly winds over Southeast Florida and the adjacent waters. As Noel moved north across the western Bahamas, the strong winds continued across southeast Florida. The event caused severe beach erosion, coastal flooding, and minor wind damage. The event began in the last week of October.

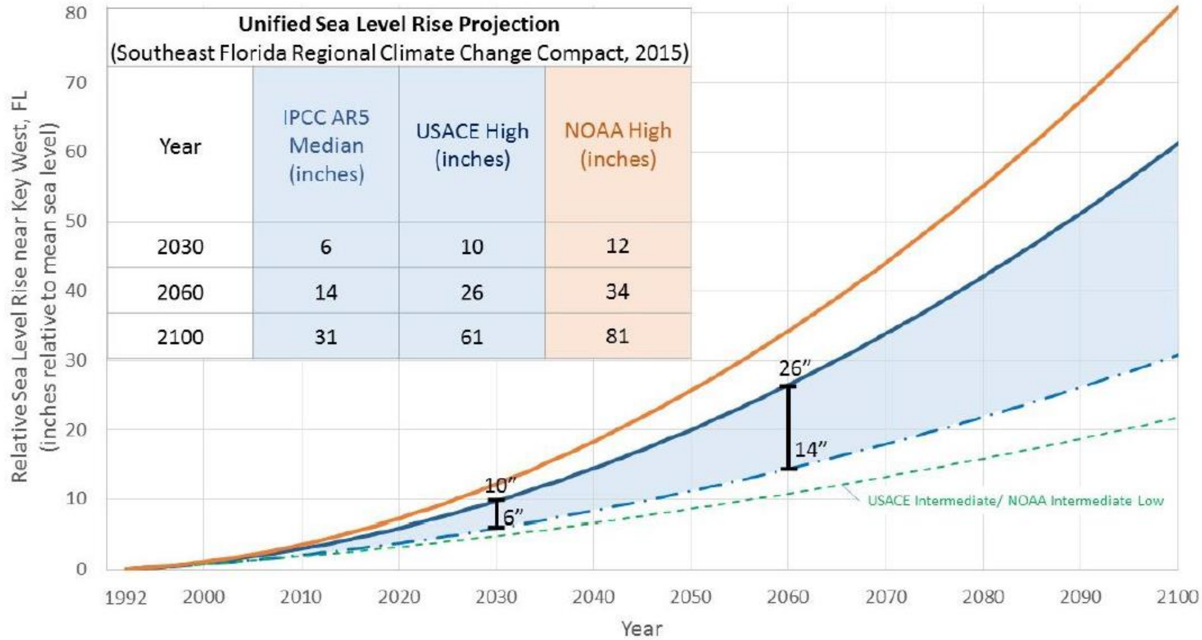
*Hurricane Sandy of October 25, 2012*. The main impact of Hurricane Sandy to the Palm Beach coast was large northeast swells generated by the storm, which pummeled the Southeast Florida coast with significant beach erosion and coastal flooding. Large breaking waves of possibly over 20 feet were estimated along the coast. As a result, major coastal flooding occurred with the most significant impacts experienced from central Palm Beach north, including the Manalapan area where beachfront structures were threatened by water intrusion. In all, there was an estimated $14 million in damage sustained in PBC. A maximum storm tide of 5.2 feet above mean lower low water (MLLW) was observed at Lake Worth Beach Pier on October 28 at 7:12 a.m. along with a maximum storm surge of 2.28 feet on October 28th at 2:26 a.m. Similar tide and surge levels were measured at the highest daily high tide during this period, generally between 7:00 and 9:00 a.m.

*Hurricane Irma of September 10-11, 2017.* Hurricane Irma, which centered over southwest Florida when it made landfall, caused an estimated $44 million dollars in damages from lost sand in PBC, according to County sources (http://cbs12.com/weather/hurricane-stories/hurricane-irma-causes-major-erosion-in-palm-beach-county). The hurricane removed enough sand from the area's 46 mile coastline to fill 380 olympic-sized swimming pools. A nourishment project completed years ago was undone by the force of the waves and wind from Hurricane Irma. Some sand was also lost in the Town of Palm Beach as well.

**2.1.1.11 Sea Level Rise**

Sea level rise is defined as a mean rise in sea level. Since 1870, global sea level has risen by about eight (8) inches. Nationally, sea level has risen 6.5 inches since 1950, and the rate of increase is accelerating with sea levels now rising by an average of one (1) inch every five (5) years (NOAA Tides and Currents). As coastal populations increase, vulnerability of those populations to sea level rise increases as well.

The curves below represent the 2015 Unified Sea Level Rise Projection for Southeast Florida. In the short term, sea level rise is projected to be six (6) to ten (10) inches by 2030 and 14 to 26 inches by 2060 (above the 1992 mean sea level). In the long term, sea level rise is projected to be 31 to 61 inches by 2100. For critical infrastructure projects with design lives in excess of 50 years, use of the upper curve is recommended with planning values of 34 inches in 2060 and 81 inches in 2100. Projected sea level rise, especially by 2060 and beyond, has a significant range of variation as a result of uncertainty in future greenhouse gas emissions and their geophysical effects, the incomplete quantitative understanding of all geophysical processes that might affect the rate of sea level rise in climate models, and the limitations of current climate models to predict the future. For these reasons, the Sea Level Rise Work Group of the Southeast Florida Regional Climate Change Compact has produced a guidance document describing recommended planning applications of the Unified Sea Level Rise Projection (see www.southeastfloridaclimatecompact.org).




*These projections are referenced to mean sea level at the Key West tide gauge. The projection includes three global curves adapted for regional application: the median of the IPCC AR5 RCP8.5 scenario as the lowest boundary (blue dashed curve), the USACE High curve as the upper boundary for the short term for use until 2060 (solid blue line), and the NOAA High curve as the uppermost boundary for medium and long term use (orange solid curve). The table lists the projection values at years 2030, 2060, and 2100. The USACE Intermediate or NOAA Intermediate Low curve is displayed on the figure for reference (green dashed curve). This scenario would require significant reductions in greenhouse gas emissions in order to be plausible and does not reflect current emissions trends.

*Figure 2.10 :* Unified Sea Level Rise Projection

The Southeast Florida Regional Climate Change Compact defines the consequences associated with sea level rise to include the following direct physical impacts:

- Coastal inundation of inland areas
- Increased frequency of flooding in vulnerable coastal areas
- Increased flooding in interior areas resulting from impairment of the region's stormwater infrastructure (i.e., impacts to gravity drainage systems, saltwater intrusion into the aquifer and local water supply wells, and contamination of the land and ocean with pollutants and debris and hazardous materials released by flooding)

Consequences of sea level rise also include socio-economic impacts such as displacement, decreases in property values and tax base, increases in insurance costs, loss of services, and impaired access to infrastructure.

Sea Level Rise is a relatively new hazard for the County and much of the Atlantic Coast resulting in increasing flooding frequency in coastal communities. The County did not monitor or record any incidents of Sea level Rise before 2013. High tide flooding which results in public inconveniences, often termed "nuisance flooding" or "sunny-day flooding," is increasing in frequency as sea level rises. Additionally, perigean spring tides, or tidal events which occur when a new or full moon are closest to the earth, are especially concerning to the public in South Florida. These tides, also known as "king tides," occur once or twice a year and produce slightly larger tidal ranges. In South Florida, we often see the effects of tidal flooding during the fall

(September–December) with the highest tide of year usually occurring in October. For example, according to the NOAA tide table below for the Lake Worth Beach Pier, highest predicted tides of 2017 were as follows:

Table 2.4

*NOAA 2017 Tide Table, Lake Worth Beach Pier*

| Date Range | Highest Date | Prediction (Ft) |
|---|---|---|
| October 5 -11, 2017 | October 8, 2017 | 3.86 |
| October 17-22, 2017 | October 18-20, 2017 | 3.57 |
| November 2-9, 2017 | November 5, 2017 | 4.01 |
| December 2-7, 2017 | December 4, 2017 | 4.00 |

When heavy rains or coastal storms coincide with high tide conditions, flooding can be exacerbated. Low-lying, coastal communities in PBC are most vulnerable to tidal flooding, and that risk is expected to increase as sea levels rise. Impacts include reduced access/egress to dwellings, businesses, parking lots and marinas; loss of business revenue; damage to vegetation and vehicles; and potential property damage.

### 2.1.1.12 Seismic Hazards

**Tsunamis**

Recent, widely published, research by British and American scientists warned of potential catastrophic destruction of coastal areas of the Atlantic, including the Florida east coast, by mega tsunami waves generated by a future volcanic collapse in the Canary Islands. The research predicted a gigantic wave would traverse the Atlantic at jet aircraft speeds and devastate the Florida coast as far as 10 miles inland. Such an event would present a tremendous warning challenge and a virtually impossible evacuation response. Subsequent research by the Tsunami Society, a body of scientists solely dedicated to the study of tsunamis, has concluded the threat has been grossly overstated. The society challenged many of the assumptions made relative to the probability and magnitude of a collapse on La Palma and the characteristics of waves should such a collapse occur. The Society notes that there have been no such mega-tsunami events in the Atlantic or Pacific oceans in recorded history.

The threat of a tsunamis impacting PBC is considered to be extremely low (approximately 5% or less per century). Tsunamis are most often generated by earthquake-induced movement of the ocean floor. Landslides, volcanic eruptions, and even meteorites can also generate a tsunami. They are often incorrectly referred to as tidal waves, but a tsunami is actually a series of waves that can travel at speeds averaging 450 (and up to 600) miles per hour in the open ocean. In the open ocean, tsunamis are not felt by ships because the wavelength is hundreds of miles long, while the amplitude is only a few feet. This would also make them unnoticeable from the air. As tsunami waves approach a coast, their speed decreases, and their amplitude increases. Unusual wave heights have been known to be over 100 feet high. However, waves that are 10 to 20 feet high can be very destructive and cause many deaths or injuries.

There have been no reported or recorded Tsunamis in PBC history.

**Earthquakes**

Although Florida is not usually considered to be a state subject to earthquakes, several minor shocks have occurred in recorded time, causing little if any damage. PBC has not been susceptible to earthquake activity. Therefore, earthquakes will not be fully profiled in the LMS.

- In January 1879, a shock occurred near St. Augustine that is reported to have knocked plaster from walls and articles from shelves. Similar effects were reported in Daytona Beach. The shock was felt in Tampa, throughout central Florida, and in Savannah, Georgia as well (Zirbes, 1971).
- In January 1880 another earthquake occurred, this time with Cuba as the focal point. Shock waves were sent as far north as the town of Key West (Zirbes, 1971).
- In August 1886, Charleston, South Carolina was the center of a shock that was felt throughout northern Florida. It rang church bells in St. Augustine and severely jolted other towns along sections of Florida’s east coast. Jacksonville residents felt many of the strong aftershocks that occurred in September, October, and November, 1886 (Zirbes, 1971).
- In June 1892, Jacksonville experienced a minor shock that lasted about ten (10) seconds. Another earthquake occurred in October 1892, and did not cause any damage either (Zirbes, 1971).
- In November 1948, doors and windows rattled in Captiva Island, west of Ft. Myers. It was reportedly accompanied by sounds like distant heavy explosions (Zirbes, 1971).
- In November 1952, a slight tremor was felt in Quincy, a town located 20 miles Northwest of Tallahassee. Windows and doors rattled, but no damage was reported (Zirbes, 1971).

### 2.1.1.13 Geologic Hazards

**Sinkholes and Subsidence**

Sinkholes are a common feature of Florida's landscape. They are only one of many kinds of karst land forms, which include caves, disappearing streams, springs, and underground drainage systems, all of which occur in Florida. Karst is a generic term, which refers to the characteristic terrain produced by erosion processes associated with the chemical weathering and dissolution of limestone or dolomite, the two most common carbonate rocks in Florida. Dissolution of carbonate rocks begins when they are exposed to acidic water. Most rainwater is slightly acidic and usually becomes more acidic as it moves through decaying plant debris. Limestone in Florida is porous, allowing the acidic water to percolate through it, dissolving some and carrying it away in solution. Over time, this persistent erosion process has created extensive underground voids and drainage systems in much of the carbonate rocks throughout the state. Collapse of overlying sediments into the underground cavities produces sinkholes (Florida Geological Survey, 1998). Sink holes vary in size, length and depth.

We based Geological hazards on a probabity scale of occurance. This scale takes into effect the likelihood that PBC will be impacted by this hazard within a given period of time or the return rate of a hazard and is based on the historical data, estimated return periods, recurrence, or chance of occurrence.

- Very Low – Although the hazard is noted, no previous occurrence has been recorded; or less than a 0.1% chance of occurrence; or a 100-year event or greater.
- Low – The hazard has occurred 10 years or more ago; or greater than 0.1% to 1.0% chance of occurrence; or a 100-year event.
- Medium – The hazard has occurred in the past 6 to 10 years; or greater than 1.0% to 2.0% chance of occurrence; or a 50-year event.
- High – The hazard to occurred in the past 1-5 years; or greater than 2.0% chance of occurrence; or less than a 50-year event.

PBC has not had any reported sinkholes as they are defined in this paragraph in the past 20 years. This is due to our location and the lack of limestone deposits in the County which does not provide an opportunity for acidic decay to occur.

#### 2.1.1.14 Pandemic/Communicable Diseases

Infectious diseases emerging throughout history have included some of the most feared plagues of the past. New infections continue to emerge today, while many of the old plagues are still with us. As demonstrated by influenza pandemics, under suitable circumstances, a new infection first appearing anywhere in the world could travel across entire continents within days or weeks (Morse, 1996). Due to the potential of complex health and medical conditions that can threaten the general population, Florida's vulnerability to a pandemic is continually monitored. With millions of tourists arriving and departing the state annually, disease and exposure (airborne, vector, and ingestion) are constantly evaluated and analyzed.

Primarily as a result of the entrance of undocumented aliens into south Florida, and the large number of small wildlife, previously controlled or eradicated diseases have surfaced. Health officials closely monitor this potential threat to the public health. The emphasis upon preventive medical measures such as school inoculation, pet licensing, rodent/insect eradication, water purification, sanitary waste disposal, health inspections, and public health education mitigate this potential disaster.

Another potential threat to south Florida's population is food contamination. Frequent news stories document that *E.coli* and botulism breakouts throughout the country are not that uncommon.

While this plan addresses all potential pandemic diseases, those that have actually affected PBC will be addressed in that disease discussion.

**Avian (Bird Flu) H5N1**

Although there are many forms of bird flu, the form that has most recently concerned health officials is the H5N1 flu virus carried by wild birds. While wild birds seldom get sick from the virus, they can easily pass the virus to farm birds such as chickens, ducks, and turkeys being raised for food. There have been very few rare cases of H5N1 being transmitted to humans, mostly in Asia. The Centers for Disease Control (CDC) recommends if you work closely with birds such as poultry farms, and develop conjunctivitis or flu-like symptoms, to seek medical attention to rule out H5N1.

**Swine Flu A (H1N1)**

One way an antigenic shift can occur is through pigs. Pigs can be infected with both avian and human influenza viruses. If pigs become infected with viruses from different species at the same time, it is possible for genes of the viruses to mix and create a new virus for which humans have no natural immunity. This is termed by the CDC as a “variant” virus.

According to the CDC, estimating the number of individual flu cases in the United States is very challenging because many people with flu don’t seek medical care and only a small number of those that do seek care are tested. More people who are hospitalized or die of flu-related causes are tested and reported, but under-reporting of hospitalizations and deaths occurs as well. For this reason CDC monitors influenza activity levels and trends and virus characteristics through a nationwide surveillance system and uses statistical modeling to estimate the burden of flu illness (including hospitalizations and deaths) in the United States.

Influenza viruses that normally circulate in pigs are called “variant” viruses when they are found in people. Influenza A H3N2 variant viruses (also known as “H3N2v” viruses) with the matrix (M) gene from the 2009 H1N1 pandemic virus were first detected in people in July 2011. The viruses were first identified in U.S. pigs in 2010. In 2011, 12 cases of H3N2v infection were detected in the United States (Indiana, Iowa, Maine, Pennsylvania, and West Virginia). In 2012, 309 cases of H3N2v infection across 12 states were detected. In 2013, 19 cases of H3N2v across five (5) states were detected.

The CDC assessment from 2017 states it’s possible that sporadic infections and even localized outbreaks among people with this virus may occur. While there is no evidence at this time that sustained human-to-human transmission has occurred, all influenza viruses have the capacity to change and it’s possible that this virus may change and become widespread in people. Illness associated with H3N2v infection so far has been mostly mild with symptoms similar to those of seasonal flu. Like seasonal flu, however, serious illness, resulting in hospitalization and death is possible.

There have been no documented cases of any of the H1N1 or variants in the state of Florida since 2011.

**MERS-CoV**

MERS-CoV is a novel corona virus causing severe acute respiratory illness. Corona viruses are transmitted by close person-to-person contact. Corona viruses are thought to be transmitted most readily by respiratory droplets produced when an infected person coughs or sneezes, or through living with or caring with someone who has a confirmed case of MERS. The virus also can spread when a person touches a surface or object contaminated with infectious droplets and then touches his or her mouth, nose, or eye(s). Signs and symptoms of MERS-CoV are fever, cough, and shortness of breath. The death rate is 30-40% of all people who have reported with MERS.

**West Nile Virus**

The PBC Health Department reported cases of the West Nile Virus in 2002, 2002, 2010, and 2011. This disease is transmitted by mosquitoes. Health notifications were given throughout the County both years to alert and caution the public. Individuals were advised to take precautions when outdoors and to try to avoid being outside after dusk.

The West Nile Virus is an arthropod-borne virus (arbovirus) most commonly spread through infected mosquitoes. In a very small number of cases, the virus has been transmitted through blood transfusions, organ transplants, and from mother to baby during pregnancy, delivery, or breastfeeding. Most people (70-80%) who contract West Nile Virus never develop symptoms. Those with symptoms include a fever with headache, body aches, joint pains, vomiting, diarrhea, or rash. Some severe symptoms (less than 1% will exhibit) are serious neurologic illness such as encheaphalitis or meningitis.

**SARS**

Severe Acute Respiratory Syndrome (SARS) is a viral respiratory illness caused by a corona virus, called SARS-associated corona virus (SARS-CoV). It is transmitted by close person-to-person contact. The virus that causes SARS is thought to be most readily spread by respiratory droplets produced when an infected person coughs or sneezes, or when a person touches a surface or object contaminated with infectious droplets and then touches his/her nose, mouth, or eyes. Signs and symptoms of SARS generally begins with a high fever (greater than 100.4 degrees Fahrenheit) and may include headache, overall feeling of discomfort, and body aches. Some people will also have mild respiratory symptoms.

**Malaria**

Malaria is a parasite (*P.faliciparum, P.vivax, P.malariae,* and *P.ovale*) that infects humans primarily after being bitten by an infected mosquito. It also can be transmitted from infected mothers to their babies during pregnancy or during delivery, and in rare cases, through blood transfusions. Malaria was eradicated from the US in the early 1950's, and nearly all cases today in the US are from recent overseas travelers.

Symptoms of malaria include fever and flu-like illness, including chills, headache, muscle aches, and tiredness. Nausea, vomiting, and diarrhea may also occur. For most people, symptoms begin ten (10) days to four (4) weeks after infection, although a person may feel ill as early as eight (8) days or as late as one (1) year later.

**Dengue**

Dengue fever is caused by any of four (4) closely related viruses, or serotypes of dengue 1-4. Dengue is transmitted by the bite of infected mosquitoes (*Aedes aegypti* and *Aedes albopictus*) which are found throughout the world, including PBC. Signs and symptoms include severe headache, high fever, severe eye pain (behind the eyes), muscle, bone, and joint pain, low white cell count, mild bleeding manifestation (e.g., nose or gum bleed, petechiae, or easy bruising), and rash.

Dengue hemorrhagic fever is a similar illness but also occurring with hemorrhagic manifestations. A person can be infected separately by all four (4) dengue fever serotypes, and research has shown that infection by more than one increases the chances of developing dengue hemorrhagic fever.

**Ebola**

Ebola Virus Disease is a rare and deadly disease most commonly affecting people and nonhuman primates (monkeys, gorillas, and chimpanzees). It is caused by an infection of one (1) of five (5) known Ebola virus species, four (4) of which can cause disease in people: Ebola virus, Sudan virus, Tai Forest virus, Bundibugyo virus, and Reston virus (only nonhuman primates and pigs, not humans). Ebola spreads to people through direct contact with bodily fluids of a person who is sick or who has died from the virus. It enters through broken skin or mucous membranes in the eyes, nose, or mouth. In 2014, the Ebola virus drew national attention with one (1) suspected case in the County. DEM worked with Florida Health and other key stakeholders to develop the Port of Entry sections of this plan that would mitigate against passengers coming into PBC affected with any communicable disease. As of March 29, 2016, the World Health Organization terminated the Public Health Emergency of International Concern for the Ebola outbreak in West Africa. There have been no cases in the US since before that time.

**Zika**

Zika is a virus which spreads to people primarily through the bite of an infected *Aedes* species mosquito. It can also be passed through sex from a person who has Zika to his or her sex partners, and it can be spread from a pregnant woman to her fetus. In 2015, Zika was not a nationally reportable disease however, nine (9) cases, representing 15% of all US cases of symptomatic infections, occurred in the State of Florida. In 2016, Florida reported 1,115 cases, representing 22% of all US cases of infections. In 2017, this number dropped significantly to 110 cases, and in 2018 dropped again to 14. As of this writing, there have been no reported cases in Florida in 2019. This is due to efforts by local, state, and federal health and government officials identifying outbreaks and using mitigation strategies (i.e. mosquito spraying) to reduce the chances of infected mosquitoes transmitting the virus.

The County has a very active mosquito spraying program which has likely limited the spread of Zika from the *Aedes* species mosquito.

PBC bases Pandemic Diseases on a probabity scale of occurance. This scale takes into effect the likelihood that PBC will be impacted by disease hazards within a given period of time or the return rate of a hazard and is based on the historical data, estimated return periods, recurrence, or chance of occurrence.

- Very Low – Although the hazard is noted, no previous occurrence has been recorded; or less than a 0.1% chance of occurrence; or a 100-year event or greater.
- Low – The hazard has occurred 10 years or more ago; or greater than 0.1% to 1.0% chance of occurrence; or a 100-year event.
- Medium – The hazard has occurred in the past 6 to 10 years; or greater than 1.0% to 2.0% chance of occurrence; or a 50-year event.
- High – The hazard to occurred in the past 1-5 years; or greater than 2.0% chance of occurrence; or less than a 50-year event.

### 2.1.2 Technological Hazards

#### 2.1.2.1 Dike Failure

Dam/levee failure poses a threat to population and property in several areas of PBC. All are earthen structures and are state, regionally, locally, or privately controlled. The most significant risk related to dam/levee failure is flooding due to substantial rainfall and its eastward migration to final discharge in the Indian River Lagoon. Structural and non-structural techniques to slow and contain this runoff incorporate several drainage systems, some dating back to 1919. Rainfall in excess of designed capacities could cause erosion of constructed drainage facilities and flooding of many areas including primary roadway evacuation routes (CEMP, 2015).

The Herbert Hoover Dike (HHD) was completed in 1927 to protect PBC citizens from experiencing another flooding event similar to the occurrence in 1928. The flooding derived from the 1928 hurricane, which resulted in over 2,500 deaths and thousands more injured in the western portion of PBC. The dike protects from major flooding events occurring in Belle Glade, Pahokee, and South Bay municipalities. Also, there is a potential for flooding in The Village of Wellington, Royal Palm Beach, West Palm Beach, Palm Beach Gardens, and unincorporated PBC. The HHD is continuously monitored by the Army Corps of Engineers in partnership with the SFWMD.

The U.S. Army Corps of Engineers has finalized a key report that authorizes additional rehabilitation work on the HHD that surrounds Lake Okeechobee in south Florida. The Corps' Jacksonville District received notification in 2017 that the dam safety modification report for the dike has been approved, marking the culmination of a four-year effort to conduct a risk assessment of the 143-mile earthen structure and develop alternatives for its rehabilitation.

The report, known as HHD Dam Safety Modification Study Environmental Impact Statement focuses on a tentatively selected plan to extend embankment repairs over 28 miles on the south and west sides of the structure.

The approved repairs include installing 24 miles of seepage barrier, commonly known as a partial cutoff wall from Moore Haven to Lake Harbor (this is in addition to installing 6.8 miles of seepage barrier between Lake Harbor and Belle Glade approved in a 2015 report). The Corps also plans to install four (4) miles of cutoff wall near Lakeport. In addition, engineers recommended armoring the embankment around the State Route 78 bridge near the Harney Pond Canal and installing floodwall near water control structures on the Harney Pond and Indian Prairie Canals.

Jacksonville District engineers anticipate rehabilitation work on the dike will continue until the mid-2020s, around 2025. The current cost of additional construction features is estimated at $900 million.

A catastrophic failure of the HHD could pose a significant danger to the residents, local economies, and environment of PBC and South Florida. Completion of the HHD rehabilitation projects will serve to better protect the PBC communities of Belle Glade, Pahokee, and South Bay.

#### 2.1.2.2 Hazardous Materials Accident

Hazardous materials accidents can occur anywhere there is a road, rail line, pipeline, or fixed facility storing hazardous materials. Virtually the entire state is at risk to an unpredictable accident of some type. Most accidents are small spills and leaks, but some result in injuries, property damage, environmental contamination, and other consequences. These materials can be poisonous, corrosive, flammable, radioactive, or pose other hazards and are regulated by the Department of Transportation. Out of approximately 1,662 hazardous materials incidents reported statewide in 1997, no known fatalities were reported, less than 4% resulted in injuries, and less than 6% resulted in evacuation.

Emergencies involving hazardous materials can be expected to range from a minor accident with no off-site effects to a major accident that may result in an off-site release of hazardous or toxic materials. The overall objective of chemical emergency response planning and preparedness is to minimize exposure for a wide range of accidents that could produce off-site levels of contamination in excess of Levels of Concern (LOC) established by the U.S. Environmental Protection Agency. Minimizing this exposure will reduce the consequences of an emergency to people in the area near to facilities, which manufacture, store, or process hazardous materials (TCRPC).

Large volumes of hazardous materials are transported to and through the county by railroad, highway, air, water, and pipeline daily. Within PBC, there are a number of both public and private fixed facilities, which produce or use hazardous materials. Coordinating procedures for hazardous material response are found within the County's *Hazardous Materials Hazard Specific Plan*.

In addition to the County's *Hazardous Materials Hazard Specific Plan*, as well as other hazardous materials plans, Local Emergency Planning Committee (LEPC) officials have prepared a plan for use in responding to and recovering from a release of hazardous or toxic materials. This plan addresses the range of potential emergency situations and the appropriate measures to be implemented to minimize exposure through inhalation, ingestion, or direct exposure.

Mishandling and improper disposal or storage of medical wastes and low-level radioactive products from medical use are also a hazard to PBC. For example, a few years ago an incident occurred in New Jersey when improper disposal of medical wastes resulted in some of the used products ending up on Atlantic Ocean beaches.

The county has not experienced any significant hazardous material accidents in the past ten (10) years.

### 2.1.2.3 Radiological Accidents (Nuclear Power Plant Accident)

While an actual release of radioactive material is extremely unlikely and the immediate threat to life extremely low, vulnerability to a nuclear plant disaster could consist of long-range health effects with temporary and permanent displacement of populations from affected areas. The potential danger from an accident at a nuclear power plant is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloud-like) formation. The area the radioactive release might affect is determined by the amount released from the plant, wind direction, and speed and weather conditions (e.g., rain, snow, etc.) which would quickly drive the radioactive material into the ground, causing increased deposition of radio nuclides.

The levels of response to the release of radioactive materials are as follows:

- Notification of Unusual Event - The event poses no threat to plant employees, but emergency officials are notified. No action by the public is necessary.
- Alert - An event has occurred that could reduce the plant's level of safety, but back- up systems still work. Emergency agencies are notified and kept informed, but no action by the public is necessary.
- Site Area Emergency - The event involves major problems with the plant's safety and has progressed to the point that a release of some radioactivity into the air or water is possible, but is not expected to exceed Environmental Protection Agency Protective Action Guidelines (PAGs). Thus, no action by the public is necessary.
- General Emergency - The event has caused a loss of safety systems. If such an event occurs, radiation could be released that would penetrate the site boundary. State and local authorities will take action to protect the residents living near the plant. The alert and notification system will be sounded. People in the affected areas could be advised to evacuate, or in some situations, to shelter in place. When the sirens are sounded, radio and television alert will have site-specific information and instructions.

Thirty of the 67 counties in the State of Florida are involved in preparedness planning for a commercial nuclear power plant emergency.

The St. Lucie nuclear power plant is located on Hutchinson Island approximately four (4) miles east-northeast of the City of Port St. Lucie, approximately 5.5 miles north of Martin County/St. Lucie County boundary line. This facility is owned and operated by the Florida Power & Light Company. The county is located more than 20 miles from the plant and is well outside the ten (10) mile Emergency Planning Zone/potential plume area, so there is not a risk to direct radiation exposure. Therefore, PBC would provide assistance to St. Lucie and Martin Counties in the unlikely chance of an accident at the plant. The County municipalities located in part or whole within 50 miles of the power plant (Tequesta, Jupiter Inlet Colony, Jupiter, Juno Beach, Palm Beach Gardens, North Palm Beach, Lake Park, Riviera Beach, Mangonia Park, West Palm Beach, Palm Beach, Pahokee, Royal Palm Beach, Haverhill, Glen Ridge, Wellington, Palm Springs, Greenacres and Lake Clarke Shores) fall within the 'Ingestion Pathway Zone' meaning if there is a major release at the power plant, radioactive contamination could be deposited as far as 50 miles affecting food and water supplies.

The purpose of the County radiological preparedness program is to prepare to receive, shelter, and decontaminate (if necessary) potentially contaminated evacuees from an accident at the St. Lucie nuclear power plant. A radiological emergency response plan has been developed and is exercised in order to have reasonable assurance that adequate protective measures can be taken in the event of a radiological emergency.

#### 2.1.2.4 Communications Failure

Perhaps the most common cause of communications failures during disasters is the physical damage to devices or components that make up a network infrastructure. Hurricane-force winds, floodwaters, terroristic or cyber activity can all create physical disturbances that have the power to do significant damage to cities and the vulnerable communications equipment that's responsible for supporting these areas.

Disruptions caused by physical damage have the potential to be incredibly costly and time consuming to restore, as they require maintenance or sometimes replacement of complex network hardware to re-establish communications. This is especially problematic if major installations such as cell towers or fiber-optic cables are involved. If a cell tower is severely damaged or even knocked down, it not only causes major disruptions in the area's wireless communications but is extremely expensive to replace and will remain a significant problem until the service provider is able to get a repair crew into the affected area.

Likewise, damage to fiber-optic cables can be an even greater challenge to repair. Because the cables are concealed underground, large portions of earth and roadway may need to be excavated just to pinpoint the exact location of the damage.

Wireless links are also susceptible to disruption or damage during disasters, as different wavelength signals can be cut off by heavy rain, or high winds. The transmitter itself can also receive damage or be knocked out of alignment with its receiver. While these issues are sometimes cheaper and less difficult to correct than damage to wired infrastructure, it nonetheless remains a serious obstacle to rescue efforts if knocked offline during a disaster.

### 2.1.2.5 Hazardous Materials Release

A large volume of hazardous materials are transported to and through the County by railroad, highway, air, water, and pipeline daily, on a routine basis. Within PBC, there are a number of both public and private fixed facilities, which produce or use hazardous materials. Coordinating procedures for hazardous material response are found within the County's *Hazardous Materials Hazard Specific Plan*.

Mishandling and improper disposal or storage of medical wastes and low-level radioactive products from medical use are also a hazard to PBC. In 1988, an incident occurred in New Jersey when improper disposal of medical wastes resulted in used products ending up on Atlantic Ocean beaches.

The county has not experienced any significant hazardous material releases in the past ten years.

### 2.1.2.6 Transportation System Accidents

Florida has a large transportation network consisting of major highways, airports, marine ports, and passenger railroads. The heavily populated areas of PBC are particularly vulnerable to serious accidents, which are capable of producing mass casualties. With the linear configuration of several major highways in PBC, such as Interstate highways and the Florida Turnpike, major transportation accidents could occur in a relatively rural area, severely stressing the capabilities of local resources to respond effectively. A notorious regional example is the crash in the Everglades of the Value Jet Flight 592 on May 11, 1996, which resulted in 110 fatalities and cost millions of dollars to respond, severely taxing the financial and public safety resources of Miami-Dade County. Similarly, a major transportation accident could involve a large number of tourists and visitors from other countries, given Florida’s popularity as a vacation destination, further complicating the emergency response to such an event.

The county has not experienced any significant Transportation System Accidents in the past ten years.

### 2.1.2.7 Coastal Oil Spill

As a major industrial nation, the United States produces, distributes, and consumes large quantities of oil. Petroleum-based oil is used as a major power source to fuel factories and various modes of transportation, and in many everyday products, such as plastics, nylon, paints, tires, cosmetics, and detergents. At every point in the production, distribution, and consumption process, oil is invariably stored in tanks. With billions of gallons of oil being stored throughout the country, the potential for an oil spill is significant, and the effects of spilled oil can pose serious threats to the environment.

In addition to petroleum-based oil, the U.S. consumes millions of gallons of non-petroleum oils, such as silicone and mineral-based oils, and animal and vegetable oils. Like petroleum products, these non-petroleum oils are often stored in tanks that have the potential to spill, causing environmental damages that are just as serious as those caused by petroleum-based oils. To address the potential environmental threat posed by petroleum and non-petroleum oils, the U.S. Environmental Protection Agency has established a program designed to prevent oil spills. The program has reduced the number of spills to less than 1 % of the total volume handled each year (Environmental Protection Agency, 1998). Spilled oil poses serious threats to fresh water and marine environments, affecting surface resources and a wide range of subsurface organisms. Most oils tend to spread horizontally into a smooth and slippery surface, called a slick, on top of the water. However, once the oil reaches the shoreline it can escape downward into sand, making it difficult to clean up and reducing its ability to degrade. Spilled oil can harm the environment in several ways, including the physical damages that directly impact wildlife and their habitats (such as coating birds or mammals with a layer of oil), and the toxicity of the oil itself, which can poison exposed organisms.

Not only would an oil spill adversely affect the environment, but also the economy would suffer due to a decrease in tourism. Depending on the severity of the spill, the economy could suffer mild, short-term effects to devastating, long-term effects.

Many advanced response mechanisms are available for controlling oil spills and minimizing their impacts on human health and the environment. Mechanical containment or recovery is the primary line of defense against oil spills. This type of equipment includes a variety of booms, barriers, and skimmers. Natural and synthetic sorbent materials are used as well to capture and store the spilled oil until it can be disposed of properly. Chemical and biological methods can be combined with mechanical means for containing and cleaning up oil spills. Dispersants and gelling agents are most useful in helping to keep oil from reaching shorelines and other sensitive habitats. Physical methods are used to clean up shorelines as well. Wiping with sorbent materials, pressure washing, raking, and bulldozing can be used to assist natural environmental recovery processes. Scare tactics are used to protect birds and animals by keeping them away from oil spill areas.

The County has 46 miles of Atlantic Ocean coastline that is subject to contamination caused by an oil spill. By Executive Order, the responsibility for preparing response plans for coastal oil spills is designated to the Department of Environmental Protection, Division of Florida Marine Patrol. There are two (2) active oil field regions in Florida: in Escambia and Santa Rosa counties in the Panhandle, and Collier, Hendry, and Lee counties in southwest Florida.

On April 20, 2010, an explosion on the Deepwater Horizon/BP MC252 drilling platform in the Gulf of Mexico killed 11 workers and caused the rig to sink. As a result, oil began leaking into the Gulf creating one of the largest spills in American history. During the next 87 days an estimated 4.9 million barrels (210 million gallons) of oil were released. While the spill did not affect the waterways or coastal communities of PBC, it did put DEM and other supporting agencies throughout the County on alert. Extensive plans were coordinated to prepare for a potential containment and oil clean up response.

### 2.1.2.8 Wellfield Contamination

As communities become more aware of both the potential health risks and the economic effects of ground water contamination, they are beginning to look increasingly toward preventative efforts. Even when no immediate hazard appears to exist, a community should be concerned about protecting its drinking water supply for three (3) reasons: to reduce potential risks to the health of the community; to avoid the costs of cleaning up contamination and providing alternative water supplies; and to prevent the negative economic impacts on community development that ground water contamination can cause.

The development of wellfield protection programs is a major preventative approach for the protection of community drinking water supplies. Wellfield protection is a means of safeguarding public water supply wells by preventing contaminants from entering the area that contributes water to the well or wellfield over a period of time. Management plans are developed for the wellfield protection area that include inventorying potential sources of groundwater contamination, monitoring for the presence of specific contaminants, and managing existing and proposed land and water uses that pose a threat to groundwater quality.

Ground water is a vitally important natural resource. It is a source of drinking water for more than half of the U.S. population and more than 95 % of the rural population. In addition, ground water is a support system for sensitive ecosystems, such as wetlands or wildlife habitats.

Between 1971 and 1985, there were 245 ground water related outbreaks of disease nationwide, resulting in more than 52,000 individuals being affected by associated illnesses (Browning). While most of these diseases were short-term digestive disorders caused by bacteria and viruses, hazardous chemicals found in wells nationwide also pose risks to public health.

The 1986 Amendments to the Federal Safe Drinking Water Act require states to implement wellfield protection programs for public water wells. Prevention strategies include maintaining the isolation distances from potential contamination sources, reporting to the state violations of the isolation distance to the state, and asking a local governmental unit to regulate these sources.

Cleaning up contaminated ground water can be technically difficult, extremely expensive, and sometimes cannot be done. Contaminated ground water also affects the community by discouraging new businesses or residents from locating in that community.

### 2.1.2.9 Power Failure (Outages)

In the U.S., from July 2 to August 10, 1996, the Western States Utility Power Grid reported widespread power outages that affected millions of customers in several western states and adjacent areas of Canada and Mexico. These problems resulted from a variety of related causes, including sagging lines due to hot weather, flashovers from transmission lines to nearby trees, and incorrect relay settings. According to the electric utility industry's trade association, the potential for such disturbances is expected to increase with the profound changes now sweeping the electric utility industry.

On August 14, 2002, the largest power outage occurred in the Northeast and Midwest states. The power outage started around 2:00 p.m. in the afternoon, and was out in some places until August 18. There were major cities without power for an extended period of time. Some of the cities included: New York, Cleveland, Detroit, Buffalo, and Toronto. The power outage affected millions of people across states and Canada. The source of the outage is unclear at this time. The entire northeast power grid was affected.

In PBC, the major causes of a power failure are lightning and trees. Lightning strikes and trees falling onto power lines can shut down power for hundreds of people. Other factors that can cause a power failure are:

- Age of facility (transmission and distribution);
- Community growth; and
- High winds.

The location of power lines underground or above ground also has significance. Lines underground have the advantage of being less vulnerable to tree foliage; however, they are still at risk from other underground hazards such as tree roots.

To address times when generating capacity is tight, or falls below consumer demand due to state or local emergencies, the Florida Electrical Emergency Contingency Plan was developed. Alerts have been created to give early warning of potential electricity shortfalls and bring utilities, emergency management officials, and the general public to a state of preparedness. The Contingency Plan has four (4) stages (Florida Reliability Coordinating Council):

- Generating Capacity Advisory - A Generating Capacity Advisory is primarily for information purposes. It starts utility tracking activities, and it initiates inter-utility and inter-agency communication. No action by the public is required. General information may be distributed to consumers to forewarn them of conditions if necessary.
- Generating Capacity Alert - A Generating Capacity Alert starts actions to increase reserves. Available emergency supply options will be explored. When reserves fall below the size of the largest generating unit in the state, loss of that size unit to an unexpected mechanical failure could lead to blackouts somewhere since insufficient backup is available.
- Generating Capacity Emergency - A Generating Capacity Emergency occurs when blackouts are inevitable somewhere in Florida. Every available means of balancing supply and demand will be exhausted. Rolling blackouts, manually activated by utilities are a last resort to avoid system overload and possible equipment damage. Frequent status reports are provided to agencies and the media. The Division of Emergency Management will consider using the Emergency Broadcast System to inform citizens of events and to direct them to available shelters if conditions warranted. Recognizing the consequences of a loss of electricity, individual utility emergency plans include provisions for special facilities critical to the safety and welfare of citizens.

- System Load Restoration - System Load Restoration is instituted when rolling blackouts have been terminated and power supply is adequate. It is the recovery stage, and efforts are made to provide frequent system status reports.

### 2.1.3 Human-Caused Hazards

#### 2.1.3.1 Civil Disturbance

As in any other area, PBC is subject to civil disturbances in the form of riots, mob violence, and a breakdown of law and order in a localized area. Although they can occur at any time, civil disturbances are often preceded by periods of increased tension caused by questionable social and/or political events such as controversial jury trials or law enforcement actions. Police services are responsible for the restoration of law and order in any specific area of the County.

With the election of President Donald Trump in 2016, and his properties located in PBC, there has been a marked escalation of protests and civil disturbances. These are most evident in the winter months when the president spends many weekends at his home in the Town of Palm Beach. Agencies throughout PBC spend much time and resources to ensure the safety of the president and his family when they are in the area, as well as the safety of protesters in the areas surrounding his home in Palm Beach. The PBC LMS HVA Subcommittee recognizes this increased likelihood of civil disturbances in the analyses of probabilities located in Appendix A. Additionally, Presidential visits, while bringing civil disturbance issues, are also, by nature, domestic security hazards, therefore the planning process for those visits is contained in the PBC *Domestic Security Plan*.

#### 2.1.3.2 Domestic Security

**Terrorism**

The FBI defines terrorism as, “the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in furtherance of political or societal objectives.” A terrorist incident could involve the use of a Weapon of Mass Destruction (WMD) that would threaten lives, property and environmental resources by using explosives or incendiary devices and/or by contamination with chemical, biological, and/or radiological materials.

It is recognized that the state has many critical and high-profile facilities, high concentrations of population and other potentially attractive venues for terrorist activity that are inherently vulnerable to a variety of terrorist methods. Governmental/political, transportation, commercial, infrastructure, cultural, academic, research, military, athletic, and other activities and facilities constitute ideal targets for terrorist attacks, which may cause catastrophic levels of property and environmental damage, injury and loss of life. Furthermore, some extremist groups are known to be present within Florida. Terrorist attacks may take the form of the hazards described in this section when incidents of these types are executed for criminal purposes, such as induced dam or levee failures, the use of hazardous materials to injure or kill, or the use of biological weapons to create a pandemic. Terrorists have the potential to create disasters, which threaten the safety of a large number of citizens.

In the recent years, terrorist acts have become a reality for the nation. The county is not immune from acts of terrorism. The 2001 World Trade Center bombing was the largest terrorist attack the United States has ever experienced. After the World Trade Center attack, it was learned that many of the perpetrators resided in, and the (terrorists) pilots took flight lessons in PBC. In addition, Anthrax, which was dispersed via the postal system in late 2001, claimed the lives of five (5) US citizens including one (1) person from PBC. It was determined that he became infected with the disease at American Media Incorporated (AMI), in Boca Raton, his place of employment. A second employee became infected and survived.

In the past two (2) decades, terrorism has had a significant influence on the daily lives of Americans. The consistent attacks abroad and intermittent attacks within the United States have made most communities more conscious of the growing risks and vulnerabilities in a free environment. The advancement of technologies has made our communities more vulnerable to the impacts from these hazards. It should be noted that the impact of a terrorist attack can extend well beyond the immediate targeted facility. The effects of terrorism include:

- Direct Result: Injury, illness, or death.
- Psychological Reactions: fear, anxiety, stress, shock, revulsion, long-term emotional effects, post-traumatic stress.
- Economic, Political, and Social Impacts.

The terrorism incident at the Pulse Night Club in Orlando on June 12, 2016 is a prime example of other acts of terrorism that are emerging in society today. A heavily armed man entered the nightclub and killed 49 victims and injured over 50 more. While no incidents of terrorism to this scale have ever occurred in PBC, the regional Fusion Center and local law enforcement work together on a daily basis to be on alert for signs of impending terrorist activity in the South Florida region.

**Sabotage, Computer Accidents, and Cyber Attacks**

The President's Commission on Critical Infrastructure Protection (PCCIP) reported that there is an increasing threat that the U.S. could suffer something similar to an "Electronic Pearl Harbor". Networked information systems present new security challenges in addition to the benefits they offer. Long-term power outages could cause massive computer outages, with severe economic impacts such as loss of sales, credit checking, banking transactions, and the ability to communicate and exchange information and data. Today, the right command sent over a network to a power generating station's control computer could be just as effective as a backpack full of explosives, and the perpetrator would be harder to identify and apprehend (Rubin, 1998).

With the growth of a computer-literate population, increasing numbers of people possess the skills necessary to attempt such an attack. The resources to conduct a cyber attack are now easily accessible everywhere. A personal computer and an internet service provider anywhere in the world are enough to cause a great deal of harm.

Threats include:

- Human error
- Insider use of authorized access for unauthorized disruptive purposes
- Recreational hackers – with or without hostile intent
- Criminal activity – for financial gain, to steal information or services, organized crime
- Industrial espionage
- Terrorism – including various disruptive operations
- National Intelligence – information warfare, intended disruption of military operations

As the internet becomes more and more important, the loss of its services, whether by accident or intent, becomes a greater hardship for those relying on this form of communication. The outcomes of such activities may take the form of disruption of air traffic controls, train switches, banking transfers, police investigations, commercial transactions, defense plans, power line controls, and other essential functions. Computer failures could affect emergency communications as well as routing civilian applications, such as telephone service, brokerage transactions, credit card payments, Social Security payments, pharmacy transactions, airline schedules, etc.

There have been multiple cyber attacks in recent years involving the theft of citizen's private information such as bank account numbers, social security numbers, etc. The PBC LMS HVA Subcommittee recognizes this, and in their most recent update to this hazard profile of the LMS, advised that the threat will only become greater as we continue to transition the bulk of our financial transactions over to online platforms.

#### 2.1.3.3 Mass Migration Crisis

Florida's location as the nearest United States land mass bordering the Caribbean basin makes it a chosen point of entry for many migrants attempting to enter the country illegally. A major consequence of a mass arrival of illegal aliens could be disruptive to the routine functioning of the impacted community, resulting in significant expenditures that are related to the situation. An example of this threat occurred in 1994, when the state responded to two (2) mass migration incidents. In May 1994, there was an unexpected migration of approximately 100 Haitian refugees; in August 1994, there was an influx of 700 Cubans. These events are typically preceded by periods of increasing tension abroad, which can be detected and monitored. Enforcement of immigration laws is a federal responsibility. However, it is anticipated that joint jurisdictional support of any operation will be required from the state and local governments.

The Atlantic shore of PBC is the frequent scene of arrival of undocumented aliens, usually Haitian or Cuban. The County has both the history and potential for the unannounced arrival of a large number of aliens. Until relieved of the responsibility by the state and federal governments, PBC must be capable of providing mass refugee care to include shelter, food, water, transportation, medical, police protection, and other social services. The County's *Mass Migration Hazard Specific Plan* addresses the response to this hazard should it occur in PBC.

The LMS HVA Subcommittee recognizes that natural hazards (such as hurricanes) have the potential to influence other hazards such as Mass Migration. An example of this is the influx of American citizens from Puerto Rico into Florida following the devastation from Hurricane Maria in September of 2017. While not illegal, the burden of such a sudden migration of persons from one area of the US to another can severely strain local and state resources.

#### 2.1.3.4 Workplace/School Violence

A workplace/school violence incident could occur without warning in a number of settings. The workplace will be defined as a place of business or government offices where commerce occurs; schools are educational settings which can be both public and private. Acts of violence in the workplace are handled by municipal or county law enforcement, dependent on jurisdictional boundaries. Palm Beach County School Police would have a large role in the response to an act of violence in a school.

Due to the current international climate and following the rising trend of active shooter/assailant incidents, public safety agencies have remained at a level of heightened awareness. The number of active shooter/assailant incidents are on the rise with less use of traditional weaponry, making it difficult for law enforcement agencies to detect would-be attackers.

In 2014, the Federal Bureau of Investigation (FBI) published a study and defined an active shooter as, "an individual actively engaged in killing or attempting to kill people in a populated area" (Blair, P., Schweit, W., 2014). The County will adopt the FBI's definition of an active shooter/assailant with one adjustment to the verbiage. Within this plan, the word "shooter" will be accompanied by the word "assailant", as "active shooter/assailant" to coincide with an international trend of the word "assailant", stated in the aforementioned FBI report. "Assailant" was defined by the report as "those (who) commit violence in the workplace or schools, using weapons other than fire arms to commit killings or attempted killings." (Blair, P., Schweit, W., 2014). These weapons include but is not limited to the use of knives, hatchets, vehicles, explosives, and blunt objects (e.g., baseball bats, metal pipes).

The school violence incident at the Marjory Stoneman Douglas High School in Parkland, Florida (Broward County) on February 14, 2018 resulted in 17 deaths and 14 injuries. This further emphasizes the importance of planning for these types of incidents. Due to the nature of the incident being in an adjacent county to PBC, special attention will be paid to the outcomes identified in the after-action report to assist in continued planning in the unfortunate event such an incident occurs in PBC. Planning for such an incident isn't limited to the incident itself, but should include planning for memorials/vigils, reunification and survivor care, as well as many other considerations. The *Workplace/School Violence HSP* addresses the County's response to such an incident.

## 2.2 Vulnerability Assessment

The County is diversified. While all PBC residents are exposed to the hazards identified in **Table 2.1** to some degree, geographic location and other factors greatly affect individual vulnerabilities and probabilities relating to specific hazards illustrated in Appendix A for the County and each jurisdiction. Factors influencing vulnerability include community location, type of construction, demographics, and cultural characteristics. **Table A-1** summarizes individual community vulnerability within PBC. **Table A-2** relates the probability of future hazard events for each identified hazard within PBC. Appendix B includes mitigation initiatives to reduce the impacts of each jurisdiction risks for PBC in reference to the individual hazards identified in **Section 2.1** Additional maps will be located in Appendix G. These maps will be illustrated by hazard addressing critical facilities having the potential to be effected by hazard. The critical facilities will have a potential dollar loss figure tied to it.

With the assistance of the DEM, the LMS conducted impact analyses to assess the potential for detrimental impacts from all identified natural, technological, and human caused hazards. Results of these analyses are summarized below. Impacts were categorized into the following groupings: health and safety of the resident population in the affected area; health and safety of incident responders; impacts on the continuity of government and non-government operations; impacts to property, facilities and infrastructure; impacts to the critical community services; impacts to the environment; economic and financial impacts; impacts on regulatory and contractual obligations; and impacts negatively affecting the PBC's reputation, image, and/or ability to attract public and commercial interests.

Most hazards in PBC affect the entire county equally. However, there are some that may be more likely in one area of the County. For example, a Herbert Hoover Dike breach would cause more damage to the western communities. For the purpose of this document, the County has been divided into four (4) geographical areas: Northern PBC, Southern PBC, Western PBC, and Coastal PBC.

In addition, the charts show probability of occurrence and impact. These will be rated as low = under 5% chance of occurring, medium, 5% - 15% chances of occurring, or High, greater than 15%. These rating responds with the information of the charts presented.

- An impact rating of "Low" for any hazard type means the hazard is not likely to have any measurable or lasting detrimental impact of a particular type and consequences will likely be rectified promptly with locally available resources. Chances here are less than 5%.
- An impact rating of "Medium" means there will likely be a measurable detrimental impact which may require some time to rectify and may require outside resources and/or assistance. The chances here are between 5% - 15%. As such, the hazard is considered a threat to the whole community of PBC.
- An impact rating of "High" means the impact will likely be severe and of longer duration, and require substantial time, resources, and/or outside assistance to rectify. The chances

are greater than 15%. As such, the hazard is considered a threat to the whole community of PBC.
- Multiple ratings indicate detrimental impacts might easily vary within the range indicated.

### 2.2.1 Natural Hazards

#### 2.2.1.1 Hurricanes and Tropical Storms

From 1920 through 1959, a total of 58 hurricanes struck the U.S. mainland, 25 of which were Category 2 or higher (major storms). Between 1960 and 1989, 42 hurricanes struck the U.S. of which only 16 were Category 2 or stronger. Most hurricane experts feel we are entering a period of increased hurricane formation similar to the levels seen in the 1920s and 1940s. Current hurricane risk calculations are complicated by climatic factors suggesting the potential for even greater hurricane frequency and severity in the world's entire hurricane spawning grounds. Since 1995, there have been 62 Atlantic hurricanes, 12 of which occurred in 2010 alone. Global warming may cause changes in storm frequency and the precipitation rates associated with storms. A modest 0.9 degree Fahrenheit (0.5 degree centigrade) increase in the mean global temperature will add 20 days to the annual hurricane season, and increase the chances of a storm-making landfall on the U.S. mainland by 22%. The warmer ocean surface will also allow storms to increase in intensity, survive in higher latitudes, and develop storm tracts that could shift farther north, producing more U.S. landfalls.

Currently an average of 1.75 hurricanes strikes the U.S. every year. Severe (Category 4 or 5 on the Saffir-Simpson scale) hurricanes strike the U.S. on the average of three (3) every five (5) years (0.60 per year) (see http://www.aoml.noaa.gov/hrd/tcfaq/E19.html). Annually, hurricanes are estimated to cause approximately $1.2 billion in damages. The proximity of dense population to the Atlantic Ocean, as well as the generally low coastal elevations, significantly increases the County's vulnerability. The potential for property damage and human casualties in PBC has increased over the last several decades primarily because of the rapid growth this county has experienced since 1970, particularly along the vulnerable coastline areas.

Hurricane damage is caused by two factors:
- High winds
- Storm surge (discussed under "Flooding")

Generally, it is the wind that produces most of the property damage associated with hurricanes, while the greatest threat to life is from flooding and storm surge. Although hurricane winds can exert tremendous pressure against a structure, a large percentage of hurricane damage is caused not by wind, but from flying debris. Tree limbs, signs and sign posts, roof tiles, metal siding, and other lose objects can become airborne missiles that penetrate the outer shells of buildings, destroying their structural integrity and allowing the hurricane winds to act against interior walls not designed to withstand such forces. Once a structure's integrity is breached, the driving rains associated with hurricanes can enter the structure and completely destroy its contents. Hurricane winds are unique in several ways:

- They are more turbulent than winds in most other type storms
- They are sustained for a longer period of time (several hours) than any other type of atmospheric disturbance
  They change slowly in direction, thus they are able to seek out the most critical angle of attack on a given structure
- They generate large quantities of flying debris as the built environment is progressively damaged, thus amplifying their destructive power

In hurricanes, gusts of wind can be expected to exceed the sustained wind velocity by 25 to 50 %. This means a hurricane with sustained winds of 150 mph will have wind gusts exceeding 200 mph. The wind's pressure against a fixed structure increases with the square of the velocity. For example, a 100 mph wind will exert a pressure of approximately 40 lbs per square foot on a flat surface, while a 190 mph wind will exert a force of 122 lbs per square foot on that same structure. In terms of a four (4) by eight (8) foot sheet of plywood nailed over a window, there would be 1,280 lbs of pressure against this sheet in a 100 mph wind, and 2,904 lbs or 1.95 tons of pressure against this sheet in a 190 mph wind.

The external and internal pressures generated against a structure vary greatly with increases in elevation, shapes of buildings, openings in the structures, and the surrounding buildings and terrain. Buildings at ground level experience some reductions in wind forces simply because of the drag exerted by the ground against the lowest levels of the air column. High-rise buildings, particularly those located along the beachfront, will receive the full strength of a hurricane's wind on their upper stories. Recent studies estimate that wind speed increases by approximately 27 % just 15 feet above ground level.

The wind stream generates uplift as it divides and flows around a structure. The stream following the longest path around a building, generally the path over the roof, speeds up to rejoin the wind streams following shorter paths, generally around the walls. This is the same phenomena that generate uplift on an aircraft's wing. The roof, in effect, becomes an airfoil that is attempting to take off from the rest of the building. Roof vortexes generally concentrate the wind's uplift force at the corners of a roof. These key points can experience uplift forces two (2) to five (5) times greater than those exerted on other parts of the roof.

Once the envelope of the building has been breached through the loss of a window, door, or roof damage, wind pressure on internal surfaces becomes a critical factor. Openings may cause pressurizing or depressurizing of a building. Pressurizing pushes the walls out, while depressurizing will pull the walls in. Internal pressure coupled with external suction adds to the withdrawal force on sheathing fasteners. Damages from internal pressure fluctuations may range from blowouts of windows and doors to total building collapse due to structural failure.
During Andrew, catastrophic failure of one and two-story wood-frame buildings in residential areas was observed more than catastrophic failures in any other type of building. Single-family residential construction is particularly vulnerable because less engineering oversight is applied to its design and construction. As opposed to hospitals and public buildings which are considered fully engineered, and office and industrial buildings which are considered "marginally

engineered," residential construction is considered "non-engineered." Historically, the bulk of wind damage experienced nationwide has occurred to residential construction. Fully engineered construction usually performs well in high winds due to the attention given to connections and load paths.

Hurricane winds generate massive quantities of debris, which can easily exceed a community's entire solid waste capacity by three (3) times or more. Debris removal is an integral first step toward recovery, and as such must be a critical concern of all those tasked with emergency management and the restoration of community services. The Arbiter of Storms (TAOS) model predicts the following quantities of debris for PBC given the following hurricane strengths:

Table 2.5

*Arbitor of Storms Model*

| Storm Strength | Debris Generated |
|---|---|
| Tropical Storm | 156,142 cubic yards/acre |
| Category 1 Hurricane | 1,049,571 cubic yards/acre |
| Category 2 Hurricane | 2,182,522 cubic yards/acre |
| Category 3 Hurricane | 7,421,401 cubic yards/acre |
| Category 4 Hurricane | 16,289,149 cubic yards/acre |
| Category 5 Hurricane | 44,874,888 cubic yards/acre |

Both the Town of Palm Beach and City of West Palm Beach are old, historical communities on PBC's east coast. Their age alone makes them particularly vulnerable to hurricane damage. Both cities have old, historically significant structures whose loss would represent the loss of irreplaceable cultural resources. The age and construction type of much of the housing in West Palm Beach and to a lesser extent in many of the other coastal communities, suggests these communities would be hit very hard by a major storm.

### 2.2.1.2 Flooding

Vulnerability

While damages caused by storm surge and dike failure can be extensive and costly, historically physical damages from inland structural flooding have been relatively minor and isolated. As a predominantly localized event, inland flooding does not pose a significant threat to the ability of the county, municipalities and businesses to carry on normal operations.

People, structures, and infrastructure located within floodplains and areas with poor drainage are most susceptible to inland flooding, particularly to flash flooding. However, flash flooding can and does affect all areas of the county. Continued development will certainly contribute to an increased frequency of runoff flooding.

For the most part, flooding depths are not sufficient to inundate large residential and commercial areas. Developed parcels tend to be elevated to a level that limits significant water intrusion from water build-up. Where water does intrude structures, damage can be costly for individual property owners. Beyond physical water damage, perhaps the greater issue is the potential for mold infestation, which can create health problems for occupants and lead to costly cleanup and repairs.

Flooding can cause damage to cars and outdoor equipment, contaminate water systems, and interrupt water treatment. Sewage overflow raises health concerns.

Significant expanses of street flooding are common, can be costly in terms of loss of function for extended periods of time, and can create dangerous, even potentially deadly, driving conditions.

Post storm accidents, especially electrocutions, are not uncommon, when people wander into flood waters where live wires or generators are present.

Flooding in PBC results from one or a combination of both of the following meteorological events:

- Tidal surge associated with northeasters, hurricanes, and tropical storms
- Overflow from streams and swamps associated with rain runoff
- Coastal inundations from lakes and basins

Major rainfall events occur in association with hurricanes, tropical storms, and thunderstorms associated with frontal systems.

When these types of intense rainfall events occur, streams and drainage ditches tend to reach peak flood flow concurrently with tidal water conditions associated with coastal storm surge. This greatly increases the probability of flooding in the low-lying areas of the coastal zone. Areas along the PBC coast are particularly susceptible to flooding under these conditions. The most flood prone areas in the eastern portion of the County feature poorly drained soils, a high water table, and relatively flat terrain, all of which contribute to their flooding problems. Flat, swampy terrain and heavily wooded areas in the western part of PBC aggravate flood problems by preventing rapid drainage in some areas.

In response to mounting losses from flooding nationwide, the United States Congress initiated the NFIP in 1968. The program is administered through FEMA. Under this program, FEMA produces FIRM maps which show areas subject to various levels of flooding under different conditions. This flood risk information is based on historic, meteorological, hydrologic, and hydraulic data, as well as open-space conditions, flood control works, and development.

Appendix G, Map Section, presents a generalized picture of the flood prone areas in PBC based on the 2017 version of the FIRM maps.

In addition to the FIRM maps there are two (2) numerical models, which predict the effects of storm surge in PBC. The older model, developed by the National Oceanic and Atmospheric

Administration, is called the Sea, Lake, and Overland Surges from Hurricanes model. Appendix G, Map Section illustrates the areas of PBC vulnerable to this type of flooding.

The State of Florida acquired another model for predicting hurricane storm surge as well as wind and property damage. This model, known as The Arbiter of Storms (TAOS) model, predicts storm surge height and wind field intensity for Category 1 through Category 5 hurricanes. Appendix G, Map Section illustrates the areas of PBC subject to flooding during a Category 5 Hurricane. It is important to remember that the TAOS model projections are based on a Maximum of Maximums or absolute worst-case scenario. For this analysis, we have considered the TAOS model projections as reflecting total, worst-case exposure for PBC.

### 2.2.1.3 Coastal & Beach Erosion / Sea Level Rise

The county's vulnerability to coastal and beach erosion is moderate along its entire coastline. The most significant areas of beach erosion are the areas south of the stabilized inlets where the natural flow of laterally transported sand has been artificially interrupted. Many areas in PBC have been the subject of major beach re-nourishment projects sponsored jointly by the County and Army Corps of Engineers. Inland communities report some erosion problems along major canals and around water control structures.

PBC completed an assessment of vulnerability due to sea level rise in a report entitled "Analysis of the Vulnerability of Southeast Florida to Sea Level Rise, South Florida Regional Climate Change Compact Inundation, Mapping, and Vulnerability Assessment Work Group, August 2012." In this report, the County conducted an inundation analysis, identifying land at elevations below sea level, highlight areas located near PBC's coastline and tidal waterways. The report concluded that limited physical infrastructure in PBC is at risk at the one (1), two (2) and three (3) foot sea level rise scenario. Initially low volume roads and parking areas may be impacted at one (1) foot and increase to up to 41 miles of roadways as the sea level continues to rise to three (3) feet. Property with a current taxable value of $396-557 million may become vulnerable at one (1) foot of sea level rise; properties valued at $3.6-4.5 billion may be vulnerable at three (3) feet of rise. One (1) school, one (1) landfill site, and one (1) hospital are estimated to be impacted at the higher three (3) foot sea level rise scenario.

An initiative conducted by Florida Department of Economic Opportunity in 2011 to analyze sea level rise integration utilized PBC as a pilot study (Statewide Post-Disaster Redevelopment Planning Initiative: Phase V). It concluded that while sea level rise was not addressed as an independent hazard category, other identified hazards may anticipate heightened impacts as the condition of sea level rise impacts over. Floods (Section 2.1.1.1), hurricanes (Section 2.1.1.2), and soil and beach erosion (Section 2.1.1.10) may be intensified due to the condition of sea level rise altering the traditional elements of the natural and man building environment. Section 2.1.1.1 details the conditions under which flooding occurs within the County and provides an overview of historical flooding events sea level rise will likely exacerbate flooding in flood prone areas, because flow rates in low lying areas may be further inhibited. The traditional flood conditions due to severe rain events will be impacted by sea level rise. Section 2.1.1.2 addresses these vulnerabilities associated with hurricanes. It details the overall vulnerability of the state and region due to its topography. Due to dense population along the coast, the potential for property damage and human casualties continues to increase. Florida not only has the most people at risk from hurricanes, but it also has the most coastal property exposed to these storms. While there continues to be debate, global climate change is likely to impact the development, intensity, and frequency of hurricanes in the world. Similarly, the condition of a higher sea level will increase the total inundation resulting from the storm surge. Section 2.1.1.10 address the vulnerability associated with beach and soil erosion stating that the natural forces of wind, waves, and long shore currents move the natural sand placement and change the beach shape and structure. However, this retreat is altered by man-made structures, and creates a perceived need to protect the existing shoreline conditions. This condition will be vastly augmented by the increase of the sea level. Existing homes, businesses, roads, bridges, and other man-made structures will suffer more rapid beach erosion and eventual water intrusion.

Access to and from the barrier islands could be vulnerable due to bridges being inaccessible from local roadway inundation, and coastal marinas could experience impacts. Natural habitats may also become increasingly vulnerable as water salinity levels and areas of inundation alter. Palm Beach County Assessment prioritizes saltwater ponds, saltwater marshes, and mangrove swamp as potential sensitive impacted habitats. In Appendix G, the sea level rise map illustrates PBC's vulnerability to a two (2) foot sea level rise.

Generally, the areas in the southern parts of the County do not appear they will suffer as much inundation in comparison with the central parts of the County, particularly along the Intracoastal Waterway. In the northern part of the County, large areas of projected inundation occur around existing natural waterways including the Loxahatchee River, Admiral's Cove, and Frenchman's Harbor. Most of the areas in PBC that are impacted by sea level rise are already fully developed or consist of natural lands. The rise in sea level will result in losses of land and structures, impact on utilities and infrastructure, and cause a reduction in value of real estate.

Areas within PBC that may be most problematic consist of those already below sea level. Cities in the northern portions of the County that are most inundated include Juno Beach, and the coastal areas of North Palm Beach and Palm Beach. The areas most inundated in Juno Beach and North Palm Beach includes the designated natural areas. The land uses most impacted are the residential, commercial, and recreation designations. Further analysis of this area may be necessary to determine if future land uses may be changed over time in order to decrease vulnerability to hurricane storm surge augmented by sea level rise. Land uses in the southern portions of the County include residential and commercial designations.

#### 2.2.1.4 Severe Thunderstorms/Lightning

Risk of severe thunderstorms and lightning is high (Appendix A Table A-3**)** in PBC, but many of the jurisdictions shown in Appendix A Table A-1 have only moderate vulnerabilities relative to these hazards. This variation in relative levels of vulnerability is again due primarily to construction practices and community characteristics. Working communities have a higher vulnerability to economic impacts from lightning than residential or retirement communities. All other factors being equal, residential and retirement communities have a historically higher vulnerability in terms of lightning fatalities.

### 2.2.1.5 Wildfire/Urban Interface Zone

Less urbanized communities and areas within the County are more vulnerable to wildfires than the more developed communities. Large areas in the western part PBC and many isolated unincorporated pockets of residential development are quite vulnerable to wildfire. The southern and western portion of the Village of Wellington, the unincorporated areas west of Boca Raton, South Bay, Pahokee, and Belle Glade, and virtually all of PBC's unincorporated areas have a high vulnerability to wildfire during the dry season each year. The problems in the Village of Wellington, west Boca Raton area, and in the various unincorporated pockets of development such as Jupiter Farms, Loxahatchee, and the Lion Country Safari area arise from the fact that these areas have an extensive canopy of slash pine (*Pinus elliotii*) and sand pines (*Pinus clausa*), and numerous undeveloped lots interspersed with residences.

Upland pine communities in South Florida are adapted for periodic episodes of fire, and they burn very easily. They also generate large quantities of flammable leaf litter and other combustible by-products, which catch fire easily and generate a very hot, if short-lived fire. Clearing of vacant lots, periodic removal of accumulated leaf litter, maintained firebreaks, and controlled burns in the undeveloped or rangeland areas of PBC, are the best mitigation measures that can be applied for this hazard.

### 2.2.1.6 Muck Fire

Muck fires have never occurred in PBC. The only areas where this hazard might produce impacts are the western portions of the County. At the present time, muck fires are not considered a significant hazard anywhere other than the Pahokee, Belle Glade, and South Bay areas in the western County.

### 2.2.1.7 Tornado

Historical data indicates the frequency of tornadoes in PBC is relatively low. However, the vulnerability does exist as proven in June of 2012 when PBC was affected by a tornado. Some individual communities have a higher vulnerability to this hazard due to the type of construction or numbers of mobile homes (manufactured housing units) within their boundaries.

### 2.2.1.8 Extreme Temperatures

Extreme temperatures, both freezes and periods of excessive heat, impact communities with a larger senior population to a greater extent than those with younger populations. Inland communities away from the moderating influence of the ocean or the estuary are more vulnerable to temperature extremes, as are areas with significant agricultural assets.

The increase in temperature across the U.S. in this century is slightly smaller, but of comparable magnitude to the increase of temperature that has characterized the world as a whole. The increase in minimum temperature and the related increase in area affected by much above normal minimum temperatures are also found in many other countries of the northern hemisphere. Worldwide precipitation over land has changed little through the twentieth century; increases noted in high latitudes have been balanced by low-latitude decreases. By comparison, the change in precipitation in the U.S. is still relatively moderate compared to some of the increases and decreases at other latitudes. Decreases in the day-to-day differences of temperature observed in the U.S. are also apparent in China and Russia, the only other large countries analyzed as of this date. The persistent increase in the proportion of precipitation derived from extremely heavy precipitation has not been detected in these other countries.

A Climate Extremes Index (CEI), defined by an aggregate set of conventional climate extremes indicators, supports the notion that the climate of the U.S. has become more extreme in recent decades, yet the magnitude and persistence of the changes are not now large enough to conclude that the climate has systematically changed to a more extreme state. Similarly, a U.S. Greenhouse Climate Response Index (GCRI), composed of indicators that measure the changes that are expected to follow increased emissions of greenhouse gases, reflects in recent years the very changes that are predicted. Still, the rate of change of the GCRI, as with the CEI, is not large enough to unequivocally reject the possibility that the increase in the GCRI may have resulted from other factors, including natural climate variability, although statistically this is but a 5 to 10% chance. Both indices increased rather abruptly during the 1970s, at a time of major circulation changes over the Pacific Ocean and North America. There is little doubt that the increase in the indices is at least partially related to these circulation variations, although the role of increased anthropogenic greenhouse gas concentrations in such circulation variations is poorly known.

Since the indices are influenced by natural changes and variations that can either add to or subtract from any underlying long-term anthropogenic-induced change it will be important to carefully follow their behavior over the next decade to see if they sustain their incipient trends or return to previous levels. Such an effort is critical for a better understanding of climate itself, how it changes, and how these changes can affect our own lives and well-being.

#### 2.2.1.9 Agricultural Pests and Diseases

Agricultural pests and disease are a more significant hazard in those areas of PBC where agriculture is a more significant element in the economic base. The western portion of PBC is a major ranching and farming area and there are numerous nurseries and smaller agriculture related businesses located throughout the County.

#### 2.2.1.10 Drought

The county overall has a moderate vulnerability to the impacts from drought due to the County's large agricultural land use in the west and extensive urbanization in the east. Overall, PBC has a narrow reserve of potable water and this could become a significant problem during a long-term drought. The western area of the County is most vulnerable to the impacts of drought because this area is extensively involved in farming and ranching. The urbanized communities along PBC's coast are less vulnerable economically due to their location and non-agricultural economic base. Potential impacts to PBC's potable water supply by saltwater intrusion during drought conditions are generally low, with the exception of the City of West Palm Beach, which draws its water from surface supplies.

#### 2.2.1.11 Pandemic/Communicable Diseases

Florida is more vulnerable than many other states to possible outbreaks of infectious diseases due to the large number of international and U.S. tourists it attracts. In addition, vulnerability to disease hazards has increased by the number of illegal immigrants reaching U.S. shores. The county's vulnerability to pandemic outbreaks, while higher than some other Florida counties due to its large immigrant population is still considered only moderate. Medical facilities are adequate for current needs, but would be stressed if forced to deal with a major disease outbreak.

#### 2.2.1.12 Seismic Hazards

**Sink Holes and Dam/Levee Failures**

There are areas in PBC where canal bank failures could cause or exacerbate flooding during heavy rain events or storms. This problem is, however, more related to soil erosion than to actual levee failure. There has never been any seismic activity, soil failures, or sinkhole activity in PBC. While these hazards may exist, County vulnerability to them at this time must be considered very low as referenced in an earlier section. As such, PBC does not have a Hazard Specific Plan to address sinkholes.

The county does have a major vulnerability to levee failure around the eastern boundary of Lake Okeechobee. Extensive dyking of Lake Okeechobee has taken place since the hurricane of 1928 when about 2,500 people were killed from surge in western PBC. The county has the dubious distinction of having had the second highest number of fatalities (following Galveston, Texas) of any county in the United States. The U.S. Army Corps of Engineers maintains the levees around Lake Okeechobee and they are considered to be sound. A levee failure with today's population would be a catastrophic disaster for PBC.

**Tsunamis**

There have been no recorded tsunamis to have ever affected PBC. However, scientists have been studying La Palma Island in the Canaries as a possible site where a tsunami could originate if a massive landslide were to occur. Research published in 2001 by two (2) prominent geologists (Ward & Day) created a major debate and concern over whether a predicted volcanic collapse in the Canary Islands could generate a mega tsunami, which could traverse the Atlantic Ocean at jet aircraft speeds (eight (8) to nine (9) hours) and devastate the eastern coast of the U.S., including Florida. It was postulated that the wave, at impact on the Florida coast, could be approximately 50 meters high and cause damage inland as far as 20 km. This mega tsunami would cause unprecedented destruction and loss of life.

Subsequently, more comprehensive and rigorous research published by several scientists of the Tsunami Society has taken exception with the original research. The original research, they argue, was based on several erroneous assumptions regarding a structural weakness observed in the western flank of the Cumbre Vieja volcano on island of La Palma in the Canary Islands, the probability of a gravitation collapse of a massive land mass of the ocean bottom, and the magnitude and traveling distance of a wave that might be generated should such a collapse occur.

The mega tsunami was postulated to occur sometime in the next 1500 years. The weight of scientific evidence suggests there is no discernible tsunami threat to the coast of Florida as a result of geological activity in the Canary Islands. The probability of a tsunami is low.

### 2.2.2 Technological Hazards

#### 2.2.2.1 Hazardous Materials Accident

A community's vulnerability to hazardous materials accidents depends on three (3) factors. These are:

- The major transportation routes that pass through the community;
- The hazardous material generators located in or near the community; and
- The resources in terms of people and property that are in an area of possible impact from a hazardous materials release.

Overall, unincorporated PBC has a low vulnerability to impacts from hazardous materials releases. There are relatively few major generators within the County and those that do exist are generally away from major population centers.

Specific areas with higher vulnerability for hazardous materials accidents are along the transportation network (both highway and rail) that pass through the County. All the jurisdictions along the eastern sand ridge (Boca Raton, Delray Beach, Boynton Beach, Hypoluxo, Lantana, Lake Worth Beach, West Palm Beach, Riviera Beach, Lake Park, Palm Beach Gardens, Jupiter, and Tequesta) are extremely vulnerable to toxic material spills and releases from transportation system accidents, primarily rail accidents. The Florida East Coast Railroad runs through all these areas and toxic material spills have occurred along the rail line. Given the right set of circumstances, such releases could produce significant detrimental effects on life and property in these communities.

### 2.2.2.2 Radiological Accidents (Nuclear Power Plant Accidents)

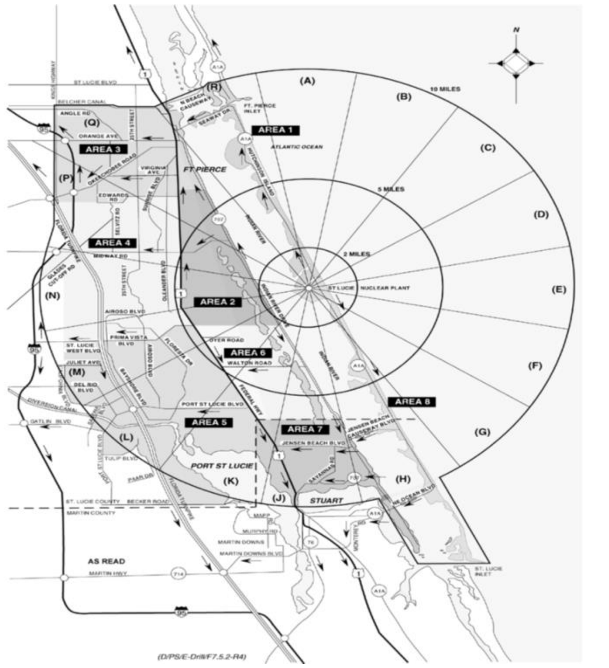


*Figure 2.11:* St. Lucie Nuclear Power Plant 10 Mile EPZ

The Florida Power and Light St. Lucie Nuclear Power plant is located on south Hutchinson Island in St. Lucie County. In the US, federal regulations define two (2) distinct planning zones with regard to commercial nuclear power plant emergency planning. The Plume Exposure Pathway Emergency Planning Zone, commonly known as the EPZ, has a radius of 10 miles (16 km). The focus of the EPZ defines the geographic area for the management of protective actions related to the direct exposure to, and inhalation of, airborne radioactive contamination in citizens. The Ingestion Planning Zone, commonly known as the IPZ, has a radius of about 50 miles (80 km). The focus of the IPZ is to define the geographic area for the management of protective actions related to the ingestion of food and liquid contaminated by radioactivity that may reach the food supply. Approximately 45% of PBC falls within the 50-mile radius IPZ for the St. Lucie Nuclear Power plant. This means that a significant portion of PBC is vulnerable to a nuclear power plant accident. Fortunately, the frequency with which nuclear power plant accidents occur is very low, and the overall risk to the citizens of PBC is therefore considered low.

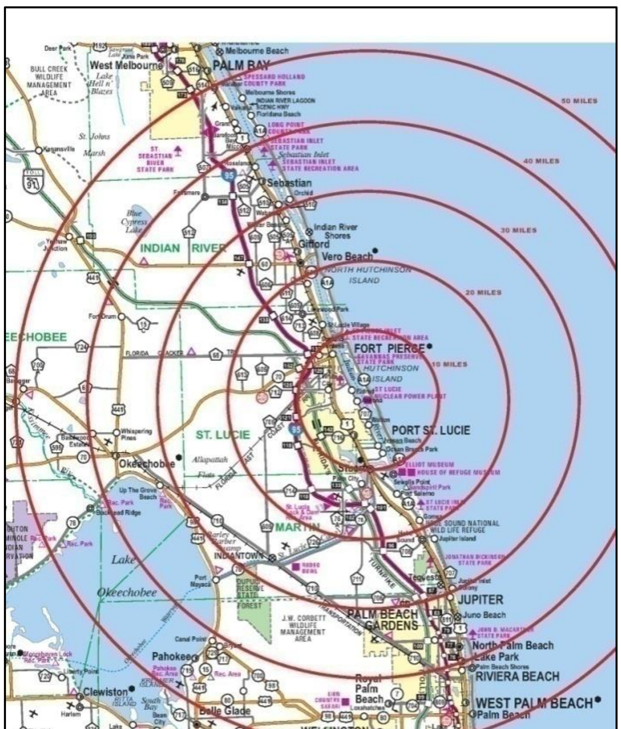


*Figure 2.12:* 50 Mile Ingestion Pathway Map for St. Lucie Nuclear Power Plant (Copyright © 2010 GIS Dolph Map LLC – Used with permission)

Nuclear emergency is perhaps the single hazard facing PBC which has received massive emergency management attention at all levels of government. Emergency management planning and regulation relative to nuclear power plant accidents exists at the federal, state, local, and corporate levels. Drills are held routinely and extensive documentation is required by the Nuclear Regulatory Commission, as well as several other federal agencies. Contingency planning for nuclear accidents at the plant itself appears to be well in hand. Of greater risk to the citizens of PBC is the transport of fissionable material to and from the plant. Such materials transfers are handled with a great deal of care and there has never been a significant accident during any such transfer. Again, while PBC's vulnerability to such accidents is high, the risk that this hazard will produce an impact within the community appears to be low. Some risks to PBC include:

- Loss of life or potential physical injury (including long-term effects such as cancer)
- Loss of property (displacement from homes)
- The county is within the 50 mile IPZ making contamination of food supplies and drinking water a possibility
- Exaggerated media reporting could lead to heightened public alarm. Impacts to tourism industry are possible

In the event of an accidental release of radioactive materials from the St. Lucie Nuclear Plant, evacuation areas would depend on several metrological factors such as wind direction and wind speed. According to the 2010 Census data, there are approximately 268,000 people living within 10 miles of the power plant. If an accident at the plant took place during tourist season, PBC could expect half this population to evacuate into PBC (approximately 110,000 evacuees). The County must be prepared to shelter 10 % (11,000 people) of the evacuating population. All evacuees will be sheltered in Palm Beach, Indian River, and/or Brevard Counties.

There are several safety design measures at the plant and stringent federal safety standards govern plant operations (e.g. plants have protective barriers and are designed to withstand aircraft attack, tornados, severe accidents and earthquakes). It is most likely that an accident would slowly progress from one stage of emergency classification to the next. A "fast breaker" accident is very unlikely, but the plant can shut down operations within two (2) seconds if needed. Most likely, an accident would slowly progress providing time to warn the public and implement protective measures. In the case of a radioactive release, Florida Power and Light and the American Nuclear Insurers organization would reimburse evacuees for damage or re-location

#### 2.2.2.3 Communications System Failure

Communication failures have a greater potential to produce adverse economic impacts in business-based rather than retirement or residential communities. On the other hand, communication system failures in residential and retirement communities may put more human lives at risk. The county's vulnerability to communication system failures is generally considered moderate. Basically, PBC's vulnerability to this hazard is no greater or less than most other Florida coastal counties.

#### 2.2.2.4 Transportation System Accidents

Palm Beach International Airport is a major commercial air transportation hub, with extensive commercial passenger and freight business as well as a significant amount of private or general aviation activity as well. The airport is located directly to the south and west of the City of West Palm Beach and the runway approaches pass directly over both the Town of Palm Beach and the City of West Palm Beach. Aviation is an important element of the economy in PBC, and this activity raises the County's vulnerability to aviation associated accidents. Another busy airport for general aviation is the Lantana airport, which has been a source of many non-commercial incidents over the years.

Vulnerability to transportation system accidents is also associated with the highway and rail systems that run through PBC. Individual community and population center vulnerabilities to this hazard are entirely dependent upon location. Again, the communities built on the eastern sand ridge of the County are most vulnerable. Major transportation hubs, rail yards, trucking centers, and the Port of Palm Beach all raise these communities' vulnerabilities to transportation system accidents and breakdowns. Transportation accidents have occasioned blockages on the major highways throughout PBC. The Town of Palm Beach and the City of West Palm Beach are also more vulnerable to plane crashes due to their location relative to the Palm Beach International Airport. The east-central portion of the County has a higher vulnerability to major highway accidents due to the presence of Interstate 95 and the Florida Turnpike.

Due to their locations along the rail line, the eastern cities have higher vulnerabilities to rail system accidents. The Brightline express train, which began service between Fort Lauderdale and West Palm Beach in November of 2017, with plans to ultimately service between Miami and Orlando, has a potential top speed of 125 mph, which is much faster than other regional commuter trains. It is anticipated by the LMS HVA Subcommittee that there will be additional people struck while ignoring rail crossing warning devices, due to the high speeds that the public is not accustomed to in the area.

#### 2.2.2.5 Wellfield Contamination

Wellfield contamination has not been a major problem for most of PBC. There is some potential exposure to this hazard in the eastern portion of the County, but overall the vulnerability to this hazard is considered low at this time.

#### 2.2.2.6 Power Failure

Power failures have the same potential impacts in all PBC communities. The vulnerabilities of all communities to power failures are considered moderate. The power grid throughout PBC is diversified and there is no single choke point or distribution node whose failure would disrupt power distribution to the entire community.

### 2.2.3 Human Caused Hazards

#### 2.2.3.1 Civil Disturbance

The overall potential for civil disturbance in PBC is considered moderate. The municipalities of West Palm Beach, Delray Beach, Boynton Beach, Palm Beach, and Riviera Beach are considered to have relatively high vulnerability to this hazard. There has been significant civil unrest in certain areas of these cities in the past and a significant potential for such unrest remains. Within the past two (2) years, particularly with the election of the US President who owns and frequents a home in PBC, the numbers of civil disturbance activities have increased significantly, although they are most often considered peaceful in nature. This is expected to continue through 2020 and possibly 2024. The LMS HVA Subcommittee has recognized and elevated the level of vulnerability to civil disturbance for the Town of Palm Beach due to the civil disturbances that they have in the area of the President's Palm Beach home.

### 2.2.3.2 Domestic Security

**Terrorism, Sabotage, and Cyber Attacks**

The possibility for terrorism, sabotage, and cyber attacks in PBC does exist. The County's vulnerability to this hazard is moderate and thus this hazard is considered a threat to the PBC community. The City of West Palm Beach has a slightly higher vulnerability to terrorism since it is the center of government and also by the role played by aviation in the local economy, but this vulnerability is still considered only moderate. The Town of Palm Beach, as well as many other wealthy enclaves within PBC has a slightly higher vulnerability to celebrity terrorism since so many well-known and wealthy personalities make their residence there. While this vulnerability exists, it is considered to be no greater than that faced by many other communities around the country where the rich and famous live.

The warm temperatures, onshore winds, high rate of sunshine (UV exposure), and rainfall in PBC make this area a less favorable target for biological or chemical terrorism than many other areas of the United States. The population here is dispersed when compared to major cities in the northeastern U.S., and the transportation system infrastructure is highly dependent upon individual vehicles. Both of these features make PBC a less desirable target for transportation system or conventional type (bomb related) terrorist acts.

Crime/terrorism hazards will damage or impair the County's infrastructure, disrupt commerce, and possibly result in large-scale health emergencies, disease outbreaks, and/or epidemics. Public awareness of terrorist incidences worldwide has increased since 2001, and the percentage of terrorist events resulting in fatalities continues to grow. As a metropolitan area and a key tourist/economic component of the United States, PBC could be a possible target for terrorist activities. Government buildings, large market sectors, critical infrastructure, tourist attractions, and large-scale events are all prime targets for terrorist organizations. Additional vulnerabilities include:

- Transportation Systems – highways, railways, waterways, and airports are vital to the transportation of materials, goods, services, and people.
- Population – an attack on a large population is attractive to gain large media attention.
- Industry – large manufacturers and companies house hazardous materials. Disruption of these facilities can have an economic impact and cause physical damages to property and loss of lives due to the large volume of hazardous materials housed.
- Utilities – there is a large dependency on telecommunications, power, water, wastewater, and pipeline services for daily activities and operations.

- Government Buildings – an attack on government buildings is attractive in order to deliver a political statement.
- Entertainment/Recreation – anywhere that attracts large populations is an attractive target.

The Threat and Hazard Identification and Risk Assessment (THIRA) provides detailed information regarding the crime/terrorism hazards mentioned below that could affect PBC.

- Terrorism (see *Domestic Security HSP*)
- Bomb Threat Incident
- Cyber-Security Incident (see also *PBC Information Systems Services (ISS) Department Business Continuity and Disaster Recovery Plan* and *IT Security Policy Manual*).

### 2.2.3.3 Mass Migration Crisis

Reviewing the data on past illegal immigration and mass population movements, such as the Haitian influx and Cuban raft incidents of the 1980s, indicates that illegal immigration has never reached a crisis state for the local authorities in PBC. The county's vulnerability to this hazard is moderate, however, due to demographic features, and thus, mass migration is a threat to the public. The cities of West Palm Beach, Delray Beach, Boynton Beach, Rivera Beach, South Bay, Pahokee, and Belle Glade all have a slightly higher vulnerability to illegal immigration impacts due their larger populations of Latin American and Caribbean immigrants.

### 2.2.3.4 Workplace/School Violence

While a workplace/school violence incident statistically ends within five (5) minutes, the consequences of the attack could last well beyond a single operating period (deemed to be 12 hours in duration per the CEMP) 70% of the time (Blair, P., Schweit, W., 2014), including many years, as these types of incidents create a detrimental psychological impact on the community. The County's vulnerability to this hazard is moderate and thus, this hazard is considered a threat to the PBC community.

A workplace/school violence incident tends to occur with the following actions:

1. An assault is acted upon by an active shooter/assailant.
2. Law enforcement moves into the scene to neutralize the assailant.
3. Fire rescue moves into the scene to assist wounded victims.
4. Victims are transported to health care facilities (e.g., hospitals).
5. Services are provided to victims and/or victims' families, such as victim and family mental health counseling.
6. Economic consequence management occurs.
7. Coordinated public messages and press releases are conducted.
8. Other numerous foreseen and unforeseen consequences may emerge.

Due to the majority of these type of incidents ending within five (5) minutes, planning will focus a strong focus on preparedness and mitigation, including the practice of educating the public on recommended actions they can take prior to an incident.

### 2.2.4 Vulnerability of Critical Facilities

In Appendix G, maps demonstrate the vulnerability of each hazard in relation to the County and each jurisdiction's location and critical facilities and/or infrastructure. Structures have been identified for each hazard with jurisdictional boundaries. An estimated dollar figure in relation to potential dollar losses has been identified and summarized in a narrative for each identified hazard by jurisdiction.

The county determined a criticality based on the relative importance of its various assets for the delivery of vital services, the protection of special populations, and other important functions. The types of critical facilities and infrastructure identified within these risk assessment maps are: schools, police stations, fire stations, specific government buildings, nursing homes, assisted living facilities, hospitals, shelters, Herbert Hoover Dike, Turnpike, I-95, water treatment facilities, utility stations, draw bridges, seaports, and airports. These facilities can be located on the risk assessment maps and a potential dollar loss will be correlated in the charts broken down by municipality and unincorporated PBC. The estimated costs are based upon information from the County Auditor's Office. The dollar figures specific to each hazard by municipality or unincorporated area express the potential human and economic impacts within PBC. Appendix M specifically addresses critical facilities in PBC.

## 2.3 Risk Assessment

In order to effectively plan hazard mitigation projects and allocate scarce financial resources, a community's vulnerability to a specific hazard must be coupled with other critical factors to perform a risk assessment.

Risk, or the probability of loss, depends on three (3) elements:

- Frequency – How frequently does a known hazard produce an impact within the community?

- Vulnerability – How vulnerable is a community to the impacts produced by a known hazard?

- Exposure – What is the community's exposure in terms of life and property to the impacts produced by a specific hazard?

Once these three (3) factors are established, the risk level faced by a community with regard to any specific hazard can be calculated using the Risk Triangle approach (Crichton, 1999).

In this approach, these three (3) factors become the sides of a triangle, and the risk or probability of loss is represented by the triangle's area (**Figure 2.3a**). The larger the triangle's area, the higher the community's risk with respect to a given hazard. If a community wishes to reduce its potential for loss or risk of impacts from any given hazard, it can attack the problem by reducing any one of the three (3) elements forming the sides of this triangle; the frequency of a hazard's occurrence, the vulnerability of the community, or the exposure of the community.

For example, if a community wishes to reduce its exposure to hurricanes, it could move off of the barrier islands. This actually happened in the 1870s when an entire community on the North Carolina barrier islands moved to the mainland after suffering two (2) devastating hurricanes in three (3) years. By moving out of harm's way, a community drastically reduces its exposure and therefore its potential for loss from a given natural hazard (**Figure 2.3b**).

In today's world, the potential to relocate an entire community off the barrier islands is, to say the least, remote. A community may, however, reduce its vulnerability to hurricanes by strengthening its buildings. If buildings are hardened, vulnerability is reduced and there is a corresponding reduction in a community's probability of loss (**Figure 2.3c**).

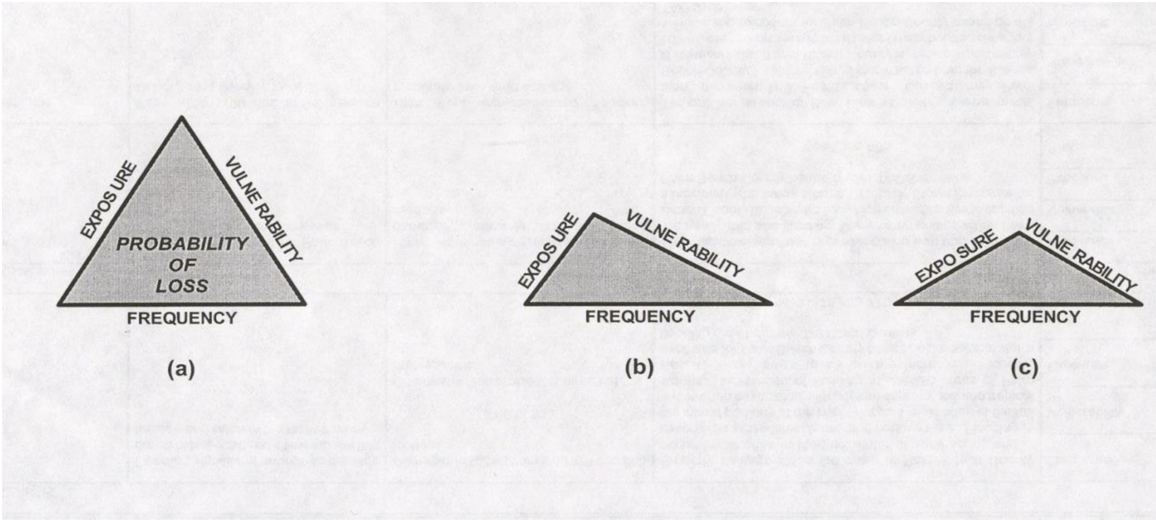


*Figure 2.13:* a, b, c Risk Triangles

In terms of natural hazards, there is very little, if anything that can be done to change the frequency with which they produce impacts in a community. Mitigation planning relative to those hazards must therefore focus on reducing the community's vulnerability or exposure. In terms of technological and human caused hazards, the most cost-effective type of mitigation is to limit or reduce the frequency with which such hazards actually occur. Table A-4 summarizes The county's potential for loss relative to each of the hazards identified. In addition, Appendix A will include a risk assessment by jurisdiction. The risk assessments will be illustrated by means of maps located in Appendix G by hazard. This is to give a clear image of potential risk throughout PBC hazard specific with potential dollar losses estimated tied to assessed property values. This assessment refers to Appendix B and Appendix G illustrating mitigation actions being addressed in the PBC comprehensive plans. The overall strategy is to mitigate to reduce damage of a potential hazard.

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# SECTION 2A: VULNERABILITY OF CRITICAL FACILITIES

This subsection assesses the vulnerability of critical facilities by jurisdiction in terms of the dollar values of property at risk from key hazards. It addresses, in part, the following FEMA requirement:

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

Numbers and types of existing residential, commercial, and critical service facilities and infrastructure are referenced in Appendix J:

With regard to future facilities, the following should be considered:

- Developable coastal areas of the County in are substantially built out. Future development is likely to be replacement and upgrading of existing facilities.

- Development in the Coastal High Area is strictly limited and managed by local ordinances and codes which tend to meet or exceed those recommended of the State.

- Future growth throughout the County is guided by the managed growth tiers which consider hazard vulnerability.

- Virtually the whole County is potentially vulnerable to isolated flooding during excessive rain events, even areas lying outside Special Flood Hazard Areas. Repetitive flood loss properties are widely scattered - not clustered - because PBC has no riverines or significant elevation variations to speak of.

- All new residential, commercial, and critical service facilities will be built to meet or exceed South Florida Building hurricane standards. Several local developers are now building Category 5 type structures.

- Wildfire mitigation practices are being promoted for development in the wildland-urban interface areas.

As the State of Florida and the US as a whole are currently experiencing economic growth, the current trend for PBC is increased values year over year. The PBC Property Appraiser's 2017 Annual Report, continued to indicate a modest to significant rise in values. County property values increased 7.9% in 2016 over 2015. There was a 7.3% increase from 2017 over 2016 (Palm Beach Post/Property Appraiser Data). This trend may be indicative of longer term stabilization and economic growth throughout the Florida real estate markets. The Table below details the 2016 – 2017 property value trends by city.

Table 2A

*2016-2017 property value trends by city in PBC*

| Community ▼ | 2016 taxable value | 2017 preliminary taxable value | Percent change |
|---|---|---|---|
| Atlantis | $468.7 million | $491.5 million | 4.86 |
| Belle Glade | $311.5 million | $324.8 million | 4.27 |
| Boca Raton | $21 billion | $22.5 billion | 7.22 |
| Boynton Beach | $5 billion | $5.4 billion | 8.25 |
| Briny Breezes | $41.3 million | $44.9 million | 8.59 |
| Cloud Lake | $5.4 million | $5.7 million | 6.49 |
| Delray Beach * | $8.8 billion | $9.6 billion | 9.53 |
| Glenridge | $15 million | $16.1 million | 7.7 |
| Greenacres | $1.5 billion | $1.7 billion | 10.47 |
| Gulf Stream | $1 billion | $1.1 billion | 2.87 |
| Haverhill | $80.5 million | $86.6 million | 7.57 |
| Highland Beach | $2.2 billion | $2.4 billion | 8.43 |
| Hypoluxo | $313 million | $329.9 million | 5.41 |
| Juno Beach | $1.3 billion | $1.4 billion | 7.49 |
| Jupiter | $9.7 billion | $10.3 billion | 6.79 |
| Jupiter Inlet Colony | $300.5 million | $319.7 million | 6.41 |
| Lake Clark Shores | $227 million | $242.3 million | 6.74 |
| Lake Park | $574.8 million | $627 million | 9.08 |
| Lake Worth * | $1.5 billion | $1.6 billion | 11.54 |
| Lantana | $889.9 million | $955.7 million | 7.4 |
| Loxahatchee Groves | $254 million | $294.4 million | 15.87 |
| Manalapan | $1.2 billion | $1.2 billion | 6.91 |
| Mangonia Park | $170 million | $181.3 million | 6.65 |
| North Palm Beach | $1.8 billion | $2.1 billion | 15.15 |
| Ocean Ridge | $891 million | $939.7 million | 5.47 |
| Pahokee | $81.3 million | $82 million | 0.86 |
| Palm Beach | $15.9 billion | $16.9 billion | 6.42 |
| Palm Beach Gardens | $10.1 billion | $10.9 billion | 7.84 |
| Palm Beach Shores | $550.9 million | $575.3 million | 4.43 |
| Palm Springs | $909.5 million | $1.1 billion | 22 |
| Riviera Beach | $4.9 billion | $5.1 billion | 3.29 |
| Royal Palm Beach | $2.5 billion | $2.7 billion | 7.80 |
| South Bay | $61.1 million | $64.6 million | 5.79 |

| | | | |
|---|---|---|---|
| South Palm Beach | $305.2 million | $326 million | 6.79 |
| Tequesta | $1 billion | $1.1 billion | 5.84 |
| Village of Golf | $155.4 million | $161 million | 3.61 |
| Wellington | $7.5 billion | $8 billion | 7.7 |
| West Palm Beach * | $11 billion | $11.9 billion | 8.35 |
| Westlake | | $27.4 million | undefined |

** Includes debt service.*
Source: Palm Beach County Property Appraiser • Created with Datawrapper

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# SECTION 2B: VULNERABILITY OF RESIDENTIAL & COMMERCIAL PROPERTIES

This subsection assesses the structural vulnerability of residential and commercial properties by jurisdiction in terms of the dollar values of property at risk from key hazards, in partial fulfillment of the following FEMA requirement:

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

Numbers, types and characteristics of existing residential, commercial and critical service facilities and infrastructure are referenced in Appendix C.

Since the last update of the LMS in 2015, there has been significant growth in residential and commercial property spending throughout the State of Florida. Specifically, there was $16 billion in 2015, up from $12.6 billion in 2014, in non-residential starts (The Associated General Contractors of America - http://files.agc.org/files/economic_state_facts/FLstim.pdf, 2016). Also, according to ConstructConnect, there was a $4.1 billion increase (16.8%) in non-residential construction over 2016 (https://www.constructconnect.com/wp-content/uploads/2018/01/Construction-Industry-Snapshot-Package-December-2017.pdf). However, there is still a cloud of uncertainty in the marketplace. Higher demand for housing, more occupancy in apartments, and retail are providing lifts to the industry. According to the Property Appraiser's Comparison of Taxes Levied (http://www.pbcgov.com/papa/pdf/tax/Palm%20Beach%20County%20Table%201%20-%20Comparison%20of%20Taxes%20Levied.pdf ), there was a 4.25% increase in FY16 over FY16. Based on the information obtained, the LMS expects that the Florida real estate markets will continue to improve in the near term.

The following observations are offered with regard to future facilities:

- Developable coastal areas of the County are substantially built out. Future development in these areas will likely be replacement and upgrading of existing facilities.
- Development in the Coastal High Area is strictly limited by local ordinances and codes which tend to meet or exceed those recommended by the State of Florida.
- Future growth throughout the County is guided by the managed growth tiers which consider hazard vulnerability.
- Nearly the whole County is potentially vulnerable to isolated flooding during excessive rain events, even areas lying outside Special Flood Hazard Areas. Repetitive flood loss properties are widely scattered - not clustered - as the County has only one (1) river and no significant elevation variations.
- All new residential, commercial and critical service facilities will be built to meet or exceed South Florida Building hurricane standards. Several local developers are now building Category 5 type structures.

- Wildfire mitigation practices are being promoted for development in the wildland-urban interface areas.

The following pages provide assessments of the dollar values of existing properties at risk as of this writing, by hazard, by jurisdiction.

**Methodology for Assessing Vulnerability of Existing Structures**

It was decided to use local property appraisal databases, Geographic Information System (GIS) mapping capabilities, and hazard environment profiles as the basis for identifying and quantifying property and dollars at risk from key hazards.

Analyses of the types and numbers of existing buildings in PBC are complicated by the County's size, diversity, highly variable and incompatible databases, and inconsistent record keeping practices. The primary data source is the Property Appraiser Database (PAPA). The PAPA database is not well suited for purposes of vulnerability assessments, but it continues to be the best data available.

A comprehensive profile of PBC's built environment is contained in the Special Appendix. It describes the residential, commercial, industrial, government, education, healthcare, religious, and other building stocks.

The paragraphs below provide a brief summary of existing residential and commercial properties.

<u>Residential Units</u>

According to Property Appraiser data, there are an estimated 597,300 residential parcels and 681,915 structures in PBC. The residential housing stock is well distributed throughout the eastern portion of the County. Forty-six (46) percent of residential units reside in the unincorporated areas of the county. The seven (7) municipalities of West Palm Beach, Boca Raton, Boynton Beach, Palm Beach Gardens, Jupiter, Wellington and Delray Beach collectively have about 34% of PBC's residential units.

The overwhelming majority of residential structures (75.6%) are of CB Stucco construction. Less than 5% have exterior walls composed of wood in the form of wood siding, wood frame stucco, or board batten. The remaining structures are constructed of a variety of other materials. The PAPA database consists of approximately 25 categories, many of which have a multiplicity of variations.

We have summarized the Property Appraiser Residential Dwelling Data in the following tables:

Table 2B-1

*Summary Table of Property Appraiser's DWELDAT table*

| Row Labels | Count of Parcels | # of Buildings | # of Buildings as a % of Total | Total Reconstruction Cost "NEW" |
|---|---|---|---|---|
| Atlantis | 1,254 | 1,256 | 0.18% | $254,022,317 |
| Belle Glade | 2,929 | 18,940 | 2.78% | $287,422,651 |
| Boca Raton | 40,011 | 40,551 | 5.95% | $11,785,957,207 |
| Boynton Beach | 31,692 | 31,798 | 4.66% | $3,940,998,201 |
| Briny Breezes | 483 | 515 | 0.08% | $12,297,643 |
| Cloud Lake | 57 | 74 | 0.01% | $4,704,027 |
| Delray Beach | 30,493 | 32,370 | 4.75% | $5,738,831,451 |
| Glenridge | 96 | 117 | 0.02% | $10,886,520 |
| Greenacres | 14,564 | 14,665 | 2.15% | $1,726,179,797 |
| Gulf Stream | 693 | 763 | 0.11% | $507,066,313 |
| Haverhill | 650 | 690 | 0.10% | $77,261,878 |
| Highland Beach | 4,147 | 4,155 | 0.61% | $2,127,633,865 |
| Hypoluxo | 2,058 | 2,062 | 0.30% | $345,009,508 |
| Juno Beach | 3,024 | 3,145 | 0.46% | $1,086,321,716 |
| Jupiter | 28,333 | 28,510 | 4.18% | $7,076,077,900 |
| Jupiter Inlet Colony | 231 | 237 | 0.03% | $78,962,167 |
| Lake Clarke Shores | 1,458 | 1,462 | 0.21% | $210,013,605 |
| Lake Park | 2,620 | 2,678 | 0.39% | $257,159,212 |
| Lake Worth Beach | 12,366 | 13,293 | 1.95% | $1,076,319,402 |
| Lantana | 4,227 | 4,364 | 0.64% | $473,198,178 |
| Loxahatchee Groves | 1,915 | 3,108 | 0.46% | $166,003,197 |
| Manalapan | 314 | 348 | 0.05% | $281,715,595 |
| Mangonia Park | 454 | 461 | 0.07% | $29,530,667 |
| North Palm Beach | 7,348 | 7,386 | 1.08% | $1,553,473,914 |
| Ocean Ridge | 1,429 | 1,451 | 0.21% | $570,290,662 |
| Pahokee | 1,184 | 2,224 | 0.33% | $109,978,252 |
| Palm Beach | 9,427 | 10,034 | 1.47% | $6,594,956,531 |
| Palm Beach Gardens | 25,163 | 25,220 | 3.70% | $7,300,319,779 |
| Palm Beach Shores | 960 | 976 | 0.14% | $450,713,626 |
| Palm Springs | 7,346 | 7,649 | 1.12% | $622,990,777 |
| Riviera Beach | 14,153 | 14,365 | 2.11% | $3,388,691,372 |
| Royal Palm Beach | 13,309 | 13,355 | 1.96% | $1,997,437,235 |
| South Bay | 696 | 737 | 0.11% | $66,991,807 |
| South Palm Beach | 1,865 | 1,865 | 0.27% | $377,345,901 |
| Tequesta | 3,245 | 3,250 | 0.48% | $704,566,726 |
| Unincorporated PBC | 261,177 | 313,648 | 46.00% | $42,855,956,432 |

| | | | | |
|---|---|---|---|---|
| Village of Golf | 178 | 212 | 0.03% | $69,466,662 |
| Wellington | 22,628 | 24,875 | 3.65% | $5,143,668,770 |
| West Palm Beach | 43,120 | 49,084 | 7.20% | $7,005,681,217 |
| Westlake | 3 | 22 | 0.00% | $90,567 |
| **Grand Total** | **597,300** | **681,915** | **100.00%** | **$116,366,193,247** |

Table 2B-2

*Residential Structures by Exterior Wall Type in PBC*

| Row Labels | # of Buildings | # of Buildings as a % of Total |
|---|---|---|
| CB STUCCO | 515,518.00 | 75.60% |
| Data Not Available | 81,596.00 | 11.97% |
| WOOD FRM STUCCO / HOLLOW TILE | 30,295.00 | 4.44% |
| WOOD SIDING | 21,205.00 | 3.11% |
| VINLY/ALUM/CON SIDING | 9,216.00 | 1.35% |
| PRECAST PNL/REIN. CONC | 7,228.00 | 1.06% |
| CONC. BLOCK | 2,775.00 | 0.41% |
| BD & BATTEN | 2,586.00 | 0.38% |
| ABOVE AV | 1,769.00 | 0.26% |
| ASB. SHG. | 1,683.00 | 0.25% |
| COMMON BR | 1,533.00 | 0.22% |
| MOD. MET. | 1,451.00 | 0.21% |
| CEMENT BR | 1,180.00 | 0.17% |
| WOOD SHT/PLY | 965.00 | 0.14% |
| BD & BATTEN ABAV | 605.00 | 0.09% |
| MINIMUM | 545.00 | 0.08% |
| CEDER/REDWOOD | 497.00 | 0.07% |
| PREF. MTL. | 346.00 | 0.05% |
| CORR. MTL. | 305.00 | 0.04% |
| BELOW AV | 151.00 | 0.02% |
| WOOD SHINGLE | 125.00 | 0.02% |
| PREFAB PNL | 123.00 | 0.02% |
| NONE | 44.00 | 0.01% |
| FACE BR | 42.00 | 0.01% |
| COMP OR WALL BD | 29.00 | 0.00% |
| STONE | 28.00 | 0.00% |
| REIN. CONC. | 28.00 | 0.00% |
| SINGLE SIDING | 21.00 | 0.00% |
| N/A | 10.00 | 0.00% |

| | | |
|---|---|---|
| CORR. ASB | 8.00 | 0.00% |
| GLASS THERM. | 8.00 | 0.00% |
| **Grand Total** | **681,915.00** | **100.00%** |

Commercial Properties

Property Appraiser data indicates that there are approximately 27,113 commercial parcels with 93,663 commercial structures countywide. The cost of reconstruction for those structures is estimated at $42B. These data are summarized as follows:

Table 2B-3

*Property Appraiser commercial parcels, buildings, and reconstruction costs*

| Row Labels | Count of Parcels | # of Buildings | Total Reconstruction Cost "NEW" |
|---|---|---|---|
| APARTMENTS | 566 | 7085 | $90,857,080 |
| APARTMENTS - SENIOR | 136 | 583 | $745,667,390 |
| APARTMENTS - TOWNHOUSE | 240 | 2439 | $275,973,010 |
| APARTMENTS HIGH RISE | 76 | 166 | $1,107,670,140 |
| APARTMENTS LOW RISE | 2360 | 13273 | $2,494,273,710 |
| ARENA | 22 | 92 | $65,151,650 |
| AUDITORIUM | 51 | 190 | $198,478,720 |
| AUTO DEALER/F-SERVICE | 221 | 503 | $397,041,740 |
| AUTO SERVICE GARAGE | 589 | 1162 | $228,464,660 |
| BANK/MAIN OFFICE | 68 | 83 | $163,998,920 |
| BAR/TAVERN | 59 | 81 | $14,292,510 |
| BARNS | 77 | 499 | $20,869,530 |
| BIOTECH RESEARCH DEVELOPMENT | 5 | 18 | $109,427,140 |
| BOWLING ALLEY | 5 | 5 | $11,142,650 |
| CAR WASH - AUTOMATIC | 63 | 174 | $28,849,830 |
| CAR WASH - MANUAL | 23 | 52 | $4,731,980 |
| CAR WASH SERVICE STATION | 59 | 121 | $5,518,540 |
| CINEMA/THEATER | 25 | 89 | $148,427,510 |
| CLUBHOUSE | 2059 | 7302 | $664,267,440 |
| COCKTAIL LOUNGE | 13 | 17 | $14,130,710 |
| COLD STORAGE | 46 | 149 | $27,207,590 |
| COLLEGES / UNIVERSITY | 117 | 2451 | $454,763,910 |
| COMM SHOPPING CENTER | 522 | 1538 | $1,662,495,900 |
| COMMERCIAL MIXED USE | 7 | 14 | $1,120,150 |
| CONVENIENCE FOOD MKT | 339 | 381 | $157,669,290 |
| CORRECTIONAL | 4 | 18 | $21,866,460 |
| COUNTRY CLUB | 44 | 79 | $93,237,260 |

| | | | |
|---|---|---|---|
| COUNTRY CLUB/W GOLF CRSE | 235 | 611 | $570,708,050 |
| CULTURAL FACILITIES | 18 | 63 | $66,317,120 |
| DAY CARE CENTER | 293 | 898 | $179,421,570 |
| DEPARTMENT STORES | 25 | 36 | $524,076,830 |
| DISCOUNT DEPT STORE | 222 | 506 | $634,188,470 |
| DOG/HORSE TRACK | 2 | 3 | $11,889,840 |
| DORMITORY | 168 | 1355 | $177,997,490 |
| DOWNTOWN ROW TYPE | 233 | 588 | $798,459,400 |
| DRUG STORE FREESTANDING | 101 | 136 | $204,242,310 |
| EDUCATION/RELIGIOUS | 686 | 2788 | $762,696,870 |
| EFFICIENCY APARTMENT | 152 | 870 | $10,141,580 |
| FRANCHISE FOOD | 305 | 481 | $151,734,460 |
| FUNERAL HOME | 56 | 83 | $45,185,670 |
| FURNITURE STORE | 39 | 47 | $115,005,720 |
| GARAGE STORAGE | 216 | 1641 | $24,577,620 |
| GOVERNMENTAL | 230 | 581 | $1,352,307,010 |
| GUARDHOUSE | 195 | 301 | $14,275,180 |
| GYMNASIUM | 73 | 313 | $159,228,740 |
| HANGAR | 117 | 2295 | $98,893,460 |
| HEALTH CLUB | 20 | 54 | $82,664,890 |
| HEAVY MANUFACTURING | 8 | 62 | $14,558,190 |
| HOME IMPROVEMENT | 18 | 18 | $113,686,030 |
| HOSPITALS | 55 | 240 | $1,987,367,100 |
| HOTEL- HI RISE | 62 | 67 | $802,272,940 |
| HOTEL/MOTEL BUSINESS | 183 | 401 | $70,636,450 |
| HOTEL/MOTEL LO RISE | 69 | 180 | $128,017,100 |
| KWIK LUBE | 22 | 34 | $7,720,700 |
| LIBRARY | 16 | 20 | $46,856,750 |
| LIGHT MANUFACTURING | 299 | 495 | $267,410,760 |
| MEDICAL OFFICE BLDG | 514 | 889 | $940,204,290 |
| MEGA WAREHOUSE DISCOUNT | 1 | 1 | $9,510,660 |
| MINI WAREHOUSE | 811 | 4286 | $681,328,480 |
| NEIGHBORHOOD BANK | 331 | 491 | $291,768,180 |
| NURSING HOME | 195 | 413 | $723,602,060 |
| OFFICE BLDG L/R 1-4S | 2419 | 5664 | $4,458,268,930 |
| OFFICE H-R 5ST | 98 | 140 | $2,062,303,420 |
| OFFICE/WAREHOUSE | 439 | 624 | $863,516,210 |
| PARKING GARAGE/DECK | 128 | 454 | $1,339,513,930 |
| POLICE/FIRE STATIONS | 129 | 228 | $155,135,930 |
| PREFAB AGR STORAGE | 3 | 3 | $557,920 |
| PREFAB WAREHOUSE | 3 | 5 | $355,010 |
| PRIVATE CLUB | 25 | 96 | $58,324,040 |

| | | | |
|---|---|---|---|
| RADIO/TV TRANSMITTER BLD | 12 | 67 | $4,062,600 |
| RADIO/TV/ PIC STUDIO | 6 | 8 | $24,837,130 |
| RAIL/BUS/AIR TERMINAL | 29 | 261 | $153,228,510 |
| REGIONAL SHPMALL/CNT | 13 | 61 | $206,053,610 |
| RELIGIOUS | 729 | 1147 | $788,236,760 |
| RESIDENTIAL BARNS | 4 | 11 | $2,254,680 |
| RESORT HOTEL | 34 | 92 | $780,258,840 |
| RESTAURANT | 402 | 787 | $286,309,480 |
| RETAIL MULTI OCCUP | 247 | 357 | $274,740,480 |
| RETAIL SINGLE OCCUP | 1111 | 1472 | $484,404,130 |
| SCHOOL | 757 | 3024 | $2,807,540,590 |
| SERVICE STATION NO BAYS | 121 | 141 | $30,522,400 |
| SERVICE STATION W/BAYS | 47 | 49 | $11,962,570 |
| SFR CONVERT TO COMM | 446 | 657 | $84,783,500 |
| SKATING RINK | 3 | 4 | $5,992,760 |
| SOCIAL/FRATERNAL HALL | 93 | 121 | $37,954,760 |
| STADIUM | 2 | 48 | $52,017,990 |
| STRIP SHOPPING CNTR | 988 | 1318 | $1,075,897,500 |
| SUPER REG SHOPMALL | 7 | 13 | $971,117,190 |
| SUPERMARKET | 145 | 349 | $505,114,130 |
| TECHNICAL MANUFACTURING | 40 | 276 | $263,439,810 |
| TELECOMMUNICATION EQUIPMENT | 31 | 55 | $54,179,050 |
| VETERINARY CLINIC | 61 | 92 | $45,197,240 |
| WAREHOUSE DISCOUNT STORE | 9 | 15 | $60,086,930 |
| WAREHOUSE DISTRIBUTION | 214 | 420 | $660,284,960 |
| WAREHOUSE SINGLE TENANT | 2 | 2 | $758,280 |
| WAREHOUSE STORAGE | 4550 | 15791 | $1,998,645,550 |
| **Grand Total** | **27,113** | **93,663** | **$41,884,404,210** |

<u>Number & Assessed Values of Residential & Commercial Property at Risk</u>

Deriving an accurate estimate of residential property values at risk from hazards is complicated by multiple factors. However, the Property Appraiser does calculate the estimated cost of reconstruction based upon its knowledge of the building and its construction, as well as estimated costs of construction. This value is provided the RCN ("reconstruction value new") which is used above.

The methodology used to estimate the value of residential property at risk involved a number of compromises using best available data. Parcel data was extracted from the Property Appraiser database. It was sorted by jurisdiction and hazard boundaries. A derived factor for land values was backed out of loss estimates to concentrate only on improved parcels.

Estimating the Value of Property Contents

Based on analyses of property records, values for residential contents at risk are assumed to be approximately 80% of the appraised value of the structure. Values for commercial contents and inventory at risk are assumed to be 175% of the appraised value of the structure. A countywide summary of property values at risk, including contents, is presented at the end of this Section.

Critical Facilities

For the purpose of the LMS, Critical facilities are defined as any facility that would have a major negative effect on a large percentage of the population of a community. Based on the nature of the service (s) it provides to the community or the negative impact that would occur to that same community if the facility became damaged, destroyed, or non functional. These facilities include but are not limited to law enforcement and fire rescue facilities, schools, government facilities, utility facilities, sea ports and airports, hospitals, and other critical medical facilities, shelters, adult living facilities, etc. For security reasons and their sensitive nature, critical facility listings are excluded from publicly distributed copies of the LMS plan. A list is maintained by DEM and made available to authorized personnel.

# SECTION 3: MITIGATION STRATEGY

## 3.1 Governmental

Local Mitigation Strategies take into account an abundance of information from the Federal and State levels, as each has their own mitigation strategy as well. For example, the Federal Government has the National Mitigation Strategy, and the State of Florida has the State Hazard Mitigation Plan. Strategies, goals, and objectives from these are very beneficial for local LMS officials to use in the formulation of their own strategies, as they help align the overall mitigation goals with each other, in order to make all communities more resilient after a disaster has occurred.

This section, in part, addresses the following FEMA requirements:

**Requirement 44CFR 201.6(c)(2)(i):** Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? **(Element R6)**

**Requirement 44CFR 201.6(c)(2)(ii):** Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? **(Element R7)**

**Requirement 44CFR 201.6(c)(2)(ii):** Does the Plan address NFIP insured structures within each jurisdiction that have been repetitively damaged by floods? **(Element R9)**

**Requirement 44CFR 201.6(c)(3)(i):** Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? **(Element S1)**

**Requirement 44CFR 201.6(c)(3)(ii) and 201.6(c)(3)(iv):** Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? **(Element S4/S5)**

**Requirement 44CFR 201.6(c)(4)(ii):** Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? **(Element S10/S11)**

### 3.1.1 Federal

The National Mitigation Strategy has been developed to provide a framework for reducing the exposure of all Americans to the catastrophic losses caused by natural disasters. Federal mitigation action planning is directed toward protecting U.S. citizens by:

- Utilizing the scientific and technical knowledge resulting from the research efforts of the National Institute of Standards and Technology (NIST), and integrating it into local fire and building codes in order to reduce major urban fires and building failures;
- Establishing under the NFIP a national program for floodplain management with strong mitigation provisions to significantly reduce flood losses;
- Developing a national system of emergency management with a coordinated Federal Response Plan to replace the piecemeal approach to recovery after disaster strikes;
- Establishing a National Earthquake Hazards Reduction Program to increase the availability of applied seismic research, develop state seismic hazard reduction programs, and improve training and education on methods to the risk of loss of life and property to earthquakes;
- Establishing a National Hurricane Program to minimize loss of life and property from hurricanes through better property protection, warning and evacuation procedures, and training and education;
- Developing a National Inventory of Dams identifying high-hazard dams and encouraging the development of warning systems and emergency plans for many of these facilities;
- Establishing an effective program of assistance to state and local governments for post-disaster mitigation actions through the Stafford Act's Section 404, HMGP, and under Section 406 in terms of the mitigation of damage to public facilities; and
- Establishing a nationwide program of federal, state, and local preparedness consisting of trained personnel, facilities, equipment, training, and exercises to save lives and protect property through warning, evacuation, shelter, and other post-disaster actions.

In 1986, the United States Congress enacted the Emergency Planning and Community Right-to-Know Act. It imposed upon state and local governments planning and preparedness requirements for emergencies involving the release of hazardous materials. The role of the federal government in response to an emergency involving the release of hazardous materials is to support local and state emergency operations. Activation of the Federal Regional Response Team provides access to federal resources not available at the state and local levels. An on-scene coordinator is designated to manage federal resources and support.

- The national warning and communications center for emergencies involving the release of hazardous materials. It is manned 24 hours a day, and is located at the U.S. Coast Guard headquarters in Washington, D.C.

### 3.1.2 State

The FDEM, under the Executive Office of the Governor, has primary responsibility in disaster response and mitigation. The FDEM developed the State Enhanced Hazard Mitigation Plan (SHMP) to establish a comprehensive program to effectively and efficiently mobilize and coordinate the state's services and resources to make Florida's communities more resistant to the human and economic impacts of disasters. The SHMP Strategy achieves this purpose through the following goals and objectives:

**Goal 1: Implement and effective comprehensive statewide hazard mitigation plan.**

- Objective 1.1: Provide training opportunities and encourage staff to pursue professional development.
- Objective 1.2: Pursue methodologies that will enhance mitigation successes.
- Objective 1.3: Integrate mitigation practices throughout all state plans, programs, and policies.

**Goal 2: Support local and regional mitigation strategies.**

- Objective 2.1: Maintain up-to-date risk assessment information in coordination with local communities.
- Objective 2.2: Assist in integrating hazard mitigation concepts into other local and regional planning efforts such as comprehensive plans, local mitigation strategies, and comprehensive emergency management plans.
- Objective 2.3: Ensure that all communities are aware of available mitigation funding sources and cycles.
- Objective 2.4: Assist in the integration of climate change and sea level rise research into state, local, and regional planning efforts.
- Objective 2.5: Conduct all possible actions to mitigate severe repetitive loss properties.

**Goal 3: Increase public and private sector awareness and support for hazard mitigation in Florida**

- Objective 3.1: Work with other state and regional entities to incorporate mitigation concepts and information into their outreach efforts.
- Objective 3.2: Educate Florida's private sector about mitigation concepts and opportunities.
- Objective 3.3: Develop and integrate hazard mitigation curriculum into higher education.
- Objective 3.4: Educate state risk management entities on mitigation incentives.
- Objective 3.5: Support hazard mitigation research and development.

**Goal 4: Support mitigation initiatives and policies that protect the state's cultural, economic, and natural resources.**

- Objective 4.1: Support land acquisition programs that reduce or eliminate potential future losses due to natural hazards and that are compatible with the protection of natural or cultural resources.
- Objective 4.2: Support restoration and conservation of natural resources whenever possible.
- Objective 4.3: Seek mitigation opportunities that reduce economic losses and promote responsible economic growth.
- Objective 4.4: Retrofit existing state-owned facilities.
- Objective 4.5: Participate in climate change and sea level rise research that will further the state and local government's ability to plan for and mitigate the impacts of future vulnerability.
- Objective 4.6: Coordinate effective partnerships between state agencies for floodplain management.

The SHMP provides the FDEM with operational and programmatic guidance to promote the goals and objectives of the nationally based National Mitigation Strategy as coordinated by FEMA.

The FDEM has the lead role in coordinating state resources to support local government unless the scope of the emergency warrants a higher degree of state involvement. This may occur when emergencies involve multi-jurisdictional hazards, when local governments believe the emergency is beyond the capabilities of local resources, or when the Governor determines there is an overriding concern for the safety of the public. For these situations, the Governor can designate the primary responsibility for emergency response to the state by issuing an Executive Order under the provisions of Section 252.36, Florida Statutes (F.S.).

The FDEM is the designated State Watch Office as the notification point in the event of a hazardous materials incident. As such, the FDEM is responsible for receiving notification of an emergency from the County Communications Coordinator (i.e., County Warning Point), and coordinating the request(s) for County support, if requested. The DEM is responsible for assisting LEPC's in providing warnings and instructions to the general public.

The Florida Division of Forestry (DOF) has major responsibility for protecting forest lands and the public from the effects of wildfire. Local fire-rescue departments have primary responsibility for structural fires. They also are the first responders to all fires. If the local fire-rescue department has determined that the wildfire event is beyond its capacity to fight, the local fire-rescue department can request assistance from the DOF. When that occurs, an incident command control is established with state and local fire-rescue departments working together to extinguish the wildfire.

### 3.1.3 Regional

#### 3.1.3.1 Treasure Coast Regional Planning Council (TCRPC)

The TCRPC was created under Section 186.501, F.S. The TCRPC is multi-county entity encompassing Indian River, Martin, Palm Beach, and St. Lucie counties. It has responsibility for addressing growth management issues that are multi-jurisdictional in scope. This includes working in cooperation with federal and state agencies planning for emergency management issues as described in Section 252.34(4) F.S. The TCRPC provides full-time staffing for the District X LEPC. The LEPC is charged with administering regional compliance with hazardous materials reporting and training laws. Its many initiatives include the State Hazardous Materials Training Task Force; District X Hazardous Materials Emergency Plan; training for emergency first response personnel; hospital and hazardous materials response team needs; public hazardous chemical awareness and reporting seminars; public and private sector hazardous materials emergency exercises; and assisting public and private facilities with chemical emergency preparedness planning.

Section 186.507, F.S. directs regional planning councils to prepare strategic regional policy plans. One of the elements that the plan must address is emergency preparedness. The TCRPC promotes mitigation initiatives within Section 5.0, Emergency Preparedness, of its "Strategic Regional Policy Plan". (Appendix B).

- **Strategy 5.1.1** Direct development away from areas most vulnerable to the effects of natural and man-made disasters.
- **Strategy 5.2.1** Utilize land use, transportation, and community planning processes to address vulnerability issues.
- **Strategy 5.3.1** Provide shelter space for residents of areas susceptible to flooding from the effects of hurricanes and other storms.
- **Strategy 5.4.1** Develop the mechanisms necessary to ensure that emergency planning agencies have in-put into the local government decision-making process.
- **Strategy 5.5.1** Initiate disaster preparedness activities which will protect lives and property and reduce evacuation times.
- **Strategy 5.5.2** Establish mechanisms and regulations necessary for post-disaster reconstruction to occur in a consistent manor making future disasters less destructive to life and property.

### 3.1.3.2 South Florida Water Management District

The creation of the SFWMD along with the four (4) other water management districts were enabled under Section 373.069, F.S. As required under Section 373.036(2), F.S., each district has prepared a district water management plan. The plan provides the overarching vision for the districts.

The key elements of the plans are:

- Environmental protection and enhancement
- Water supply
- Flood protection
- Water quality protection

One of the purposes of the plan is to provide a framework to address issues of water conservation, extreme drought and flooding. The SFWMD administers several programs that achieve hazard mitigation relative to flooding, hurricanes, and drought. The SFWMD operates and maintains the regional drainage system throughout its jurisdictional area. Local drainage systems are operated by a variety of special districts, private property owners, and local governments. The local systems typically convey water from individual projects to the regional system. The SFWMD's responsibilities for flood protection relate primarily to serving as the regional water conveyance and storage entity. To meet this responsibility the SFWMD maintains an ongoing "Canal Conveyance Capacity" evaluation program. The objectives of the program are:

- To implement a systematic approach to the inspection of all SFWMD canals to determine the need for periodic dredging
- To inspect all canals over a five (5) year period

- To establish standard canal survey criteria
- To develop construction plans and specifications to implement restoration of conveyance to the canals

In addition to private applicants, local units of government involved in building new stormwater systems or retrofitting older ones are required to petition the SFWMD for a surface water management permit approval.

Besides flood control, the SFWMD is responsible for protecting existing water resources from excessive drawdown during periods of drought, and protecting wellfields from contamination. Also, the District administers the "Save Our Rivers" program for the purpose of protecting environmentally sensitive lands. Some of the lands purchased under the program have been situated in the Coastal High Hazard Area (CHHA); thus, in addition to achieving the program's primary goal - the protection of environmentally sensitive resources - the intensity and density of development in CHHAs is reduced.

### 3.1.4 Local

#### 3.1.4.1 Palm Beach County

The County occupies approximately 1,993 square miles on Florida's southeastern Atlantic coast. It is the second largest county in the state in terms of land area. It has approximately 46 miles of coastal shoreline that fronts the Atlantic Ocean.

The county is the third most populated county in the state. In 2010 the countywide population was listed as 1,320,134 (US Census). That is an increase of nearly 200,000 people from the 2000 census. It is projected that by the year 2020, the population will increase by over another 200,000 to about 1,597,535. The majority of the growth is expected between the coastal ridge and Water Conservation Areas.

Thirty-nine (39) municipalities exist in the County. In terms of population, they vary significantly. The City of West Palm Beach is the largest (110,396) while the City of Westlake (5) is the smallest (see **Table 3.1**). There are three (3) urban centers of population along the coast: in south PBC, the Boca Raton/Delray Beach/Boynton Beach area (combined population – 231,593); the West Palm Beach/Lake Worth Beach/Riviera Beach area (combined population – 183,399) in central PBC; and in north PBC, the Palm Beach Gardens/Jupiter area (combined population – 113,979). Two (2) other centers of population exist in the County. One is the Glades agricultural communities of Belle Glade, Pahokee, and South Bay that border on Lake Okeechobee, (combined population – 28,394). This area has unique needs because of its relative physical isolation from the highly urban area along the Atlantic coast. The other area, rapidly urbanizing, is the Royal Palm Beach/Wellington/Greenacres (combined population – 139,030) area. Based upon the estimates provided by the Bureau of Economic and Business Research at the University of Florida, the City of West Palm Beach has experienced the largest population growth amongst the municipalities of PBC, with an estimated growth of 10,053 during the period of 2010 through 2018.

As growth has occurred, and PBC has become more and more urbanized, large portions of the County have experienced shifting land use patterns, moving from rural, agricultural areas to emerging residential communities, industrial and business employment centers. Land in PBC is used for three (3) major purposes: urban uses, agriculture, and protecting environmentally sensitive resource areas (e.g., water conservation areas, Corbett Wildlife Refuge, beach areas). **Table 3.2** provides a synopsis of each municipality.

From a hazards perspective, transportation is an important component shaping the overall development pattern. Being a major urban county, the residents and businesses are serviced by many suppliers that depend upon the air, rail, and trucking industries that distribute goods throughout the region. Key major modes of transportation traverse throughout PBC. The area is served by major transportation corridors (e.g., Interstate 95, Florida Turnpike), four (4) rail lines (Florida East Coast Railroad, CSX Railroad, Tri-Rail, and Brightline), the Port of Palm Beach, and Palm Beach International Airport. Brightline is a new high-speed railroad service that currently services West Palm Beach and Fort Lauderdale, but plans to expand from Orlando to Miami. As the area becomes more urban and more congested, the potential for transportation accidents will increase.

Within PBC, the SFWMD operates six (6) major drainage canals: C-18, C-17 (Earman River), C-51 (West Palm Beach Canal), C-16 (Boynton Canal), C-15 canal, and the Hillsboro Canal. Secondary stormwater drainage canals drain into these regional conveyance system drains. Prior to the construction of the extensive SFWMD canal system, flooding was a common occurrence after significant rainfall events, and served as a limiting factor to growth. In addition to providing drainage relief, the regional drainage facilities also benefit the area's water resources. Eastern PBC generally relies upon local rainfall and water stored in Lake Okeechobee and the Water Conservation Areas for its water. The regional SFWMD system can move water from Lake Okeechobee, the Water Conservation Areas, and then to eastern PBC where the water helps supplement local recharge of urban wellfields. The county's connection to the SFWMD regional system makes it less vulnerable to drought conditions than if it depended solely on local supplies. In general, the south County wellfields would be seriously impacted by the loss of recharge from surface water systems.

It is the goal of PBC to protect human life and property by limiting public expenditures in areas subject to destruction by natural disasters (especially within the coastal high hazard area), maintaining and implementing an effective emergency management program, and providing for orderly recovery and redevelopment in a post-disaster period. Toward this end, PBC and its 39 municipalities maintain a series of coordinated, interlinked preparedness and recovery plans including, but not limited to:

Comprehensive Plans at County and municipal levels which focus on environmental resources management, managed avoidance of development in high hazard areas, and responsible post disaster redevelopment;

Comprehensive Emergency Management Plan and Local Emergency Plans, which establishes the framework to ensure that PBC and the municipalities will be adequately prepared to deal with the hazards threatening the lives and property of citizens and details pre and post-disaster hazard mitigation strategies, policies and activities;

Local Mitigation Strategy, which describes county-wide strategies and projects for mitigating the effects of identified vulnerabilities to natural, technological and human caused hazards;

Continuity of Operations Plan, which ensures the continuance of essential governmental functions during any emergency or situation that, might otherwise disrupt normal operations.

Through subcommittees of the Local Mitigation Strategy, these and other plans relevant to the protection of life and property are closely monitored in an effort to ensure their language, policies, procedures, and practices are compatible, consistent, coordinated, and mutually beneficial.

The County and its 39 municipalities participate in a full complement of federal, state, and local mitigation programs and initiatives. Representative of these programs and initiatives are the LMS, CRS, NFIP, FMAP, Community Emergency Response Team, Continuity of Operations, counter-terrorism, radiological emergency preparedness initiatives, and hazardous materials. The collective purpose of these activities is the elimination or mitigation of hazards presenting significant risk to PBC and its residents, with a focus on new and existing buildings and infrastructure.

| County , City | April 1 2017 Estimate | Total Change 2010-2017 | April 1 2010 Census | Inmates | Estimates less Inmates April 1, 2017 |
|---|---|---|---|---|---|
| **Palm Beach County** | 1,414,144 | 94,010 | 1,320,134 | 2,898 | 1,411,246 |
| Atlantis | 2.024 | 19 | 2.005 | 0 | 2.024 |
| Belle Glade | 17.290 | -177 | 17.467 | 0 | 17.290 |
| Boca Raton | 91.797 | 7.405 | 84.392 | 0 | 91.797 |
| Boynton Beach | 73.992 | 5.775 | 68.217 | 0 | 73.992 |
| Briny Breezes | 422 | -179 | 601 | 0 | 422 |
| Cloud Lake | 139 | 4 | 135 | 0 | 139 |
| Delray Beach | 65.804 | 5.282 | 60.522 | 0 | 65.804 |
| Glen Ridge | 227 | 8 | 219 | 0 | 227 |
| Golf | 258 | 6 | 252 | 0 | 258 |
| Greenacres | 39.770 | 2.197 | 37.573 | 0 | 39.770 |
| Gulf Stream | 1.001 | 215 | 786 | 0 | 1.001 |
| Haverhill | 2.063 | 190 | 1.873 | 0 | 2.063 |
| Highland Beach | 3.609 | 70 | 3.539 | 0 | 3.609 |
| Hypoluxo | 2.725 | 137 | 2.588 | 0 | 2.725 |
| Juno Beach | 3.400 | 224 | 3.176 | 0 | 3.400 |
| Jupiter | 61.388 | 6.232 | 55.156 | 0 | 61.388 |
| Jupiter Inlet Colony | 407 | 7 | 400 | 0 | 407 |
| Lake Clarke Shores | 3.409 | 33 | 3.376 | 0 | 3.409 |
| Lake Park | 8.784 | 629 | 8.155 | 0 | 8.784 |
| Lake Worth | 37.946 | 3.036 | 34.910 | 0 | 37.946 |
| Lantana | 10.797 | 374 | 10.423 | 24 | 10.773 |
| Loxahatchee Groves | 3.321 | 141 | 3.180 | 0 | 3.321 |
| Manalapan | 421 | 15 | 406 | 0 | 421 |
| Mangonia Park | 2.033 | 145 | 1.888 | 0 | 2.033 |
| North Palm Beach | 12.574 | 559 | 12.015 | 0 | 12.574 |
| Ocean Ridge | 1.812 | 26 | 1.786 | 0 | 1.812 |
| Pahokee | 5.889 | 240 | 5.649 | 355 | 5.534 |
| Palm Beach* | 8.291 | 130 | 8.161 | 0 | 8.291 |
| Palm Beach Gardens* | 52.591 | 4.151 | 48.440 | 0 | 52.591 |
| Palm Beach Shores | 1.200 | 58 | 1.142 | 0 | 1.200 |
| Palm Springs | 23.250 | 4.322 | 18.928 | 0 | 23.250 |
| Riviera Beach | 35.057 | 2.569 | 32.488 | 0 | 35.057 |
| Royal Palm Beach | 37.485 | 3.345 | 34.140 | 0 | 37.485 |
| South Bay | 5.215 | 339 | 4.876 | 1.934 | 3.281 |
| South Palm Beach* | 1.400 | 42 | 1.358 | 0 | 1.400 |
| Tequesta | 5.731 | 102 | 5.629 | 0 | 5.731 |
| Wellington | 61.775 | 5.267 | 56.508 | 0 | 61.775 |
| Westlake**** | 5 | 5 | 0 | 0 | 5 |
| West Palm Beach* | 110.396 | 10.053 | 100.343 | 246 | 110.150 |
| UNINCORPORATED* | 618,446 | 31,014 | 587,432 | 339 | 618,107 |

*Source: Bureau of Economic and Business Research, University of Florida

*Figure 3.1:* PBC Population Estimates as of April 1, 2017

| ***Municipality*** | ***Location*** | ***Urban/Rural*** | ***Community Character (Residential/Working/ Retirement)*** | ***Percent Built Out*** | ***Source Year*** | ***Economic Base (Agricultural/Business/Industrial/ Residential/Retirement)*** |
|---|---|---|---|---|---|---|
| Atlantis | Inland | Urban | Residential | NI | | Residential/Retirement |
| Belle Glade | Lakefront | Rural | Working | 75 | 89 | Agricultural |
| Boca Raton | Coastal | Urban | Working | 97 | 2014 | Business/Residential |
| Boynton Beach | Coastal | Urban | Residential | NI | | Business/Residential |
| Briny Breezes | Coastal | Urban | Retirement | 100 | 89 | Retirement |
| Cloud Lake | Inland | Urban | Residential | 94 | 89 | Retirement/Residential |
| Delray Beach | Coastal | Urban | Residential/Working | 98.9 | 08 | Business |
| Glen Ridge | Inland | Urban | Residential | 86.3 | 89 | Residential/Commercial |
| Golf | Inland | Urban | Residential | NI | | Residential |
| Greenacres | Inland | Urban | Residential | 97 | 06 | Residential/Commercial |
| Gulfstream | Coastal | Urban | Residential | NI | | Residential |
| Haverhill | Inland | Rural/Urban | Residential | 96 | 89 | Residential/Commercial |
| Highland Beach | Coastal | Urban | Residential/ Retirement | 98 | 08 | Residential/Retirement |
| Hypoluxo | Coastal | Urban | Residential | NI | | Retirement |
| Juno Beach | Coastal | Urban | Residential | 90 | 2014 | Residential/Commercial |
| Jupiter | Coastal | Urban | Residential/Working | 90 | 2014 | Business/Residential |
| Jupiter Inlet Colony | Coastal | Urban | Residential | 99 | 08 | Residential/Retirement |
| Lake Clark Shores | Inland | Urban | Residential | 96 | 2014 | Residential/Commercial |
| Lake Park | Coastal | Urban | Working | 95 | 08 | Business |
| Lake Worth Beach | Coastal | Urban | Residential | NI | | Commercial |
| Lantana | Coastal | Urban | Residential | NI | | Residential/Commercial |

| | | | | | | |
|---|---|---|---|---|---|---|
| Loxahatchee Groves | Inland | Rural | Residential | NI | 09 | Residential |
| Manalapan | Coastal | Urban | Residential | NI | | Residential |
| Mangonia Park | Inland | Urban | Working | 85 | 2014 | Working/Residential |
| North Palm Beach | Coastal | Urban | Residential | 98 | 89 | Residential/Commercial |
| Ocean Ridge | Coastal | Urban | Residential | NI | | Residential/Retirement |
| Pahokee | Lakefront | Rural | Working | NI | | Agricultural |
| Palm Beach | Coastal | Urban | Residential | 97 | 2014 | Residential/Commercial |
| Palm Beach Gardens | Inland | Urban/Rural | Residential/Working | 95% | 2014 | Agricultural/Business |
| Palm Beach Shores | Coastal | Urban | Residential | NI | | Residential/Retirement |
| Palm Springs | Inland | Urban | Residential | 96 | 2014 | Residential/Commercial |
| Riviera Beach | Coastal | Urban | Working | 94 | | Industrial |
| Royal Palm Beach | Inland | Urban | Residential | 90 | | Business/Industrial/Residential |
| South Bay | Inland | Rural | Residential/Working | 91 | 89 | Agricultural/Industrial |
| South Palm Beach | Coastal | Urban | Residential | 100 | 89 | Residential/Retirement |
| Tequesta | Coastal | Urban | Residential | 95 | 89 | Residential/Retirement |
| Wellington | Inland | Urban | Residential | NI | | Residential |
| Westlake | Inland | Rural | Residential | 1 | 2017 | Residential |
| West Palm Beach | Coastal | Urban | Residential | NI | | Business |

*Figure 3.2:* Characterization of the municipalities in PBC.

**County Agencies with Key Roles in Mitigation**

Within the existing county organizational structure, there are a number of departments that play key roles in hazard mitigation. They are as follows:

*Public Safety Department (PSD)*. The PSD is composed of six (6) divisions: DEM, Animal Care & Control Division, Consumer Affairs Division, 9-1-1 Technical Services Division, Victim Services Division, and Justice Services Division. During emergency events (e.g., hurricanes), the DEM has the lead role in coordinating the resources and key agencies, non-profits, and private sector entities involved in the emergency situation.

*Department of Planning, Zoning & Building (PZ&B)*. The PZ&B is comprised of three (3) divisions: Planning, Zoning and Building. The PZ&B has primary responsibility for administering the PBC Comprehensive Plan, and appraising and updating it from time to time. In addition to its long-range planning role, PZ&B is responsible for processing development petitions (i.e., rezoning petitions, site plans). The Building Division issues and oversees compliance with all building permits. The Zoning Division administers the Zoning Ordinance and Lot Clearing Ordinance. The County also issues building permits for one (1) municipality Gulf Stream.

*Department of Environmental Resource Management (ERM)*. The ERM is involved in the evaluation and assessment of environmental projects (e.g., shoreline stabilization projects, beach erosion initiatives), and administering various environmental ordinances (i.e., Irrigation & Water Conservation, Sea Turtle Protection/Sand Preservation Ordinance, Stormwater Pollution Prevention, Vegetation Protection and Preservation, Turnpike Wellfield Protection). To mitigate erosion and enhance and restore the beaches and dunes along its coastal shorelines, the County has developed a Shoreline Protection Plan. The County avoids the use of shoreline armoring (except as a measure of last resort). Preferred alternatives include beach nourishment, dune restoration, and inlet sand transfer.

*Facilities Development and Operation (FD&O)*. This department is responsible for the development of County buildings including siting, real estate, design and construction, and operations of the facilities. The department is responsible for overseeing the construction of capital projects as well as the long-term maintenance of County facilities (e.g., emergency management operations center).

*Engineering and Public Works Department (EPWD).* The EPWD is responsible for project design and construction of roads and bridges and street improvements (includes stormwater drainage facilities), and vehicular and pedestrian traffic control, as well as the maintenance of the facilities.

*PBC Fire Rescue (PBCFR).* Palm Beach County Fire Rescue provides fire suppression, emergency medical services, fire prevention, and community education programs throughout PBC. The department not only serves the unincorporated County, but 19 municipalities. They include: Belle Glade, Cloud Lake, Glen Ridge, Haverhill, Juno Beach, Jupiter, Lake Clarke

Shores, Lake Park, Lake Worth Beach, Lantana, Loxahatchee Groves, Manalapan, Pahokee, Palm Springs, Royal Palm Beach, South Bay, South Palm Beach, Wellington, and Westlake. The County also provides fire-rescue dispatch service to 13 municipalities. Besides emergency services, the Department provides other types of services. The Bureau of Safety Services is responsible for ensuring that buildings comply with appropriate fire codes. The department also offers public education programs which focus on fire safety guidelines for schools, community groups, and individuals. In addition, the department has responsibility for coordination of fire protection, hazardous materials mitigation, and advance life support services.

*Palm Beach County Sheriff's Office (PBSO).* Besides their responsibilities for crowd and traffic control during emergency events such as hazardous waste truck spills, the Sheriff's Department is responsible for enforcing PBC's dumping ordinance.

**Mitigation Policies and Ordinances**

*Policy Plans*. The two (2) key policy plans that address issues related to natural and technological hazards include: the County Comprehensive Plan and the County Comprehensive Emergency Management Plan. They are described, briefly below.

- County Comprehensive Plan

  The County's Comprehensive Plan provides the framework for future development within the unincorporated area, and provides mechanisms and standards through which changes could occur. The directives include implementing County-wide growth management strategies while providing the opportunities for flexibility that recognize and maintain the diversity of lifestyles. The Comprehensive Plan contains the nine (9) required plan elements, as set out in Section 163.3177, F.S. They include: Conservation, Coastal Management, Utilities (i.e., potable water, sanitary sewer, stormwater management, solid waste, and natural aquifer recharge), Future Land Use, Housing, Recreation and Open Space, Transportation, Intergovernmental Coordination, and Capital Improvement. In addition, the County has added several optional elements to the Comprehensive Plan. This plan addresses: Library Services, Public School Facilities, Historic Preservation, Fire-Rescue Services, Health and Human Services. Hazard Mitigation is addressed in the Conservation and Coastal Management Elements. A listing of relevant hazard mitigation objectives and policies for PBC is located in Appendix B.

  Mitigation of natural hazards such as flooding, hurricanes, drought, and beach erosion is a focus of the Coastal Management Element in the Comprehensive Plan. Technological and societal hazards are also addressed in the plan Coastal Management Element.

  Effective October 25, 2002 by Ordinance 2002-51, PBC's Comprehensive Plan contains specific language which recognizes, concurs with, and links the County's LMS objectives, processes, and project prioritization criteria with capital improvement and coastal management policies and priorities. Key references can be found in Policy 1.4 of the Capital Improvement Element; and Section 2, Objective 2.4 and Policies 2.4-e and 3.1-c of the Coastal Management Element. By virtue of their intended purpose to mitigate public hazards, projects carried on the LMS Prioritized Project List are considered to meet the County's standards for categorization as "Essential." The Comprehensive Plan also recognizes that the governing body of the LMS program shall comprise representatives assigned by each of the 39 municipalities and PBC and be governed by appropriate policies, procedures and/or either interlocal agreements or resolutions.

**Appendix B**

**Conservation Element**: Policy 1.3-e: The County shall pursue opportunities, such as State Hazard Mitigation Grant Funding, to preserve lands for natural resources (i.e. beaches and dunes, native vegetation, wetlands and barrier islands). A benefit of preserving lands for natural resources is hazard mitigation aimed at protecting development from natural disasters.

**Coastal Management Element**: Policy 2.5-d: The County shall continue to enforce regulations and codes, which provide for hazard mitigation. These include land use, building construction, flood elevation, septic and sanitary sewer, coastal construction setback, and stormwater facility regulations. These regulations shall also be applied to eliminate unsafe conditions and inappropriate uses.

**Coastal Management Element**: Policy 2.5-e: The County shall, pursuant to the Comprehensive Emergency Management Plan, continue recommended hazard mitigation activities, including land development regulations and construction law administration. Post-disaster recommendations contained in Hazard Mitigation Plans shall be incorporated to avoid future destruction and loss of life.

- Comprehensive Emergency Management Plan (CEMP)

The BCC has adopted the CEMP. It is an operations-oriented document that establishes the framework for effective management of emergencies and disasters for PBC. The CEMP addresses a broad range of hazards. They include:

- Severe Weather
- Flooding
- Fire
- Agricultural Pests and Diseases
- Hazardous Materials
- Nuclear Power Plant
- Dike Failure
- Domestic Security
- Mass Migration
- Communicable Diseases

- Transportation
- Workplace/School Violence

The CEMP addresses evacuation in terms of local and regional evacuation, public shelter, disaster response and recovery, rapid deployment of resources, communications and warning systems, training exercises, and agency responsibilities. These responsibilities constitute Emergency Support Functions (ESF). Each ESF is headed by a lead agency which has been selected based on its authorities, resources, and capabilities in the functional area. The ESFs serves as the primary mechanism through which outside assistance to PBC is coordinated.

In the Mitigation section of the CEMP, there is extensive language stating the objectives and details of the Local Mitigation Strategy. The mitigation techniques within the two (2) plans include projects, policies, or programs which will reduce, eliminate, or alleviate damage caused by disasters. Moreover, the CEMP and the LMS work collectively to improve the community's resistance to damage from known natural, technological, and human caused hazards.

*Ordinances.* Hazard-related ordinances are administered primarily by the PZ&B, ERM, or Fire-Rescue departments. The list of relevant ordinances includes:

- Irrigation & Water Conservation
- Sea Turtle Protection/Sand Preservation
- Stormwater Pollution Prevention
- Countywide Wellfield Protection
- Turnpike Wellfield Protection
- Lot Clearing
- Zoning
- Building Code
- Fire Prevention Code
- Vegetation Protection and Preservation

**County Mitigation Plans, Programs, Projects/Initiatives**

There are a number of projects and initiatives PBC has implemented to mitigate potential damage resulting from various hazards.

The County has also made a statement of the importance of hazard mitigation, by incorporating within its Comprehensive Growth Management Plan policy statements regarding the development of a county-wide Local Mitigation Strategy. In addition to its CEMP, there are special hazard plans that apply to unique situations. They address hazards such as coastal oil spills, hazardous materials, and airport safety. In addition, in a county that experiences substantial development each year, Fire-Rescue actively participates on the County development review committee. The Fire-Rescue staff reviews and comments on whether there is adequate access to buildings by both personnel and apparatus, and whether there is adequate vehicle ingress and egress.

The Fire-Rescue Department has a significant role relative to hazardous materials. Fire-Rescue staff pre-identifies hazardous chemical waste facilities and pre-plans emergency response. In addition, staff works with the facility managers by assisting in writing their emergency operations/evacuation plans.

Also, as many other counties have done since Hurricane Andrew, PBC has upgraded its building code. It requires that all structures be able to withstand 110 mph wind load. The code now requires a finished floor elevation at six (6) inches above minimum 100-year flood level. The County's building code also requires corrosion resistant hurricane clips, water resistant adhesives for shingles, and trusses manufactured in accordance with local wind models. Unlike many counties in Florida, PBC also requires shutters for all new single family homes, and glazing of exterior windows to achieve impact resistance from windborne debris.

Another mitigation activity of Fire-Rescue involves pre-planning for hurricanes. This involves identifying "target hazards." These are buildings/developments that are highly vulnerable to damage during a hurricane. In pre-storm stage, Fire-Rescue personnel identify residents that did NOT evacuate, and where they live in the event Fire-Rescue staff has to search for individuals following the storm event.

All fire stations have been fitted with shutters and have emergency generator and LP gas power sources. Also, all new facilities are being built to updated standards and have fire sprinkler/alarms.

**National Flood Insurance Program (NFIP)**

The function of NFIP is to provide flood insurance to homes and businesses located in floodplains at a reasonable cost, and to encourage the location of new development away from the floodplain. The program is based upon mapping areas of flood risk, and requiring local implementation to reduce that risk, primarily through guidance of new development in floodplains.

Congress created the NFIP in 1968 to minimize response and recovery costs and to reduce the loss of life and damage to property caused by flooding. FEMA administers the NFIP. The two fundamental objectives of NFIP are to:

1. Ensure that new buildings will be free from flood damage; and
2. Prevent new developments from increasing flood damage to existing properties.

The primary benefits of the NFIP are to:

1. Provide flood insurance coverage not generally available in the private market;
2. Stimulate local floodplain management to guide future development;

3. Emphasize less costly nonstructural flood control regulatory measures over structural measures;
4. Reduce costs to the federal and state governments by shifting the burden from the general taxpayer to floodplain occupants.

The County and its 39 municipalities participate in the NFIP **(**Appendix J**)**. In return for NFIP making flood insurance available to property owners, the County and municipalities are required to adopt ordinances to manage development within 100-year floodplains to prevent increased flooding and minimize future flood damage. Palm Beach County Flood Insurance Rate Maps, published by the FEMA and updated in 2017 are used as the basis for delineating the 100-year floodplain and identifying regulated land.

**Flood Damage Prevention Ordinances**

The County's Flood Damage Prevention Ordinance, covering the unincorporated areas of the County, can be accessed through the DEM's website (http://discover.pbcgov.org/publicsafety/dem/Publications/Flood-Damage-Ordinance-Article-18.pdf#search=flood%20prevention). Municipal residents should contact their respective building department officials to determine what requirements are in effect for their jurisdictions.

**Floodplain Permitting**

The NFIP requires participating counties and municipalities to issue permits for all development in the 100-year floodplain. Development is broadly defined by NFIP to include any man-made change to land, including grading, filling, dredging, extraction, storage, subdivision of land, as well as the construction or improvement of structures. Proposed development must not increase flooding or create a dangerous situation during flooding, especially on neighboring properties. If a structure is involved, it must be constructed to minimize damage during flooding. Permitting officials work with applicants to discourage development in the floodplain wherever possible, but when unavoidable, the effects of development must be minimized.

The permitting review process is a requirement for continued community participation in the NFIP. Violations can not only jeopardize a community's standing in the NFIP; moreover, they can impact the ability of residents to obtain flood insurance. Residents witnessing development occurring without permits are asked to protect their rights by reporting violators to the local permit office.

**Map Modernization Program**

The County is an active participant in the Map Modernization Program. Since September 2000, PBC and its 39 municipalities have been working with FEMA, their contract consultants, local engineering agencies, the SFWMD, and the County's contract consultant in the development of a complete new set of FIRM maps. The data provided to FEMA's contractor included new accurate Light Detection and Ranging (LIDAR) developed elevation data obtained from the U.S. Army Corps of Engineers and from a PBC contract with Florida International University.

As of October 5, 2017, that complete set of new FIRM maps for all of PBC has been put into effect. The coordination process established between all of the agencies listed above will continue to provide for faster coordination of future changes with FEMA, to ensure continued improvement in the currency and accuracy of the FIRMs.

**Community Rating System (CRS)**

In 1991, the NFIP implemented the CRS for encouraging and recognizing community flood plain management activities that “exceed” these minimum NFIP standards. Today more than 900 communities across the nation participate in CRS, including PBC and most of its municipalities. The County joined the CRS program in October of 1991.

As an incentive and reward for participation, the flood insurance rates of residents in CRS communities may be reduced by up to 45% to reflect the reduced flood risk resulting from activities that meet CRS’s three (3) goals: reducing flood losses, facilitating accurate insurance ratings, and promoting the awareness of flood insurance.

Communities can earn points in creditable activity areas grouped into four (4) areas of emphasis: promoting public awareness, reduction of flood damage, improved mapping and regulations; and enhanced flood preparedness. Based on the number of points earned, each CRS community is ranked in one of ten (10) classes (with Class 1 requiring the most points). In turn, a community’s class rating determines the amount of flood premium reduction its residents are eligible to receive. Communities are encouraged to improve their class ratings. Property owners residing within a Special Flood Hazard Area, an area subject to the 1 % chance a year, may qualify for anywhere between 5% and 45% discount. Property owners outside the Special Flood Hazard Area qualify for a standard discount of 5%. The County strongly encourages all of its communities to take part in the CRS program.

The County and its CRS participating municipalities track repetitive loss properties county-wide on an ongoing basis using information gathered annually from FEMA and state Focus reports. For analysis, LMS GIS maps and databases are updated using these inputs to reflect repetitive loss property locations relative to historical flood areas and designated Special Flood Hazard Areas.

In accordance with CRS guidelines, letters are mailed annually to repetitive loss property owners by the County and municipalities explaining NFIP program benefits, the availability of mitigation assistance funding through the FMAP and other mitigation assistance programs. Repetitive loss properties are an ongoing discussion and planning priority for the LMS. These Committees, comprised of public and private sector representatives, are encouraged to develop and promote mitigation project ideas and strategies.

**Table 3.1** outlines the communities involved in the CRS program. All the communities involved in the CRS program have program activities that follow the same strategies. The County’s CRS program activities overlap and are inextricably interlinked with the activities of the LMS program. While the objectives of the CRS program are many, its key strategic objectives include:

1. Heightening public awareness of flood threats in PBC
2. Discouraging/managing development in flood plains
3. Minimizing flood losses in the community
4. Mitigating to eliminate repetitive loss properties
5. Ensuring residents have access to the most cost affordable flood insurance possible

Some of these goals were met through the Education and Outreach Subcommittee formed during the development of the PBC Local Mitigation Strategy. Today, a countywide CRS committee's purpose is to provide information to the community and involve the community in mitigation efforts. The countywide CRS Committee has been organized and adopted by PBC as a Program for Public Information. One major effort of this committee has been to encourage countywide participation in the CRS program by providing technical assistance to communities wishing to enter the CRS program, and assisting those communities already participating in the CRS program to improve their CRS ratings. Most communities in PBC are already participants in the program.

These objectives are met by encompassing County and municipal plans and programs including FMA, CRS, CEMP, Comprehensive Plan, Capital Improvement Plan and the LMS. All have the objective to ensure the successful mitigation activities to reduce repetitive loss properties throughout the County and its municipalities.

**Outreach & Education**

The LMS administers and otherwise supports a range of community Outreach and Education initiatives. Detailed descriptions of these activities and initiatives are contained in the County's Multi Year Training and Exercise Plan, Comprehensive Emergency Management Plan, the Five (5) Year Strategic Plan, documentation associated with Community Rating System recertification, DEM website, etc. Outreach activities take many forms, including (but not limited to): presentations, workshops, courses, multilingual brochures, flyers, websites, media releases, plans, telephone directory postings, mailings and inserts, expos, on-site briefings, special websites and website postings, and library holdings. Many of these activities are done in cooperation with private-public partners and sponsors.

Another significant part of mitigation outreach education are the community outreach presentations that are conducted throughout the Palm Beach Community. These presentations provide municipalities, schools, neighborhood associations, non for profit organizations, and residents information on mitigation, mitigation projects, disaster preparedness, and hazards that may affect the County. More than 100 presentations are conducted each year.

As part of its participation in the Community Rating System program, the County maintains a collaborative Outreach Project Strategy Program under a PPI, which encompasses a number of major outreach activities which are updated and reported to the Insurance Services Office as part of the annual recertification process.

A representative listing of some of the more significant outreach and education activities includes:

- Annual publication of a Hurricane & Flood Survival Guide (3 languages)
- Annual Hurricane & Flood Awareness Expo(s)
- Preparation/distribution of hazard and audience-specific brochures
- Business preparedness and post-disaster needs posting websites
- Business disaster planning guide - CD
- Flood Information website
- Emergency Information website
- Social Media (Twitter/FaceBook)
- LMS meetings open to the public
- Library holdings through the County Library System
- Special programs for association represented communities
- On-site presentations, structural evaluations, and planning assistance for special-interest groups such as home owner associations, property management firms, businesses, churches & synagogues, public gathering facilities, etc.
- Participation in numerous fairs and expos hosted by public and private sector groups
- Course offerings (certified and not) on safety and preparedness topics
- Participation as presenters/instructors at the National and Governor's hurricane conferences
- Published articles, papers

Most of the activities above are provided on an ongoing or seasonal basis. Details of most activities are documented in one or more of the following forms: in program specific reports, recertification packages, post-activity reports, monthly status reports, and in plan updates. The County and municipal jurisdictions maintain and distribute government and not-for-profit publications as appropriate. Lists of most distributed and held government and not-for-profit publications are contained in PBC's CEMP and relevant Community Rating System documentation.

**Flood Mitigation Assistance Program (FMAP)**

The FMAP is an NFIP initiative administered by the FDEM to help communities identify and implement measures to reduce or eliminate the long-term risk of flood damage to homes and other structures insurable under the NFIP.

Presently PBC offers the program on a limited basis to owners of "repetitive flood loss" properties based on the availability of federal and state funds and the availability of local resources to administer the program. The program provides homeowners with reasonable, cost-effective hazard mitigation options and potential public and private financing alternatives.
The FEMA contributes 75% of eligible mitigation costs. The remaining 25% must come from non-federal sources. The homeowner must contribute at least 12.5%. However at the present time, PBC requires the homeowner to contribute the full non-federal share.

Examples of flood mitigation projects that might qualify for FMA funding assistance include:

- Elevation of flood prone structures
- Relocation of flood prone structures
- Demolition (with or without rebuilding at higher elevation)
- Acquisition
- Various flood proofing measures.

Information and support is provided in a variety of forms to potential FMA applicants to assist them in developing projects and preparing application packages. Through the County's LMS committee structure, the Hazard Vulnerability Analysis Subcommittee, as well as FDEM, is available to offer technical and administrative guidance and assistance to applicants, including assistance with benefit-cost computations.

Table 3.1

*Summary of repetitive loss properties by local government and Community Rating System (CRS)*

| Community Number | Community Name | Number of Repetitive Loss Properties | Number of Claimed Repetitive Losses | CRS Rating | % Reduction in NFIP Rates |
|---|---|---|---|---|---|
| 120192 | PBC - Unincorporated | 74 | 175 | 5 | 25% |
| 120193 | City of Atlantis | 1 | 2 | 7 | 15% |
| 000000 | City of Belle Glade | 0 | 0 | NP | 0% |
| 120195 | City of Boca Raton | 10 | 22 | 8 | 10% |
| 120196 | City of Boynton Beach | 18 | 44 | 7 | 15% |
| 000000 | Town of Briny Breezes | 0 | 0 | NP | 0% |
| 120198 | Town of Cloud Lake | 1 | 2 | 6 | 20% |
| 125102 | City of Delray Beach | 16 | 39 | 8 | 10% |
| 120200 | Town of Glen Ridge | 0 | 0 | 10 | 0% |
| 000000 | Village of Golf | 0 | 0 | NP | 0% |
| 000000 | City of Greenacres | 0 | 0 | 9 | 0% |
| 125109 | Town of Gulf Stream | 3 | 7 | 10 | 0% |
| 120205 | Town of Haverhill | 1 | 4 | NP | 0% |

| Community Number | Community Name | Number of Repetitive Loss Properties | Number of Claimed Repetitive Losses | CRS Rating | % Reduction in NFIP Rates |
|---|---|---|---|---|---|
| 125111 | Town of Highland Beach | 0 | 0 | 10 | 0% |
| 120207 | Town of Hypoluxo | 0 | 0 | 8 | 10% |
| 120208 | Town of Juno Beach | 4 | 10 | 5 | 25% |
| 125119 | Town of Jupiter | 13 | 39 | 5 | 25% |
| 120162 | Town of Jupiter Inlet Colony | 0 | 0 | NP | 0% |
| 120211 | Town of Lake Clark Shores | 0 | 0 | 8 | 10% |
| 120212 | Town of Lake Park | 2 | 4 | 8 | 10% |
| 120213 | City of Lake Worth Beach | 12 | 30 | 8 | 10% |
| 120214 | City of Lantana | 6 | 21 | 9 | 5% |
| 000000 | Loxahatchee Groves | 0 | 0 | NP | 0% |
| 120215 | Town of Manalapan | 3 | 9 | 8 | 10% |
| 120216 | Town of Mangonia Park | 2 | 11 | 10 | 0% |
| 120217 | Village of North Palm Beach | 2 | 4 | 7 | 15% |
| | | | | | |

| Community Number | Community Name | Number of Repetitive Loss Properties | Number of Claimed Repetitive Losses | CRS Rating | % Reduction in NFIP Rates |
|---|---|---|---|---|---|
| 125134 | Town of Ocean Ridge | 16 | 39 | 7 | 15% |
| 120219 | City of Pahokee | 1 | 2 | NP | 0% |
| 120220 | Town of Palm Beach | 90 | 264 | 7 | 15% |
| 120221 | City of Palm Beach Gardens | 6 | 13 | 10 | 0% |
| 125137 | Town of Palm Beach Shores | 2 | 5 | 8 | 10% |
| 120223 | Village of Palm Springs | 10 | 24 | 8 | 10% |
| 125142 | City of Riviera Beach | 10 | 22 | 9 | 5% |
| 000000 | Village of Royal Palm Beach | 0 | 0 | NP | 0% |
| 000000 | City of South Bay | 0 | 0 | NP | 0% |
| 120227 | City of South Palm Beach | 1 | 5 | 9 | 5% |
| 120228 | Village of Tequesta | 2 | 5 | 7 | 15% |
| 125157 | Village of Wellington | 2 | 4 | 6 | 20% |
| 000000 | City of Westlake | 0 | 0 | NP | 0% |
| 120229 | City of West Palm Beach | 29 | 77 | 6 | 20% |

• Based on the FEMA Florida Repetitive Loss List • NP Non-Participant in the CRS Program

**Elevation of New and Substantially Improved Structures**

Damage to "new" and "substantially improved" floodplain structures is minimized by elevating the lowest floor of occupied areas a specified amount above the 100-year flood elevation. Substantially improved structures are those where the cost of reconstruction, rehabilitation, additions or other improvements equals or exceeds 50% of the building's market value. Substantially improved structures are subject to the same elevation standards as new structures. Check with your local permit office for specific requirements in your jurisdiction.

**Elevation Certificates**

To verify that a building has been properly elevated, building officials require the completion of an Elevation Certificate by a professional engineer or surveyor. After the lowest floor is in place, its elevation above sea level is determined by a survey. The Elevation Certificate is part of the permit record and must be submitted before the building may be occupied.

Further information on the requirements for floodplain development, the permitting process and Elevation Certificates can be obtained from your local permit office.

**Documented Repetitive Losses**

The County adheres to FEMA's definition of repetitive loss properties, that is, properties whose owners have received payment for more than one (1) claim within a 10-year period of their flood insurance policies as recorded by the NFIP. **Table 3.1** summarizes the repetitive losses from PBC and the incorporated areas. Also, present data on each community's CRS score indicates the percent reduction in National Flood Insurance rates each community's residents receive if they participate actively in the CRS program. Appendix H contains repetitive loss properties and evaluates its continued vulnerability to flooding damage.

Currently, FEMA records accounted for 337 registered repetitive loss properties within unincorporated PBC and its jurisdictions as of December 31, 2017. The number has grown steadily with the increased tropical activity and extraordinary rain events the County has experienced. A significant percentage of these repetitive loss properties lie outside PBC's recognized special flood hazard areas.

The PBC LMS's goal is to reduce the number of repetitive loss properties throughout the County and prevent new properties from being added to the list. The County takes great strides in trying to reduce and prevent repetitive loss properties. The County takes part in various programs to reduce and prevent repetitive losses such as FMA and CRS as demonstrated above. The LMS also has various plans incorporated into it to ensure it correlates with the other objectives throughout the County and its jurisdictions. The LMS is referenced throughout the Mitigation section of the Comprehensive Emergency Management Plan as the guiding source for mitigation activities pre and post disasters. Also, the Capital Improvement Plans reflect mitigation objectives to prevent repetitive loss properties.

Since its inception, PBC's LMS has placed a major emphasis on drainage improvement projects as a major flood mitigation strategy. Indeed, drainage improvement projects have had a predominant representation on the LMS prioritized project list. Some large-scale drainage improvement projects, perceived to be beyond the threshold for funding assistance applications, have historically been handled locally by Capital Improvement Plans rather than through the LMS. The LMS drainage projects are often coordinated with larger self-funded community drainage improvement projects.

Drainage improvement projects; however, are often not the answer for isolated repetitive flood loss properties. Increasingly, the LMS has been moving toward a more comprehensive program of mitigation directed at repetitive loss problems.

The County's network of CRS communities provides an excellent mechanism for identifying repetitive flood loss properties and coordinating comprehensive activities to launch mitigation initiatives. The LMS program not only provides the strategic guidance necessary to coordinating flood mitigation initiatives, it also helps in translating those strategies into viable flood mitigation projects. The final component in PBC's multi-program strategy is participation in the FMAP.

**Mitigation Projects to Repetitive Loss Properties**

The County first submitted project applications for FMAP assistance in 1999. It was not until 2002 that the initial two (2) projects were approved for FMAP funding. The projects were completed in 2003. These projects provided all jurisdictions an opportunity to learn about the program and information that would be useful in planning their own programs. These two (2) completed projects have been successful since two (2) properties have been taken off the repetitive loss properties list.

*Project #1 - Elevation Project*
The first project involved a home in the unincorporated area of PBC referred to as "The Acreage." The property has amassed four (4) insurance losses since 1988 despite, the fact that the property does not reside in Special Flood Hazard Area.

The elevation involved raising a slab on grade structure with the slab intact and placing it on extended foundation walls. A series of coordinated hydraulic jacks were used to achieve the target elevation above the base flood elevation. Openings for equalization of flood forces were included per FEMA specifications.

*Project #2 – Flood Wall Project*
The second FMAP project involved a multiple flood loss property located in a residential community in the Lake Park area. The property did not suffer from flood water build up. Instead, flood water runoff from neighboring properties tended to enter the slab at grade level structure, flowing through the house before exiting to lower elevations on the opposite side of the home. The project involved a combination of mitigation measures, including construction of a

deflection wall, creation of swales, and the installation of improved drainage systems. These measures permit flood water runoff to be redirected around the structure rather than through it. These projects served two important purposes. They gave the county's CRS participating communities opportunity to observe and learn about the requirements and procedures of the FMAP and what will be required to organize and manage their local initiatives. They also provided lessons learned that will be valuable in developing a model for County jurisdictions and residents seeking FMA assistance.

### 3.1.4.2 Municipalities

Within PBC, there are 39 municipalities (see **Table 3.1**). There is wide variation among the jurisdictions in terms of community character. Community character is shaped by factors such as land use mix, density, size of population, and location (e.g., on the Atlantic Ocean, adjacent to Lake Okeechobee, inland). Due to the differences, it is not unusual for local governments to have different perspectives relative to the significance various hazards have on their community. Certainly there are hazards that all jurisdictions, regardless of the community character, have concern over such as flooding, hurricanes, tornadoes. In agricultural communities like Pahokee, South Bay and/or Belle Glade, agricultural pests, freezes, and drought are more likely to be of greater concern, while in communities bordering the Atlantic Ocean (e.g., Ocean Ridge, Palm Beach, and Jupiter), hazards such as beach erosion and shoreline stabilization generate considerable concern among the residents.

The information in the section below was reviewed, inserted, and agreed upon by PBC and its participating jurisdictions as a way to demonstrate examples of how mitigation has been incorporated for each jurisdiction within the scope of the PBC Unified Local Mitigation Strategy.

**Figure 3.2** delineates the location, type, community character, economic base, and degree to which each of the participating municipalities within PBC is "built-out" at the present time. The following defines the headings displayed in the table:

- Location
  - Coastal - Municipality borders on the Atlantic Ocean
  - Inland - Municipality does not border on the Atlantic Ocean or Lake Okeechobee
  - Lakefront - Municipality borders on Lake Okeechobee
- Urban/Rural
  - Urban - Area characterized by activities predominantly based on the manufacture, production, distribution, or provision of goods and services in a setting which typically includes residential and nonresidential development uses other than those which are characteristic of rural areas
  - Rural - Areas characterized by activities which are largely based on agricultural uses or the extraction of natural resources, or areas containing large proportions of undeveloped, unimproved, or low density property
- Community Character
  - Residential - Land use is primarily for housing
  - Retirement - Land use is primarily for adult housing communities

Working - Land use is primarily connected with the sale, rental, and distribution of products or performance of services

- Percent Built Out
- Economic Base

Agricultural - Main source of income is activities within land areas which are predominantly used for the cultivation of crops and livestock
Business - Main source of income is primarily connected with the sale, rental, and distribution of products or performance of services
Industrial - Main source of income is activities predominantly connected with manufacturing, assembly, processing, or storage of products
Residential/Retirement - Main source of income is primarily connected with real estate.

**Listing of Municipal Agencies**

The organizational structure of each municipality in the County differs in terms of organizational complexity and functional responsibility. A city like West Palm Beach (population – 110,396) has an organizational structure that is considerably more complex than some of the smaller communities like Atlantis, Cloud Lake, or Jupiter Inlet Colony.

The following is a brief discussion of typical agencies within the municipal organizational structure having hazard mitigation functional responsibilities.

*Emergency Management*. Emergency management responsibilities generally fall within the purview of public safety, fire, and/or police departments. West Palm Beach is one of the few municipalities that have a staff person whose sole responsibility is emergency management. It is not unusual in many cities that emergency management is an individual's secondary responsibility. During emergency events, such as hurricanes, each local government has an "executive group" (e.g., Mayor, city manager, police chief, fire chief) which coordinates the city's efforts with the County Division of Emergency Management.

*Planning*. The larger jurisdictions such as West Palm Beach, Boca Raton, Jupiter, Boynton Beach, Delray Beach, and Palm Beach Gardens operate planning departments with professional staffs. Some of the smaller jurisdictions have single-person staffs, while the smallest assign those duties to a lay planning and zoning board and provide staff support by a building official or comparable staff person**.** The community development departments review zoning petitions, site plans, and other development orders (e.g., variances and special exceptions), as well as administer their local comprehensive plan.

*Building*. Most municipalities issue their own building permits. However, for one (1) municipal government, the County Building Division reviews and issues their permits. The-community is the Town of Loxahatchee Groves. All communities in the state operate under the *Florida Building Code.* Modifications can be made to the administrative / enforcement provisions (e.g., what requires a permit, what inspections are required, etc...) of the Code, as long as the administrative provisions are equal or more stringent than the "base" version of the Code;

however, municipalities may not amend their local building code to be less stringent, or make changes to the technical provisions of the Florida Building Code without going through a formal technical amendment process which requires demonstration of unique local geographical need for the amendment and an analysis of the cost impact of the proposed technical amendment. If local technical amendments are enacted and adopted by a community, then the amendments automatically sunset during the next statewide code adoption (unless the local technical amendment is adopted statewide by the Florida Building Commission).

*Public Works and Engineering*. While not all municipalities have a public works and engineering department, all generally perform this function in some manner. If it is under a contractual arrangement, there is someone in the jurisdiction responsible for overseeing the consultant. The group having responsibility for public works and engineering has the responsibility for implementing structural improvements (e.g., stormwater facility retrofit, shuttering buildings, constructing new Emergency Operations Centers (EOCs).

*Fire Departments*. While many cities contract with the PBC Fire Rescue Department, there are others that operate their own fire-rescue departments. In some instances, smaller jurisdictions contract with a larger municipal neighbor.

**Municipal Mitigation Policies, Ordinances, and Plans**

*Policy Plans*

- Municipal Comprehensive Plans

  Like the County, each city has an adopted Comprehensive Plan. It serves as a policy instrument for each city and defines that particular city's development and redevelopment policies. All comprehensive plans are required by Section 163.3161, F.S. to contain eight (8) plan elements: Conservation, Infrastructure (i.e., potable water, sanitary sewer, stormwater management, solid waste, and natural aquifer recharge), Future Land Use, Housing, Recreation and Open Space, Transportation, Intergovernmental Coordination, and Capital Improvement. For units of local government abutting the Atlantic Ocean, they must also prepare a Coastal Management Element. In PBC, 19 municipalities border the Atlantic Ocean coastline.

  There is considerable variation among local governments in the depth to which hazards are addressed in their comprehensive plans. Certainly the population size, geographic spatial limits, diversity in mix of land uses, and depth of understanding of hazard mitigation affects the level of detail local governments apply to the issue of hazards. Any extended discussion of hazards occurs, for the most part, are in the Conservation, Coastal Management, and Infrastructure elements.

- Local Emergency Management Plans

A number of municipalities have adopted emergency management plans. Most follow the content of the PBC CEMP. Their focus is on emergency response versus long-term hazard mitigation.

*Ordinances and Other Plans*. Other types of ordinances and plans municipalities that have adopted that are relevant to hazard mitigation include:

- Incorporating the 2017 Florida Building Code (6$^{th}$ edition) complete with Appendices A,B,C,D,E,F,G,H,I,J and K
- Adding window glazing and/or shuttering requirements to their building codes
- Becoming affiliated with the CRS program (*currently 29 out of 39 local governments are CRS qualified)*
- Emergency Water Restriction ordinances
- Stormwater Master Plan
- Repetitive Loss Area Analysis
- Flood Damage Prevention and Protection Ordinance
- Adoption of FDEM Model Floodplain Ordinance which 1) eliminates the possibility of having conflicting or duplicative regulations for buildings, 2) keeps local programs consistent with the Florida Building Code even when it changes over time, and 3) incorporates clarifying language from FEMA guidance documents to address problems DEM has observed in the field.

**Mitigation Projects/Initiatives/Outreach**

A LMS Survey was prepared and distributed to all participating local governments as a means to inventory and assemble data on mitigation projects and initiatives each governmental entity had or was implementing. Projects are defined as capital facilities. Initiatives can be anything from purchase of property and relocation of homes or businesses, to upgraded building codes, to incentives, to public information campaigns, to preparedness training and drills, to professional development seminars. *Thirty-six municipalities responded*. There is wide variation; while a number of municipalities have not undertaken any mitigation projects, others have been highly proactive, completing multiple projects/initiatives. The following provides a general discussion of what is being accomplished by municipal governments in PBC. Also, there are a few communities that already have well-developed hazard mitigation programs in place. A brief discussion of each is included.

*Projects.* Shuttering public facilities and upgrading or correcting drainage facility deficiencies are the two most common types of hazard mitigation projects undertaken by PBC municipalities. Other types of projects reported in the local government LMS Survey are:

- Glazing exterior windows on public facilities to achieve impact resistance from windborne debris
- Replacing and/or upgrading drainage pumps
- Installing emergency power generators
- Installing a radio telemetry monitoring system for public utilities
- Sirens/loudspeaker warning system used for severe storms/lightning

*Codes/Ordinance Amendments*. Many municipalities incorporated the Florida Building Code 2017 (6th Edition). Some of the more important features include:

- Modifying building codes to require floor slab or wood joists be above the 100-year floodplain and a minimum of 18 inches above the crown of the road
- Establishing increased freeboard of one (1) to two (2) feet above the Base Flood Elevation in Special Flood Hazard Areas (SFHAs)
- Addition of a specified accumulation of modification and repair costs (i.e. 5 years) for substantially damaged or substantially improved structures in the SFHAs.
- Requiring the elevation of structures
- Trusses manufactured in accordance with local wind models

Other actions municipalities have taken include:

- Modifying existing Local Development Regulation (LDR) to incorporate windborne debris impact standards
- Amending LDR to include section titled, "Building and Property Maintenance: Hurricane Precautions
- Professional Development Training. *Twenty-three* municipalities reported that their staff received professional development training over the course of a year. The amount of training staffs received differed by jurisdiction.
- Computer-Aided Management of Emergency Operations (CAMEO) is a system of software applications used to plan for and respond to chemical emergencies. Developed by EPA and the National Oceanic and Atmospheric Administration to assist front-line chemical emergency planners and responders, CAMEO can access, store, and evaluate information critical for developing emergency plans.
- Amending LDR to include section titled, “Building and Property Maintenance: Hurricane Precautions”
- Orientation to disaster assistance programs
- Radiological emergency management
- Annual state hurricane conference training sessions
- Natural hazards mitigation and recovery
- Yearly conference of National Fire Protection Association
- Yearly conference of Building Officials Association of Florida
- Training sessions with Federal Emergency Management Agency
- Building Inspector courses on topics like hurricane resistant structural design, roofing updates, wood construction, and fire resistance and egress

*Preparedness Training.* Fourteen (14) local governments reported that they conduct preparedness training and drills for emergency situations. They carry out hurricane exercises and other types of preparedness training based on their Municipal CEMP or EAP as reported to the LMS Coordinator:

- Structural fire drills
- Tornado drill
- Chemical spills
- Terrorist response
- Chlorine leak drills
- Communication tests
- Generator tests

*Education/Public Awareness*. It is common practice among local governments to distribute informational materials to its citizens, especially as it relates to hurricanes. Among the 18 local governments reporting, the scope of their programs varied. The following are methods municipalities in PBC use to disseminate information about hazards or an impending emergency event:

- Annual correspondence mailed to the residents reminding them of the need to be prepared for a hurricane
- Hurricane Survival Guide
- A Homeowner's Guide to Hurricane Retrofit
- Classes on Emergency Response Training and Community Emergency Response Team
- Discussions with residents about hurricane preparedness
- Hurricane preparation video shown on city cable station
- StormWatch, a preparedness series on the County Cable TV channel produced by DEM
- Brochures on variety of disaster/emergency topics, including insurance, pet care, business interests, children and disasters, lightning and tornado safety
- FAX-back system with a menu of public safety information
- Emails to residents
- Everbridge or a similar system which automatically dials and plays recorded information regarding imminent emergencies, as well as sending out blast text messages to subscribers of the service.
- City newsletter and County's "LMS Times" mitigation newsletter
- Various social media outlets

### 3.1.5 Intergovernmental Coordination

An essential element of the hazard mitigation process is intergovernmental coordination. Disasters know no boundaries; governments and service providers increasingly must work together to strengthen communities against the loss of life and property. Coordination is important not only horizontally at the local level between county, municipalities, non-profit organizations, and the private sector, but also vertically with key state and federal agencies. Besides the potential of the LMS initiative, there are several other coordination mechanisms that already exist. They are described briefly below.

**Metropolitan Planning Organization**

The Metropolitan Planning Organization of PBC, commonly known as the MPO, coordinates local, state, and federal funding for thoroughfare improvements. The policy board is comprised of 18 voting members (i.e., five (5) representatives of the BCC, 13 representatives from the municipalities), and one (1) non-voting member (i.e., Secretary of the Florida Department of Transportation, District IV). Two key policy documents of the MPO are the long-range transportation plan, and the five-year transportation improvement plan (TIP). The TIP identifies and schedules all future roadway improvements in the near-term.

**Local Government Comprehensive Plans**

One mechanism to achieve intergovernmental coordination is the local comprehensive plan. Each comprehensive plan contains an intergovernmental coordination plan element.

**Palm Beach County Comprehensive Emergency Management Plan**

The County's CEMP, as described in the section titled **Mitigation Policies and Ordinances**, is very important in terms of coordination. It identifies coordination of the responsibilities and functions of agencies and organizations during disaster situations.

**District X Local Emergency Planning Committee**

The LEPC is an important vehicle to coordinate administering regional compliance with hazardous materials reporting and training laws. The TCRPC provides full-time staff to administer the activities of the Committee.

**State Emergency Management Plan**

The State of Florida CEMP establishes the framework of a coordination system to ensure that the State of Florida is prepared to respond to the occurrence of emergencies and disasters. The plan describes roles and responsibilities of state agencies, special districts, local governments, and voluntary organizations, unites the efforts of these groups for a comprehensive approach. The plan is divided into three (3) sections.

| | |
|---|---|
| The Basic Plan: | Outlines how the state will assist counties in response, recovery, and mitigation of disasters; details responsibility at various levels of government; describes method of operations and financial management policies; ensures continuity of government; and addresses recovery issues. |

Specific Response/Recovery Actions: Actions that are unique to a specific hazard, and are described in the Basic Plan and Response Functions sections.

Response Functional Annexes: Present the State's strategies for disaster response by outlining ESF. ESF's are structured from the Federal Response Plan.

**Comprehensive Plan Amendment Coordinated Review Committee**

The Comprehensive Plan Amendment Coordinated Review Interlocal Agreement establishes a countywide Comprehensive Plan Coordinated Review Process. It is designed to provide coordination of proposed plan amendments, cooperation between affected local governments and service providers, and opportunities to resolve conflicts only within the Plan Amendment Process. This process includes the following actions:

- Proposed plan amendments must have sufficient distribution and dissemination to insure that initial transmittal and final approval do not occur without adequate notice to local governments and service providers who may be adversely affected by the action.
- An avenue for discussion and evaluation of the proposed plan amendments is created so that the governing body is aware of objections, the basis for them, and the reasonableness of the objection.
- An opportunity is created for conflict resolution of an item which, if approved, may result in a potential problem for another local government or service provider.
- The Comprehensive Plan Amendment Coordinated Review Process does not diminish or transfer existing authority with respect to planning and implementation decision of the participants.

**The Multi-Jurisdictional Issues Coordination Forum**

The forum has been established through a resolution/interlocal agreement. The primary goal of this entity is to establish a mechanism that will provide a means of communication and education between the various local governments and service providers. This is accomplished through the receipt and review of reports; through presentations of items of multi-jurisdictional impact; and through the review of actions taken by the Executive Committee. All members of this forum must be participants in the Comprehensive Plan Amendment Coordinated Review Interlocal Agreement.

**Emergency Management (EM) Team**

Emergency Management Team is an organization of professionals from agencies and municipalities throughout PBC who share a mutual interest in emergency management issues. The EM Team meets bi-monthly. Meeting notices of related interest and other information are distributed in advance of the scheduled meeting date. Members of EM Team benefit by:

- Receiving the latest information from federal, state, and local levels of government concerning all issues relating to comprehensive emergency management;
- Strengthening ties and sharing information with the County, neighboring municipalities and other agencies in the area;
- Exchanging ideas and receiving information regarding training opportunities in emergency management (many of which are free or involve minimal costs);
- Meeting the managers and officials they may need to call on in times of emergency or disaster.

## 3.2 Private Sector

### 3.2.1 Background

Major disasters have repeatedly demonstrated that all components of the community can be significantly impacted, either directly or indirectly by the event. It is therefore important that mitigation and redevelopment planning efforts also involve the entire community. Involvement of the private sector in the LMS process was given high priority from the outset of the program by the DEM. Besides receiving funding from the FDEM to prepare the LMS, FDEM also awarded PBC a grant pursuant to Chapter 9G-19, Florida Administrative Code, to develop a Business Community Recovery and Redevelopment Strategy program. Since private sector involvement was important in both efforts, the DEM a committee for education and outreach was created. In addition, staff from the DEM and the PBC Office of Economic Development coordinated with each other on all relevant issues of mutual interest to both programs.
The following groups have participated actively in the program:

- Business Alliance
- Business Loan Funds of the Palm Beaches
- Florida Light & Power Company
- Palm Beach State College
- Florida Insurance Council
- Black Business Investment, Inc.
- Brown Distributing
- Home Depot
- Tourist Development Board
- Motorola
- Farm Bureau West
- Port of Palm Beach
- Palm Beach County Purchasing Department
- Delray Beach Chamber of Commerce
- Delray Beach Community Development Agency
- WPBF Channel 25
- PBC Information System Services Department
- The Boynton Beach Mall
- Palm Beach County Economic Office
- Fidelity Federal of the Palm Beaches
- Poe & Brown, Inc
- The Northern Palm Beach Chamber of Commerce
- Small Business Bank
- Suntrust Bank
- Marine Industries Association of Palm Beach County, Inc
- Pratt & Whitney
- Bank Atlantic

Perhaps the greatest accomplishment, beyond the specific accomplishments outlined in this section, has been special collaborative relationships now established between the private sector and public sector entities. Cornerstone partnerships in this endeavor now exist between the DEM and Economic Development Divisions, and participating municipalities on the public side and a network of participating Chambers of Commerce.

The initiatives outlined in this section are an integral part of the ongoing local disaster mitigation strategy. In the private sector, efforts are directed at minimizing private sector losses, improving business survival rates, protecting and preserving the economic base provided by businesses, and speeding the overall community recovery process.

Four (4) key objectives were addressed:

| | |
|---|---|
| <u>*Objective 1*</u> | *Establish improve intergovernmental and private sector coordination.* |
| <u>*Objective 2*</u> | *Refine the hazard and vulnerability analysis for the economic sector.* |
| <u>*Objective 3*</u> | *Evaluate local available resources, identify gaps, and develop appropriate funding mechanisms and strategies to fill any gaps.* |
| <u>*Objective 4*</u> | *Create a public education program focusing on educating the business community to be prepared for disasters and able to recover quickly.* |

### 3.2.2 Accomplishments

The following summarizes the improved accomplishments of the private sector work effort of the Outreach and Education Committee by objective:

#### *3.2.2.1 Objective 1: Establish improved intergovernmental and private sector coordination.*

Three (3) tasks related to this objective represent the beginning points for an ongoing, long-range program to improve intergovernmental and private sector collaboration, coordination and relations.

**Task 1**

*Prepare a comprehensive vendor list and inventories of equipment and supplies.* The primary thrust of this task was to create a system whereby businesses victimized by disasters could access vendors and suppliers to procure goods and services necessary to rebuild and resume normal business operations.

Early in the project, the Economic Development Specialist met with the purchasing staff of several County and municipal agencies relative to the characteristics of their databases and their potential suitability for business disaster applications. With the assistance of representatives from the PBC Information Systems Services Department (ISS), the idea was conceived of housing the vendor database in the business section of the PBC Emergency Management web site.

Upon further discussion, the idea eventually evolved to the creation of a reverse vendor database, an emergency need posting system for disaster-impacted businesses. This approach avoids most of the maintenance costs and burdens that are associated with traditional vendor databases.
ISS was subsequently commissioned to develop this system, eventually dubbed the "Emergency Business Buyers' Database." Development and testing were successfully accomplished in early July; the system awaits activation if and when a local disaster occurs.

**Task 2**

*Develop a comprehensive list of needs for emergency contracts and agreements, and secure sources for items needed by the response community which are usually not needed in day to day operations.* Research determined that the PBC Purchasing Department has in place item lists, source lists, and systems and procedures necessary for fully meeting the needs of the County's response community and to satisfy the assistance requirements spelled out by the mutual aid agreement with Orange County. Efforts to publicize the existence of this list to the local community are being made through the Chambers of Commerce to facilitate local involvement, when possible.

**Task 3**

*Establish Business Hotlines, Business Aid and Redevelopment Assistance Centers.* An important element in the support of private sector preparedness and timely recovery is the ability of businesses to stay abreast of critical information. An objective in this project was to provide the business community with a single-point contact for accessing important business-related information to assist pre-disaster preparations and post-disaster recovery activities. As part of its partnership agreements with various Chambers of Commerce throughout the County, PBC Emergency Management is encouraging chambers to dedicate one or more telephone lines to serve as an emergency "hot line" service for community businesses.

### ***3.2.2.2 Objective 2: Refine hazard and vulnerability analysis for the economic sector.***

The LMS definition (as described earlier) of critical facilities includes several economic sector facilities, notably nursing and convalescent centers, and public communication facilities in what are designated as primary critical facilities, and financial institutions, pharmacies, reconstruction material suppliers, medical clinics, and food distribution centers in what are designated as secondary critical facilities. Private sector primary critical facilities are included in the ArcView database, and, when the Property Appraiser’s office completes the automated inventory conversion of commercial and industrial properties into an ArcView database, secondary critical facility information will be merged with the database file.

The vulnerability of the business community to potential disasters was analyzed. Mapping and tabular products were developed that may be used by commercial/industrial property owners for performing self-analysis of hazard vulnerabilities. These products also provide a better understanding of the various hazards that could potentially impact segments of business community.

An Economic Disaster Management Information System (EDMIS) was developed and designed. Unfortunately, this product cannot be used until database conversion is completed by the Property Appraiser's Office. Once on-line, however, EDMIS will be used to more fully explore mitigation opportunities in the private sector.

#### *3.2.2.3 Objective 3: Evaluate local available resources, identify gaps, and develop appropriate funding mechanisms and strategies to fill the gaps.*

Exploratory initiatives were explored relating to ensuring post-disaster cash flow, creating emergency loan programs and community credit programs, expediting the processing of post-disaster loans, and establishing a "bridge loan" capability. The policies and programs of area banks were reviewed, various loan funds examined, and state and federal agency programs, including "Operation Open for Business," were reviewed. Among the most glaring "gaps" uncovered that could impact PBC businesses were the following:

- Meeting the managers and officials they may need to call on in times of emergency or disaster.
- Insurance typically does not cover all business losses.
- Banks will not necessarily loan money to victimized businesses and may not relax their requirements for financial documentation and credit status in emergency periods.
- Business interruption insurance is seldom purchased by businesses because it is so costly.
- Low interest loans for mitigation projects are not yet available in PBC.

The challenge of dealing with these issues, however, is indeed complex. The decision authority for creating policies and programs dealing with these issues invariably resides at levels outside PBC. Creation of emergency business assistance programs will likely require legislative initiatives and corporate lobbying beyond the influence of even regional interests. Even so, the need for creative funding mechanisms and strategies was a consistent theme throughout the project and was a common speaking point at private sector and public sector forums.

The project team of a year 1999-2000 grant funded to PBC, entitled Businesses Addressing Readiness & Recovery (BARR), will continue efforts to mobilize sufficient support to positively influence private sector and public sector decision makers to institute meaningful emergency assistance programs for businesses. It will support other related initiatives underway at the state level. The BARR program will also pattern many of programs and initiatives after those of *Project Impact* and the City of Deerfield Beach's *Operation Open for Business*.

### *3.2.2.4 Objective 4: Create a public education program focusing on educating the business community to be prepared for a disaster and able to recover quickly.*

Two (2) tasks of this objective address a program to enable the business community to educate and prepare itself, reaching the greatest number of businesses in the shortest time possible.

**Task 1**

*Train Chamber of Commerce staff and the business community.* During the course of the project, staff members attended, participated in, and led a variety of business-related forums on disaster issues, including disaster conferences, workshops, professional association meetings, expos and trade shows, and community planning sessions. They also worked closely with private and public sector experts on a number of significant community initiatives and reviewed extensive literature from FEMA, state, federal and non-government organization sources. Among the many methods employed to reach and educate the business community throughout PBC were:

- Insurance typically does not cover all business losses
- Distribution of specially designed BARR pamphlets and business cards
- "Business" location on the County's Emergency Management web site
- Booths in expos, fairs, trade shows
- Presentations to business, professional and public sector groups
- Media interviews and articles
- Presentations at the National and Florida Governor's Hurricane Conference
- Participation in other initiatives

One-on-one contingency planning assistance for larger businesses. In this task, members of several Chambers of Commerce and mentors from large and medium-sized businesses have been trained to train others and make presentations raising the business community's awareness of preparedness issues and options. These efforts will continue.

**Task 2**

*Develop a written business contingency planning guide*. It was reasoned that preparation and distribution of a business contingency planning workbook and a business contingency plan template would be practical and productive contributions to building a more disaster resistant business community. The workbook that has been developed serves as the primary text for Emergency Management's ongoing series of contingency planning workshops. Following the template, small- to middle-sized businesses are able to easily prepare contingency plans tailored to their specific needs.

More information regarding business survival and recovery can be found on DEM's website at http://discover.pbcgov.org/publicsafety/dem/HurricanePlanning/Protecting-Business.aspx.

## 3.3 Strengthening the Role of Local Governments

As has been described earlier in this document, local governments in PBC have taken steps to strengthen themselves both in terms of capital facility improvements and ordinances, regulations, and programs. Becoming more disaster-resistant is not limited to just hardening of structures. There are a number of activities that the County and municipalities can undertake to strengthen the role of local governments to lessen the impacts resulting from emergency events which do not require expending money on capital projects. Plans can be modified, laws and regulations can be amended, informational materials published and distributed, and professional training augmented. Ideas were generated from a variety of sources: interviews with local jurisdictions, and information generated from LMS Survey forms, the LMS Steering Committee and subcommittees, and discussions with local governments. The suggestions for countywide projects resulting from the various discussions with local government include:

1. Projects on the LMS PPL should be incorporated in local government comprehensive plans, capital improvement elements (CIE), at the time the CIE's are on an annual basis in accordance with Section 163.3177 (3) (a), Florida Statutes (F.S.).

2. As permitted under Section 163.3177 (7) (h) & (l), F.S., local governments could incorporate optional comprehensive plan element for public safety, or a hazard mitigation/post-disaster redevelopment plan;

3. Integrate the LMS into the PBC CEMP as appropriate and within the state specified guidelines.

4. Assess existing CRS programs to determine ways to strengthen and improve the local jurisdiction's CRS rating and support non-CRS communities to join the program.

5. Recommend that public building construction, whether it be new construction or renovation of older public structures, incorporate hazard mitigation building practices, whenever financially feasible;

6. Recommend to the appropriate authorities, the incorporation of safe room requirements in the local building code.

7. Update existing PBC post-disaster redevelopment plans, and prepare a model plan as a guide for local jurisdictions.

8. Support BARR in the continuing effort of coordination and mutual support between the PBC, local, and business community, before, during, and after a disaster event.

9. The LMS Steering Committee should work with the partner communities and the County to continue ongoing funding and staffing for the continuation of LMS.

10. Recommend emergency building permit procedures to local authorities and jurisdictions.

11. Seek avenues to provide technical assistance in grant writing and engineering for local jurisdictions in the support of LMS projects.

12. Develop a model CEMP mitigation element as a guide for local jurisdictions in mitigation plan development.

13. Seek opportunities and potential funding sources to bury electrical wires, especially in multi-jurisdictional projects.

14. In order to increase shelter capacity countywide, support the retrofitting of all appropriate structures suitable for use as shelters.

Develop and disseminate multi-media outreach program countywide which will support the goals of LMS.

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# SECTION 4: PROCEDURES

## 4.1 Project Prioritization Methodology

This section satisfies, in part, the following FEMA requirements:

**Requirement §201.6(c)(3)(iii)**: [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

**Requirement §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 effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Requirement: §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

### 4.1.1 Development and Rationale

As the Goals and Objectives of the LMS were reviewed by the Working Group, Steering Committee, and specifically the Revisions Committee in 2018, it was determined that our priorities have slightly changed over the recent years. The only relatively recent hazard which is getting more attention in project development is projects related to Sea Level Rise. Our project prioritization methodology is the means by which the LMS Steering Committee or some designated subset of that Committee will develop the single prioritized list of mitigation projects, which is one of the ultimate goals of the LMS effort. The only projects eligible for FEMA approval have to be submitted by a local government who participated in the planning process. These local governments must follow and continue to follow PBC's Local Mitigation Strategy's participation rules in Section 1.

The County established a scoring procedure when the plan was first written in 1999. The scoring procedure is detailed below along with examples in Appendix I. This procedure remains in place thus the County has a structured scoring process for projects seeking alternative funding sources other than federal programs. However, there may be changes made due to new Federal regulations.

The LMS has been proactive in providing its participants with the information necessary to perform a Benefit Cost Analysis that will keep PBC eligible to compete for federal monies nationwide. Projects being submitted for federal funding require a Benefit Cost Analysis to be completed along with an application for submission. The objective is to create an adequate strategy for PBC to prioritize projects for possible funding sources other than federal funds, which would be prioritized based strictly on Benefit Cost Analysis and the criteria that are environmentally sound and technically feasible. The PPL can be referenced in Appendix E. In addition, Appendix F is a list of potential funding sources for mitigation projects. There have been no changes in priorities in the evaluation process since the last LMS update.

To be effective and gain the support of all the communities involved, the criteria used to rank and prioritize proposed mitigation projects must accomplish the following objectives:

- They must be fair and objective. Mitigation projects proposed by small communities must have equal opportunity to achieve as high a higher priority than mitigation projects proposed by larger communities or the County. Likewise, mitigation projects proposed by economically disadvantaged communities must have the opportunity to achieve as high a priority than those projects proposed by more affluent communities.
- They must be flexible enough to effectively rank projects mitigating for a variety of hazards. The LMS is an “all hazards” program. The criteria used to rank potential mitigation projects must be capable of ranking individual mitigation projects with diverse goals such as, but not limited to flood mitigation, sea level rise, impacts from climate change, wildfire protection, or hazardous waste spill prevention.
- They must be functional and tied to real-world considerations such as competitive grant funding requirements. The County will be developing a list of prioritized mitigation projects that will have to compete with a prioritized list of similar type projects from other counties in the state.
- They must be simple, easily understood, and relatively easy to apply. Many potential mitigation projects will have to be prioritized by the LMS Steering Committee or some subset thereof. This means that individual committee members will be scoring many projects. These individuals must be able to work through the project scoring process relatively rapidly for each project they evaluate.
- They must be individually well defined and specific. Each individual scoring criteria category must be well defined with the possible points to be awarded broken down in as much detail as possible to eliminate arbitrary variation in how various individuals might score the same category.

The prioritization process will be an ongoing process, as the LMS is continually refined and updated. The criteria must be such that it can be applied in a consistent manner with a minimal learning curve.

These overarching requirements are as follows:

- Community Benefit The single most important consideration for any mitigation project is "What benefit does the community derive from this effort?" How, and to what extent does this mitigation project benefit the citizens of a community?
- Community Commitment What is the community's level of commitment that is proposing this mitigation project? All mitigation projects have to compete for funding. If the community or governmental entity proposing a given project is not willing to commit substantial time, effort, and funding, the project has less chance of ever being accomplished even if it is a worthy project. There is no point in ranking a project highly that may never be accomplished even if funds are made available.
- Project Implementation Is this project technically, financially, and legally feasible? Basically this overarching requirement addresses the ease with which a project can be implemented. How easily can required permits be obtained? What is the time frame for accomplishing this project's goals? Are there any technical problems that must be overcome to implement this project?

The rationale for each scoring criterion on the Project/Initiative Evaluation Score Sheet, its connections to known funding sources, and directions on specific numbers of points to award are discussed below.

### 4.1.2 Community Benefit

**4.1.2.1** Community Benefit – What benefit does the community derive from this effort? How and to what extent does this mitigation project benefit the citizens of a community?

| Mitigation Benefit | Points Awarded (maximum of 5) |
|---|---|
| Damage Reduction | 5 |
| Mapping and Regulatory | 4 |
| Preparedness Against Hazard | 3 |
| Public Information | 2 |
| Other | 1 |

**4.1.2.2** Project Benefit - Does the project address critical elements of the community infrastructure?

The critical question addressed here is, "does this proposed project help protect the community by hardening some critical element in the community's infrastructure that will reduce the potential loss of life or property damage if a disaster strikes"? Specific programs offering state and federal grant money are available for mitigation projects to make community infrastructure or property critical to public safety more disaster resistant.

Points under this criterion are awarded based on the nature of the facility or infrastructure element being hardened or protected. If the proposed projects mitigate a problem in a primary critical facility such as a hospital, EOC, or emergency shelter it would receive ten (10) points under this criterion. Primary critical facilities are defined as "Facilities critical to the immediate support of life and public safety." These are the facilities the community cannot afford to have any loss of function, even for a short period of time.

Flooding produces a widespread direct and indirect danger to large segments of the community, while at the same time damaging or potentially damaging such critical infrastructure elements as roads and stormwater drainage systems. Therefore, a project reducing or preventing stormwater accumulation and flooding during storm events would receive eight (8) points under this criterion.

Secondary critical facilities are defined as, "Facilities that will be critical for community recovery and restoration of services." Projects that help protect these types of facilities will be awarded six (6) points.

Public convenience facilities are quality of life facilities such as parks, recreation areas, and non-essential public buildings. Projects protecting these types of public property will be awarded four (4) points under this criterion.

Residential structures are defined as private homes. Projects protecting these types of property will be awarded two (2) points under this criterion.

| Project Benefit | Points Awarded (maximum of 10) |
|---|---|
| Primary Critical Facilities | 10 |
| Stormwater/flooding | 8 |
| Secondary critical facilities | 6 |
| Public Convenience facilities | 4 |
| Residential Structures | 2 |

### 4.1.3 Community Exposure

**4.1.3.1** Does the project mitigate a frequently occurring problem or a problem to which a community is particularly vulnerable?

This criterion attempts to balance the actual risk of a specific disaster occurring versus the community's exposure in terms of life and property damage if the disaster does occur. For example, a nuclear power plant meltdown would be catastrophic if it occurred, but the frequencies with which meltdowns occur is unknown in the U.S. and optimistically extremely low. Therefore, a project proposing to mitigate for possible nuclear power plant meltdown by providing lead lined emergency shelters would score lower than a project which mitigates for a more frequent, but less catastrophic type of disaster, such as the flooding of a library.

Data for this evaluation will come from the HVA portion of the LMS project, and will be community specific. For example, communities on the coastline experience thunderstorms, lightning, and frequent localized short term flooding, but in most, the exposure in terms of life and property damage is relatively low. Some specific communities, however, such as mobile home parks, or areas with known drainage problems, have much higher exposures to ill effects from thunderstorm hazards. The entire coastline has a high exposure to damage from tropical storms and hurricanes. Category 1 and 2 hurricanes occur with a relatively high frequency, while Category 3, 4, and 5 hurricanes are less frequent. All of these factors must be evaluated in weighing the merits of one mitigation project against another.

Specific guidelines for assigning points under this evaluation criterion are as follows:

| Community Exposure # of People or $ Value of Property | Frequency or Risk of Occurrence | Points Awarded (maximum of 10) |
|---|---|---|
| High | High | 10 Points |
| Moderate | High | 8 Points |
| Low | High | 6 Points |
| High | Moderate | 9 Points |
| Moderate | Moderate | 7 Points |
| Low | Moderate | 4 Points |
| High | Low | 5 Points |
| Moderate | Low | 2 Points |
| Low | Low | 1 Points |

### 4.1.4 Cost Effectiveness

**4.1.4.1** The benefit/cost ratio of the project is calculated by applying the following Benefit/Cost ratio formula:

(Loss Exposure ($) Before Project - Loss Exposure ($) After Project) ÷ Cost of the Project

"A key criterion for mitigation projects to be eligible for funding is that they be cost effective." This is a direct quote from the FEMA 1996 guidelines for determining the cost-effectiveness of mitigation projects. "Mitigation efforts can be justified only to the extent to which the averted losses in terms of life and property exceeds the cost of a given mitigation project or effort." In other words, if a mitigation project costs more than what it is designed to protect, why do it?

While a positive Benefit/Cost Ratio is an absolute requirement for FEMA funding, it should be a primary consideration in evaluating any mitigation idea. For this reason, it is the single most highly valued component of the project prioritization criteria.

For any mitigation project to receive FEMA money, the mitigation project application will have to include a detailed Benefit/Cost analysis. Depending on the complexity of the proposed project and the amount of funding required, this Benefit/Cost analysis may require engineering drawings and/or evaluation of alternatives. Such a detailed analysis is beyond the scope of the LMS and in most cases beyond FEMA requirements. In 1996, FEMA published a new guideline for mitigation project evaluation titled “How to Determine Cost-Effectiveness of Hazard Mitigation Projects - A New Process for Expediting Application Reviews”. The formula above is derived from that publication. It was developed to allow administrators to rapidly screen potential mitigation projects in a three (3) step process:

Screen the project by reviewing the application data;

Conduct a quick Benefit/Cost analysis; and
If the quick analysis yields a Benefit/Cost Ratio greater than one (1), continue processing the application; or

If the Benefit/Cost analysis is less than one, request additional information from the proposer

An example application of the Benefit/Cost formula is as follows:

A community library has an estimated \$90,000 worth of books that may be lost due to storm surge. To shutter the library will cost \$20,000 and will prevent loss from surges associated with category 1 to 3 hurricanes. Category 1 to 3 storms represent 70% of the hurricanes likely to strike this community so the risk of loss is assumed to be reduced by 70%, leaving a remaining exposure of 30% or \$27,000.

Applying the formula:

$$(\$\ 90{,}000 - \$\ 27{,}000) \div \$\ 20{,}000 = 3.15$$

This project has a Benefit/Cost ratio of 3.15. The entire formula must be used in the submission in order to obtain maximum credit.

The community is also considering raising the floor of this library building by two (2) feet at a cost of \$75,000. Such a project would protect the books from storm surge under all but category 5 hurricane conditions, or approximately 85 % of the time. The residual exposure associated with this plan would be 15 % or \$ 13,500.

Applying the formula:

$$(\$\ 90{,}000 - \$\ 13{,}500) \div \$\ 75{,}000 = 1.02$$

The benefit/cost ratio on this plan is only 1.02. While this is still a positive ratio, the better return on dollars invested is achieved under the first alternative, shuttering the Library.

The higher the Benefit/Cost ratio, the better return per dollar invested is achieved. Under the first example the community is receiving $3.15 return in terms of lost prevention for every dollar invested. Under the second example the community is receiving only $ 1.02 return in terms of loss reduction for every dollar invested.

Points under this criterion will be awarded as follows:

| Benefit/Cost Ratio | Points (maximum of 20) |
|---|---|
| 4.0 or greater | 20 Points |
| 3.0 to 3.9 | 16 Points |
| 2.0 to 2.9 | 12 Points |
| 1.0 to 1.9 | 8 Points |
| <1.0 | 0 Points |

**4.1.5 Area Benefit**

**4.1.5.1** How many people stand to benefit from the project implementation?

| Area Benefit | Points (maximum of 5) |
|---|---|
| Multiple Jurisdictions | 5 Points |
| Community | 3 Points |
| Neighborhood | 1 Point |

**4.1.6 Project Implementation**

**4.1.6.1** Contained Within the Existing Comprehensive Growth Management Plan (CGMP)--Is the project or initiative consistent with or incorporated in the existing Comprehensive Growth Management Plan?

| Contained Within the Existing Comprehensive Growth Management Plan (CGMP) | Points (maximum of 10) |
|---|---|
| Contained within a specific Policy/Plan | 10 Points |
| Contained in "Goal" with proposed Policy/ amendment | 8 Points |
| Contained within a broad "Goal" | 5 Points |

| | |
|---|---|
| Contained in a proposed amendment | 3 Points |
| Not in conflict with the CGMP | 1 Point |

**4.1.6.2** Contained Within an Existing Emergency Management Plan or Other Functional Plan Developed by an Official Local Governmental Entity

Has this project or initiative already been proposed as a management initiative or structural improvement in any emergency or growth management plan proposed or adopted by County or local jurisdictions or entity?

This applies to both officially adopted plans and to those plans or amendments to plans which have been proposed but not yet officially adopted. One of the objectives of the LMS is to encourage local governments to officially adopt mitigation measures into their Comprehensive and Emergency Management Plans. If a community wants to improved the score of a proposed mitigation project or initiative it can propose an amendment to its CGMP or CEMP containing the measure.

| Contained within an Existing Emergency Management Plan (or other functional plan) | Points (maximum of 20) |
|---|---|
| Officially adopted | 10 Points |
| Proposed/Not officially adopted | 6 Points |
| Not in conflict with any plan | 2 Points |

**4.1.6.3** Consistency with Existing Regulatory Framework - Is the project consistent with existing legal and regulatory and environmental/cultural framework?

Does the proposed project require any changes or waivers in existing building, zoning, or environmental statutes or ordinances? If changes or waivers are required, there will be an extra step in implementing such a project and the timeline to accomplish the project must be extended accordingly. Projects which are consistent with the existing legal and regulatory framework will receive five (5) points. Projects which are in conflict with some aspect of the existing regulatory framework will receive lower point scores depending upon the seriousness and numbers of regulatory barriers to be overcome in implementing the proposed project.

| Consistency with Regulatory Framework | Points (maximum of 5) |
|---|---|
| No regulatory issues | 5 Points |
| Local issues | 4 Points |
| Regional issues | 3 Points |
| State issues | 2 Points |
| Federal issues | 1 Point |

### 4.1.7 Community Commitment

**4.1.7.1** Public Support - Is there demonstrated public support for this project or recognition of this problem?

The question of how "public support" should be demonstrated has caused much discussion. It has been decided that points under this criterion should be awarded as follows:

Has this project or problem been the subject of:

a) An Advertised Public Meeting = 3; and
b) Written evidence of public support = 2.

Has the project or problem been the subject of both:

a) An advertised public meeting, and
b) Written evidence of public concern or support.

Subsection b (above) can be letters from affected citizens, minutes from a public meeting in which members of the public request something be done to mitigate an ongoing issue (of which the project was developed), etc.

If so, award five (5) points.

**4.1.7.2** Funding Availability - Is there a funding source currently available for this particular project?

Ten (10) points will be awarded to any project for which funding is currently available. If funding is anticipated but currently not available, points will be awarded as follows:

| Funding Availability | Points (maximum of 10) |
|---|---|
| Funds available now | 10 Points |
| Available in 1 year | 8 Points |
| Available in 2 years | 6 Points |
| Available in 3 years | 4 Points |
| Available in 4 years | 2 Points |
| Available in 5 years+ | 1 Point |

**4.1.7.3** Matching Funds - Are matching funds or in-kind services available for this project?

This criterion has been added because many, if not most, funding sources require local sponsors to put up some form of match either in terms of funds or services.

Points will be awarded under this criterion as follows:

| Matching Funds/In-Kind Services | Points (maximum of 5) |
|---|---|
| Match of 50% or more | 5 Points |
| 40 to 49% | 4 Points |
| 30 to 39 % | 3 Points |
| 20 to 29 % | 2 Points |
| 1 to 20 % | 1 Point |

**4.1.7.4** Timeframe for Accomplishing Objectives - How long will it take for the proposed mitigation project to accomplish its stated goals?

Projects which can be accomplished quickly have an inherent advantage over long-term projects, although long-term projects may ultimately be more beneficial to the community. The following weighted scale assigns points to proposed projects based on the length of time that will be required before a community begins to receive benefits from the project.

| Timeframe for Accomplishing Objectives | Points (maximum of 5) |
|---|---|
| 1 Year | 5 Points |
| 2 Years | 4 Points |
| 3 Years | 3 Points |
| 4 Years | 2 Points |
| 5 Years + | 1 Point |

In order for the individuals scoring mitigation projects to perform their jobs adequately and in a meaningful time frame, it is critical that those proposing a mitigation project or projects provide as much of the critical information required for scoring as possible when they submit their projects. To help with this the attached Mitigation Project Proposal Form has been developed. Appendix I contains four (4) examples showing how this scoring process is applied in ranking proposed mitigation projects.

## 4.2 Tie-Break Procedure

In the case of tie scores, three (3) questions may be applied.

Ties decided by #1 will be so ranked: remaining ties not broken with question #1 will have question #2 applied.

Ties decided by question #2 will be so ranked; remaining ties not broken will have question #3 applied.

Ties decided by question #3 will be so ranked; remaining ties not broken with question #3 will be ranked in the order of the magnitude of effect on the community - these projects will be ranked in accordance with the number of people that will be helped by the project, largest first.

Question #1: Which project has the highest Community Benefit score?

Question #2: Which project has the highest Community Commitment score?

Question #3: Which project mitigates for the most frequently occurring hazard?

## 4.3 LMS Evaluation Panel

The LMS Evaluation Panel is responsible for reviewing and scoring proposed projects submitted to the LMS as a basis for prioritization. Panelists are solicited by the LMS Coordinator on behalf of the LMS Steering Committee based on LMS member recommendations and are subject to approval by the LMS Steering Committee. Volunteers are also eligible for consideration.

Candidates should possess a technical and administrative understanding of the LMS program and its goals and objectives. In addition, candidates are expected to exercise objectivity and independent judgment in their evaluations and scoring. The LMS Evaluation Panel members will notify the LMS Coordinator and recuse themselves from evaluating any projects submitted by their own agency, or any agency they may have been employed by in the past. This is to eliminate any potential conflict of interest or bias either in favor of, or to the detriment of any project submission that may be on the agenda for evaluation. In such cases, an alternate evaluator, usually the LMS Coordinator or DEM Planning Manager, will evaluate those projects on a case-by-case basis.

### 4.3.1 Eligibility for Federal Funding

In order to be deemed eligible for federal monies projects must:

Produce a Benefit Cost Analysis ratio greater than one (1), and
Meet additional program requirements, including being judged to be "environmentally sound" and "technically feasible."

Federal funding may require additional applications or supporting documents which will be requested based upon each individual federal program.

The LMS Coordinator from the County's Division of Emergency Management staff serves on the LMS Evaluation Panel. They will serve as an alternate evaluator for potential conflicts as well as in the place of any primary evaluator who may be sick or unavailable for scoring during an evaluation period. Also, any employee of the Division of Emergency Management may be called upon to act as an alternate evaluator if one is not available at the time of project scoring or if there are multiple primary evaluators who have conflicts on a project.

## 4.4 Project Prioritization Updating Process

STEP 1

Each year after the Spring and Fall Submission/Evaluation period, the existing countywide PPL will be updated. The approved PPL will be in effect until a new PPL has been adopted by the PBC LMS Steering Committee.

The County's DEM staff will activate the update process by notifying all LMS members of the beginning and ending dates for the submission period, and by notifying all LMS Evaluation Panel members that the PPL ranking process is being initiated, along with deadlines for submitting projects and evaluating projects. Everyone will be reminded where to locate the project submission forms in the DEM electronic LMS project tracking system, and provided with a guidance document explaining each requested item on the submission form. All applicants will have to submit their proposed projects/initiatives by the submission date in order to have their proposed projects considered for inclusion in the updated PPL. In addition, at the time an applicant submits their proposed projects; they must also identify which of their projects that are already on the existing, adopted PPL have been completed or for which funding is in process.

All proposals must be submitted electronically before the published deadline in the original notification. For a project/initiative to be considered, online proposal forms must be filled out completely. The contact person and phone number listed on the online proposal form will serve as the official point-of-contact for the applicant. As these Federal grants are awarded only to governmental and private non-profits primarily, if a private citizen within a jurisdiction has a viable and eligible project, it will be up to the jurisdiction to sponsor the project and complete all necessary submissions, applications, and monitoring of awards to remain complaint with current guidelines. A private citizen cannot be an applicant for these funds, but must remain a subapplicant, with the jurisdiction being the applicant and retaining responsibility for all required documentation.

Once per year, the evaluation panel will meet to purge the PPL to ensure outdated projects or those projects funded by local municipalities are removed from the list. The new list will be revised after each submission/evaluation period.

STEP 2

Once the proposals have been received, DEM staff will review each proposal for completeness. DEM staff will then notify the LMS Evaluation Panel of which projects they do not feel are completed, and the evaluation panel will decide whether to go ahead and score the project, or to reject the project and have the DEM staff member notify the submitting party via email that their project was rejected by the evaluation panel for being incomplete and will not be eligible for inclusion on the PPL during this cycle, while encouraging them to resubmit their proposal during the next submission/evaluation period.

STEP 3

DEM staff will notify LMS Evaluation Panel members that all projects have been submitted, and are ready on the online platform for them to begin scoring.

STEP 4

Each LMS Evaluation Panel member will score all proposals in the online platform. Each member will notify the LMS Coordinator via email when they have completed scoring all projects during the evaluation period, but no later than the last day of the period given to them by DEM staff when they were first notified that the submission/evaluation period had been initiated. In the unlikely event that the online platform malfunctions or will not accept the evaluator's scores, a paper form will be distributed to the affected evaluator to complete the scoring process and email back to the LMS Coordinator.

STEP 5

DEM staff will re-check the average attribute scores for each project received from each LMS Evaluation Panel member in the online platform. This will be provided to the Evaluation Panel members at their meeting.

STEP 6

The LMS Evaluation Panel Meeting is open to the public or proposers if they choose to attend and would like to see the scoring process, however, the evaluators will only evaluate the project proposals based on what was provided in the application.

STEP 7

The LMS Evaluation Panel will hold a meeting to review/finalize all scores and create the Draft PPL. A quorum of the LMS Evaluation Panel must be present during the meeting, Panel members will discuss possible inaccuracies and/or reliability of information used by proposers, such as obsolete cost data, questions regarding project feasibility, and project tie-breakers (see Project Tie-Break Procedure). Before the meeting concludes, a vote will be conducted to approve the "new" Draft PPL. DEM staff will provide a copy of the approved "new" Draft PPL to the LMS Steering Committee for approval.

STEP 8

DEM staff will schedule a meeting of the LMS Steering Committee. One (1) week in advance of the scheduled meeting, the "new" Draft PPL will be distributed to the LMS Steering Committee membership.

STEP 9

At the scheduled LMS Steering Committee meeting, the Draft PPL will be presented.

Project applications received after the submission deadline, but before the next project prioritization updating process, may be accepted by the LMS Steering Committee as UNRANKED projects. Prior to the PPL adoption vote, such projects will be presented for consideration. The LMS Steering Committee may vote to include any or all of these projects on the draft PPL as “unranked”. Unranked projects will be listed on the PPL under the sub-heading of Unranked Projects which will appear immediately following the list of ranked projects. Unranked projects will automatically be ranked in the next ranking cycle.

Following discussion of the Draft PPL, the LMS Steering Committee will adopt it as submitted or with modifications. Specific justification is required for any modification to the ranking of the projects as submitted by the LMS Evaluation Panel, excepting inclusion of unranked projects.

STEP 10

DEM staff will distribute copies of the new revised PPL to all appropriate entities.

## 4.5 Conflict Resolution Procedures

### 4.5.1 Background

With multiple local governments involved in the development of the PBC LMS, differences of opinions may arise over the course of the program with regard to goals, objectives, policies, and projects. In cases where an impasse occurs, a procedure is needed that can be activated to resolve such conflicts. This section describes the procedure that will be used to resolve conflicts arising among the participating governmental entities in the development and implementation of the PBC LMS.

The two types of conflicts that may arise are issues and disputes. Issues are technical problems that are susceptible to informal resolution by DEM staff. Disputes are problems that require formal resolution by neutral third parties. In either case, resolution and settlement are best settled through mutually agreed-upon understanding between the disputing parties. When that is not possible, some form of binding resolution is needed.

The Subcommittee will be comprised of three (3) people: one (1) member of the Subcommittee will be appointed by the LMS Steering Committee Chair, a second person will come from the Division of Emergency Management and be selected by the Director, and a third member will be someone drawn from the LMS Steering Committee who has been selected by mutual agreement of the LMS Steering Committee chair and the Director of DEM (This individual or their municipality cannot be involved personally in the conflict).

Once the Subcommittee has been selected, DEM, as lead agency will prepare a memorandum delineating the dispute, include supporting documentation when available, and schedule the Subcommittee meeting.

If no resolution could be reached, the issue would then be heard by the entire LMS Steering Committee. The vote of the LMS Steering Committee would be binding. Other DEM staff shall provide support to the committee.

### 4.5.2 Procedure

The following provides a detailed, step-by-step procedure that would be followed should a dispute arise under the LMS.

**Objective**: To institute a fair, effective, and efficient process to resolve conflicts among local governments during the development and implementation of the LMS.

During the development or implementation of the LMS, a local government(s) may reach an impasse on a particular issue or position. The local government has an opportunity to exercise the following LMS Conflict Resolution Procedure.

<u>STEP 1</u>
The local government submits a letter of dispute (LOD) to the DEM Director explaining in as much detail as possible, describing their concern and position along with documentation to support their position. Also, they should outline potential alternative solutions.

<u>STEP 2</u>
DEM Director reviews the LOD making sure that it clearly outlines the position of the local government(s) and provides sufficient information supporting their position so the dispute in question can be readily understood by the members of the Conflict Resolution Subcommittee. If DEM staff determines that additional facts are needed to describe the dispute outlined in the LOD, DEM staff will provide, in writing, a letter identifying the information that will clarify the position of the disputing party.

<u>STEP 3</u>
Once the LOD is determined to be complete, DEM staff will notify and arrange a telephone conference call or a meeting of the LMS Steering Committee Chair and DEM Director to select individuals to serve on the LMS Conflict Resolution Subcommittee (an ad hoc

committee) within seven (7) calendar days. Before the selection process is completed, a verification of a willingness to serve will have been completed. Only voting members of the LMS Steering Committee are eligible to serve on the Subcommittee.

<u>STEP 4</u>
Within a day of the Subcommittee selection, (see STEP 3), DEM staff will send a follow-up letter and/or email to each Subcommittee member confirming their appointment.

<u>STEP 5</u>
Included with the follow-up letter will be the LOD and any supportive materials provided by the disputing party.

<u>STEP 6</u>
In an effort to expedite the process, DEM staff will make every attempt to schedule the meeting within two (2) calendar weeks from the date the LOD was determined complete.

<u>STEP 7</u>
The conflict resolution meeting is held. DEM will provide staff to document the proceedings of the meeting. Every effort on the part of the two parties will attempt to resolve the impasse at the meeting.

<u>STEP 8</u>
If resolution is achieved, DEM staff will prepare a memorandum documenting the issue and the mutually agreed upon resolution. The memorandum will contain three (3) signature blocks, one (1) for the Chair of the Subcommittee and two (2) for the representatives of the disputing parties. By their signature, all parties will formally agree to the mediated result. A copy will be provided to each party and another copy filed at the DEM. If resolution is still not achieved, the process will move to STEP 9.

<u>STEP 9</u>
If no resolution is achieved at the meeting, the Subcommittee will develop an alternative proposal which will be proffered to the disputing party within seven (7) days following the conclusion of the conflict resolution meeting.

<u>STEP 10</u>
If the impasse is not resolved at the Subcommittee level, DEM will schedule a meeting of the full LMS Steering Committee. In an effort to continue to try to resolve the impasse expeditiously, DEM staff will make every attempt to schedule the meeting within two (2) calendar weeks from the date that a solution cannot be achieved at the Subcommittee level. Each member will be sent a copy of the LOD and any supportive materials provided by the disputing party. The disputing party will be notified of the meeting date and time.

<u>STEP 11</u>
A meeting of the LMS Steering Committee is held. The representative of each disputing party will present their positions and the Chair of the Subcommittee will present the views

of LMS Conflict Resolution Subcommittee. At the end of the meeting, if no mutually acceptable compromise is achieved, the LMS Steering Committee will vote to accept one (1) solution from among the offered solutions or those that may develop at this special LMS Steering Committee meeting. This resolution vote of the LMS Steering Committee will be final.

The outcome of the meeting will be detailed in a memorandum of understanding that will be prepared by DEM. This memorandum will be signed by the LMS Steering Committee Chair. Thereafter, a disputing party can exercise the legal remedy of going to court.

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# ACRONYMS

| | |
|---|---|
| BCC | Board of County Commissioners |
| CDC | Centers for Disease Control |
| CEI | Climate Extremes Index |
| CEMP | Comprehensive Emergency Management Plan |
| C-MAN | Coastal-Marine Automated Network |
| CRS | Community Rating System |
| DEM | Palm Beach County Division of Emergency Management |
| DOF | Florida Division of Forestry |
| EDMIS | Economic Disaster Management Information Systems |
| EM | Emergency Management |
| EMAP | Emergency Management Accreditation Program |
| EOC | Emergency Operations Center |
| ERM | Environmental Resource Management |
| ESF | Emergency Support Function |
| FDACS | Florida Department of Agriculture and Consumer Services |
| FDEM | Florida Division of Emergency Management |
| FEMA | Federal Emergency Management Agency |
| FIRM | Flood Insurance Rate Maps |
| FMAP | Flood Mitigation Assistance Program |
| GCRI | Greenhouse Climate Response Index |
| GIS | Geographic Information System |
| HHD | Herbert Hoover Dike |
| HLB | Huanglongbing disease |
| HMGP | Hazard Mitigation Grant Program |
| IPZ | Ingestion Pathway Zone |
| LMS | Local Mitigation Strategy |
| LDR | Local Development Regulations |
| LEPC | Local Emergency Planning Committee |
| LOD | Letter of Dispute |
| MAT | Mitigation Assessment Team |
| MPO | Metropolitan Planning Organization |
| NFIP | National Flood Insurance Program |
| NGO | Non-Governmental Organization |
| NGVD | National Geodetic Vertical Datum |
| NOAA | National Oceanic Atmospheric Administration |
| NWS | National Weather Service |
| PAPA | Property Appraisers Database |
| PPL | Project Prioritization List |
| PZ&B | Department of Planning, Zoning, & Building |
| SARS | Severe Acute Respiratory Syndrome |
| SFHA | Special Flood Hazard Area |
| SFWMD | South Florida Water Management District |
| SHMP | State Hazard Mitigation Plan |
| TCRPC | Treasure Coast Regional Planning Council |
| WFO | NWS Weather Forecast Office |

# APPENDICES A - K

Palm Beach County Local Mitigation Strategy 2020

## Contents

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# Appendix A: Risk & Vulnerability Analyses Data

The risk and vulnerability data presented in this Appendix addresses, in part, the following FEMA requirements:

> **RISK ASSESSMENT: §201.6(c)(2):** The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.
>
> **Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.
>
> **Requirement §201.6(c)(2)(i):** The risk assessment shall include a] description of the … 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.
>
> **Requirement §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. This description shall include an overall summary of each hazard and its impact on the community.

Additional information relating to these requirements is contained in Section 3, in the Palm Beach County Hazard Environment, in Appendix C, and in the new hazard write-up sections of the Plan.

This Appendix presents the results of updated risk, vulnerability and impact analyses for the original hazards identified in the 2004 Plan. The summary tables for these analyses are indicated below:

**Table A-1: Relative Vulnerability to Hazards, by Local Government**

| **Hazard Category**<br>**Community Vulnerability**<br>**H: High**<br>**M: Medium**<br>**L: Low**<br>**V: Very Low** | **Unincorporated County** | **MUNICIPALITIES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
| **NATURAL HAZARDS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flood* | H | M | H | H | H | M | M | H | M | M | M | M | M | M | L | M | H | M | M | H | H | H | H | L | M | H | L | M | H | H | M | M | H | L | M | H | M | H | H | H |
| Hurricane/tropical storm | H | M | H | H | H | H | M | H | M | M | M | H | M | H | M | H | H | H | M | H | H | H | H | M | M | H | H | H | H | M | H | M | H | M | H | H | M | M | H | H |
| Tornado | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Severe thunderstorms/ lightning | H | M | M | M | M | H | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | H | M | M | M | M | H | M | M | M | M | M | H | M | M | M | M | H | H |
| Drought | H | L | H | M | M | L | L | M | H | H | L | M | L | H | L | M | M | M | L | L | L | L | H | L | L | M | L | H | M | M | L | M | L | L | H | L | L | H | H | M |
| Extreme temperatures | M | L | L | L | M | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | M | L | L | H | L | L | L | M | L | L | L | L | L | H | L | M | M | M |
| Agricultural pests and diseases | H | V | H | L | L | L | V | L | V | V | L | L | V | V | V | L | M | V | V | V | V | V | M | V | V | L | V | H | L | M | V | V | V | V | H | L | V | M | M | L |
| Wildfire/urban interface zone | H | L | H | M | L | V | L | L | M | M | L | L | L | V | V | L | M | V | V | V | L | L | M | V | V | L | V | H | V | M | V | V | L | M | H | V | V | M | M | M |
| Muck fire | H | V | H | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | L | V | V | V | V | H | V | V | V | V | V | L | H | V | V | L | L | L |
| Soil/beach erosion | M | L | M | M | M | M | V | M | H | H | V | M | V | H | V | H | H | V | L | V | M | M | L | V | M | M | H | V | H | M | M | L | H | V | V | H | M | V | L | V |
| Geologic hazards (sinkholes and subsidence) | L | V | V | V | M | V | V | V | M | M | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| Seismic hazards (tsunamis and earthquakes) | L | M | V | H | H | H | M | H | M | M | L | M | L | H | H | H | H | H | H | H | H | H | V | H | L | H | H | V | H | M | H | L | L | V | V | H | V | V | V | L |
| Pandemic/ communicable diseases | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |

| **Hazard Category**<br>**Community Vulnerability**<br>**H: High**<br>**M: Medium**<br>**L: Low**<br>**V: Very Low** | Unincorporated County | Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Radiological accidents (including nuclear power plant accidents)** | L | V | V | V | V | V | V | V | V | V | V | V | V | V | V | L | L | L | V | V |
| **Hazardous material release** | M | L | M | M | H | M | M | H | L | L | M | V | L | V | L | L | M | L | M | M |
| **Communications failure** | M | V | L | M | M | V | V | M | L | L | V | V | V | V | V | V | M | V | L | M |
| **TECHNOLOGICAL HAZARDS** | | | | | | | | | | | | | | | | | | | | |
| Transportation system accident (airplane, ground, rail, maritime) | H | L | H | M | H | V | L | H | L | L | V | V | M | V | L | L | H | V | M | M |
| Wellfield contamination | M | L | V | M | M | V | M | M | H | H | V | V | V | V | V | L | M | V | L | L |
| Power failure (outages) | M | V | M | M | M | V | V | M | M | M | V | V | V | V | V | L | M | V | V | V |
| Dike Breach (Herbert Hoover Dike) | M | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| **HUMAN CAUSED HAZARDS** | | | | | | | | | | | | | | | | | | | | |
| Civil disturbance | M | V | L | L | M | V | V | M | V | V | V | V | V | V | V | V | L | V | V | L |
| Domestic Security: Terrorism, sabotage, and cyber attack | L | V | V | L | L | V | V | L | V | V | L | V | V | V | V | L | L | V | V | L |
| Mass Migration | M | V | M | L | M | V | V | M | V | V | V | V | V | V | V | V | L | V | V | L |
| Workplace/school violence (active shooter/assailant) | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |

| **Hazard Category**<br>**Community Vulnerability**<br>**H: High**<br>**M: Medium**<br>**L: Low**<br>**V: Very Low** | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Radiological accidents (including nuclear power plant accidents)** | V | V | V | V | V | V | V | V | V | V | V | L | L | V | V | V | V | V | M | L |
| **Hazardous material release** | M | M | L | L | L | M | V | L | V | M | V | L | M | M | M | L | L | M | V | H |
| **Communications failure** | M | M | M | V | L | V | V | L | V | M | L | L | M | L | L | M | M | V | M | M |
| **TECHNOLOGICAL HAZARDS** | | | | | | | | | | | | | | | | | | | | |
| Transportation system accident (airplane, ground, rail, maritime) | M | M | M | L | M | M | V | L | V | V | V | L | H | L | H | L | M | M | M | H |
| Wellfield contamination | L | L | M | V | L | M | V | V | V | M | V | V | M | L | V | V | L | M | M | H |
| Power failure (outages) | V | V | M | V | V | M | V | M | V | M | L | M | L | M | M | H | M | L | M | M |
| Dike Breach (Herbert Hoover Dike) | L | L | L | L | L | L | L | H | L | M | L | L | L | M | H | L | L | M | L | L |
| **HUMAN CAUSED HAZARDS** | | | | | | | | | | | | | | | | | | | | |
| Civil disturbance | L | L | L | V | L | L | V | V | V | M | V | L | L | V | V | V | L | V | L | M |
| Domestic Security: Terrorism, sabotage, and cyber attack | L | L | L | V | L | V | V | V | M | V | V | L | H | V | V | V | L | V | L | M |
| Mass Migration | L | L | L | V | V | V | L | M | V | V | M | L | M | V | M | L | V | V | L | M |
| Workplace/school violence (active shooter/assailant) | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |

*Sea level rise is included as a flood hazard. **Coastal oil spill is considered a type of hazardous material accident.

## Table A-2: Relative Probability of Hazards, by Local Government

| **Hazard Category**<br>**Community Vulnerability**<br>**H: High**<br>**M: Medium**<br>**L: Low**<br>**V: Very Low** | **Unincorporated** | **MUNICIPALITIES** Atlantis | Belle Glade | Boca Raton | Boynton | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet | Lake Clarke | Lake Park | Lake Worth | Lantana | Loxahatchee | Manalapan | Mangonia | North Palm | Ocean Ridge | Pahokee | Palm Beach | Palm Beach | Palm Beach | Palm Springs | Riviera Beach | Royal Palm | South Bay | South Palm | Tequesta | Wellington | Westlake | West Palm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **NATURAL HAZARDS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Flood | H | M | M | H | H | M | M | H | M | M | M | H | H | H | H | H | H | H | M | H | H | M | M | H | M | H | H | M | H | H | H | M | H | L | M | H | M | M | M | H |
| Hurricane/tropical storm | H | M | M | H | H | H | M | H | M | M | M | H | M | H | H | H | H | H | M | H | H | M | H | H | M | H | H | M | H | M | H | M | H | M | M | H | M | M | H | H |
| Tornado | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | M | L | L | L | L | M | L | M | M | M | L | L | L | M | M | M | L | M | L | H |
| Severe thunderstorms/ lightning | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| Drought | H | L | H | L | M | L | L | M | L | L | L | L | L | L | L | L | M | L | L | L | L | L | M | L | L | L | L | H | M | M | L | L | L | L | H | L | L | H | M | M |
| Extreme temperatures | M | L | M | L | L | V | L | L | L | L | L | V | L | V | V | V | H | V | L | V | V | L | M | V | L | L | V | M | L | L | V | L | L | L | M | L | L | M | M | M |
| Agricultural pests and diseases | H | V | H | L | M | V | V | M | V | V | L | V | L | V | V | V | M | V | L | V | V | L | M | V | L | V | V | H | L | L | V | L | L | V | H | L | V | M | M | L |
| Wildfire/urban interface zone | H | V | H | L | M | V | V | L | V | V | L | V | L | V | V | V | M | V | L | V | L | L | H | V | L | L | V | H | V | L | V | V | L | M | H | V | V | M | H | M |
| Muck fire | H | V | H | V | L | V | V | L | V | V | V | V | V | V | V | V | V | V | V | V | V | V | L | V | V | V | V | V | H | V | V | V | L | L | H | V | V | L | L | L |
| Soil/beach erosion | M | V | L | M | M | M | V | M | V | V | V | M | V | M | M | H | H | H | V | V | M | V | V | H | V | M | H | L | H | V | H | V | H | V | L | H | M | V | V | L |
| Geologic hazards (sinkholes and subsidence) | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| Seismic hazards (tsunamis and earthquakes) | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | L | V | V | V | V | V | V | L |
| Pandemic/ communicable diseases | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |

| Hazard Category / Community Vulnerability (H: High; M: Medium; L: Low; V: Very Low) | Unincorporated County | Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **MUNICIPALITIES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **TECHNOLOGICAL HAZARDS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hazardous materials accident** | M | L | L | M | M | V | V | L | L | V | V | V | V | V | V | V | L | V | V | L | L | V | L | V | L | M | V | M | V | L | V | L | M | L | M | L | V | M | L | H |
| Hazardous material release | L | L | L | L | L | V | L | H | L | V | L | V | V | V | V | L | L | V | V | L | L | V | L | V | M | M | V | L | V | L | V | V | L | L | L | L | L | M | L | H |
| Radiological accidents (including nuclear power plant accidents) | V | V | V | V | V | V | V | L | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V | V |
| Communications failure | M | V | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | V | L | L | L | L | L | L | M | V | L | L | M |
| Transportation system accident | H | L | M | M | M | V | L | H | L | V | L | V | L | V | V | V | L | V | V | L | L | L | M | V | M | M | V | M | V | M | V | V | M | L | M | L | L | M | M | H |
| Wellfield contamination | M | L | V | M | M | V | V | M | L | V | V | V | V | V | V | V | L | V | V | L | L | V | M | V | M | L | V | L | V | L | V | V | M | L | L | V | V | M | M | H |
| Power failure (outages) | M | M | V | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | L | M | M | M | M | M | M | L | M | M | M | M | M | M | M | H | M | V | M | M |
| Dike Breach (Herbert Hoover Dike) | M | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | M | L | L | L | M | H | L | L | M | L | M |
| **HUMAN CAUSED HAZARDS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Civil disturbance | M | V | L | L | L | V | V | M | V | V | L | V | V | V | V | V | L | V | V | L | L | V | V | V | L | L | V | L | M | L | V | V | L | V | L | V | V | V | V | M |
| Domestic Security: Terrorism, sabotage, and cyber attack | L | V | V | L | L | V | V | L | V | V | V | V | V | V | V | V | L | V | V | V | L | V | V | L | V | V | V | L | L | V | V | V | L | V | L | V | V | V | V | M |
| Mass Migration | L | V | L | L | L | L | V | M | V | V | V | L | V | L | L | L | L | L | V | V | L | V | L | L | V | L | L | V | V | V | L | V | L | V | L | L | V | V | L | M |
| Workplace/school violence (active shooter/assailant) | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |

*Sea level rise is included as a flood hazard. **Coastal oil spill is considered a type of hazardous material accident

**Table A-3: Risk Assessment by Hazard and Jurisdiction**

| Hazard Category<br>Community Vulnerability<br>H: High<br>M: Medium<br>L: Low<br>V: Very Low | **Unincorporated County** | MUNICIPALITIES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
| **NATURAL HAZARDS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Flood*** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| Vulnerability | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| Exposure | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| Risk | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| **Hurricane/Tropical Storm** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| Vulnerability | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| Exposure | M | H | M | H | H | H | H | H | H | H | M | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H | H | H | M | M | H | M | M | H | H |
| Risk | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | M | H | H | H |
| **Tornado** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | L | M | M | M | M | M | M | M | M |
| Vulnerability | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | L | L | L |
| Exposure | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Risk | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| **Severe thunderstorms/lightning** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exposure | M | M | H | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | H | M | M | M | M | M | M | H | M | L | M | M | M |
| Risk | M | M | H | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | H | M | M | M | M | M | M | H | M | L | M | M | M |
| **Seismic Hazards: Tsunamis and Earthquakes** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | M | L | H | H | H | M | H | M | L | L | H | L | H | M | H | H | H | M | H | H | M | L | H | M | H | H | L | H | M | H | L | H | L | L | H | L | L | L | H |
| Exposure | M | M | L | H | H | H | M | H | M | L | L | H | L | H | M | H | H | H | M | H | H | M | L | H | M | H | H | L | H | M | H | L | L | L | L | H | M | L | L | H |
| Risk | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| **Agricultural Pests/Diseases** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | L | M | M | M | M | L | M | M | M |
| Vulnerability | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | L | M | M | M | M | L | M | M | M |
| Exposure | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | L | L | L | L | L |
| Risk | M | H | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | H | M | M | M | M | M | M | M | M | M | M | M | M |
| **Drought** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H |

| **Hazard Category** <br> **Vulnerability Rating** <br> **H: High** <br> **M: Medium** <br> **L: Low** | **Unincorporated County** | **MUNICIPALITIES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
| Vulnerability | H | M | H | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | H | M | M | M | L | M | M | M | H | M | M | M | M |
| Exposure | H | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | H | L | L | L | L | L | L | H | L | L | L | M | L |
| Risk | M | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | H | L | L | L | L | L | L | H | L | L | L | M | L |
| **Wildfire/Urban Interface** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | M | L | L | L | L | L | L | M | L | L | L | M | L | L | L | M | M | L |
| Vulnerability | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | M | L | L | L | L | L | L | M | L | L | L | M | L | L | L | M | M | L |
| Exposure | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Risk | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | M | L | L | L | L | L | L | M | L | L | L | M | L | L | L | M | M | L |
| **Muck Fires** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Exposure | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Risk | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| **Soil /Beach Erosion** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | M | M | L | L | L | M | L | L | L | L | M | L | M | M | L | L | M | M | L | L | M | L | M | M | L | M | L | M | L | M | L | L | L | M | L | L | L |
| Vulnerability | L | L | L | H | H | L | L | L | H | L | L | L | L | H | L | H | H | L | L | H | H | L | L | H | L | H | H | L | H | L | H | L | H | L | L | L | H | L | L | L |
| Exposure | L | L | L | M | M | L | L | L | M | L | L | L | L | M | L | H | H | L | L | H | H | L | L | H | L | H | H | L | H | L | H | L | H | L | L | L | H | L | L | L |
| Risk | L | L | L | M | M | L | L | L | M | L | L | L | L | M | L | M | M | L | L | M | M | L | L | M | L | M | M | L | M | L | M | L | M | L | L | L | M | L | L | L |
| **Geologic Hazards: Sinkholes and Subsidence** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |

| **Hazard Category** **Vulnerability Rating** **H: High** **M: Medium** **L: Low** | **Unincorporated County** | **MUNICIPALITIES** Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vulnerability | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Exposure | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Risk | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| **Pandemic/ communicable diseases** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Exposure | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Risk | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| **TECHNOLOGICAL HAZARDS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Hazardous Materials Accident**** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Vulnerability | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Exposure | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Risk | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| **Radiological Accident** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Exposure | M | L | L | L | L | L | L | L | L | L | L | L | M | L | L | M | M | M | M | L | M | L | L | L | L | M | L | L | M | M | M | L | M | L | L | L | L | L | L | M |
| Risk | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Hazard Category<br>Vulnerability Rating<br>H: High<br>M: Medium<br>L: Low | Unincorporated County | Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MUNICIPALITIES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Communications Failure** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | L | M | M | M | M | M | M | M | M |
| Exposure | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | L | M | M | M | M | M | M | M | M |
| Risk | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | L | M | M | M | M | M | M | M | M |
| **Hazardous Material Release** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | M | M | M | M | L | M | M | M | M | M | L | M | L | M | L | M | M | M | M | M | M | L | L | M | M | L | M | L | M | M | M | M | M | M | L | L | M | L | M |
| Exposure | M | M | M | M | M | L | M | M | M | M | M | L | M | L | M | L | M | M | M | M | M | M | L | L | M | M | L | M | L | M | M | M | M | M | M | L | L | M | L | M |
| Risk | M | M | M | M | M | L | M | M | M | M | M | L | M | L | M | L | M | M | M | M | M | M | L | L | M | M | L | M | L | M | M | M | M | M | M | L | L | M | L | M |
| **Transportation Accident** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | L | M | M | M | L | L | M | M | L | L | L | M | L | M | L | M | L | L | M | M | M | M | L | M | L | L | M | L | M | L | L | M | L | M | L | M | L | M | M |
| Exposure | M | L | M | M | M | L | L | M | M | L | L | L | M | L | M | L | M | L | L | M | M | M | L | L | M | L | L | M | L | M | L | L | M | L | M | L | M | L | L | M |
| Risk | M | L | M | M | M | L | L | M | M | L | L | L | M | L | M | L | M | L | L | M | M | M | M | L | M | L | L | M | L | M | L | L | M | L | M | L | M | L | M | M |
| **Wellfield Contamination** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | L | L | M | M | L | L | M | L | L | L | M | L | L | L | L | M | L | L | M | L | L | M | L | M | L | L | L | L | M | L | L | L | L | L | L | L | M | M | M |
| Exposure | M | L | L | M | M | L | L | M | L | L | L | M | L | L | L | L | M | L | L | M | L | L | M | L | M | L | L | L | L | M | L | L | L | L | L | L | L | M | M | M |
| Risk | M | L | L | M | M | L | L | M | L | L | L | M | L | L | L | L | M | L | L | M | L | L | M | L | M | L | L | L | L | M | L | L | L | L | L | L | L | M | M | M |

| Hazard Category<br>Vulnerability Rating<br>H: High<br>M: Medium<br>L: Low | Unincorporated County | Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **MUNICIPALITIES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Power Failure (Outages)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | L | L | L | L | L | M | L | L | L | L | L | L | L | L |
| Vulnerability | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Exposure | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Risk | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| **Dike Breach (Herbert Hoover Dike)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | M | H | L | L | M | L | L |
| Exposure | M | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | M | H | L | L | M | L | L |
| Risk | M | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | M | H | L | L | M | L | L |
| **HUMAN CAUSED HAZARDS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Civil Disturbance** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Exposure | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Risk | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| **Domestic Security: Terrorism, sabotage, and cyber attack** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | L | M | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | M | M | L | L | M | L | M | L | L | L | L | M |
| Exposure | M | L | M | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | M | M | L | L | M | L | M | L | L | L | L | M |
| Risk | M | L | M | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | M | M | L | L | M | L | M | L | L | L | L | M |

| Hazard Category<br>Vulnerability Rating<br>H: High<br>M: Medium<br>L: Low | Unincorporated County | MUNICIPALITIES<br>Atlantis | Belle Glade | Boca Raton | Boynton Beach | Briny Breezes | Cloud Lake | Delray Beach | Glen Ridge | Golf | Greenacres | Gulf Stream | Haverhill | Highland Beach | Hypoluxo | Juno Beach | Jupiter | Jupiter Inlet Colony | Lake Clarke Shores | Lake Park | Lake Worth Beach | Lantana | Loxahatchee Groves | Manalapan | Mangonia Park | North Palm Beach | Ocean Ridge | Pahokee | Palm Beach | Palm Beach Gardens | Palm Beach Shores | Palm Springs | Riviera Beach | Royal Palm Beach | South Bay | South Palm Beach | Tequesta | Wellington | Westlake | West Palm Beach |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mass Migration** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | L | M | L | M | L | L | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | M | L | L | M | L | M | L | L | L | L | M |
| Exposure | M | L | M | L | M | L | L | M | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | M | L | M | L | L | M | L | M | L | L | L | L | M |
| Risk | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| **Workplace/school violence (active shooter/assailant)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Frequency | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L |
| Vulnerability | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Exposure | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |
| Risk | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M | M |

*Sea level rise is included as a flood hazard. **Coastal oil spill is considered a type of hazardous material accident.

**Table A-3.1**: **Risk Assessment by Hazard and Vulnerability to People, Property, Environment, and Government Operations**

Based on the vulnerability, probability, and risk assessments conducted of all possible hazards that could impact Palm Beach County's municipalities in tables A-1 through A-3, an analysis was made to determine the risk these hazards pose as a threat across the entire spectrum of community exposure and service elements that define the whole community for the county.

Risk is defined as the probability of loss and depends on three factors:

- Frequency
- Vulnerability
- Exposure

Frequency is defined as how often a known hazard produces a detrimental impact within the community. Vulnerability is defined as how quickly the county can recover from the incidents caused by the hazard. The longer it takes to recover from the incident, the higher the vulnerability factor. Exposure means the extent life, property, and community resources (including responders) face the detrimental impact(s) of the hazard.

**Risk Measurement**

The following scale was used to assess the risk potential to people, property, the environment, and government operations within the county using the magnitude classification system from Section 2.1 (pg. 18):

**L=Low**

A hazard with a "Low" risk rating indicates that it is not likely to have any measurable or lasting detrimental impact and will likely be rectified promptly with locally available resources, thus not considered a threat to the whole community.

1. People: The damage level to life is minimal (i.e., deaths and injuries) or there are no reported deaths and injuries.
2. Property: Damage to property is minimal or there are no reported damages to property.
3. Environment: No damage was done to the environment or little detrimental impact was caused by the disaster.
4. Government Operations: Local and county government operations were not interrupted by the disaster or results required minimal state or federal assistance.

A low overall risk rating indicates that the hazard has less than a 5% chance of occurring and should it occur, it will likely cause a minor disaster or an incident that will be rectified promptly by local or county resources.

**M=Medium**

A hazard with a "Medium" risk rating indicates that it has a 5%-15% chance of occurring and will likely cause a "Major Disaster" as defined under the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5122).

1. People: The damage level to life is significant (i.e., deaths and injuries). Reported numbers of victims meet the classification of a Mass Casualty Incident (MCI) Level 1 from the Mass Casualty/Mass Fatality Plan at a minimum[1].
2. Property: Reported damage to property is significant enough to warrant disaster assistance from the federal government under a Presidential Disaster Declaration[2].
3. Environment: Reported damage to the environment is significant enough to warrant disaster assistance from the federal government under a Presidential Disaster Declaration.
4. Government Operations: The economy and local and county government operations are partially or completely interrupted for some time by the disaster and results requires assistance from state or federal partnering agencies. Public confidence in the jurisdiction's governance are detrimentally impacted.

A medium overall risk rating indicates one of the following results:

1. The hazard has a 5%-15% chance of occurring and will likely cause sufficient severity and magnitude to warrant disaster assistance under the Robert T. Stafford Disaster Relief and Emergency Assistance Act.
2. The hazard has less than 5% chance of occurring based on historical data (e.g., radiological accident), but should it occur, the hazard will cause sufficient severity and magnitude to warrant disaster assistance under the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

As such, the hazard is considered a major threat to the whole community.

**H=High**

The hazard with a "High" risk rating indicates that it has more than 15% chance of occurring and will likely cause a catastrophic disaster.

1. People: A disaster caused by the hazard produces a substantial number of deaths and/or injuries.
2. Property: The hazard will likely cause extreme damage or destruction to facilities that provide and sustain human needs (e.g., hospitals, schools).
3. Environment: The hazard will likely cause a major detrimental impact on the environment (e.g., severe erosion of beaches).
4. Government Operations: The hazard will likely cause an overwhelming demand on state and local response resources and mechanisms. Local and private sector capabilities will have difficulties starting or sustaining and delivering governmental and community services.

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1 An MCI Level 1 is defined as an emergency involving 5-10 victims, 2 closest hospitals, and at least 1 Trauma Center.

2 In order for a Presidential Disaster Declaration to be made, the Florida Division of Emergency Management must determine the need for federal assistance by reporting a threshold of the loss of governmental properties and need for individual assistance through a Preliminary Damage Assessment.

An overall high-risk rating indicates that the hazard has a probability of occurrence greater than 15% and is considered a significant threat to the community. Detrimental impacts from the hazard will require substantial time, resources, and/or outside assistance to rectify damages. More than likely, there will be long-term effects on the general economy, the private sector, and public confidence in the jurisdiction's governance.

| **Hazard** | **People**<br>Health and Safety of:<br>• Residents<br>• Visitors<br>• Responders | **Property**<br>• Private and Public owned<br>• Facilities<br>• Historical Resources<br>• Infrastructure | **Environment** | **Government Operations**<br>• Delivery of services<br>• Continuity of government<br>• Continuity of operations<br>• Economy<br>• Public confidence in jurisdiction's governance | **Overall Risk** |
|---|---|---|---|---|---|
| **Natural Hazards** | | | | | |
| Flood<br>• Coastal and inland inundation<br>• Sea level rise*<br>• Storm surge | H | H | H | H | H |
| Hurricane/tropical storm | H | H | H | M | H |
| Tornado | M | M | L | L | M |
| Severe thunderstorms/ lightning | M | M | L | L | M |
| Drought | M | L | L | M | M |
| Extreme temperatures | M | L | L | M | M |
| Agricultural pests and diseases | M | L | L | M | M |
| Pandemic/ communicable diseases | M | L | L | M | M |
| Wildfire/ urban interface zone | L | L | L | L | L |
| Muck fire | L | L | L | L | L |
| Soil/beach Erosion | L | L | M | L | L |
| Geologic Hazards<br>• Sinkholes<br>• Subsidence | L | L | L | L | L |
| Seismic Hazards<br>• Earthquakes<br>• Tsunamis | L | L | L | L | L |
| **Technological Hazards** | | | | | |
| Hazardous materials accident** | M | M | M | M | M |

| **Hazard** | **People**<br>Health and Safety of:<br>• Residents<br>• Visitors<br>• Responders | **Property**<br>• Private and Public owned<br>• Facilities<br>• Historical Resources<br>• Infrastructure | **Environment** | **Government Operations**<br>• Delivery of services<br>• Continuity of government<br>• Continuity of operations<br>• Economy<br>• Public confidence in jurisdiction's governance | **Overall Risk** |
|---|---|---|---|---|---|
| Hazardous materials release | M | M | M | L | M |
| Radiological accident<br>• Nuclear Power Plant accident | M | L | M | L | M |
| Communications failure | M | L | L | M | M |
| Transportation system accident<br>• Airplane<br>• Ground<br>• Rail<br>• Maritime | M | M | L | L | M |
| Wellfield Contamination | M | M | H | L | M |
| Power failure<br>• Outages | M | L | L | M | M |
| Dike Breach<br>• Herbert Hoover Dike | M | M | M | L | M |
| **Human Caused Hazards** | | | | | |
| Domestic Security<br>• Terrorism<br>• Sabotage<br>• Cyber attack | M | M | L | L | M |
| Workplace/ school violence<br>• Active Shooter/ Assailant | M | M | L | M | M |
| Civil disturbance | L | L | L | L | L |
| Mass Migration | L | L | L | L | L |

*Sea level rise is considered a type of flood. **Oil spill is considered a type of hazardous material accident.

**Table A-4: Impact Analysis**

An impact analysis was conducted to assess the potential of detrimental impacts from all possible natural, technological and human caused hazards in Palm Beach County. Results are based from previous vulnerability and risk assessments and are summarized in the following table according to essential elements that make up the whole community aspect of Palm Beach County. Impacts were measured against the following groupings:

1. Health and safety of the resident population in the affected area;
2. Health and safety of incident responders;
3. Continuity of government and non-government operations;
4. Property, facilities, and infrastructure;
5. Delivery of critical community services;
6. Environment
7. Economic and financial conditions
8. Regulatory and contractual obligations; and the
9. County's reputation, image, and/or ability to attract public and commercial interests.

An impact rating of "Low" for any hazard type means the hazard is not likely to have any measurable or lasting detrimental impact of a particular type and consequences will likely be rectified promptly with locally available resources. An impact rating of "Medium" means there will likely be a measurable detrimental impact, which may require some time to rectify and may require outside resources and/or assistance. An impact rating of "High" means the impact will likely be severe and of longer duration, and require substantial time, resources, and/or outside assistance to rectify. Multiple ratings indicate detrimental impacts might easily vary within the range indicated.

Although the PBC Comprehensive Emergency Management Plan (CEMP) allows for the flexibility and adaptability to provide the emergency organizational structure for all hazards, regardless of type or size, and identifies the roles, responsibilities, and lines of authority for that structure, 12 Core Hazards have been identified as likely causing major and catastrophic disasters. These hazards were found to have a classification of "Medium" and/or "High" impact to the county's community elements.

As such, 12 dedicated Hazard Specific Plans (HSPs) were developed to address the response, recovery, and mitigation of disasters caused by these hazards. In the following table, HSPs have been arranged vertically by alphabetical order (and not by severity of impact to the County) within categories as follows:

| Natural | Technological | Human Caused |
|---|---|---|
| Agricultural Pests & Diseases | Dike Failure | Domestic Security |
| Communicable Disease | Hazardous Materials | Mass Migration |
| Fire | Nuclear Power Plant | Workplace/School Violence |
| Floods | Transportation | |
| Severe Weather | | |

| Hazard | Health & Safety Residents | Health & Safety Responders | Continuity of Operations | Property, Facilities, Infrastructure | Historical Resources | Delivery of Services | Environ-ment | Economic & Financial Conditions | Regulatory Contractual Obligations | Reputation of County |
|---|---|---|---|---|---|---|---|---|---|---|
| **NATURAL HAZARDS** | | | | | | | | | | |
| Flood* | Medium | Medium | Low | Medium | Medium/ | Medium | Medium | Medium | Low | Low |
| Tropical Storm | Medium | Medium | Low | Medium | Medium | Medium | Medium | Medium | Low | Low |
| Hurricane Cat 1 | Medium | Medium | Low | Medium | Medium | Medium | Medium | Medium | Low | Low |
| Hurricane Cat 2 | Medium | Medium | Medium | Medium | Medium | Medium | Medium | Medium | Low | Low |
| Hurricane Cat 3 | Medium/ High | Medium/ High | Medium/ High | Medium/ High | Medium/ High | Medium/ High | High | Medium/ High | Medium | Low/ Medium |
| Hurricane Cat 4 | High | High | High | High | High | High | High | High | High | Medium/ High |
| Hurricane Cat 5 | High | High | High | High | High | High | High | High | High | Medium/ High |
| Tornado | Low/ Medium | Medium | Low | Low/ Medium | Low/High | Low | Low/ Medium | Medium | Low | Low |
| Severe thunder storms/lightning | Low | Low | Low | Low | Low/ Medium | Low | Low | Low | Low | Low |
| Drought | Low | Low | Low | Low | Low | Low | Low/ Medium | Medium/ High | Low | Low |
| Extreme Temperature | Low/ Medium | Low | Low | Low | Low | Low | Low/ Medium | Medium | Low | Low |
| Agricultural Pest/Disease | Low | Low | Low | Low | Low | Low | Low/ Medium | Medium/ High | Low | Low/ Medium |
| Pandemic/ Communicable diseases | Medium | Medium | Medium | Low | Low | Low | Low | Medium | Low | Low |
| Wildfire/Urban Interface Zone | Low/ Medium | Medium/ High | Low | Medium/ High | Low | Low | Low/ Medium | Medium/ High | Low | Low |
| Muck fire | Low | Low | Low | Low | Low | Low | Low | Low | Low | Low |
| Soil/beach erosion | Low | Low | Low | Low/ Medium | Low/High | Low | Medium/ High | Medium/ High | Low | Low/ Medium |
| Geologic hazards (Sinkholes and subsidence) | Low | Low | Low | Low | Low | Low | Low | Low | Low | Low |
| Seismic hazards (tsunamis and earthquakes) | Low | Low | Low | Low | Low | Low | Low | Low | Low | Low |

| Hazard | Health & Safety Residents | Health & Safety Responders | Continuity of Operations | Property, Facilities, Infrastructure | Historical Resources | Delivery of Services | Environment | Economic & Financial Conditions | Regulatory Contractual Obligations | Reputation of County |
|---|---|---|---|---|---|---|---|---|---|---|
| **TECHNOLOGICAL HAZARDS** | | | | | | | | | | |
| Hazardous Materials Accident** | Medium/ High | Medium/ High | Low/ Medium | Low | Low | Low | Medium/ High | Low/ Medium | Low | Low |
| Radiological Accidents | Low/ Medium | Low/ Medium | Low | Low | Low | Low | Low/ Mediu m | Low/ Financial | Low | Low/ Medium |
| Communication Failure | Medium | Medium | Medium/ High | Low | Low | Medium/ High | Low | Medium/ High | Low | Low |
| Hazardous Material Release | Medium/ High | Medium/ High | Low/ Medium | Low | Low | Low | Medium/ High | Low/High | Medium | Low/ Medium |
| Transportation Accidents | Low/High | Low/High | Low/High | Low/High | Low | Low/ Medium | Low | Low/High | Low | Low/ Medium |
| Wellfield Contamination | Low/ Medium | Low | Low | Low/ Medium | Low | Low/ Medium | Medium/ High | Low/ Medium | Low | Low |
| Power Failure (Outage) | Medium/ High | Medium/ High | Medium/ High | Low/ Medium | Low | Medium/ High | Low | Medium/ High | Low | Low/ Medium |
| Dike Failure (Herbert Hoover Dike) | Medium | Medium | Low | Medium | Medium | Low | Low/ Medium | Medium | Low | Low |
| **HUMAN CAUSED** | | | | | | | | | | |
| Civil Disturbance | Low/High | Low/High | Low/High | Low/High | Low | Low/High | Low | Low/High | Low | Low/High |
| Domestic Security: Terrorism, sabotage, and cyber attack | Medium/ High | High | Medium/ High | Low/High | Low | Medium/ High | Low/High | Low/High | Low/ Medium | Medium/ High |
| Mass Migration | Low/ Medium | Low/ Medium | Low | Low | Low | Low | Low | Low/ Medium | Low | Low/ Medium |
| Workplace/ school violence | Medium | Medium | Low | Low | Low | Low | Low | Low | Low | Low |

*Sea level rise is included as a flood hazard. **Coastal oil spill is considered a type of hazardous material accident.

**Table A-5: Data sources used for the Palm Beach County Hazard Vulnerability and Risk Assessment**

| Source | Data Type |
|---|---|
| **Natural Hazards** | |
| **Hurricanes and Severe Storms (Includes Tropical Storms and Northeasters)** | |
| Natural Hazards Research Center | Historical and current data on all types of natural hazards |
| Atlantic Hurricane Tracking Database | Historical data on hurricane tracks and intensities |
| NOAA Tropical Cyclone Database | Historical hurricane data |
| Colorado State University (Dr. Gray online site) | Hurricane probability |
| NASA Natural Disaster Reference Database | Historical data on all types of natural hazards |
| National Weather Service | Weather statistics |
| National Climate Data Center - On-Line Data Base | Weather statistics |
| Atlantic Ocean and Meteorological Laboratory, Hurricane Research Division | Hurricane forecast models |
| Federal Emergency Management Agency | Emergency management procedures |
| Tropical Storm Watch Database | Tropical storm data worldwide |
| Flood Insurance Rate Maps and Community Status Book | Areas vulnerable to potential rising water |
| Storm Surge Atlas for Palm Beach County (SLOSH model) | Areas vulnerable to storm surge flooding based on the SLOSH model |
| U. S. Geological Survey | Base maps and historical flood plain and elevation data |
| Florida State University (Meteorology Department) | Data and expertise concerning all Florida natural hazards |
| Florida Atlantic University | Data and expertise concerning all Florida natural hazards |
| National Severe Storms Laboratory | Storm effects data |
| Independent Insurance Agents of America (Natural Disaster Risk Database) | Probability data and estimated exposure Building code recommendations to reduce exposure |
| Florida Division of Emergency Management | *The Arbiter of Storms (TAOS)*@ maps and computer model projections as well as technical support and data |

| Source | Data Type |
|---|---|
| Florida Department of Environmental Protection | Environmental risk, exposure to hurricanes, environmental effects and hazards |
| Florida Game and Fresh Water Fish Commission | Hurricane effects of fish and wildlife |
| Florida Department of Corrections | Prison statistics and emergency management plans |
| Florida Department of Education | School and Board of Education emergency guidelines |
| South Florida Water Management District | Climatic and weather data, hydrologic data, water release schedules, and emergency management plans |
| Treasure Coast Regional Planning Council | Building codes and impacts of proposed statewide unified building code |
| Palm Beach County Airports Department | Weather data and hurricane protection procedures |
| Palm Beach County Comprehensive Growth Management Plan | Land management, zoning, and hurricane mitigation related ordinances |
| Palm Beach County Planning, Zoning, and Building Department | Building codes and zoning ordinances |
| Palm Beach County Property Appraiser | Tax assessor records for use in determining dollar value of exposed property |
| Palm Beach County Automated Information Management | Map products and GIS data |
| Palm Beach County Engineering and Public Works Department | Engineering, drainage, road elevations, and storm water data |
| Palm Beach County Environmental Resources Management Department | Environmental and beach erosion data |
| Palm Beach County Fire and Rescue | Critical facilities locations and emergency management plans |
| Palm Beach County Health Department | Critical facilities and health risk data |
| Palm Beach County School Board | Schools, shelter, and critical facilities data and emergency management plans |
| Palm Beach County Law Library | Building codes and ordinances |
| Palm Beach County Parks & Recreation Department | Environmental and recreational data and potential impacts data |
| Palm Beach County Public Safety Department Division of Emergency Management | Emergency management plans, historical data, critical facilities, special needs, and general guidance |

| Source | Data Type |
|---|---|
| Palm Beach County Division of Criminal Justice | County prison population and emergency management plans |
| Division of Animal Regulation | Animal protection, regulation, and control plans following natural disasters (hurricanes) |
| Palm Beach County Sheriff Department | Emergency management plans and law enforcement procedures following a natural disaster |
| Palm Beach County Tourist Development Council | Potential economic loss and specific areas of economic vulnerability |
| Palm Beach County Water Utilities | Critical facilities locations and emergency management procedures |
| Palm Beach County Red Cross | Historical data, shelter data, and emergency management plans |
| Florida Power and Light and Other Municipal/Private Power Companies (Lake Worth Utilities, etc.) | Power grid vulnerabilities, structure, and emergency management plans |
| Home Depot/Lowes | Emergency management supply plans for preparation and recovery |
| Publix/Winn Dixie | Emergency food supply plans |
| Southern Bell | Emergency communication maintenance plans |
| AT&T Wireless Services | Emergency communication maintenance plans |
| U. S. Cellular Wireless Communications | Emergency communication maintenance plans |
| The Palm Beach Post | Historical hurricane data |
| Local Radio and Television Stations | Critical facilities location and emergency management plans (operating plans) during natural disaster |
| **Tornadoes and Thunderstorms** | |
| Natural Hazards Research Center | Historical and current data on all types of natural hazard |
| The Tornado Project On-Line | Historical data |
| Optical Transient Detector Data Base | Lightning associated with thunder storms (lightning statistics) |
| NASA Natural Disaster Reference Database | Historical data all types of natural hazards |
| National Weather Service | Weather statistics |
| National Climate Data Center - On-Line Data Base | Weather statistics |

| Source | Data Type |
|---|---|
| NOAA Wind Related Fatalities Data Base | Wind related fatalities |
| NOAA Tropical Prediction Center | Storm predictions |
| Florida State University | Data and expertise concerning all Florida natural hazards |
| Florida Atlantic University | Data and expertise concerning all Florida natural hazards |
| National Severe Storms Laboratory | Storm and tornado statistics and storm effects |
| Independent Insurance Agents of America (Natural Disaster Risk Database) | Financial data concerning losses resulting from thunder storms and tornadoes |
| Florida Division of Emergency Management | Incident reports and historical data |
| South Florida Water Management District | Climatic data |
| Palm Beach County Airports Department | Weather data and protection plans and procedures during thunderstorms and tornadoes |
| Palm Beach County Fire and Rescue | Thunderstorm and tornado fire and fatality data |
| Palm Beach County Public Safety Department Division of Emergency Management | Thunderstorm and tornado historical data |
| Palm Beach County Division of Emergency Management | Historical data on thunderstorm and tornado related medical emergencies |
| Palm Beach County Red Cross | Historical data on impacts |
| Florida Power and Light and Other Municipal/Private Power Companies (Lake Worth Utilities, etc.) | Historical data on impacts to the power grid |
| Southern Bell | Historical data on communication impacts |
| AT&T Wireless Services | Historical data on communications disruptions |
| U. S. Cellular Wireless Communications | Historical data on communications disruptions |
| The Palm Beach Post | Historical data general |
| Local Radio and Television Stations | Historical data on losses and possible future losses |
| NASA Natural Disaster Reference Database | Lightning statistics |
| National Weather Service | Lightning strike data |
| National Climate Data Center - On-Line Data Base | Lightning strike data |
| NOAA Lightning Related Fatalities Data Base | Lightning fatalities |
| National Lightning Safety Institute (NLSI) | Lightning research and protection measures |
| Florida State University | Data and expertise concerning all natural hazards |

| Source | Data Type |
|---|---|
| Florida Atlantic University | Data and expertise concerning all natural hazards |
| University of Florida Lightning Research Laboratory | Current research on lightning causes and effects |
| National Severe Storms Laboratory | Lightning statistics |
| Independent Insurance Agents of America (Natural Disaster Risk Database) | Financial losses attributable to lightning and related electromagnetic discharges |
| Florida Department of Community Affairs, Division of Emergency Management | Data on major fires caused by lightning |
| Florida Fire Chief's Association | Data on fires caused by lightning |
| South Florida Water Management District | Data on lightning related losses |
| Palm Beach County Airports Department | Lightning data and protective measures |
| Palm Beach County Fire and Rescue | Lightning related fires and injuries |
| Palm Beach County Parks & Recreation Department | Data on lightning related losses |
| Palm Beach County Public Safety Department Division of Emergency Management | Lightning protection procedures |
| Palm Beach County Sheriff Department | Data on communication disruption |
| Florida Power and Light | Financial losses and power grid disruptions due to lightning |
| Southern Bell | Financial losses and communications disruptions due to lightning |
| AT&T Wireless Services | Financial losses and communications disruptions due to lightning |
| U. S. Cellular Wireless Communications | Financial losses and communications disruptions due to lightning |
| The Palm Beach Post | Historical data on significant lightning related events |
| **Flooding** | |
| Association of State Floodplain Managers | Floodplain data, flooding statistics, and mitigation approaches |
| Natural Hazards Research Center | Technical data on all natural hazards |
| NOAA Flood Related Fatalities Data Base | Flood related fatalities |
| NOAA Hydrologic Information Center | Hydrologic data |
| NOAA Tropical Cyclone Database | Rainfall associated with storm type events |
| NASA Natural Disaster Reference Database | Specific flooding and mitigation data nationwide |
| NASA Flood Hazard Research Center | Flood research and mitigation approaches |

| Source | Data Type |
|---|---|
| National Weather Service | Climatic data |
| National Climate Data Center - On-Line Data Base | Weather/rain fall historical data |
| National Flood Proofing Committee Data Base | Mitigation procedures |
| National Association of Flood and Storm Water Management Agencies | Storm water management data and procedures |
| Atlantic Ocean and Meteorological Laboratory, Hurricane Research Division | Historical meteorological data |
| Federal Emergency Management Authority | Historical flooding data |
| Tropical Storm Watch Database | Rainfall events and flooding data |
| Flood Insurance Rate Maps and Community Status Book | Identification of properties within the flood plane |
| U. S. Geological Survey | Topographic maps |
| U. S. Army Corps of Engineers | Historical flooding data and flood prevention projects |
| Dartmouth Flood Observatory | Flooding research |
| Earth Satellite Corporation (EarthSat) Flood watch Data Base | Historical flooding data |
| Florida State University | Data and expertise concerning all Florida natural hazards |
| Florida Atlantic University | Data and expertise concerning all Florida natural hazards |
| National Severe Storms Laboratory | Rainfall data and related flooding events |
| Independent Insurance Agents of America (Natural Disaster Risk Database) | Property and financial losses as a result of flooding |
| Florida Department of Community Affairs, Division of Emergency Management | Historical data on flooding events in Palm Beach County |
| Florida Association of Floodplain Managers | Flooding data specific to Florida |
| Florida Department of Environmental Protection | Environmental parameters and risk associated with flooding |
| Florida Game and Fresh Water Fish Commission | Wildlife resources impacted by flooding |
| South Florida Water Management District | Water management, hydrology, and flood prevention procedures |
| Palm Beach County Planning, Zoning, and Building Department | Zoning ordinances and building codes that affect flood protection |
| Palm Beach County Property Appraiser | Property value within flood zones |

| Source | Data Type |
|---|---|
| Palm Beach County Automated Information Management | Historical flooding and critical facilities in flood zones |
| Palm Beach County Engineering and Public Works Department | Highway and storm water management procedures |
| Palm Beach County Environmental Resources Management Department | Water resources and flooding data |
| Palm Beach County Fire and Rescue | Flooding associated fires and injuries |
| Palm Beach County Health Department | Disease risk and contamination potential associated with flooding |
| Palm Beach County Parks & Recreation Department | Recreational resources at risk due to flooding |
| Palm Beach County Public Safety Department Division of Emergency Management | Historical flooding data and emergency management procedures |
| Division of Animal Regulation | Animal control problems associated with flooding |
| Palm Beach County Sheriff Department | Emergency management procedures associated with flooding |
| Palm Beach County Water Utilities | Critical facilities at risk due to flooding and potential impacts |
| Independent Drainage Districts | All independent drainage districts will be contacted for historical data and identified areas at risk |
| Palm Beach County Red Cross | Historical flooding data and repetitively damaged structures data |
| Florida Power and Light | Flooding emergency plans and critical facilities at risk |
| The Palm Beach Post | Historical data on flooding incidents |
| **Freezing Temperatures** | |
| National Climate Data Center - On-Line Data Base | Historical records on freezing temperatures |
| National Weather Service | Historical records on freezing temperatures |
| U. S. Department of Agriculture - County Extension Agents | Local agricultural data on frequency, impacts, and financial losses due to freezing temperatures |
| Florida Citrus Commission | Frequency and amount of financial losses to citrus crops due to freezing temperatures and long term industry impacts |
| Florida Department of Citrus | Frequency and amount of financial losses to citrus crops due to freezing temperatures and current mitigation strategies |

| Source | Data Type |
|---|---|
| Florida Department of Agriculture & Consumer Services | Frequency and amount of financial losses to all agricultural business as a result of freezing temperatures |
| Florida Farm Bureau | Frequency and amount of financial losses to all agricultural business as a result of freezing temperatures and current mitigation and risk reduction strategies |
| Florida State University | Agricultural research and new mitigation strategies to reduce freeze impacts |
| Florida Atlantic University | Freeze impacts to aquaculture industry |
| University of Florida | Agricultural research and new mitigation strategies to reduce freeze impacts |
| University of Miami | Agricultural research and new mitigation strategies to reduce freeze impacts |
| Florida Department of Environmental Protection | Environments at risk from freezing and environmental consequences of current agricultural mitigation strategies |
| South Florida Water Management District | Climate records and water demands associated with freeze mitigation |
| Palm Beach County Department of Agriculture | Historical impact and financial losses resulting from freezing temperatures in Palm Beach County |
| Palm Beach County Citrus and Farming Interest | Historical freeze losses and current mitigation strategies |
| Palm Beach County Red Cross | Impacts to poor and homeless due to freezing temperatures |
| **Wildfires/Urban interface Zone and Muck Fires** | |
| National Weather Service | Climate data/drought predictions |
| National Interagency Coordination Center Reports | Wildfire repots |
| National Climate Data Center - On-Line Data Base | Climate data |
| U. S. Forest Service | Wildfire reports and preventative measures |
| U. S. Department of Agriculture - County Extension Agents | Controlled burning/muck deposits |
| U. S. Geological Survey | Soil types/muck deposits |
| Florida Geological Society | Soil types/muck deposits |

| Source | Data Type |
| --- | --- |
| The Wildfire Assessment System | Wildfire statistics and containment procedures |
| Florida Forest Protection Bureau | Florida specific wildfire statistics and current preventative practices |
| Florida Department of Environmental Protection | Natural resources at risk and protective measures |
| Florida Fire Chief's Association | Florida specific wildfire statistics, firefighting technology, and potential mitigation measures for Florida communities |
| South Florida Water Management District | Water resources and right of way management practices |
| Palm Beach County Department of Agriculture | Land use patterns in Palm Beach County to establish areas at risk |
| Palm Beach County Planning Zoning & Building Department | Land use patterns in Palm Beach County to establish areas at risk |
| Palm Beach County Parks & Recreation Department | Land use patterns in Palm Beach County to establish areas at risk |
| Palm Beach County Fire Rescue - Fire Prevention Bureau | Land use patterns in Palm Beach County to establish areas at risk and current or in-place protective measures |
| Wildfire Magazine Data Base | Wildfire statistics |
| Palm Beach Post | Historical data on Palm Beach County wildfires/muck fires |
| **Drought and High Temperatures** | |
| National Weather Service | Climate data and drought predictions |
| National Climate Data Center - On-Line Data Base | Climate data |
| U.S.G.S. Historical and Real Time Data on Water Resources of South Florida | Water resources |
| U. S. Department of Agriculture - County Extension Agents | Historical data on droughts and the economic impacts to local agriculture |
| Florida Citrus Commission | Economic losses to the citrus industry from droughts |
| Florida Department of Citrus | Economic losses to the citrus industry from droughts and current irrigation technology |
| Florida Forest Protection Bureau | Drought statistics |
| Florida Department of Environmental Protection | Environmental impacts of droughts to natural ecosystems |
| Florida Department of Agriculture & Consumer Services | Agricultural losses due to droughts and current irrigation technology |

| Source | Data Type |
|---|---|
| South Florida Water Management District | Water allocations during drought conditions |
| Palm Beach County Department of Agriculture | County specific economic losses from drought and current economic vulnerability |
| Palm Beach County Parks & Recreation Department | Recreational resources impacted by droughts |
| Palm Beach County Water Utilities | Impacts from droughts of the potable water supplies and impacts in urban areas<br>Water rationing plans |
| Municipal water utilities | Impacts of and water allotment plans during times of droughts in cities<br>Water rationing plans |
| **Coastal & Beach Erosion** | |
| Florida Inland Navigational District | Maintenance records for the Intracoastal Waterway and other Palm Beach County navigable waters |
| South Florida Water Management District | Canal maintenance and erosion |
| Palm Beach County Environmental Resources Department | Environmental problems associated with erosion control and natural resources threatened by erosion |
| Palm Beach County Engineering and Public Works Department | Current erosion prevention measures |
| Palm Beach County Parks & Recreation Department | Current erosion prevention measures |
| Palm Beach County Coastal Municipalities | Current erosion prevention measures |
| Jupiter Inlet District | Information on beach erosion in and around Jupiter Inlet |
| Port of Palm Beach | Information on beach erosion in and around channel and inlet |
| **Agricultural Pest and Diseases** | |
| U. S. Forest Service | Forest diseases and current problem/preventative measures |
| U. S. Dept. of Agriculture - County Extension Agents | Local agricultural pest and potential exotic treats |
| U. S. Customs | Current programs to prevent introduction of agricultural pest and diseases |
| Florida Farm Bureau | Economic losses due to agricultural pest and diseases |

| Source | Data Type |
|---|---|
| Florida Citrus Commission | Citrus losses due to agricultural pest and diseases |
| Florida Forest Protection Bureau | Forest diseases and current problem/preventative measures |
| Florida State University | Agricultural research and pest control |
| Florida Atlantic University | Agricultural research and pest control |
| University of Florida | Agricultural research and pest control |
| University of Miami | Agricultural research and pest control |
| Florida Department of Environmental Protection | Environmental resources at risk and environmental consequences of current or proposed control measures |
| Florida Department of Agriculture & Consumer Services | Economic losses from agricultural pest and diseases and current control technology |
| Palm Beach County Department of Agriculture | Economic losses and current control programs |
| Palm Beach County Parks & Recreation Department | Pest control programs on public lands |
| **Seismic Hazards** | |
| U. S. Geological Survey | Geologic structure and seismic risk |
| Florida Geological Society | Geologic structure and soil characteristics |
| **Technological Hazards** | |
| **Radiological Hazards** | |
| U. S. Nuclear Regulatory Commission | Nuclear power plant regulation, accident statistics, and emergency procedures |
| Federal Emergency Management Agency | Nuclear power plant accident statistics, and emergency procedures |
| National Emergency Management Agency | Nuclear power plant and radiological emergency management procedures |
| Florida Division of Emergency Management | Nuclear power plant and radiological emergency management procedures |
| Florida Emergency Preparedness Association | Radiological emergency management procedures |
| State & Local Emergency Data Users Group Data Base | Radiological accident management database |
| Florida Power and Light Emergency Plan | Industry emergency management plans |
| Palm Beach County Division of Emergency Management Comprehensive Emergency Management Plan (CEMP) | Local radiological emergency management plan |

| Source | Data Type |
|---|---|
| Hospital Plans - Both Radiological Materials Disposal (Hazardous Waste) and Mass Radiation Casualties or Nuclear Accident Plans | Local radiological emergency plans and safeguards |
| **Hazardous Materials** | |
| Federal Emergency Management Agency | Hazardous material emergency management guideline |
| National Transportation Safety Board | Hazardous material transport regulation, spill cleanup procedures, and spill statistics |
| Occupational Safety and Health Agency | Hazardous material handling requirements |
| U. S. Environmental Protection Agency | List of hazardous materials |
| Hazardous Chemicals Database (On-line) | Hazardous materials data |
| Material Safety Data Sheets (On-line) | Specific chemical facts |
| State Emergency Response Commission (SERC) Emergency Plan for Hazardous Materials | Spill response procedures |
| Florida District and Local Emergency Planning Committee (LEPC) Emergency Plan for Hazardous Materials | Local sources and emergency management plans (vulnerabilities) |
| Facilities Database for Users of Extremely Hazardous Substances (EHS) and Hazardous Materials | Geo-referenced local database of users |
| Florida Division of Emergency Management | Methodology for handling hazardous material releases |
| Florida Emergency Preparedness Association | Methodology for handling hazardous material releases |
| Florida Department of Transportation | Highway spill data for hazardous material spill data<br>Methodology for handling hazardous material releases |
| State & Local Emergency Data Users Group Database | Spill and release of hazardous materials statistics |
| Florida Fire Chiefs Association | Hazardous material emergency plans and containment procedures<br>Spill/release statistics |
| Palm Beach County Division of Emergency Management | Methodology for handling hazardous material releases |
| Palm Beach County Fire Rescue | Methodology for handling hazardous material releases |
| Municipal Fire and Police Departments | Methodology for handling hazardous material releases |

| Source | Data Type |
|---|---|
| Palm Beach County Health Department | Methodology for handling hazardous material releases and emergency treatment procedures |
| Identified Users of EHS Emergency Plans | Industry control and emergency management plans for hazardous material |
| Local Gasoline and Natural Gas Companies | Location of critical facilities/infrastructure elements |
| **Transportation System Accidents** | |
| Federal Aeronautical Administration | Aircraft accident statistics and airport safety procedures |
| National Transportation Safety Board | Aircraft accident statistics |
| U. S. Coast Guard | Boating/shipping accidents (including oil and hazardous materials releases) and spill containment procedures |
| Florida Department of Transportation - Motor Carrier Compliance Division | Truck accidents (including oil and hazardous materials releases) |
| Florida Highway Patrol | Truck accidents (including oil and hazardous materials releases) |
| Florida Marine Patrol | Boating/shipping accidents (including oil and hazardous materials releases) and spill containment procedures |
| Palm Beach County Airports Department | Aircraft accident statistics and airport safety procedures |
| Palm Beach International Airport | Aircraft accident statistics and airport safety procedures |
| Port of Palm Beach Port Authority | Port management, accident statistics, and emergency management procedures |
| Palm Beach County Sheriff's Department - Marine Unit and Environmental Crimes Unit | Boating/shipping accidents (including oil and hazardous materials releases), spill containment procedures, and environmental crimes statistics |
| Florida East Coast Railway | Railway accident statistics (including oil and hazardous materials releases), and safety procedures |
| CSX Rail | Railway accident statistics (including oil and hazardous materials releases), and safety procedures |
| Palm Beach County Fire Rescue | Accident statistics involving injuries in Palm Beach County |
| Municipal police and fire departments | Accident statistics involving injuries in the cities |
| **Power/Communications/Computer Grid System Failures** | |

| Source | Data Type |
|---|---|
| Florida Power and Light Emergency Management Plans and Historical Database | Historical data and emergency management plans |
| Bell South Emergency Management Plan and Historical Database | Historical data and emergency management plans |
| Cellular and Satellite Communication Companies | Historical data and emergency management plans |
| The Banking Industry (Large Area Network - LANs Protection and Emergency Restoration Plans, as well as historical data on system failures) | Historical data and emergency management plans |
| **Human Caused Hazards** | |
| **Civil Disturbance** | |
| Federal Bureau of Investigation Database | Historical data |
| National Security Council Database | Historical data and risk analysis |
| Drug Enforcement Agency Database | Historical data |
| Immigration and Naturalization Service Database | Historical data |
| U. S. Customs Service | Historical data |
| U. S. Census Database | Population demographics |
| Florida Department of Law Enforcement | Historical data and situation plans |
| Florida Department of Health Education and Welfare | Historical data |
| Palm Beach County Sheriff's Department | Historical data and situation plans |
| Municipal Police Departments | Historical data and situation plans |
| Palm Beach County Fire Rescue | Historical data and situation plans |
| Palm Beach County Division of Emergency Management | Historical data and situation plans |
| **Domestic Security: Terrorism, Sabotage, and Cyber Attacks** | |
| Federal Bureau of Investigation Database | Historical data, situation plans, and risk analysis |
| National Security Council Database | Historical data, situation plans, and risk analysis |
| Drug Enforcement Agency Database | Historical data |
| Immigration and Naturalization Service Database | Historical data and preventative measures |
| U. S. Census Database | Population demographics |
| Florida Department of Law Enforcement | Historical data, situation plans, and risk analysis |
| Florida Department of Health Education and Welfare | Population demographics |
| Palm Beach County Sheriff Department | Historical data, situation plans, and risk analysis |

| Source | Data Type |
|---|---|
| Municipal Police Departments | Historical data, situation plans, and risk analysis |
| Palm Beach County Fire Rescue | Historical data, situation plans, and risk analysis |
| Palm Beach County Division of Emergency Management | Historical data on injuries |
| American Society for Industrial Security | Risk analysis techniques and database |
| **Mass Migration** | |
| U. S. Coast Guard | Historical data and situation plans |
| Immigration and Naturalization Service | Historical data, situation plans, and risk analysis |
| Florida Marine Patrol | Situation plans and interagency coordination |
| Florida Department of Law Enforcement | Historical data, situation plans, risk analysis, and interagency coordination |
| Florida Department of Health, Education and Welfare | Population demographics |
| Palm Beach County Sheriff Department | Historical data, situation plans, risk analysis, and interagency coordination |
| Municipal Police Departments | Historical data, situation plans, risk analysis, and interagency coordination |
| Palm Beach County Fire Rescue | Situation plans and interagency coordination |
| Palm Beach County Division of Emergency Management | Historical data and medical risk analysis |
| **Workplace/School Violence** | |
| Palm Beach County Division of Emergency Management | Workplace/School Violence Hazard Specific Plan |
| **Miscellaneous Data Sources** | |
| Federal Bureau of Investigation Database | Historical data |
| National Security Council Database | Historical data |
| Drug Enforcement Agency Database | Historical data |
| Immigration and Naturalization Service Database | Historical data |
| U. S. Census Database | Population demographics |
| U. S. Public Health Service | Disease risk |
| Florida Department of Law Enforcement | Historical data |
| Florida Department of Health Education and Welfare | Historical data |
| Florida Department of Labor | Historical data |

| Source | Data Type |
|---|---|
| Palm Beach County Sheriff Department | Historical data |
| Municipal Police Departments | Historical data |
| Palm Beach County Fire Rescue | Historical data |
| Palm Beach County Health Department | Historical data |

Sources used by HVA Subcommittee for 2020 LMS Update:

| | |
|---|---|
| Florida Division of Emergency Management | State Hazard Mitigation Plan Hazard Profile Drafts (2017) |
| Treasure Coast Regional Planning Commission | Palm Beach County Appendix, 2016 Supplemental Summary, Statewide Regional Evacuation Summary |
| Florida Department of Environmental Protection | The Favorability of Florida's Geology to Sinkhole Formation (2017) |
| Florida Division of Emergency Management | Mitigation Goals and Capabilities (2018 Draft) |
| Florida Division of Emergency Management | Florida Repetitive Loss Strategy (2017 Draft) |

The above referenced plans and studies were used throughout this document as a review and incorporation of existing plans, studies, reports, and technical information in order to bolster this LMS plan.

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# Appendix B: Countywide Mitigation Initiatives

Appendix B provides a description of representative mitigation programs and initiatives undertaken by PBC and its jurisdictions, and the principles guiding intergovernmental coordination. These programs and initiatives served as the basis for the mitigation projects outlined in Appendix E. This appendix includes:

Section B-1 Mitigation Initiatives of PBC

This sections addresses, in part, the following FEMA requirements:

**Requirement §201.6(c)(3)(i):** The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

**Requirement §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 effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. The mitigation strategy must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Requirement: §201.6(c)(3)(iii):** The mitigation strategy section shall include an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization *shall* include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

**B-1: PBC Initiatives**

Palm Beach County and its 39 municipalities participate in a full range of federal, state, and local mitigation programs and initiatives. Representative of these programs and initiatives are the LMS, Community Rating System (CRS), National Flood Insurance Program (NFIP), Flood Mitigation Assistance Program (FMA), Pre-Disaster Mitigation Program (PDM), Hazard Mitigation Grant Program (HMGP), Emergency Management Preparedness & Assistance Program (EMPA), CERT, Continuity of Operations, Post Disaster Redevelopment Plan (PDRP), ESF18, Private-Public Partnerships, counter-terrorism, radiological emergency preparedness initiatives, hazardous materials, etc. The overarching purpose of these activities is the elimination or mitigation of hazards presenting significant risk to PBC and its residents. The Palm Beach County Division of Emergency Management successfully obtained accreditation by the Emergency Management Accreditation Program (EMAP) in 2016, proving its commitment to the highest standards in emergency management, including mitigation measures. PBCDEM is committed to, and has been evaluated and accredited as completing EMAP Standards 4.1 through 4.4 relating to mitigation programs. These standards include:

- Hazard Identification, Risk Assessment, and Consequence Analysis,
- Hazard Mitigation,
- Prevention, and
- Operational Planning and Procedures.

The LMS program and its companion mitigation programs are described in detail in Section 4.1.4.

A major mitigation priority of the LMS is the reduction of repetitive flood losses to properties. The County and its CRS participating municipalities track repetitive loss properties countywide on an ongoing basis using data gathered annually from FEMA and the State's Focus reports. For mitigation planning and strategy development purposes, LMS maintains updated GIS maps and informational databases of repetitive loss property locations relative to historical flood areas and designated Special Flood Hazard Areas. Repetitive loss properties are an ongoing discussion and planning priority for the LMS, CRS, and Flood Mitigation Technical Advisory committees. These committees, comprised of public and private sector representatives, are encouraged to develop and promote mitigation project ideas and strategies. As a result, a majority of the projects on the Prioritized Project List (PPL) are flood mitigation projects.

In accordance with CRS guidelines, letters are mailed annually to repetitive loss property owners by PBC and municipalities, explaining NFIP program benefits, the availability of mitigation assistance funding through the FMA and other mitigation assistance programs. Non-CRS members of the LMS are encouraged to stay in compliance with NFIP standards.

Information and support is provided in a variety of forms to potential FMA applicants to assist them in developing projects and preparing application packages. Through PBC's LMS committee structure, members of the Technical Advisory Committee is available to offer technical guidance and assistance to applicants, including assistance in preparing benefit-cost analyses.

Mitigation projects are prioritized and implemented according to their direct potential for loss reduction or for their potential in contributing to longer-term, comprehensive plans and strategies for loss reduction. Once projects are underway, it is the responsibility of each jurisdiction to support and monitor performance in accordance with FEMA, state and local guidelines and codes, and to oversee and coordinate documentation and funding processes.

In addition to support of projects, mitigation is encouraged and promoted through a variety of community awareness and education activities including presentations, workshops, expos, panel discussions, plan reviews, publications, websites, etc. prepared and presented utilizing networks of public-private sector partners. As opportunities present themselves, lending institutions and insurers are urged to provide financial incentives for mitigation. Jurisdictions are urged to accelerate permitting and inspections and, if allowable, to waive or reduce fees for mitigation projects. In addition to mitigation incentives, millions of dollars of annual insurance premium savings are realized by a significant segment of PBC residents residing within the County's CRS participating jurisdictions.

Involvement of Planning, Zoning, and Building, Fire-Rescue, and other departments in LMS activities, including committee participation, bolsters communication among key agencies and the LMS. This ensures that mitigation interests are appropriately represented in local building codes, fire codes, land-use ordinances, flood loss prevention ordinances, and other governing documentation.

The PBC LMS plan articulates the goals and objectives of the County and its municipalities to avoid and/or reduce long-term vulnerability to hazards identified by the hazard identification and risk assessment processes. More detailed descriptions of the strategies, programs, and actions are contained in the body of the plan and reflected in the list of prioritized projects in Appendix E. Under the committee structure of the LMS program, increased attention is given to expanding and refining hazard-specific mitigation strategies exclusive of jurisdictional boundaries, capabilities, and interests, and to giving appropriate attention to mitigation in planning future land uses (see Appendix C).

The process and criteria employed for ranking mitigation projects and initiatives are described in detail in Section 4.0 of the LMS plan. In response to federal guidelines applying to grant awards through the Pre-Disaster Mitigation, Flood Mitigation Assistance, and HMGPs, particular emphasis is given to technically feasible and environmentally responsible projects having attractive ratios of loss reduction benefits to cost. Projects involving worthy benefits that are difficult to quantify are given serious consideration, in light of different sets of criteria and are referred to appropriate alternative funding sources not requiring stringent benefit-cost justifications.

Short-term and long-term recovery strategies are addressed by the County and municipal Continuity of Operations Plans, the CEMP, the Post-Disaster Redevelopment Plan, and specialized plans and procedures covering key recovery issues such as debris removal, public services resumption, temporary housing, unmet needs, etc. These plans, procedures, and projects address and provide guidance on priorities, processes, schedules, resource requirements, restoration, and redevelopment of critical facilities, infrastructure, services, and economic redevelopment.

The PBC Comprehensive Plan (COMP) includes the following elements: Land Use, Transportation, Housing, Utility, Recreation and Open Space, Conservation, Coastal Management, Intergovernmental Coordination, Capital Improvement, Economic, Fire-Rescue, Public School Facilities, Health and Human Services, Library Services and Historic Preservation. These elements define the components of the community and the inter-relationship among them, integrating the complex relationships of each of these elements in reference to the people who live, work, and visit PBC. Linkages of the COMP plan and LMS have been incorporated into the COMP plan.

Post-disaster mitigation initiatives are developed in response to needs and opportunities identified through collective federal, state, and local inputs following the guidance offered by the Post Disaster Redevelopment Plan. The County and LMS members are also available to work state and federal Mitigation Assessments Teams. It is PBC's goal following disasters to rebuild to a higher standard (meeting or exceeding codes) and, whenever practicable, to apply sound mitigation practices to reduce future risk.

# Appendix C: Incorporation into Other Planning Mechanisms

This appendix addresses the following FEMA requirement:

**Requirement §201.6(c)(4)(ii):** The plan 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, where appropriate.

Under the direction of the LMS Steering Committee and the LMS Coordinator, the ad hoc Plan Integration Committee interfaces with appropriate governmental and non-governmental agencies and offices to ensure LMS goals, objectives, data, and priorities are consistent with and cross-referenced with those articulated in other existing plans. This is done with coordination of all 39 municipalities. In addition, the LMS will seek opportunities at the regional, county, and municipal levels to:

- Update plans, policies, regulations, and other directives to include hazard mitigation priorities
- Encourage the adoption of mitigation priorities within capital and operational budgets and grant applications
- Share information on grant funding opportunities
- Offer guidance for carrying out mitigation actions
- Explore opportunities for collaborative mitigation projects and initiatives

Municipalities

Through our dedicated LMS Working Group meetings, all jurisdictions, including unincorporated PBC, consistently incorporate lessons learned and mitigation actions taken into their local plans, including the Comprehensive Plan, LMS, CEMPs, Capital Improvement Plan, and other local plans in which mitigation can play a role in the planning process. This plan is able to describe each community's process to integrate the data, information, and hazard mitigation goals and actions into other planning mechanisms in some of the following examples:

- The municipalities have established basic Emergency Management Plans that produces the procedures for all activities of the municipality before, during, and after recognized emergencies.
- A Storm Water Management Plan, which is focused on flood-related hazards and defines the relevant mitigation goals, evaluates appropriate and feasible mitigation measures and prioritizes such measures into an Action Plan for systematic implementation.
- A Floodplain Management Plan manages land and building development in the floodplain. All cities within the county are striving to establish a floodplain management plan and participate in the CRS. The NFIP has stated that the LMS may serve as a floodplain management plan for its participants. All our municipalities and water management districts utilize the LMS as the floodplain management plan.

- A Comprehensive Growth Management Plan controlling growth and development within the municipality.

Municipal and County Agencies and Mitigation Functions

PBC municipalities and water management districts each have within their structure certain departments and agencies which affect and promote mitigation. While these agencies may have slightly different names from village to town to city, the role they perform in the mitigation function remains similar.

PBC Public Works operates and maintains and operates drainage systems and the secondary canals throughout the County, working with the SFWMD and water management districts to implement flood control operations, when required.

Police and fire rescue departments: Many of the municipalities maintain their own Police Departments and/or fire rescue departments. Emergency responders are essential for alert and notification, lifesaving response, prevention and protection activities that all contribute to lessening the impact of identified hazards. The police and fire rescue departments also conduct educational seminars to residents to spread awareness on hazard awareness and emergency preparedness.

The Planning, Zoning, and Building Department: The functions of this department relate extensively to a wide range of mitigation projects and on-going mitigation activities. In most of our cities, the County Building Official is responsible for interpreting and enforcing all laws, codes, ordinances, regulations and municipal policies related to the construction, improvement, expansion, repair or rehabilitation of buildings within the whole County. These departments ensure that all new construction complies with the Florida Building Code which in itself is a major contribution to hazard mitigation. The department is responsible for the management of land development in Special Hazard Areas; preservation of open space; general control of land use intensities; and coordination between the capacity of public infrastructure in relation to proposals of private development. They also ensure all proposed developments in the County conforms to comprehensive plans as it relates to urban design of public areas and buildings, infrastructure planning and maintenance of flood data and other statistical information.

Planning and Development Department: Often as a part of the building department and even, at times, a part of public works. However, a number of our municipalities maintain planning and development as a separate entity which interacts within the mitigation strategy in many ways and must be part of the overall strategy especially in the area of urban land use.

Public Works Department: In most of our cities this department is responsible for construction and maintenance of roads, bridges and waterways, and storm water management including drainage system development, inspection and maintenance, all functions that relate in various ways to hazard mitigation. Public works activities are a major component of any mitigation strategy.

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# Appendix D: Public Involvement in the LMS Planning Process

This appendix addresses the following FEMA requirements:

**§201.6(b)(1) and §201.6(c)(1):** The plan will document how the public was involved in the planning process during the drafting stage.

**§201.6(c)(4)(iii)**: The plan must describe how the jurisdiction will continue to seek public participation after the plan has been approved and during the plan's implementation, monitoring, and evaluation.

The PBC LMS Steering Committee, Working Group, and Revisions Subcommittee worked extensively to gather public interest in reviewing the current plan and providing suggestions or input on the future draft of the plan that you are now reading. There were two (2) public input meetings held prior to any changes being made in the document, in order to gather this public information. The meetings were advertised through press releases, the LMS Times (LMS's quarterly newsletter that is distributed to the public through municipalities and the DEM website), social media (Facebook and Twitter), the DEM webpage, and through our LMS membership through their public interface in other outreach programs being conducted in the lead-up to the meetings.

Public input meetings were held on September 28, 2017 and October 4, 2017 during both business hours and after-hours in order to maximize availability to interested citizens. Unfortunately, even with all the effort to gain public interest, very few members of the public attended. Those that did attend did not provide any new information that was not already included in the current LMS document, or had already been identified in the future draft that was about to be written.

The LMS Coordinator, at the direction of the LMS Steering Committee, also produced an online survey to gather information from members of the public as to hazards, vulnerabilities, and mitigation for those that were unable to attend a meeting in person. This online survey was advertised via the DEM website, various municipality webpages, social media, and word of mouth. The survey ran for two months and received several responses. The results of those responses were forwarded to the Revisions Subcommittee and the Steering Committee for possible inclusion into the LMS2020 draft document. However, due to Hurricane Irma striking during the time that the survey was online, many of the responses were very hurricane-oriented in nature, not useful for other hazards, and did not provide any new usable information for the LMS2020 draft.

Finally, a brochure was produced asking for public input on hazards and mitigation strategies against hazards within PBC, and was distributed by the members of the LMS Working Group, Steering Committee, and Revisions Subcommittee throughout PBC. These brochures announced the public meetings as well as asking for public input through email to the LMS Coordinator. Many municipalities placed these brochures in highly-visible and trafficked public areas within their town halls, some were given out at various public outreach events, to neighborhood associations, and placed at other public places (such as grocery stores) in an effort to get public input.

Another public meeting, brochure, and online survey was done after the final draft was completed and awaiting approval, to give the public the opportunity to review the final draft document and make any suggestions for editing. There were two (2) public input meetings held, in order to gather this public information. The meetings were advertised through press releases, the LMS Times (LMS's quarterly newsletter that is distributed to the public through municipalities and the DEM website), social media (Facebook and Twitter), the DEM webpage, and through our LMS membership through their public interface in other outreach programs being conducted in the lead-up to the meetings.

Public input meetings on the final draft were held on May 2, 2019 and May 20, 2019 during both business hours and after-hours in order to maximize availability to interested citizens. Unfortunately, even with all the effort to gain public interest, very few members of the public attended.

The LMS Coordinator, at the direction of the LMS Steering Committee, also produced an online survey to gather information from members of the public as to hazards, vulnerabilities, and mitigation for those that were unable to attend a meeting in person. This online survey was advertised via the DEM website, various municipality webpages, social media, and word of mouth. The survey ran for four (4) weeks and received few responses. The results of those responses were forwarded to the Revisions Subcommittee and the Steering Committee for possible inclusion into the LMS2020 draft document. However, many of the responses were very hurricane-oriented in nature, not useful for other hazards, and did not provide any new usable information for the final LMS2020 draft.

Finally, a brochure was produced asking for public input on hazards and mitigation strategies against hazards within PBC, and was distributed by the members of the LMS Working Group, Steering Committee, and Revisions Subcommittee throughout PBC. These brochures announced the public meetings as well as asking for public input through email to the LMS Coordinator. Again, many municipalities placed these brochures in highly-visible and trafficked public areas within their town halls, some were given out at various public outreach events, to neighborhood associations, and placed at other public places (such as grocery stores) in an effort to get public input.

During the plan's implementation, monitoring, and evaluation, the LMS Steering Committee will continue to reach out to the public for input. This will be done through public meetings, online surveys, LMS newsletters, outreach presentations, social media posts, or a combination of any of these methods.

The following pages present documentation from the public input outreach that was conducted prior to the drafting of the LMS2020 update. The first set of pages deal with the public meetings.

Public Affairs Department
P.O. Box 1989
West Palm Beach, FL 33402-1989
(561) 355-2754
FAX: (561) 355-3819
www.pbcgov.com



# Media Advisory

| | |
|---|---|
| For release | August 18, 2017 |
| Contact | Shane Ratliff, (561) 712-6481 |

## Local Mitigation Strategy (LMS) Public Input Meeting

The Palm Beach County Public Safety Department's Division of Emergency Management will be holding two (2) meetings to provide an opportunity for the public to view the draft Local Mitigation Strategy (LMS) and make comments for consideration into the plans update.

The public is encouraged to view the current document on the Palm Beach County Division of Emergency Management's website at http://discover.pbcgov.org/publicsafety/dem/Publications/Local-Mitigation-Strategy.pdf

| | |
|---|---|
| **Who:** | **All interested persons** |
| **What:** | **Public Input to the Local Mitigation Strategy (LMS) Update** |
| **Where:** | **Lakeview Room – Wellington Community Center – 12150 Forest Hill Blvd. – Wellington, Fl** |
| **When:** | **September 28, 2017 from 5:30 pm – 6:30 pm** |
| | **Or** |
| **Where:** | **Auditorium – South Florida Water Management District – 3301 Gun Club Road – West Palm Beach, Fl** |
| **When:** | **October 4, 2017 from 1:30 pm – 2:30 pm** |
| **Contact:** | **Shane Ratliff at (561) 712-6481** |

## Local Mitigation Strategy

The Palm Beach County Local Mitigation Strategy is the guiding document used by the County and all 39 municipalities to identify community hazards, prioritize mitigation projects, and mitigate existing hazards.

Public input is needed in the process of revising our LMS for 2020. If you are unable to come to a public meeting, please email all input to SRatlif1@pbcgov.org by October 31, 2017 for consideration and possible inclusion in the 2020LMS.

***For those unable to attend the public input meetings, the brochure (linked from our website and given out at various events) still allows the public to send input on hazards by emailing the LMS Coordinator by a specified date (above), up to 4 weeks after the public meetings are over.***

FLORIDA

**T**ogether **E**mergencies **A**re **M**anaged

Palm Beach County

EM

Palm Beach County Division of Emergency Management

Shane Ratliff, Special Projects Coordinator
Local Mitigation Strategy
20 S Military Trail
West Palm Beach, FL 33415

Phone: 561-712-6481
Email: SRatliff1@pbcgov.org

Strategy

2020 Update

### We Need Your Help

The Palm Beach County Unified Local Mitigation Strategy is about to undergo an update! We need the public's help in making that update a success. We will be holding 2 public meetings to solicit input from the public and other stakeholders in Palm Beach County relating to existing, new, or upcoming hazards, as well as mitigation strategies to combat existing hazards within our county.

Our LMS Revisions Committee and Steering Committee members will be on hand to help answer questions, but mainly to hear from you regarding mitigation and your ideas so that they can be considered for inclusion in the 2020 LMS for Palm Beach County.

### What is the LMS?

The LMS is a document , reviewed and revised every 5 years, that is the FEMA approved mitigation strategy for Palm Beach County and all of its municipalities. It is also used by special taxing districts, some non-profits, and other jurisdictions as a guiding document for how to identify hazards, develop projects, and institute those projects to mitigate hazards. FEMA then administers several federal grants to help local communities deal with, prevent, and mitigate these identified hazards through projects that are submitted, evaluated, and ranked on our LMS Project Prioritized List (PPL).

### What role does the public play?

The public is being solicited for input and information into the revisions process both before the revisions begin, and again after the revisions are made. The LMS works for you in your community, and your input is not only encouraged, it is welcomed.

There are also LMS Working Group meetings held quarterly to discuss mitigation, projects, and best practices in mitigation. The public is encouraged to be part of the process and attend these meetings as well.

### When are these public meetings, and where?

Our first public meeting to gather public input will be Thursday, September 28, 2017 from 5:30 to 6:30 p.m. at the Lakeview Room of the Wellington Community Center, 12150 Forest Hill Blvd in Wellington, FL.

The second meeting will be held on October 4, 2017 from 1:30 to 2:30 p.m. in the auditorium of the South Florida Water Management District, 3301 Gun Club Road, West Palm Beach, FL.

Your input is needed, so make your voice heard.


**Posted and pinned to the DEM Facebook Page 8/31/17**

LMS Working Group meetings serve as the primary mechanism and forum for exchanging information, planning implementation of updating the Palm Beach County Local Mitigation Strategy, and mobilizing the vast experience and resources of the community. Public attendance and comments are welcomed and encouraged.

**Palm Beach County is currently seeking public input on our 2020 Local Mitigation Strategy. Please use the links below to add your input.**

Seeking Public Input - LMS 2020 Draft

LMS 2020 Public Hazard Survey

LMS Corner:

LMS Times

DEM Website requesting public input. First link is to the brochure announcing the public input meetings on 9/28 and 10/4/17. Second link is to the SurveyMonkey Public Hazard Survey which runs 8/30/17 to 10/31/17 to solicit public comment on hazards and solutions to hazards (known and unknown) in their local communities.

Palm Beach County is currently seeking public input on our 2020 Local Mitigation Strategy. Please use the links below to add your input.

Seeking Public Input - LMS 2020 Draft

LMS 2020 Public Hazard Survey

LMS Corner:

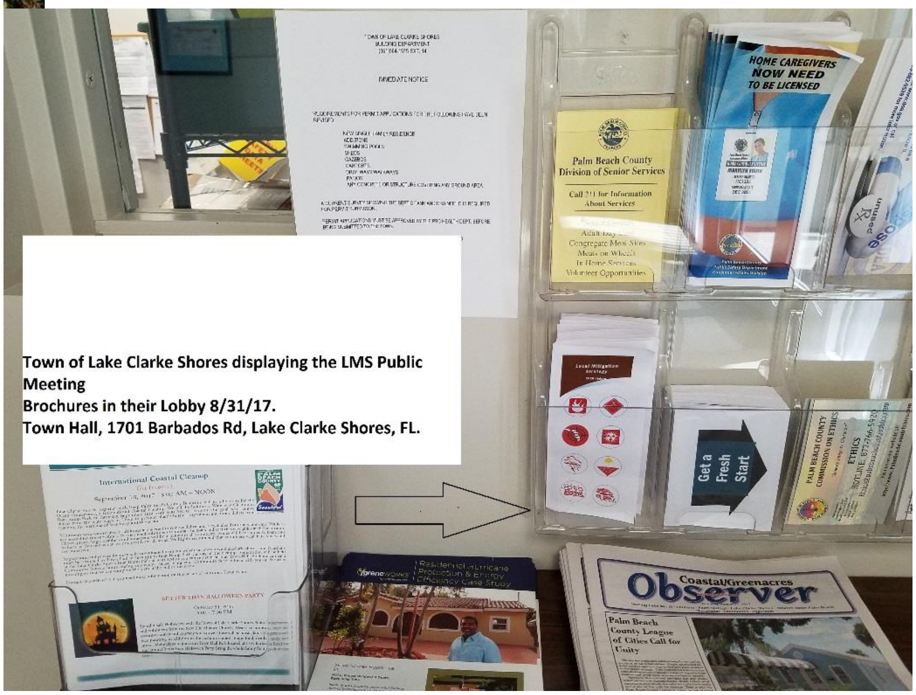
LMS Times

2016 Winter LMS Times

2017 Winter LMS Times

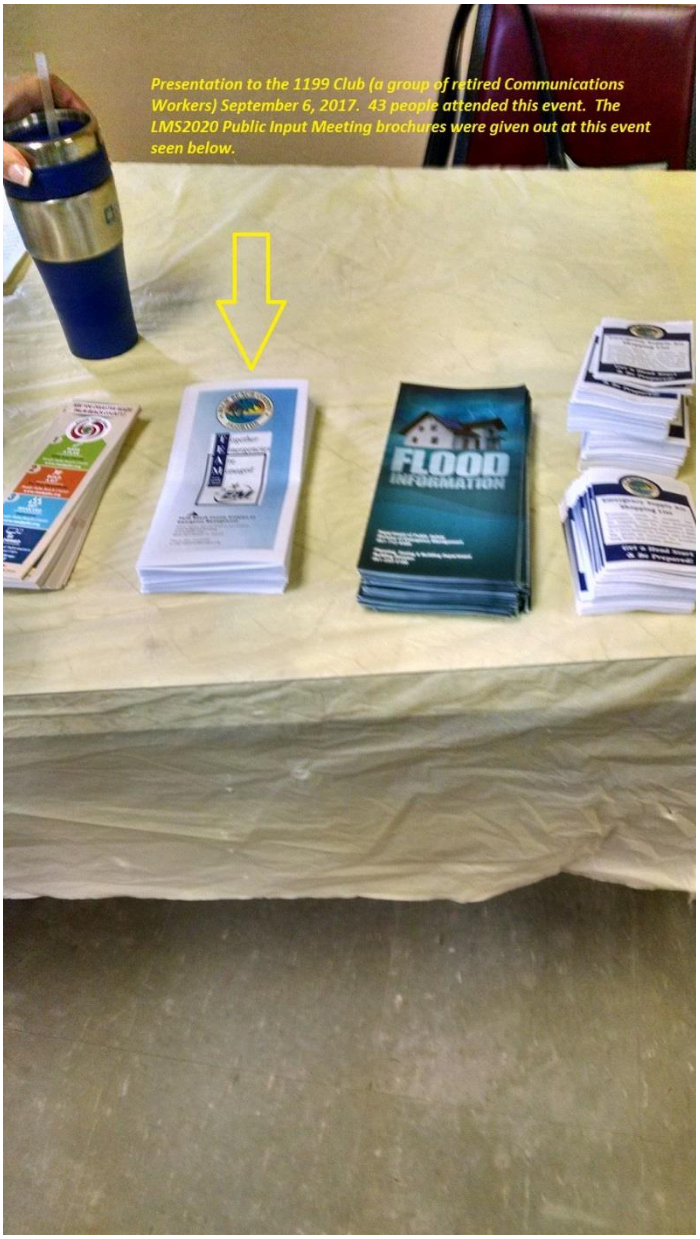
2017 Summer LMS Times

LMS Times with pre-draft public meeting announcement on DEM website 8/31/17
http://discover.pbcgov.org/publicsafety/dem/Sections/Planning-Local-Mitigation-Strategy.aspx
Posted on 8/30/17 and left on site until after meetings were over, and announced through email to all municipalities, who then put on their websites, tweeted, and facebook posted on their accounts.




**Town of Lake Clarke Shores displaying the LMS Public Meeting Brochures in their Lobby 8/31/17.**
**Town Hall, 1701 Barbados Rd, Lake Clarke Shores, FL.**


LMS Times Summer 2017 on display at Palm Beach County DEM. Issue includes info about public input meetings.
Date taken: 8/23/17
FLOOD PREPARATION
FLOOD INFORMATION
Let's Get Ready, South Florida!
It's Smart to Get Ready for the Unexpected
ALERTPBC
Palm Beach County's Emergency Notification System
YOUR NEIGHBORHOOD NEEDS YOU
LMS TIMES
Hurricane Tracking Map
www.FloridaDisaster.org


Presentation to the 1199 Club (a group of retired Communications Workers) September 6, 2017. 43 people attended this event. The LMS2020 Public Input Meeting brochures were given out at this event seen below.
FLOOD
INFORMATION

<u>This is the article in the LMS Times (our quarterly mitigation newsletter) announcing the public input meeting dates</u>.

## LMS2020 Public Showcase Dates

The initial draft of the 2020 Palm Beach County Local Mitigation Strategy document will be showcased to the public on September 28, 2017 from 5:30-6:30 p.m. at the Lakeview Room of the Wellington Community Center, 12150 Forest Hill Blvd, Wellington, FL. A second public showcase will be held on October 4, 2017 from 1:30-2:30 p.m. in the auditorium of the South Florida Water Management District, 3301 Gun Club Road, West Palm Beach, FL.

We want to provide an opportunity for the public to view the draft document (LMS2015 is the beginning draft) and make comments for the Revisions Subcommittee to consider in the LMS2020 update.

The public is invited to view the Draft LMS2020 (the current LMS2015 document) prior to the meeting at Palm Beach County Division of Emergency Management's website at http://discover.pbcgov.org/publicsafety/dem/Publications/Local-Mitigation-Strategy.pdf and are encouraged to comment at these public showcases, or send your comments to LMS Coordinator Shane Ratliff, SRatlif1@pbcgov.org and they will be compiled and sent to the Revisions Subcommittee for further analysis and possible inclusion in the LMS2020.

The next two pages are the sign-in sheets from the Public Input Meetings.

**Palm Beach County Division of Emergency Management**

**Local Mitigation Strategy Public Input Meeting**

**Sign-In Sheet**

**Wellington Community Center**

**Thursday, September 28, 2017, 5:30 p.m.**

| NAME (PLEASE PRINT) | SIGNATURE | AGENCY/ORGANIZATION/ CONCERNED CITIZEN | EMAIL | ~~TELEPHONE~~ |
|---|---|---|---|---|
| Nicole Coates | [illegible] | Wellington | nicolee@wellingtonfl.gov | |
| Ken Fernandez | [illegible] | Northern Palm Beach County Imp District | Ken@npbcid.org | |
| Kelvin Bledsoe | [illegible] | PSC Secure | Kelvin.Bledsoe@Gmail.com | |
| Brian Hanley | BHanley | PBC DEM | bhanley@pbcgov.org | |
| RAMA RANI | [illegible] | SFWMD | rrani@sfwmd.gov | |
| Shane Ratliff | [illegible] | PBC DEM | sratlif1@pbcgov.org | |
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**Palm Beach County Division of Emergency Management**

**Local Mitigation Strategy Public Input Meeting**

**Sign-In Sheet**

**South Florida Water Management District Auditorium**

**Wednesday, October 4, 2017, 1:30 p.m.**

| NAME (PLEASE PRINT) | SIGNATURE | AGENCY/ORGANIZATION/ CONCERNED CITIZEN | EMAIL | ~~TELEPHONE~~ |
|---|---|---|---|---|
| Shane Ratliff | [signature] | PBCDEM | SRatlif1@pbcgov.org | |
| Edgar Kerr | [signature] | City of SB | Kerre@Southbaycity.com | 561-261-6576 |
| Ken Rowntree | [signature] | Northern | Ken@NPBCID.ORG | |
| LAURA CORRY | [signature] | SFWMD | LCORRY@SFWMD.GOV | |
| RAMA RANI | [signature] | SFWMD | rrani@sfwmd.gov | |
| Carlos Cedeño | [signature] | Greenacres | ccedeno@greenacresfl.gov | |
| Rebecca Harvey | [signature] | City of Boynton Beach | HarveyR@bbfl.us | |
| Steve Mississulia | [signature] | City of WPB | smississulia@wpb.org | 805 6660 |
| | | | | |
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The following pages are documentation relating to the Public Input Survey that was done pre-draft to allow public input regarding hazards and vulnerabilities in their communities.

LMS Working Group meetings serve as the primary mechanism and forum for exchanging information, planning implementation of updating the Palm Beach County Local Mitigation Strategy, and mobilizing the vast experience and resources of the community. Public attendance and comments are welcomed and encouraged.

**Palm Beach County is currently seeking public input on our 2020 Local Mitigation Strategy. Please use the links below to add your input.**

Seeking Public Input - LMS 2020 Draft

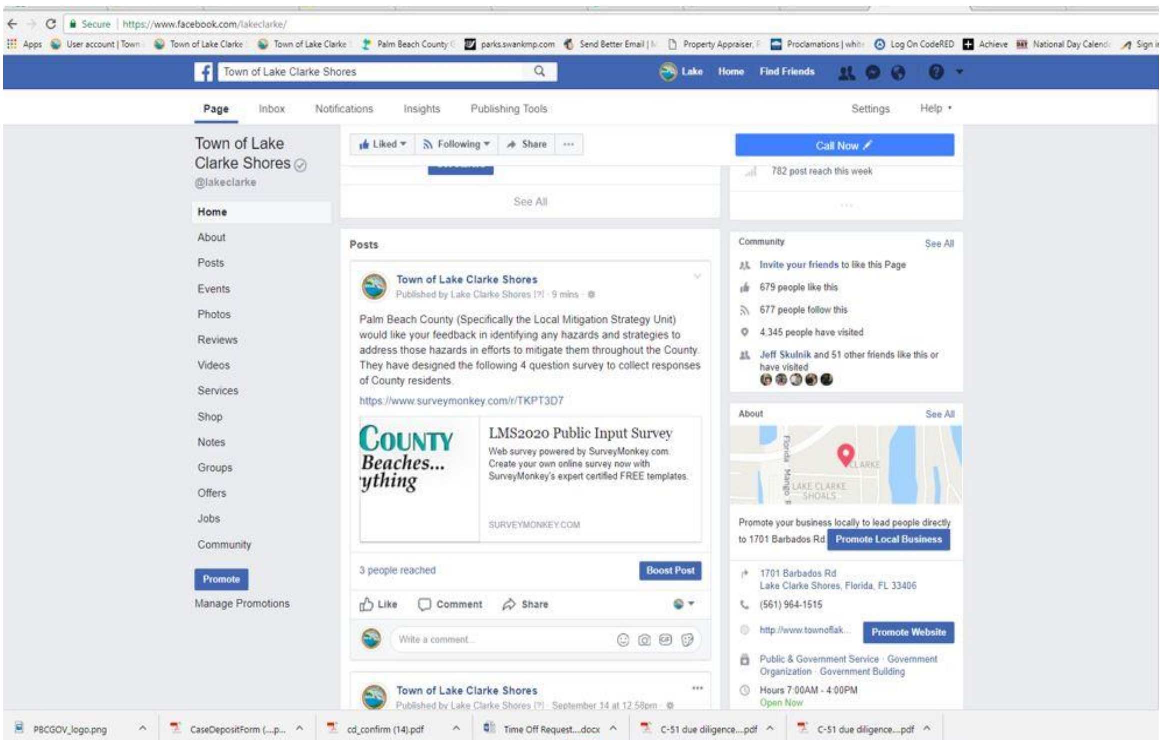
LMS 2020 Public Hazard Survey

LMS Corner:

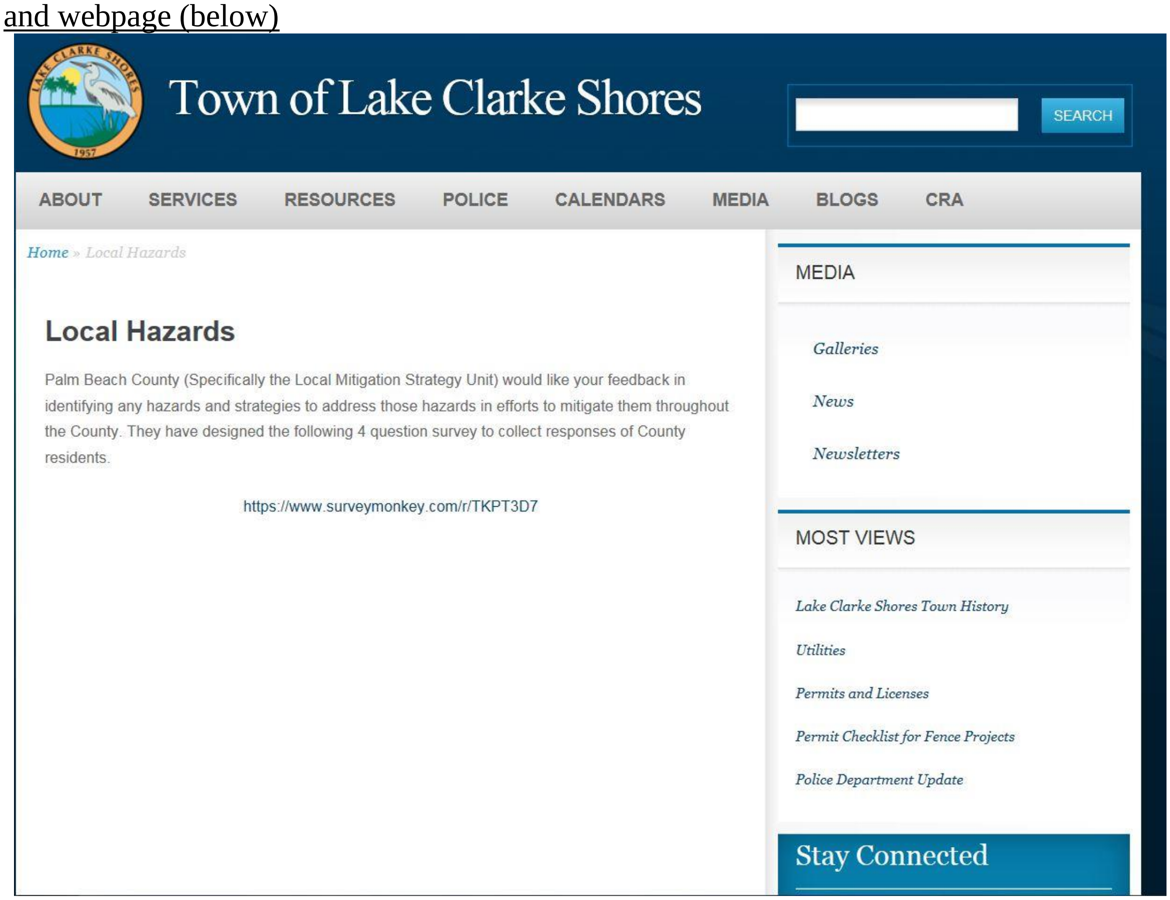
LMS Times

DEM Website requesting public input. First link is to the brochure announcing the public input meetings on 9/28 and 10/4/17. Second link is to the SurveyMonkey Public Hazard Survey which runs 8/30/17 to 10/31/17 to solicit public comment on hazards and solutions to hazards (known and unknown) in their local communities.


**Posted and pinned to the DEM Facebook Page 8/31/17**




The Town of Lake Clarke Shores placed links to the survey on their Facebook page (above) and webpage (below)



**Shane Ratliff**

| | |
|---|---|
| **From:** | Rani, Rama <rrani@sfwmd.gov> |
| **Sent:** | Wednesday, October 11, 2017 5:11 PM |
| **To:** | 5660; 5670; 5680 |
| **Cc:** | Shane Ratliff; Corry, Laura; McElroy, Elizabeth |
| **Subject:** | Local Mitigation Strategy (LMS) Public Hazard Survey |

All,

The LMS is the FEMA approved mitigation strategy document for Palm Beach County and all of its municipalities; it is used as a guide by them, special taxing districts, some non-profits, and other jurisdictions. The document is used to identify hazards, prioritize projects to mitigate them, and mitigate existing hazards. The LMS is reviewed and revised every 5 years, and is now due for revision. The public is being solicited for input into the revisions process. If you would like to read some more about LMS, here is the link:

http://discover.pbcgov.org/publicsafety/dem/Sections/Planning-Local-Mitigation-Strategy.aspx

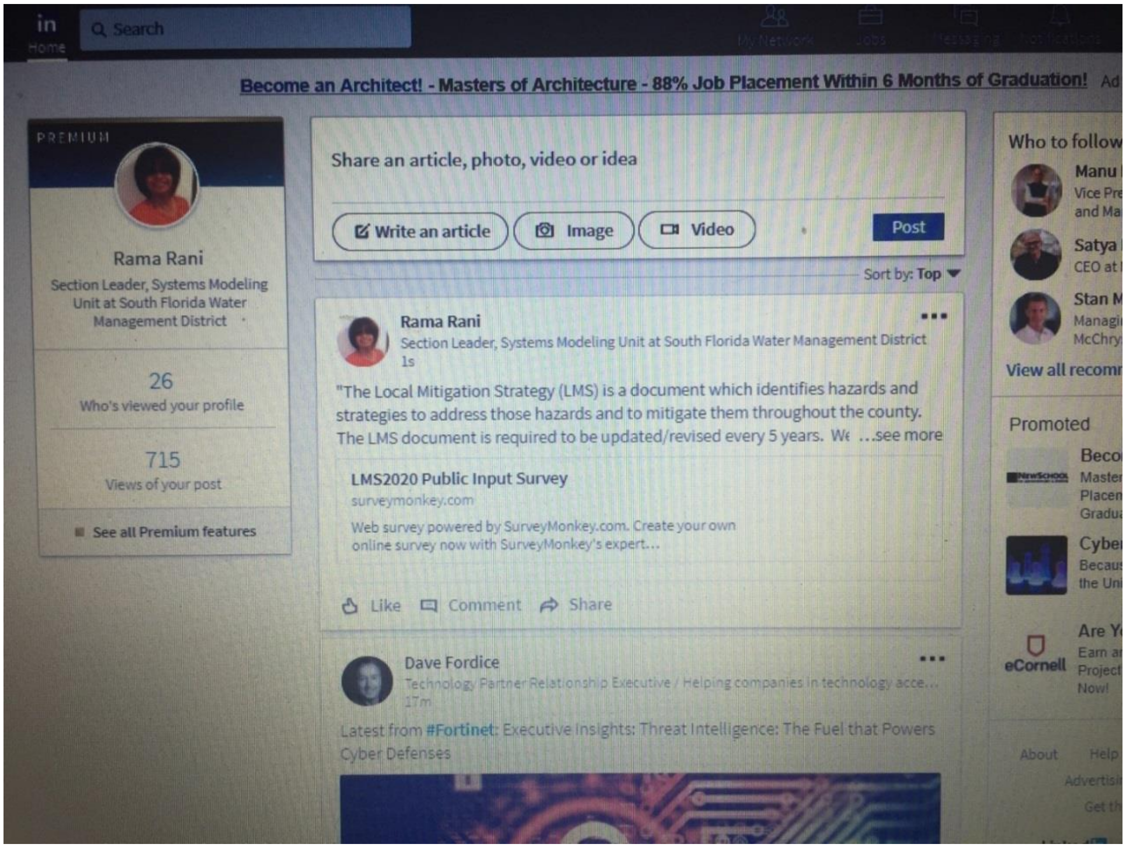
The LMS Revisions is coordinated by PB DEM, the SFWMD is part of the Revisions Subcommittee. The subcommittee created a survey to get your input (available till Oct 31, 2017). Your answers to 4 simple questions would help a lot, here is the link:

LMS 2020 Public Hazard Survey

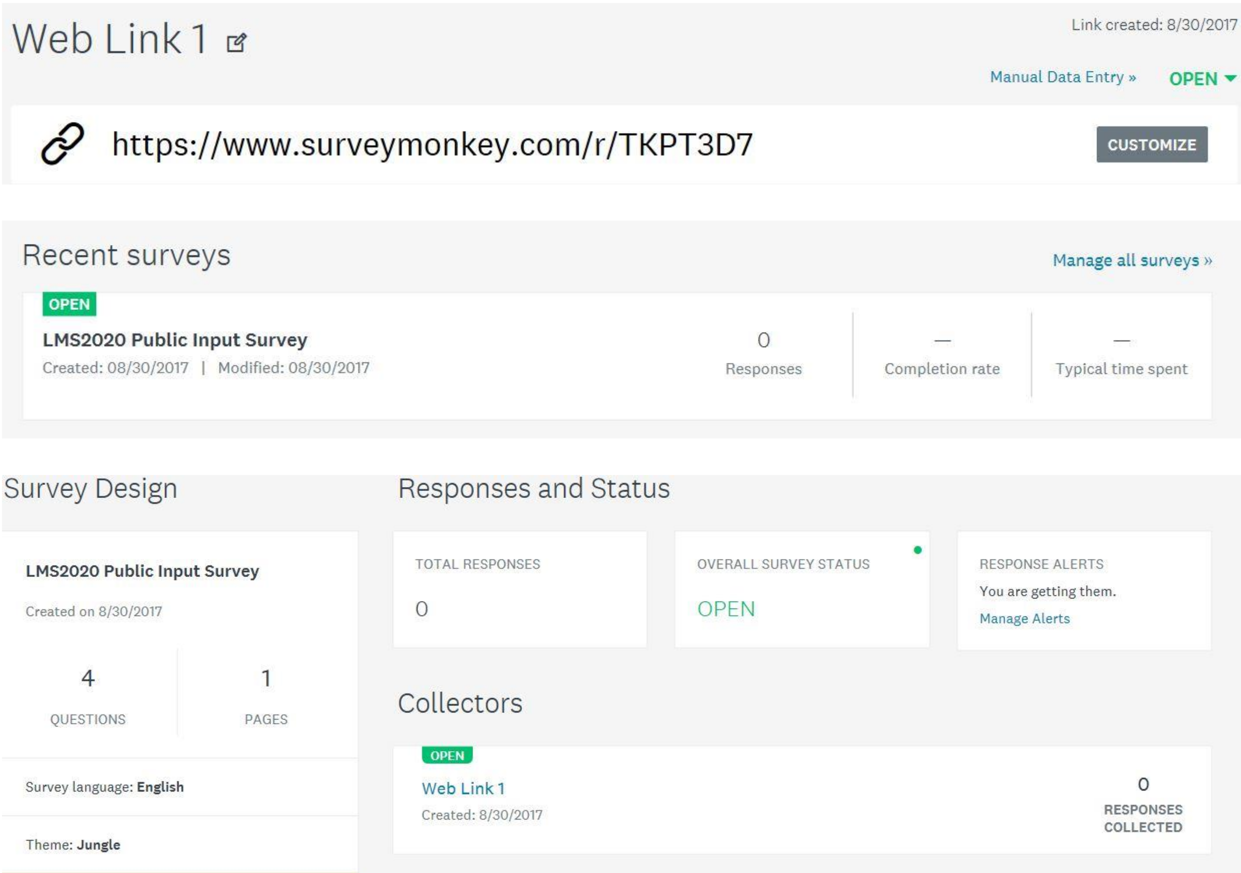
**This email went out to all of South Florida Water Mgmt District's contacts in the region regarding the survey so that they could participate.**

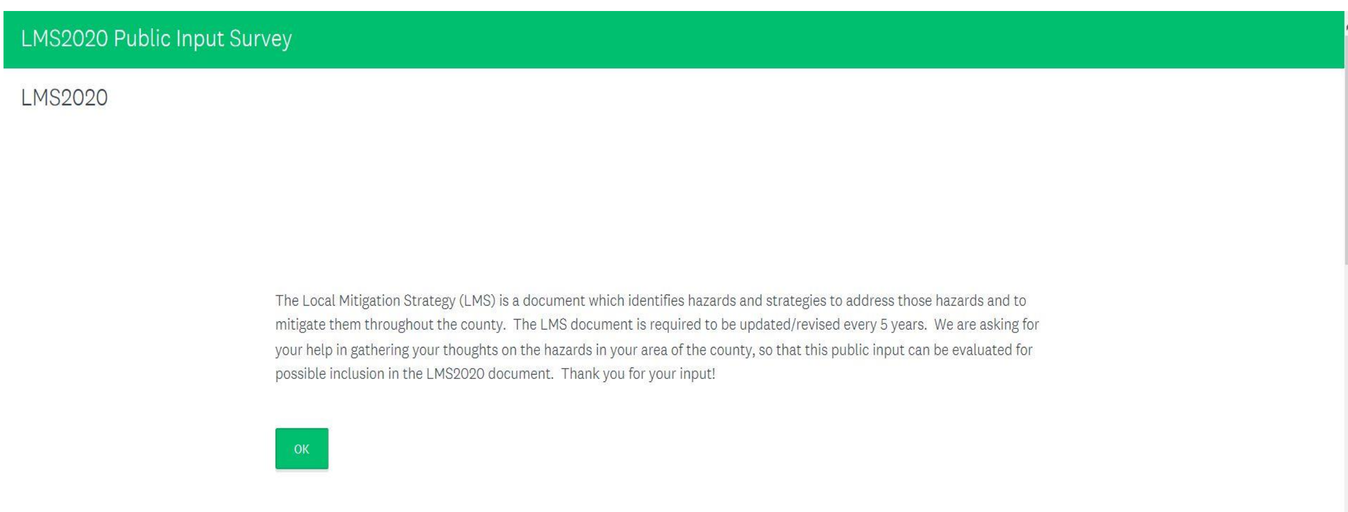
Thanks,
Rama

South Florida Water Management District also posted links to the survey on their LinkedIn Social Media webpage:


Search
Become an Architect! - Masters of Architecture - 88% Job Placement Within 6 Months of Graduation!
PREMIUM
Rama Rani
Section Leader, Systems Modeling Unit at South Florida Water Management District
26
Who's viewed your profile
715
Views of your post
See all Premium features
Share an article, photo, video or idea
Write an article
Image
Video
Post
Sort by: Top
Rama Rani
Section Leader, Systems Modeling Unit at South Florida Water Management District
1s
"The Local Mitigation Strategy (LMS) is a document which identifies hazards and strategies to address those hazards and to mitigate them throughout the county. The LMS document is required to be updated/revised every 5 years. We …see more
LMS2020 Public Input Survey
surveymonkey.com
Web survey powered by SurveyMonkey.com. Create your own online survey now with SurveyMonkey's expert…
Like
Comment
Share
Dave Fordice
Latest from #Fortinet: Executive Insights: Threat Intelligence: The Fuel that Powers Cyber Defenses
Who to follow
View all recomm
Promoted
eCornell
About
Help

<u>The following is the pre-draft public input survey link as well as the survey itself</u>



1. Which of the following hazards are probable where you live? (you may choose as many as needed)

- [ ] Flooding
- [ ] Hurricanes/Tropical Storms
- [ ] Tornado
- [ ] Severe Thunderstorms/Lightning
- [ ] Drought
- [ ] Extreme Temperatures
- [ ] Agricultural Pests and Diseases
- [ ] Wildfire/Urban Interface Zone
- [ ] Muck Fire
- [ ] Soil/Beach Erosion
- [ ] Sea Level Rise
- [ ] Geologic Hazards (i.e. Earthquake)
- [ ] Pandemic/Communicable Disease
- [ ] Dike Failure
- [ ] Hazardous Materials Accident
- [ ] Radiological Accident (Nuclear Power Plan Accident)
- [ ] Communications Failure
- [ ] Hazardous Materials Release
- [ ] Transportation System Accidents
- [ ] Coastal Oil Spills
- [ ] Wellfield Contamination
- [ ] Power Failure
- [ ] Civil Disturbance
- [ ] Domestic Security
- [ ] Mass Migration Crisis
- [ ] Workplace/School Violence

2. Considering the hazards above that are probable where you live, do you have any ideas/suggestions for how to mitigate the hazards you identified? (Note: mitigation is the act of addressing the hazard before it occurs again) Please be specific about how this hazard(s) can be mitigated through a project or process.

3. Are there any other known or unknown hazards that weren't mentioned in Question #1? If so, please identify the hazard(s).

4. If you entered a hazard in Question #3, what ideas do you have about a solution or project that may mitigate such a hazard?

DONE

Powered by
SurveyMonkey
See how easy it is to create a survey.

https://www.surveymonkey.com/r/TKPT3D7 | Home - Emergency Managem... | Plan Matrix - All Items | LMS2020 Public Input Survey

LMS2020 Public Input Survey

LMS2020

***When you click on the link from Palm Beach County Emergency Management's Webpage, it takes you directly to the introduction to the public input survey.***

The Local Mitigation Strategy (LMS) is a document which identifies hazards and strategies to address those hazards and to mitigate them throughout the county. The LMS document is required to be updated/revised every 5 years. We are asking for your help in gathering your thoughts on the hazards in your area of the county, so that this public input can be evaluated for possible inclusion in the LMS2020 document. Thank you for your input!

OK

1. Which of the following hazards are probable where you live? (you may choose as

The following pages present documentation from the public input outreach that was conducted prior to the finalizing the LMS2020 update.

**Department of Public Safety**
**Division of Emergency Management**
20 South Military Trail
West Palm Beach, FL 33415
(561) 712-6400
FAX: (561) 712-6464
www.pbcgov.com



# Media Advisory

| | |
|---|---|
| For release | April 29, 2019 |
| Contact | Joe Mercurio (561) 712-6481 |

## Local Mitigation Strategy Updated Document – LMS2020

The Local Mitigation Strategy (LMS) is a Palm Beach County document which identifies hazards to the community and strategies to address those hazards. The LMS document is required to be updated/revised every five (5) years. Its purpose is to prepare and promote local strategies and projects that will reduce long-term risks to life and property from natural, technological, and human-caused hazards. The Division of Emergency Management has concluded the review and seeks to publish the updated LMS2020. They are asking for community help in gathering final thoughts on the hazards in your area of the county, so that public input can be evaluated for possible inclusion in the LMS2020 document.

The county is seeking public input surveys whether in person or across many different social media platforms. Our first public meeting to gather public input will be held on Thursday, May 2, 2019 from 11:00 a.m. to 12:00 p.m. in the auditorium of the South Florida Water Management District, 3301 Gun Club Road, West Palm Beach. The second meeting will be Monday, May 20, 2019 from 5:30 to 6:30 p.m. at the Lakeview Room of the Wellington Community Center, 12150 Forest Hill Blvd in Wellington.

| | | |
|---|---|---|
| **Who:** | Palm Beach County Emergency Management | |
| **What:** | LMS2020 Public Input | |
| **Where:** | South Florida Water Management District Auditorium<br>3301 Gun Club Road, West Palm Beach | |
| **When:** | May 2 | 11 a.m. – 12:00 p.m. |
| **Where:** | Wellington Community Center – Lakeview Room<br>12150 Forest Hill Blvd in Wellington | |
| **When:** | May 20 | 5:30 – 6:30 p.m. |
| **Contact:** | Joe Mercurio at (561) 712-6481 | |

###

## Local Mitigation Strategy

The Palm Beach County Local Mitigation Strategy is the guiding document used by the County and all 39 municipalities to identify community hazards, prioritize mitigation projects, and mitigate existing hazards.

Public input is needed in the process of revising our LMS 2020. If you are unable to come to a public meeting, please email all input to jmercuri@pbcgov.org by May 24, 2019 for consideration and possible inclusion in the LMS 2020.

PALM BEACH COUNTY FLORIDA

**T**ogether **E**mergencies **A**re **M**anaged

Palm Beach County

EM PUBLIC SAFETY, PUBLIC TRUST

**Palm Beach County Division of Emergency Management**

Joe Mercurio, Special Projects Coordinator
Local Mitigation Strategy
20 S Military Trail
West Palm Beach, FL 33415

Phone: 561-712-6481
E-mail: jmercuri@pbcgov.org

## Local Mitigation Strategy 2020

**Final Update for Public Comment**

### What is the LMS?

The LMS is a hazards mitigation document, reviewed and revised every five years. It is the Federal Emergency Management Agency (FEMA) approved mitigation strategy for Palm Beach County and all of its municipalities. It is also used by special taxing districts, some non-profits, and other jurisdictions as a guiding document on how to identify hazards, develop projects, and institute those projects to mitigate hazards. FEMA then administers several federal grants to help local communities deal with, prevent, and mitigate these identified hazards through projects that are submitted, evaluated, and ranked on our LMS Project Prioritized List (PPL).

### We Need Your Help

The Palm Beach County Unified Local Mitigation Strategy (LMS) has recently undergone a review and update. We need the public's help in making that update a success. We will be holding two public meetings to solicit input from citizens and other stakeholders in Palm Beach County relating to existing or new hazards, as well as mitigation strategies to combat existing hazards within our county.

The County Special Projects Coordinator for Mitigation will be on hand to help answer questions, but mainly to hear from you regarding mitigation, and your ideas in considered for inclusion to the LMS 2020 for Palm Beach County.

The public is being solicited for input and information into the final revisions process to ensure the County has captured the appropriate strategies. The LMS works for you in your community, and your

Input is not only encouraged, it is welcomed.

There are also LMS Working Group meetings held quarterly to discuss mitigation, projects, and best practices in mitigation. The public is always encouraged to be part of the process and attend these regular meetings as well.

**When are these public input-meetings, and where?**

Our first public meeting to gather public input will be held on Thursday, May 2, 2019 from 11:00 a.m. to 12:00 p.m. in the auditorium of the South Florida Water Management District, 3301 Gun Club Road, West Palm Beach.

The second meeting will be Monday, May 20, 2019 from 5:30 to 6:30 p.m. at the Lakeview Room of the Wellington Community Center, 12150 Forest Hill Blvd in Wellington.

Your input is needed, so make your voice heard.

**Palm Beach County Division of Emergency Management**
May 1 at 8:00 AM ·

The Palm Beach County Local Mitigation Strategy has completed the draft of the LMS2020. There is now a post-draft survey available at https://www.surveymonkey.com/r/35BLP9Y for the public to give input into the hazards in their area and ways to mitigate those hazards. This survey will only be available until May 24, 2019, so please click the link below for your opportunity to impact mitigation.

You may view the current LMS2015 at http://discover.pbcgov.org/…/…/Local-Mitigation-Strategy.pdf (330 pages in length, may take some time to download depending on your internet speed).


SURVEYMONKEY.COM

**LMS2020 Post-Draft Public Input Survey**

Take this survey powered by surveymonkey.com. Create your own survey…

**483** People Reached | **13** Engagements | Boost Post

5


https://www.facebook.com/PBCDEM/?ref=bookmarks
Palm Beach County Division of Emergency Management
Pbc
Home
Page
Inbox
Manage Jobs
Notifications 3
Insights
Publishing T...
More
Liked
Following
Share
See All
PALM BEACH COUNTY FLORIDA
Palm Beach County Division of Emergency Management
@PBCDEM
Home
About
Photos
Videos
Events
Posts
Services
Shop
Groups
Notes
Offers
Jobs
Community
Promote
Posts
Palm Beach County Division of Emergency Management
15 hrs
The Local Mitigation Strategy is a document which identifies hazards to the community and strategies to address those hazards. The Division of Emergency Management has concluded the review and seeks to publish the updated LMS2020. They are asking for community help in gathering final thoughts on the hazard, so that public input can be evaluated for possible inclusion in the LMS2020. Our final public meeting to gather input will be held on Monday, May 20, from 5:30 to 6:30 p.m. at the Lakeview Room of the Wellington Community Center, 12150 Forest Hill Blvd Wellington.
Local Mitigation Strategy
LMS 2020
315
People Reached
12
Engagements
Boost Post
2
Like
Comment
Share
Write a comment...

## LMS2020 Public Input Survey

The Local Mitigation Strategy (LMS) is a document which identifies hazards and strategies to address those hazards and to mitigate them throughout Palm Beach County. The LMS document is required to be updated/revised every five (5) years. We are asking for your help in gathering your thoughts on the hazards in your area of the county, so that public input can be evaluated for possible inclusion in the LMS2020 document. Thank you for your input!

1. Which of the following hazards are probable where you live? (chose as many as needed)

| | | | |
|---|---|---|---|
| o | Flooding | o | Dike Failure |
| o | Hurricanes/Tropical Storms | o | Hazardous Materials Accident |
| o | Tornado | o | Radiological Accident |
| o | Severe Thunderstorms/Lightning | o | Communications Failure |
| o | Drought | o | Hazardous Materials Release |
| o | Extreme Temperatures | o | Transportation System Accidents |
| o | Agricultural Pests & Diseases | o | Coastal Oil Spills |
| o | Wildfires | o | Wellfield Contamination |
| o | Muck Fire | o | Power Failure |
| o | Soil/Sand Erosion | o | Civil Disturbance |
| o | Sea Level Rise | o | Domestic Security |
| o | Geological Hazards | o | Mass Mitigation Crisis |
| o | Pandemic/Communicable Disease | o | Workplace/School Violence |

2. Considering the hazards above that are probable where you live, do you have any ideas/suggestions for how to mitigate the hazards you identified? (Note: mitigation is the act of addressing the hazard before it occurs again) Please be specific about how this hazard(s) can be mitigated through a project or process.

3. Are there any other know or unknown hazards that weren't mentioned in Question #1? If so, please identify the hazard(s).

4. If you entered a hazard in Question #3, what ideas do you have about a solution or project that may mitigate such as hazard?

## LMS2020 Facebook

Palm Beach County is seeking public input for our updated Local Mitigation Strategy document, LMS2020. We are asking for your help in gathering your thoughts on the hazards in your area of the county, so that public input can be evaluated for possible inclusion in the LMS2020 document. Thank you for your input!

https://www.surveymonkey.com/Jablonski

## LMS2020 Linkedin

Palm Beach County is seeking public input for our updated Local Mitigation Strategy document, LMS2020. We are asking for your help in gathering your thoughts on the hazards in your area of the county, so that public input can be evaluated for possible inclusion in the LMS2020 document. Thank you for your input!

https://www.surveymonkey.com/Jablonski

## LMS2020 Web Page

See attachment

https://www.surveymonkey.com/create/preview/?sm=TGxN2sl_2BOP_2BGsMFoi6h2YEk4sEpU3NN3qcJFMsk8ojl_3D

oard My Surveys Plans & Pricing

DESIGN SURVEY → PREVIEW & SCORE → COLLECT RESPONSES → ANALYZE RESULTS → PRESENT RESULTS NEW!

## LMS2020 Post-Draft Public Input Survey

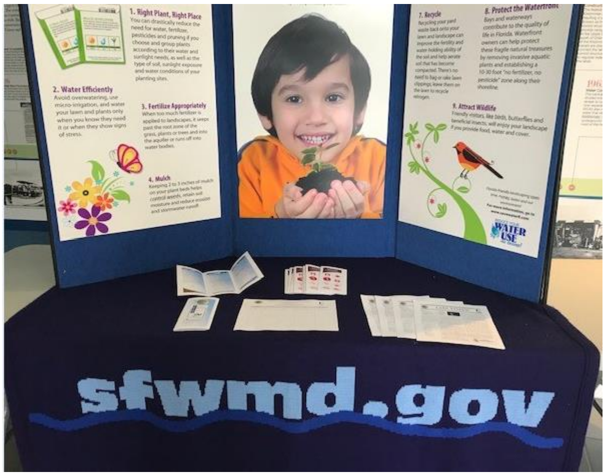
### LMS2020 Public Input Survey (Post-Draft)

The Local Mitigation Strategy (LMS) is a document which identifies hazards and strategies to address those hazards and to mitigate them throughout Palm Beach County. The LMS Document is required to be updated/revised every five (5) years. We are asking for your help in gathering your thoughts on the hazards in your area of the county, so that public input can be evaluated for possible inclusion in the LMS2020 document. You may read the current version of the LMS document at http://discover.pbcgov.org/publicsafety/dem/Publications/Local-Mitigation-Strategy.pdf THANK YOU for your input!

OK


05.02.2019 07:51


LMS2020 PUBLIC PRESENTATION/COMMENT
PALM BEACH COUNTY DIVISION OF EMERGENCY MANAGEMENT IN COOPERATION WITH THE LOCAL MITIGATION STRATEGY STEERING COMMITTEE


sfwmd.gov


LMS TIMES


THE VILLAGE OF WELLINGTON Community Center
Mon, May 20
ACTIVITY SCHEDULE
Start End Time Activity Room
4:00 PM 5:00 PM Ballet/Tap NRG Dance Studios Fitness Room
5:00 PM 6:00 PM Jazz Funk NRG Dance Studios Fitness Room
5:30 PM 6:30 PM LMS Public Mtg Palm Beach County Grande Ballroom
5:30 PM 8:30 PM 567 Workshop Seminar Bincy Thomas Panther Room
SENIOR SYMPOSIUMS
Educational opportunities on a variety of subjects are available to our seniors every month.
These FREE educational sessions are delivered in a "lunch and learn" format, and are open to our residents and their caregivers.
Pick up a schedule at the front desk or visit:
wellingtonfl.gov/Seniors
Did you know you can register for most programs online? Visit wellingtonfl.gov/Webtrac


LMS TIMES

**Palm Beach County Division of Emergency Management**
**LMS2020 Public Post-Survey**
**Sign-In Sheet**
**Wellington Community Center**
**Monday, May 20, 2019, 5:30 p.m.**

| NAME (PLEASE PRINT) | SIGNATURE | COMMUNITY | EMAIL | TELEPHONE |
|---|---|---|---|---|
| Joe Mercurio | | DEH | jmercuri@pbcgov.org | 712 6481 |
| | | | | |
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Palm Beach County Division of Emergency Management
LMS2020 Public Post-Survey
Sign-In Sheet
South Florida Water Management District
Thursday, 2 May, 2019 11:00 a.m.

| NAME (PLEASE PRINT) | SIGNATURE | COMMUNITY | EMAIL | TELEPHONE |
|---|---|---|---|---|
| Joe Mercurio | | PBC | jmercuri@pbcgov.com | 712-6481 |
| Shane Ratliff | | PBC | Sratlif1@pbcgov.com | 712-6344 |
| LAURA CORRY | | SFWMD | LCORRY @ SFWMD.GOV | 561-682-6012 |
| | | | | |
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| | | | | |

05/02/19 V10101352516 10:35 am
SFWMD
**VISITOR**
Joseph Mercurio
Visitor
self
Meeting
B1 Lobby

1

The following pages document the invitation of both 15 non-profit and 15 private sector businesses in the county/region that were invited to be a part of the LMS Working Group.

**From:** Shane Ratliff
**To:** "anna.poulin@ewrunnerctr.org"; "semrichywca@yahoo.com"; "elisabeth.perry@211pbtc.org"; "info@AchievementCentersFL.org"; "info@alzpb.org"; "info@aacy.org"; "jgavrilos@bocahelpinghands.org"; "info@cmboca.org"; "info@bgcpbc.org"; "sgomez@diocesepb.org"; "info@centerforchildcounseling.org"; "Rich@FloridaFishingAcademy.com"; "customercare@gssef.org"; "info@pbcfoodbank.org"; "sharvey@primetimepbc.org"
**Subject:** Non-Profits: Invitation to LMS Working Group
**Date:** Monday, January 29, 2018 11:43:00 AM
**Attachments:** image007.png
image009.png

Good morning,

I am writing to let you all know that you are invited to attend and participate in the Palm Beach County Local Mitigation Strategy (LMS) Working Group. This email serves to fulfill requirements set forth in the Palm Beach County Local Mitigation Strategy (LMS), as well as the National Flood Insurance Program's Community Ratings System (CRS), which require me to reach out to both non-profit organizations and private sector organizations within Palm Beach County annually. If you are not interested, please accept my apologies. If you are interested in what we are about, continue reading below.

Mitigation is the act of preventing something that is known to occur from occurring again in the future. In Palm Beach County, we are charged with mitigating disasters and hazards that have been identified through a comprehensive Hazard Vulnerability Analysis. We do this through our Local Mitigation Strategy document, which is a guide for what hazards exist and how we hope to mitigate against those in the future. This document is located on the Division of Emergency Management's LMS webpage at http://discover.pbcgov.org/publicsafety/dem/Sections/Planning-Local-Mitigation-Strategy.aspx . This document, over 300 pages in length, goes very in-depth to identify hazards and how the Working Group will work to mitigate against them. In PBC, we mitigate primarily through highly technical projects designed to reduce risk of a particular set of hazards from occurring. This is called our "Prioritized Project List" which you can find on the same web link above as well.

If you are interested in attending any meetings of the LMS Working Group, we hold our meetings quarterly in March, June, September, and December. Our next meeting is scheduled for March 14, 2018 at the Intracoastal Park Event Room in Boynton Beach at 9am. You are welcome to attend and find out how your LMS is working to protect you from hazards in PBC.

Thank you for your time.

Sincerely,

*Shane Ratliff*

Special Projects Coordinator-Planning Section
Public Safety Department, Division of Emergency Management
Palm Beach County

| | |
|---|---|
| **From:** | Shane Ratliff |
| **To:** | "Jacqueline@Grellinger.com"; "a.estatemanagementservices@gmail.com"; "rickplatz@allstate.com"; "jupiter@esppoolco.com"; "information@cruiseBP.com"; "info@balfourbeattyus.com"; "info@gobrightline.com"; "sbutler@butlerconstructionusa.com"; "sbrea@chenmoore.com"; "sales@chrisallenhomes.com"; "Info@CRRS.Com"; "info@csiteamonline.com"; "info@digitaltsunamillc.com"; "info@efundpro.com"; "palmbeachgardens@landmarkpb.com" |
| **Subject:** | Private Sector: Invitation to LMS Working Group |
| **Date:** | Monday, January 29, 2018 12:46:00 PM |

Good afternoon,

I am writing to let you all know that you are invited to attend and participate in the Palm Beach County Local Mitigation Strategy (LMS) Working Group. This email serves to fulfill requirements set forth in the Palm Beach County Local Mitigation Strategy (LMS), as well as the National Flood Insurance Program's Community Ratings System (CRS), which require me to reach out to both non-profit organizations and private sector organizations within Palm Beach County annually. If you are not interested, please accept my apologies. If you are interested in what we are about, continue reading below.

Mitigation is the act of preventing something that is known to occur from occurring again in the future. In Palm Beach County, we are charged with mitigating disasters and hazards that have been identified through a comprehensive Hazard Vulnerability Analysis. We do this through our Local Mitigation Strategy document, which is a guide for what hazards exist and how we hope to mitigate against those in the future. This document is located on the Division of Emergency Management's LMS webpage at http://discover.pbcgov.org/publicsafety/dem/Sections/Planning-Local-Mitigation-Strategy.aspx . This document, over 300 pages in length, goes very in-depth to identify hazards and how the Working Group will work to mitigate against them. In PBC, we mitigate primarily through highly technical projects designed to reduce risk of a particular set of hazards from occurring. This is called our "Prioritized Project List" which you can find on the same web link above as well.

If you are interested in attending any meetings of the LMS Working Group, we hold our meetings quarterly in March, June, September, and December. Our next meeting is scheduled for March 14, 2018 at the Intracoastal Park Event Room in Boynton Beach at 9am. You are welcome to attend and find out how your LMS is working to protect you from hazards in PBC.

Thank you for your time.

Sincerely,

*Shane Ratliff*

Special Projects Coordinator-Planning Section
Public Safety Department, Division of Emergency Management
Palm Beach County

**PBC Non-Profit Contact Information January 2019**

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info@alzpb.org Alzheimers Care Resource Center of PB

info@aacy.org American Association of Caregiving Youth

Jgavrilos@bocahelpinghands.org Boca Helping Hands

info@cmboca.org Boca Raton Children's Museum

info@bgcpbc.org Boys and Girls Clubs of PBC

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# Appendix E: Prioritized Project Lists

Appendix E contains the latest update of PBC's LMS Prioritized Project List (PPL). The list of projects is ever changing as projects completed through self- funding or with grant assistance are dropped and new proposed and planned projects are added. Jurisdictions and other potential project sponsors, particularly those not having projects on the current list, are encouraged to submit projects. The expectation is that all potential applicants be represented on the PPL with projects that address identified local hazards, vulnerabilities, and mitigation strategies. As municipalities complete projects, they will be encouraged to submit new ones. At any given time, a few communities will not have listed projects. The current project list contains 94 mitigation projects. However, not every municipality has a "brick and mortar" mitigation project. All municipalities provide outreach to their citizens. In addition, the County also provides outreach to all citizens throughout the County and within the municipalities. This outreach includes information on all hazards that are common to Palm Beach County, not just hurricanes, as well as additional information on how residents and communities can mitigate against these hazards.

Twice a year, in May and November, new projects for the PPL are evaluated and scored to be added to the PPL. Additionally, once a year in November, projects that have been on the list over four (4) years will be evaluated for potential removal from the PPL. These projects can be resubmitted with current information and will be re-scored during the next evaluation period.

Each year the evaluation committee meets in November to review the project evaluation process. This ensures that the process is current and adaptable to meet the needs of the community.

All projects on the list are maintained and monitored by the County LMS Coordinator. Once a project is funded, the project is removed from the pending list and placed on a list of active projects. Then once the project is completed, the projects will be placed on a completed list. Potential Projects funding sources include but are not limited: 406 HMP: Hazard Mitigation Program (FEMA), 404 HMGP: Hazard Mitigation Grant Program (FEMA), 426 PAAP: Public Assistance Alternative Procedures (FEMA), CDBG-DR (HUD), PDM: Pre-Disaster Mitigation (FEMA), and FMA: Flood Mitigation Assistance (FEMA).

The PPL shows the ranking of the project with the lower the number (the higher priority), the type of project, the municipality that submitted the project, the department in the municipality that will head the project, the primary funding source sought (while there may be a number of funding sources available, for the purpose of those projects, they are seeking HMGP dollars, but maintain the flexibility to other funding as it is announced and becomes available), status of project, hazard that project will mitigate against, and duration until the project is completed once funded and started.

The appendix addresses, in part, the following FEMA requirements:

**Requirement: §201.6(c)(3)(iii):** [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

**Requirement §201.6(c)(3)(iv):** For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

**Requirement §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 effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Requirement: §201.6(c)(3)(ii):** [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

**Requirement: §201.6(d)(3):** The plan must describe the status of mitigation actions in the previous plan by identifying those that have been completed or not completed. For actions that have not been completed, the plan must either describe whether the action is no longer relevant or be included as part of the updated action plan.

Other sections and appendices addressing these requirements include appendices F, G, and J and Section 3 and Section 5.

**<u>About the Prioritized Project List</u>**

Normally the PPL is updated twice a year, in the spring and in the fall. Projects are added, deleted, modified, scored, and ranked in accordance with the procedures described in Section 4.

The process and criteria used to rank projects are described in detail in Section 4. The current criteria emphasize: "community benefit" (Does the project promise tangible benefits to the community?); "project benefit" (Does the project address critical elements of the community infrastructure?); "community exposure" (Does the project mitigate an identified hazard or all-hazards to which the community is particularly vulnerable?); "cost effectiveness" (Does the project meet or exceed the thresholds of benefit to cost ratios using accepted methodologies?); "community commitment" (Is the project consistent with or incorporated in other plans, including COMP plans, CEMPs?); "public support" (Is there demonstrated public support for the project?); and "project implementation considerations" (What further is required to accomplish implementation)?

The feasibility and benefits of ranking “like” projects rather than forcing a single list of highly dissimilar projects has been discussed by the LMS Evaluation Panel and will continue to be explored.

The current procedure for prioritizing projects will be retained until any enhancements are fully developed and deemed acceptable under the rules of LMS by FEMA and the FDEM, and adopted by the LMS Steering Committee.

This section also contains completed/deferred/deleted projects as well as photos of some of our completed projects within the county that were once on the PPL list.

# PALM BEACH COUNTY
# LMS PRIORITIZED PROJECT LIST
(May 2019)

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 1 | Gladiator Lake Drainage Improvements | Greenacres | Public Works | HMGP | New | Flooding | One Year $1,300,000.00 |
| 2 | 17th Ave South Drainage Resiliency Improvements | Lake Worth Beach | Public Works | HMGP, Cap Improvement | New | Stormwater/Flooding | One Year $700,000.00 |
| 3 | 18th Ave North Drainage Resiliency Improvements | Lake Worth Beach | Public Works | HMGP, Cap Improvement | New | Stormwater/Flooding | One Year $350,000.00 |
| 4 | Sea Level Rise & Tidal Drainage Improvements | Boynton Beach | Public Works | HMGP | New | Flooding, Sea Level Rise | Two Years $850,000.00 |
| 5 | Wellesley Dr./Holy Cross Ln Drainage Improvements | Lake Worth | Public Works | HMGP, Cap Improvement | New | Stormwater/Flooding, Sea Level Rise | One Year $75,000.00 |
| 6 | Original Section Drainage Improvements Phase 6 & 7 | Greenacres | Public Works | HMGP | New | Flooding | One Year $702,000.00 |
| 7 | ITID MO Canal Reinforcement and Revetment Repair | Indian Trail Improvement District | Public Works | HMGP | New | Flooding | One Year $700,000.00 |
| 8 | Retrofit City Hall | South Bay | Public Works | HMGP, Cap Improvement | New | Flooding/Wind/Hurricane | One Year $95,000.00 |
| 9 | Wildfire Mitigation in 5 Natural Areas | Palm Beach County | Environmental Resources Management | HMGP | Funding Applied For | Fire | One Year $170,000.00 |
| 10 | Installation and Repair Stormwater System | South Bay | Public Works | HMGP | New | Stormwater/Flooding | One Year $550,000.00 |

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 11 | Lift Station 47 Generator Improvement Project | Riviera Beach | Utilities | HMGP | New | Flooding | One-Year $400,000.00 |
| 12 | Lake Shore Drainage Improvements | Lake Park | Public Works | HMGP | New | Flooding | One Year $3,500,000.00 |
| 13 | Moss Drainage Project | Indian Trail Improvement Dist | Public Works | HMGP | Funding Applied For | Flooding | One Year $400,000.00 |
| 14 | Public Works Generator | Greenacres | Public Works | HMGP, Cap Improvement | New | Severe Weather/Flooding | One Year $240,000.00 |
| 15 | North Filter Building Hurricane Hardening | Riviera Beach | Utilities | HMGP | New | All-hazards | Three Years $400,000.00 |
| 16 | WTP Generator Improvement Project | Riviera Beach | Utilities | HMGP | New | Flooding | One Year $2,350,000.00 |
| 17 | Emergency Equipment | Pahokee | Public Works | HMGP | New | Severe Weather | Five Years $271,818.00 |
| 18 | Juno Ocean Walk Drainage Project | Juno Beach | Public Works | HMGP | New | Flooding | One Year $35,000.00 |
| 19 | Bridge Slope Stabilization and Canal Dredging | Royal Palm Beach | Public Works | HMGP | New | Flooding | Three Years $60,000.00 |
| 20 | New City Services Complex – EOC | Lake Worth Beach | Public Works | HMGP | New | All-hazards | Five Years $4,000,000.00 |
| 21 | Davis Road N. Basin Storm Water Improvements | Palm Springs | Public Works | HGMP | New | Flooding | One Year $976,752.00 |
| 22 | Residential Undergrounding of Powerlines | Golf | Public Works/FPL | HMGP | New | Severe Weather | Two Years $2,000,000.00 |
| 23 | North Flagler Improvements | West Palm Beach | Public Works | HMGP | New | Flooding | Two Years $1,379,070.00 |

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 24 | Palm Beach Data Acquisition; Simulation & Scenario Mngt (PBDASS) | Palm Beach | SFWMD | HMGP | New | Stormwater/Flooding | One Year $400,000.00 |
| 25 | North F St between 3rd Ave and 6th Ave North Drainage | Lake Worth Beach | Public Works | HMGP | New | Stormwater/Flooding | Five Years $2,038,300.00 |
| 26 | 2nd Ave North to 1st So, F St to Dixie Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $2,929,300.00 |
| 27 | Stormwater System Rehab Phase 2 | West Palm Beach | Public Works | HMGP | New | Stormwater/Flooding | Three Years $3,000,000.00 |
| 28 | North Lakeside/Duke/Notre Dame/Wellesley Dr Drainage | Lake Worth | Public Works | HMGP | New | Flooding | Five Years $1,791,900.00 |
| 29 | Water Treatment Plant Hardening/Windproofing | West Palm Beach | Public Works | HMGP | New | Severe Weather/Flooding | One Year $1,000,000.00 |
| 30 | Property Acquisition | Mangonia Park | Public Works | HMGP | New | Flooding | One Year $283,603.00 |
| 31 | 10th Ave North to 13th Ave North, E and F Streets Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $721,600.00 |
| 32 | Bridge Slope Stabilization / Canal Dredge Phase II | Royal Palm Beach | Public Works | HMGP | New | Stormwater/Flooding | Three Years $2,600,000.00 |
| 33 | 22nd Ave N and Park Street Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Two Years $421,300.00 |
| 34 | South Flagler Improvements | West Palm Beach | Public Works | HMGP | New | Flooding | Two Years $1,015,014.00 |
| 35 | Lake Ave to 1st Ave South Drainage | Lake Worth | Public Works | HMGP | New | Flooding | Five Years $2,956,800.00 |

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 36 | 15th Ave North and Dixie Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $563,200.00 |
| 37 | 3rd Ave South to 5th Ave South Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $3,349,500.00 |
| 38 | Caroline Area Improvements | West Palm Beach | Public Works | HMGP | New | Flooding | Two Years $1,423,338.00 |
| 39 | Town Hall Retrofit | Jupiter | Public Works | HMGP | New | All-hazards | One Year $2,933,000.00 |
| 40 | Basin Street Pumping Station | Delray Beach | Public Works | HMGP | New | Flooding | Three Years $1,000,000.00 |
| 41 | Main County Courthouse Skylight Removal/Roof Retrofit | Palm Beach County Facilities Development | FD&O | HMGP | New | Flooding/Severe Weather | One Year $1,074,164.00 |
| 42 | Standby Generators for 5 Lift Station Improvements | Riviera Beach | Utilities | HMGP | New | Flooding | One Year $300,000.00 |
| 43 | Lantana Cove Drainage Improvements (2017) | Lantana | Public Works | HMGP | New | Flooding | One Year $380,000.00 |
| 44 | Heart of Boynton Stormwater Study & Improvement | Boynton Beach | Public Works | HMGP | New | Flooding | Three Years $400,000.00 |
| 45 | High Flow Lift Station Emergency Power | Wellington | Public Works | HMGP | New | All Hazards | One Year $250,000.00 |
| 46 | 10th Ave S and G Street Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $74,700.00 |
| 47 | 6th Ave South and F Street Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $224,400.00 |
| 48 | 10th Ave South and South N Street Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $518,100.00 |

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 49 | Town-wide Undergrounding of Utilities | Palm Beach | Public Works | HMGP | New | All-hazards | Five Years $98,600,000.00 |
| 50 | Pump Station Number 2 Hardening | Wellington | Public Works | HMGP | New | Flooding | One Year $2,085,000.00 |
| 51 | Elevate Lift Stations | Mangonia Park | Public Works | HMGP | New | Flooding | One Year $40,000.00 |
| 52 | 18th Ave South and S Palmway Drainage | Lake Worth Beach | Public Works | HMGP | New | Flooding | Five Years $111,100.00 |
| 53 | Palmetto Ave and South Pine Street | Lake Worth Baech | Public Works | HMGP | New | Flooding | Five Years $167,200.00 |
| 54 | Seawall Improvements – NE 1st Ct; NE 2nd St; NE 5th St; Bucida and Spanish Cir | Delray Beach | Public Works | HMGP | New | Sea Level Rise / Flooding | Five Years $1,200,000.00 |
| 55 | Pineapple Park Improvements | West Palm Beach | Public Works | HMGP | New | Flooding | One Year $1,961,862.00 |
| 56 | Public Works Facility Retrofit | Wellington | Public Works | HMGP | New | All-hazards | Two Years $955,000.00 |
| 57 | Culvert Improvements – Phase I | Indian Trail Improvement Dist | IDIT | HMGP | New | Flooding/Stormwater | Two Years $2,106,500.00 |
| 58 | Sub-Pump Emergency Response | Briny Breezes | Public Works | HMGP | New | Flooding | One Year $50,000.00 |
| 59 | Southern Outfall Retrofit | Lake Park | Public Works | HMGP | New | Stormwater | Three Years $3,500,000.00 |
| 60 | City Hall Retrofit | Lake Worth Beach | Public Works | HMGP | New | Severe Weather | Five Years $831,000.00 |
| 61 | Thomas Street Pump Station Replacement | Delray Beach | Public Works | HMGP | New | Flooding | Three Years $2,300,000.00 |

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 62 | Lift Station; Sea Level Rise / Tidal Flooding Impact Study Improvements | West Palm Beach | Utilities | HMGP | New | Flooding | Three Years $5,850,000.00 |
| 63 | Lakeview Stormwater Pipe Improvements | Delray Beach | Public Works | HMGP | New | Stormwater/Flooding | Two Years $1,320,000.00 |
| 64 | City Hall, Police, Fire Station Wind Retrofit | Palm Beach Gardens | Public Works | HMGP | New | All-hazards | One Year $600,000.00 |
| 65 | Marine Way Seawall Improvements | Delray Beach | Public Works | HMGP | New | Flooding/Sea Level Rise | Two Years $2,250,000.00 |
| 66 | Tidal Check Valve Improvement – Phase 1 | Delray Beach | Public Works | HMGP | New | Flooding | Two Years $750,000.00 |
| 67 | Tidal Check Valve Improvement – Phase 2 | Delray Beach | Public Works | HMGP | New | Flooding | Two Years $750,000.00 |
| 68 | Tidal Check Valve Improvement – Phase 3 | Delray Beach | Public Works | HMGP | New | Flooding | Two Years $750,000.00 |
| 69 | Tidal Check Valve Improvement – Phase 4 | Delray Beach | Public Works | HMGP | New | Flooding | Two Years $750,000.00 |
| 70 | Atlantic Dunes Park Seawall Improvements | Delray Beach | Public Works | HMGP | New | Flooding/Sea Level Rise | Two Years $1,700,000.00 |
| 71 | Standby Generators for Critical Facilities | Delray Beach | Public Works | HMGP | New | All-Hazards | One Year $300,000.00 |
| 72 | New EOC | Delray Beach | Public Works | HMGP | New | All-Hazards | Five Years $10,000,000.00 |
| 73 | Fire Station 1 Hardening | Delray Beach | Public Works | HMGP | New | Flooding/Severe Weather | One Year $1,070,000.00 |
| 74 | West Ave A Drainage | Belle Glade | Public Works | HMGP | New | Flooding | Five Years $98,102.00 |
| 75 | Water Reclamation Facility Emergency Operations Bld | Wellington | Public Works | HMGP | New | All-hazards | Two Years $500,000.00 |

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 76 | Corbett Levee | Indian Trail Improvement Dist | Public Works | HMGP | New | Flooding | One Year $5,700,000.00 |
| 77 | Universe Blvd Improvements | Juno Beach | Public Works | HMGP | New | All-hazards | One Year $2,000,000.00 |
| 78 | I Canal Drainage Improvements | Indian Trail Improvement Dist | Public Works | HMGP | New | Flooding | One Year $225,000.00 |
| 79 | Water Treatment Plant Hardening | Wellington | Public Works | HMGP | New | All-hazards | Two Years $75,000.00 |
| 80 | Drainage Improvements at City Hall | Belle Glade | Public Works | HMGP | New | Flooding | Five Years $206,205.00 |
| 81 | Marine Way Pump Station | Delray Beach | Public Works | HMGP | New | Flooding/Sea Level Rise | Four Years $4,000,000.00 |
| 82 | Town Hall Hardening | Hypoluxo | Public Works | HMGP | New | All-hazards | One Year $450,000.00 |
| 83 | Tidal Valve Implementation Phase 2 | West Palm Beach | Public Works | HMGP | New | Flooding/Sea Level Rise | Three Years $180,000.00 |
| 84 | Town Hall Emergency Generator | Glen Ridge | Public Works | HMGP | New | All-hazards | One Year $5,000.00 |
| 85 | East Lake Village Project | Pahokee | Public Works | HMGP | New | Flooding | Five Years $300,375.00 |
| 86 | Dexter Rd Drainage Project | Mangonia Park | Public Works | HMGP | New | Flooding | One Year $435,556.00 |
| 87 | EOC Construction | Belle Glade | Public Works | HMGP | New | All-hazards | One Year $2,900,000.00 |
| 88 | Landscape Hardscape | Lake Worth Beach | Public Works | HMGP | New | Flooding | One Year $741,200.00 |
| 89 | Demo of Vacant Properties | Lake Worth Beach | Public Works | HMGP | New | All-hazards | One Year $692,000.00 |

| Rank | Project Description | Jurisdiction | Responsible Agency | Potential Funding Source(s) | New, Deferred, Completed or Deleted | Hazard Being Mitigated | Completion Timeframe / Cost |
|---|---|---|---|---|---|---|---|
| 90 | Outfall Canal Control Structure | Indian Trail Improvement Dist | Public Works | HMGP | New | All-hazards | One Year $400,000.00 |
| 91 | Pump Station Hardening | Indian Trail Improvement Dist | Public Works | HMGP | New | All-hazards | One Year $750,000.00 |
| 92 | C-23/Pierson Rd Improvements | Wellington | Public Works | HMGP | New | Flooding | One Year $3,530,000.00 |
| 93 | Generator for Temporary Shelter at Community Center | Mangonia Park | Public Works | HMGP | New | All-hazards | One Year $46,362.00 |
| 94 | M-2 Impoundment | Indian Trail Improvement Dist | Public Works | HMGP | New | Flooding | One Year $205,126.00 |

# Projects deleted, deferred, awarded funding, or completed from Sept 2014 – Jun 2019

| | | | | | |
|---|---|---|---|---|---|
| Caroline Area Improvements | West Palm Beach | Public Works | Duplicate Entry | Deleted | Flooding |
| Gregory Rd Improvements | West Palm Beach | Public Works | City funded the project | Completed | Flooding |
| Washington Road Improvements | West Palm Beach | Public Works | City funded the project | Completed | Flooding |
| Lantana Cove Drainage Improvements | Lantana | Public Works | Duplicate Entry | Deleted | Flooding |
| **Project Title** | **Municipality/Agency** | **Responsible Department** | **Reason for Removal** | **Project Status** | **Hazard Mitigated** |

| | | | | | |
|---|---|---|---|---|---|
| North and South Roads Stormwater Improvement | Boynton Beach | Public Works | Duplicate Entry | Deleted | Flooding |
| Southeast Ave K Drainage | Belle Glade | Public Works | City funded the project | Completed | Flooding |
| Northeast Ave H Drainage | Belle Glade | Public Works | City funded the project | Completed | Flooding |
| Lake Shore Civic Center Retrofit | Belle Glade | Public Works | City funded the project | Completed | All-hazards |
| City Hall Retrofit | Belle Glade | Public Works | City funded the project | Completed | All-hazards |
| Public Works Hardening | Belle Glade | Public Works | City funded the project | Completed | All-hazards |
| EOC Construction | Lantana | Public Works | Duplicate Entry | Deleted | All-hazards |
| Saratoga Drainage Improvements | Royal Palm Beach | Public Works | City funded the project | Completed | Flooding |
| Original Section Drainage Improvements | Greenacres | Public Works | City funded the project | Completed | Flooding |
| North & South Roads Stormwater & Water Main Improvements | Boynton Beach | Public Works | City funded the project | Completed | Flooding |
| Miller Rd Storm Water Improvement Project | Palm Springs | Public Works | HMGP | Project Awarded | Flooding |
| Lantana Library Hurricane Shutter System | Lantana | Public Works | HMGP | Project Awarded | All-hazards |
| EOC Retrofit | Lantana | Public Works | HMGP | Project Awarded | All-hazards |
| 901 EOC Retrofit | Lantana | Public Works | HMGP | Duplicate Entry-Proj Awarded | All-hazards |
| Lantana Police Department Wind Retrofit | Lantana | Public Works | HMGP | Duplicate Entry-Proj Awarded | All-hazards |
| Palm Beach Data Acquisition, Simulation, and Scenario Mgmt | South Florida Water Management District | SFWMD | HMGP, other Internal Funding | Deleted | Flooding |

| | | | | | |
|---|---|---|---|---|---|
| Repair of City's Stormwater System | South Bay | Public Works | HMGP | Duplicate Entry | Flooding |
| Retrofit City Hall | South Bay | Public Works | HMGP | Duplicate Entry | All-hazards |
| Town Hall Impact Retrofit | Jupiter | Public Works | HMGP | Duplicate Entry | All-hazards |
| EOC/Hurricane Community Center | South Bay | Public Works | HMGP | Not eligible | All-hazards |
| Individual Mitigation Measures | Mangonia Park | Public Works | HMGP | Withdrawn | Flooding |
| Primary East-West Conveyance Improvements | Indian Trail Improvement Dist | Public Works | HMGP | Deleted | Flooding |
| Sheriff's Office Wind Retrofit | Lake Park | Public Works | HMGP, other Internal Funding | Withdrawn, no longer viable | All-hazards |
| PO4 Chemical Building Hardening | Lake Park | Public Works | HMGP, other Internal Funding | Deleted/outdated | Flooding/Hazardous Materials |
| Reed Road & Miller Way Storm Water Drains | Lake Park | Public Works | HMGP | Deleted | Flooding |
| 10th Street Stormwater Improvement | Lake Park | Public Works | HMGP | Deleted | Flooding |
| Community/Emergency Shelter | Lake Park | Public Works | HMGP | Deleted/outdated | All-hazards |

**Completed project photos from City of Belle Glade**

City Hall Retrofit


Lake Shore Civic Center Retrofit



NE Avenue H Drainage Project

Public Works Building Hardening Project

SE Avenue K Drainage Project

**City of Greenacres Completed Project**

Original Section Stormwater Drainage Systems Project


**City of Boynton Beach Completed Project**

North and South Roads Stormwater Project

# Appendix F: Funding and Data Sources

This appendix addresses, in part, the following FEMA requirements:

**Requirement §201.6(c)(3):** The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

**Requirement §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 effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

**Requirement §201.6(c)(3)(i):** The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Palm Beach County seeks to utilize every available funding source to provide comprehensive mitigation funding to mitigation projects. We do this by utilizing resources at the local, state, and federal levels and by being in continued contact with funding agencies and partners throughout the region.

The following list, though not exhaustive, includes many of the ways mitigation projects are funded or encouraged to be funded by the LMS in the county:

- Hazard Mitigation Grant Program (HMGP) – This program provides funding only after a Presidentially-declared disaster affects the county. It is provided by FEMA, and administered by the State of Florida's Mitigation Branch as an Enhanced Mitigation Plan state. All projects to apply for this program must be included on the County's PPL and each jurisdiction must have adopted the LMS in order to qualify for these funds. Additionally, jurisdictions are encouraged after a disaster to coordinate and use Section 406 funds in conjunction with Section 404 funds as allowable to mitigate future damages.
- Flood Mitigation Assistance (FMA) – Again, this is a FEMA-funded program that is released annually. It is not tied to disasters and is intended to mitigate recurring flooding issues within a jurisdiction. It is a nationwide, competitive grant program in which each state may only apply for one grant. Projects applying through this grant program must be included on the County's PPL and each jurisdiction must have adopted the LMS to qualify.
- Pre-Disaster Mitigation (PDM) – Another FEMA-funded program that is released annually. It is similar to the FMA program except it is not restricted to flood-related projects. It is a nationwide, competitive grant program. Projects applying through this grant program must be included on the County's PPL and each jurisdiction must have adopted the LMS to qualify.
- Small Business Administration Loan Program – This program is coordinated through the Division of Emergency Management, but typically does not involve the LMS. It

allows individuals as well as jurisdictions to take out low or no interest loans for specific issues related to mitigation.

- Community Development Block Grants (CDBG) – These grants, provided by the federal Housing and Urban Development department, are grants given to jurisdictions for a multitude of reasons and are somewhat flexible on how the jurisdiction may be able to use them. Although they have not been fully utilized or mitigation purposes, the LMS encourages jurisdictions to actively look at these grants as a source of potential funding for their mitigation projects. CDBG is independent of the LMS process, so funds that are used for mitigation are not required to follow the standard LMS submission and prioritization process. However, since these funds are allowable to be used as the local 25% match for HMGP funds, anytime these funds are used for that purpose they must follow the standard LMS processes.
- Hurricane Loss Mitigation Program – This program is 100% funded by the State of Florida annually as the only state-funded mitigation program in the nation. It provides small grants to jurisdictions of up to $194,000 dollars for mitigation projects. These funds are also independent of the LMS process, although HLMP funds have often been used to complete small mitigation projects that do not go over that funding limit. We also encourage jurisdictions to use these funds to assist in mitigating Repetitive Loss and Severe Repetitive Loss properties when the costs do not exceed the established funding limit.
- Capital Improvement funds – These are funds paid for locally through tax dollars to improve the capital structure of a jurisdiction. Many prioritized LMS projects over the years have eventually been funded using Capital Improvement funds locally. These funds are independent of the standard LMS process.
- Penny Tax – This is a recent funding mechanism that can be used to fund projects locally. The County has a one-percent sales tax with the funding dedicated specifically to infrastructure projects, including mitigation of infrastructure. The LMS highly encourages jurisdictions to apply for and use the penny tax to complete mitigation projects.

Several years ago, Economic Development Administration and Public Entity Risk Institute grant funds, and private sector donations were used for the establishment of a state-of-the-art community wide Post Disaster Redevelopment Plan and business preparedness initiatives designed to build a more disaster resilient community and economy.

Hazard-specific HMGP projects, submitted specifically in response to county allocations, may, at the discretion of the LMS Steering Committee and Evaluation Panel, be prioritized using other criteria relevant to flood mitigation and wind retrofit projects. In response to Hurricanes Frances & Jeanne, the LMS's Flood Mitigation Technical Advisory Committee played an important role in prioritizing HMGP flood mitigation projects.

Once projects are submitted to DEM Management and FEMA those funding agencies work directly with applicant jurisdictions and organizations. The LMS monitors project status, and assists and works with applicants and funding agencies to resolve issues and problems that may arise. A list of all mitigation funding sources is maintained on the DEM Sharepoint site.

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# Appendix G: Hazard & Risk Assessment Maps

Appendix M contains hazard boundary and risk assessment maps. Using County and municipal GIS capabilities, facility inventory lists and property appraiser databases, and other local, regional, state, and national agency databases, the LMS is able to map any location-specific hazard risk or event and estimate associated physical and financial losses, on demand. A representative sample of hazard maps available for risk assessment, strategy development, and other mitigation planning activities are presented in the following sections of this appendix.

The maps and data in this appendix addresses, in part, the following FEMA requirements:

**Requirement §201.6(c)(2)(i):** The risk assessment shall include a description of the type of all natural hazards that can affect the jurisdiction.

**Requirement §201.6(c)(2)(i):** The risk assessment shall include a description of the 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.

**Requirement §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. This description **shall** include an overall summary of each hazard and its impact on the community.

**Requirement §201.6(c)(2)(ii):** The risk assessment must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

**Requirement §201.6(c)(2)(ii)(A):** The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.

**Requirement §201.6(c)(2)(ii)(B):** The plan should describe vulnerability in terms of an estimate of the potential dollar 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.

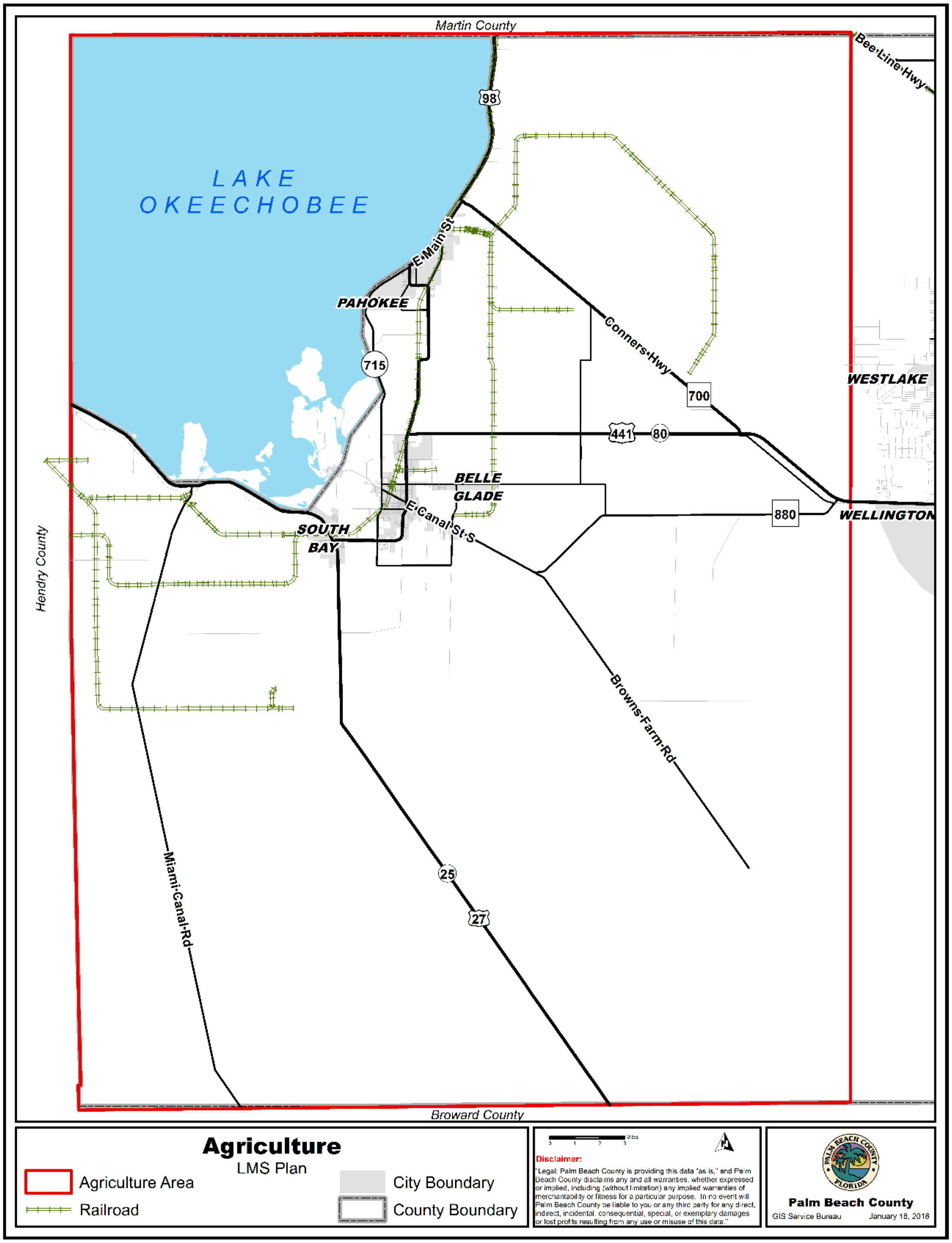
**Requirement §201.6(c)(2)(ii)(C):** The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

**Requirement §201.6(c)(2)(iii):** For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

Further risk assessment detail pertinent to these FEMA requirements are contained in Appendix A, in the PBC Hazard Environment section and in the hazard profiles.

The maps listed in this appendix are cited below.

| Map | Source |
|---|---|
| **Historical Flood Prone Areas** | SFWMD & PBCGIS |
| **Storm Surge Areas** | USACE |
| **Evacuation Zones** | DEM/USACE |
| **Coastal Erosion Boundary** | PBC ERM |
| **Hebert Hoover Dike Breach Reach** | SFWMD |
| **Wellfield Protection Zones** | PBC ERM |
| **Wildland Fire Areas** | Division of Forestry/PBCFR |
| **Radiological Ingestion Pathway Zone** | FP&L |
| **Muck Fire Areas** | PBC ERM |
| **Transportation Areas** | PBC GIS |
| **Hurricane Peak Wind Potentials** | NWS/NHC |
| **Other Countywide Hazard Threats (Tornado, Extreme Temps, etc.)** | PBC GIS |
| **Agricultural Pests** | PBC ERM |
| **Tsunami Buffer** | Tsunami Society |
| **Sea Level Rise Possible Inundation** | Southeast Florida Regional Climate Change Compact |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E-Main-St
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Conners-Hwy
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GLADE
E-Canal-St-S
SOUTH
BAY
880
WELLINGTON
Hendry County
Browns-Farm-Rd
Miami-Canal-Rd
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Broward County
Agriculture
LMS Plan
Agriculture Area
Railroad
City Boundary
County Boundary
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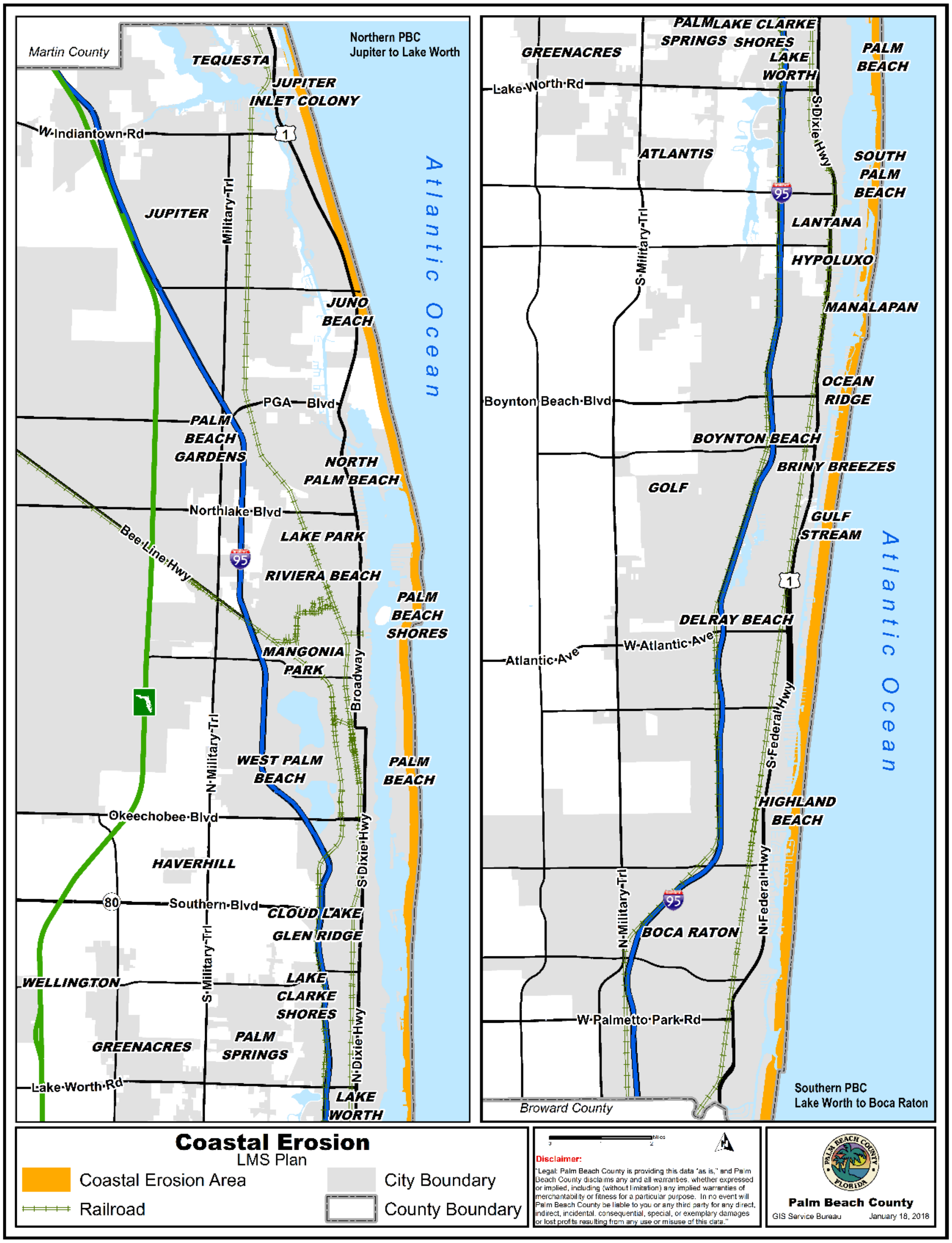
January 18, 2018



Northern PBC
Jupiter to Lake Worth
Martin County
TEQUESTA
JUPITER INLET COLONY
JUPITER
JUNO BEACH
PALM BEACH GARDENS
NORTH PALM BEACH
LAKE PARK
RIVIERA BEACH
PALM BEACH SHORES
MANGONIA PARK
WEST PALM BEACH
PALM BEACH
HAVERHILL
CLOUD LAKE
GLEN RIDGE
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PALM SPRINGS
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Northlake-Blvd
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Okeechobee-Blvd
Southern-Blvd
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N-Dixie-Hwy
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BOYNTON BEACH
BRINY BREEZES
GOLF
GULF STREAM
DELRAY BEACH
HIGHLAND BEACH
BOCA RATON
Boynton Beach-Blvd
Atlantic-Ave
W-Atlantic-Ave
S-Federal-Hwy
N-Federal-Hwy
N-Military-Trl
S-Military-Trl
W-Palmetto-Park-Rd
Broward County
Southern PBC
Lake Worth to Boca Raton
Coastal Erosion
LMS Plan
Coastal Erosion Area
City Boundary
Railroad
County Boundary
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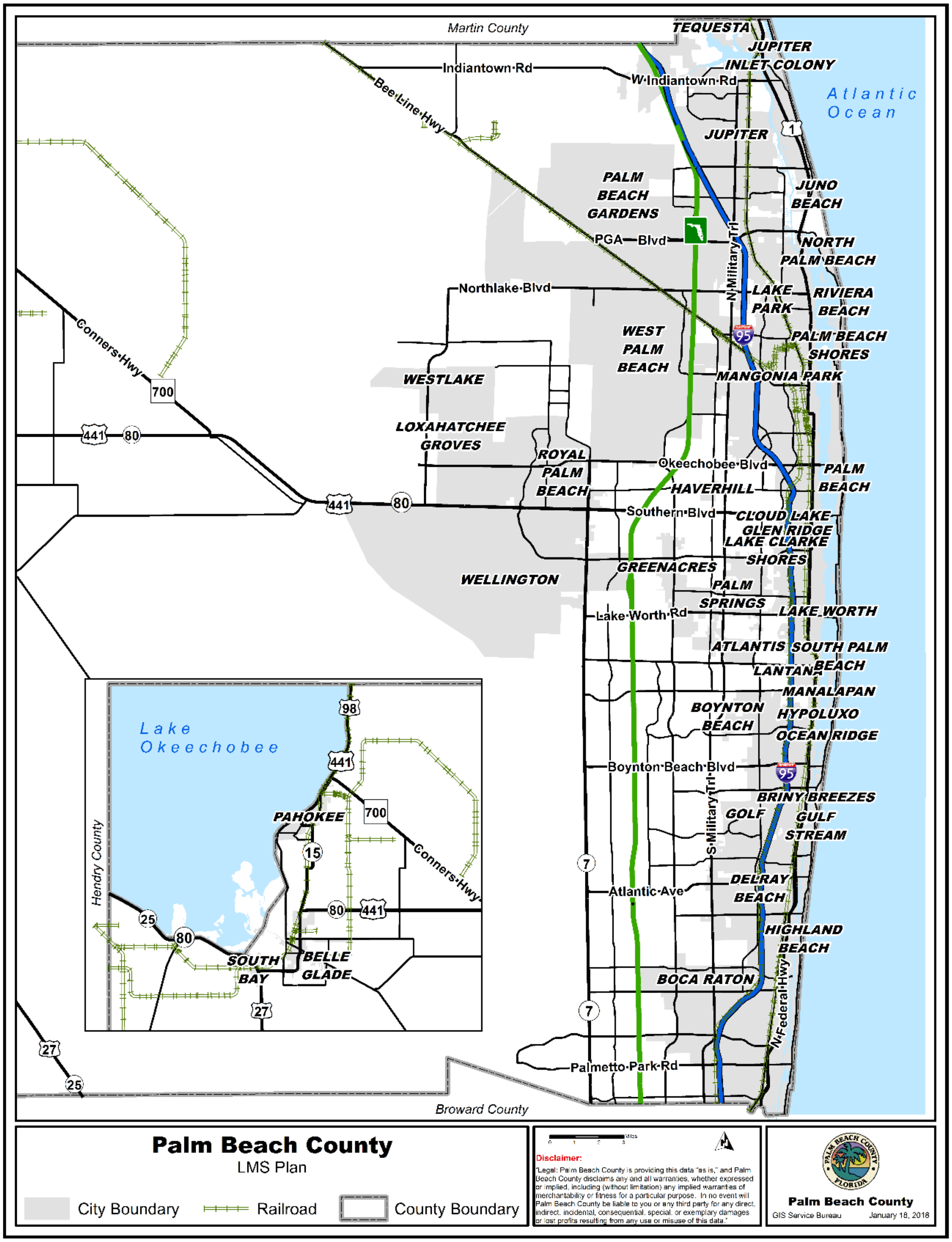

Martin County
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Hendry County
Atlantic Ocean
Lake Okeechobee
TEQUESTA
JUPITER
JUPITER INLET COLONY
PALM BEACH GARDENS
JUNO BEACH
NORTH PALM BEACH
LAKE PARK
RIVIERA BEACH
WEST PALM BEACH
PALM BEACH SHORES
MANGONIA PARK
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LOXAHATCHEE GROVES
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Palm Beach County
LMS Plan
City Boundary
Railroad
County Boundary
Miles
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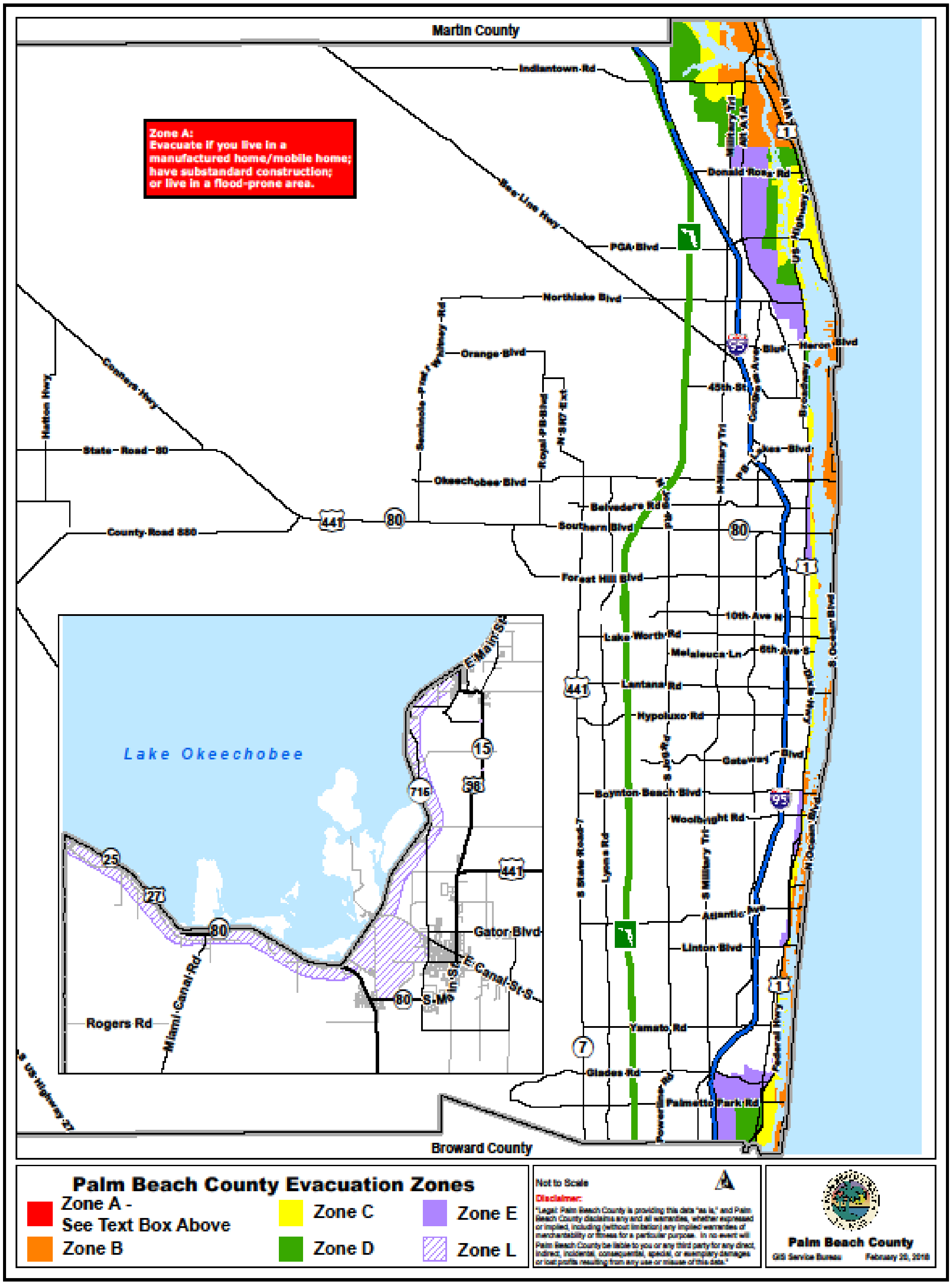
Martin County
Zone A:
Evacuate if you live in a manufactured home/mobile home; have substandard construction; or live in a flood-prone area.
Indiantown Rd
Donald Ross Rd
PGA Blvd
Northlake Blvd
Orange Blvd
Okeechobee Blvd
Belvedere Rd
Southern Blvd
Forest Hill Blvd
10th Ave N
Lake Worth Rd
Melaleuca Ln
6th Ave S
Lantana Rd
Hypoluxo Rd
Gateway Blvd
Boynton Beach Blvd
Woolbright Rd
Atlantic Ave
Linton Blvd
Yamato Rd
Glades Rd
Palmetto Park Rd
45th St
Heron Blvd
State Road 80
County Road 880
Lake Okeechobee
Gator Blvd
Rogers Rd
Miami Canal Rd
Broward County
Palm Beach County Evacuation Zones
Zone A - See Text Box Above
Zone B
Zone C
Zone D
Zone E
Zone L
Not to Scale
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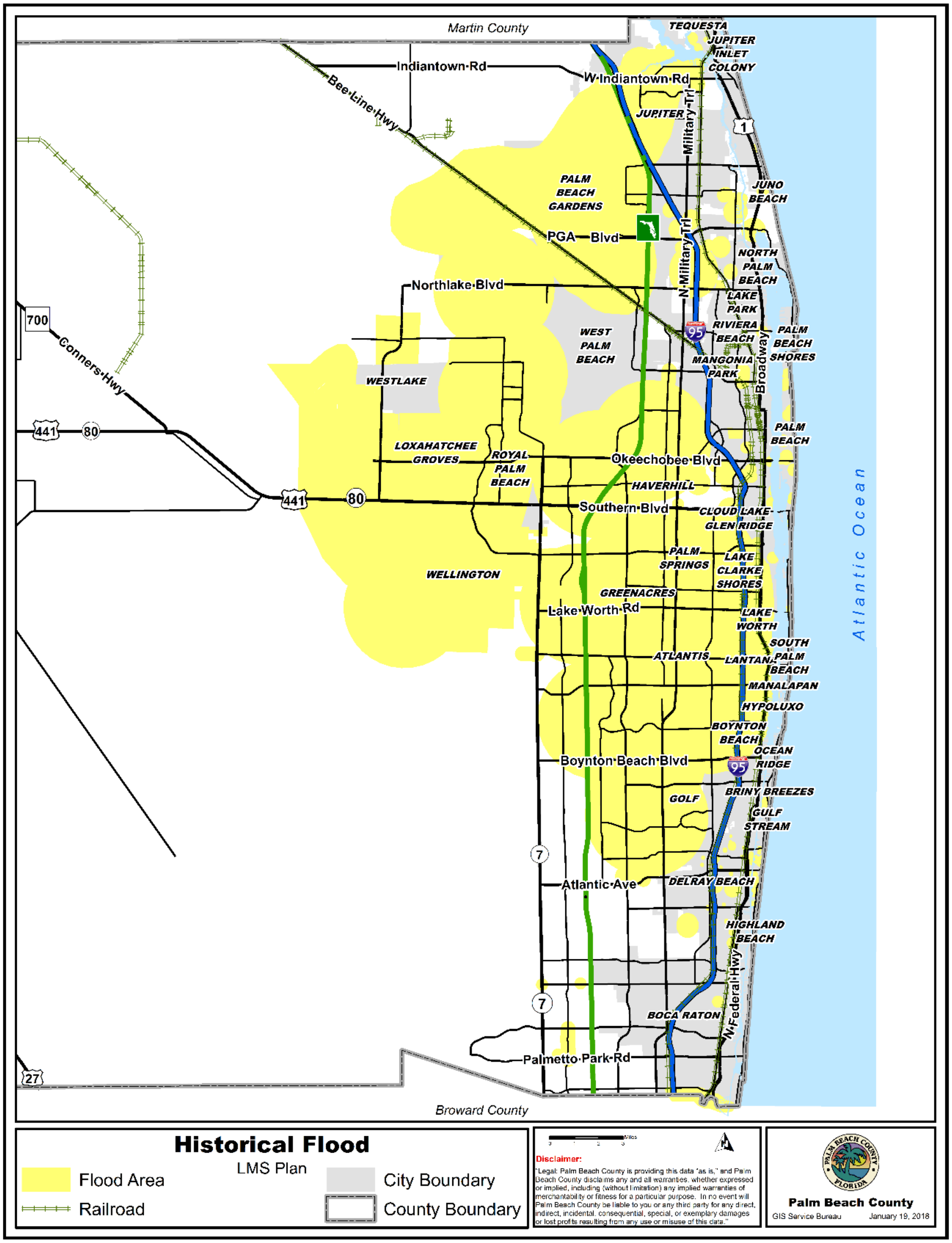
February 20, 2018



Martin County
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Boynton Beach Blvd
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Palmetto Park Rd
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Historical Flood
LMS Plan
Flood Area
Railroad
City Boundary
County Boundary
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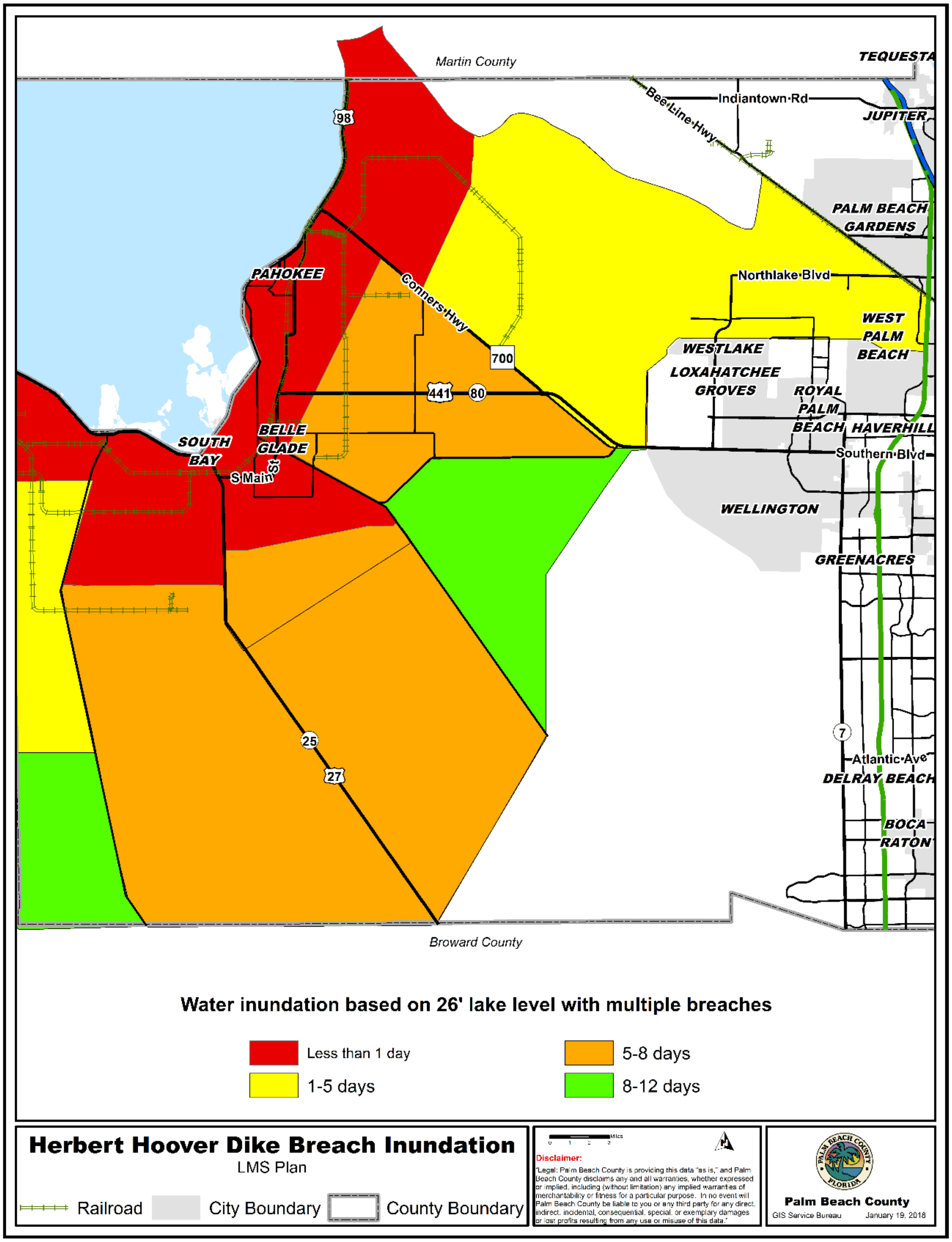

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BOCA RATON
Broward County
Water inundation based on 26' lake level with multiple breaches
Less than 1 day
1-5 days
5-8 days
8-12 days
Herbert Hoover Dike Breach Inundation
LMS Plan
Railroad
City Boundary
County Boundary
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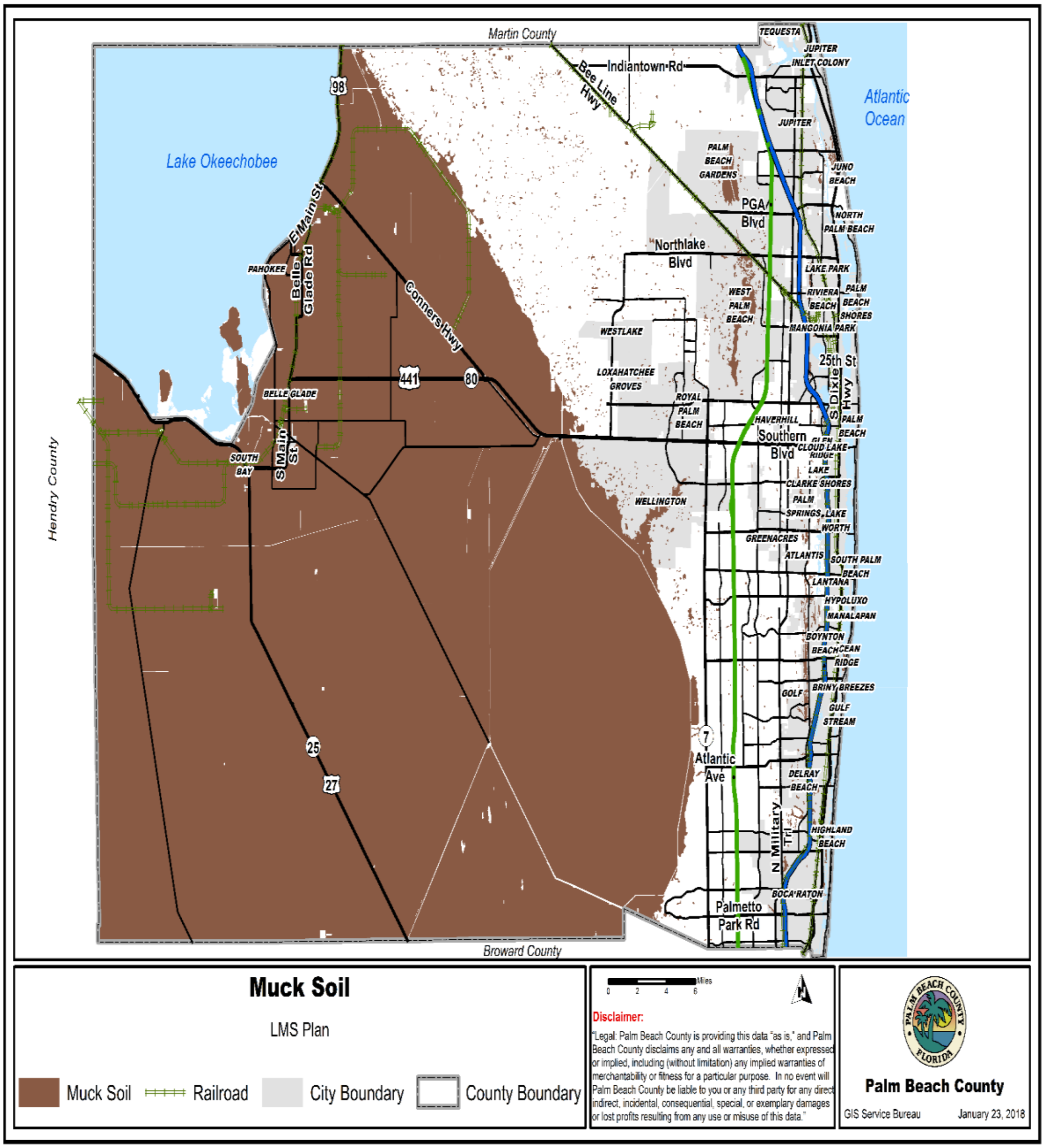
GIS Service Bureau
January 19, 2018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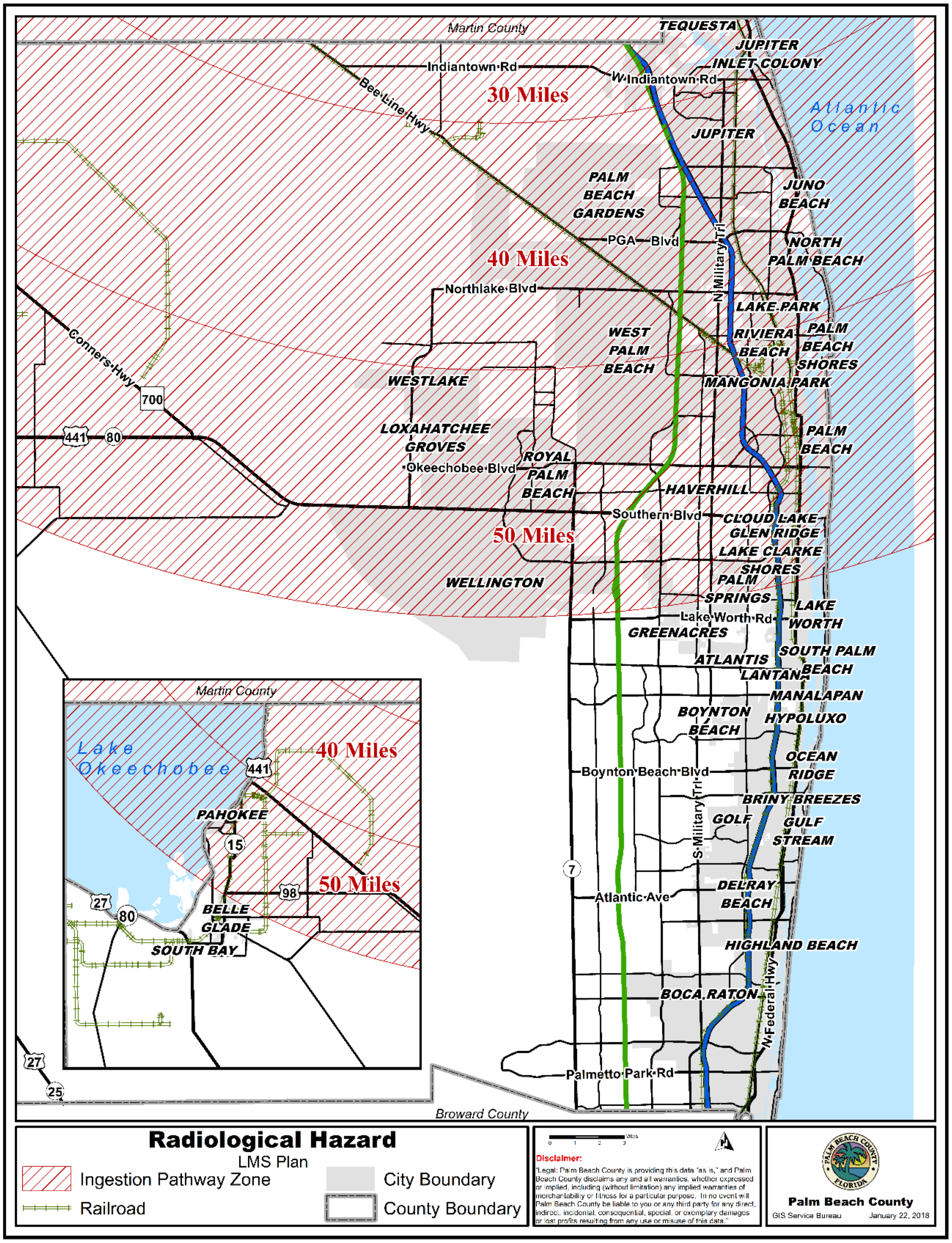
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Radiological Hazard
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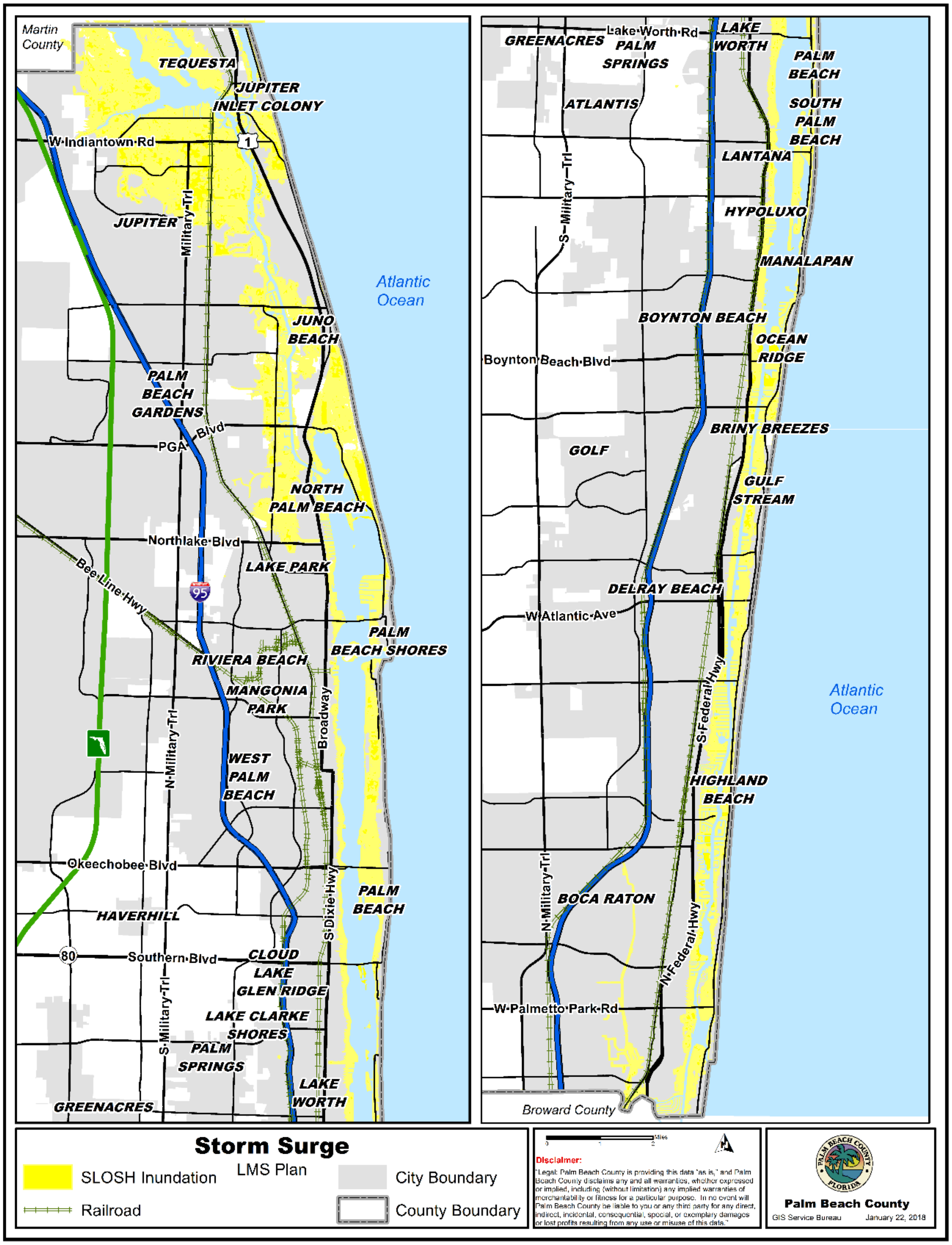
January 22, 2018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Broward County
Storm Surge
LMS Plan
SLOSH Inundation
City Boundary
Railroad
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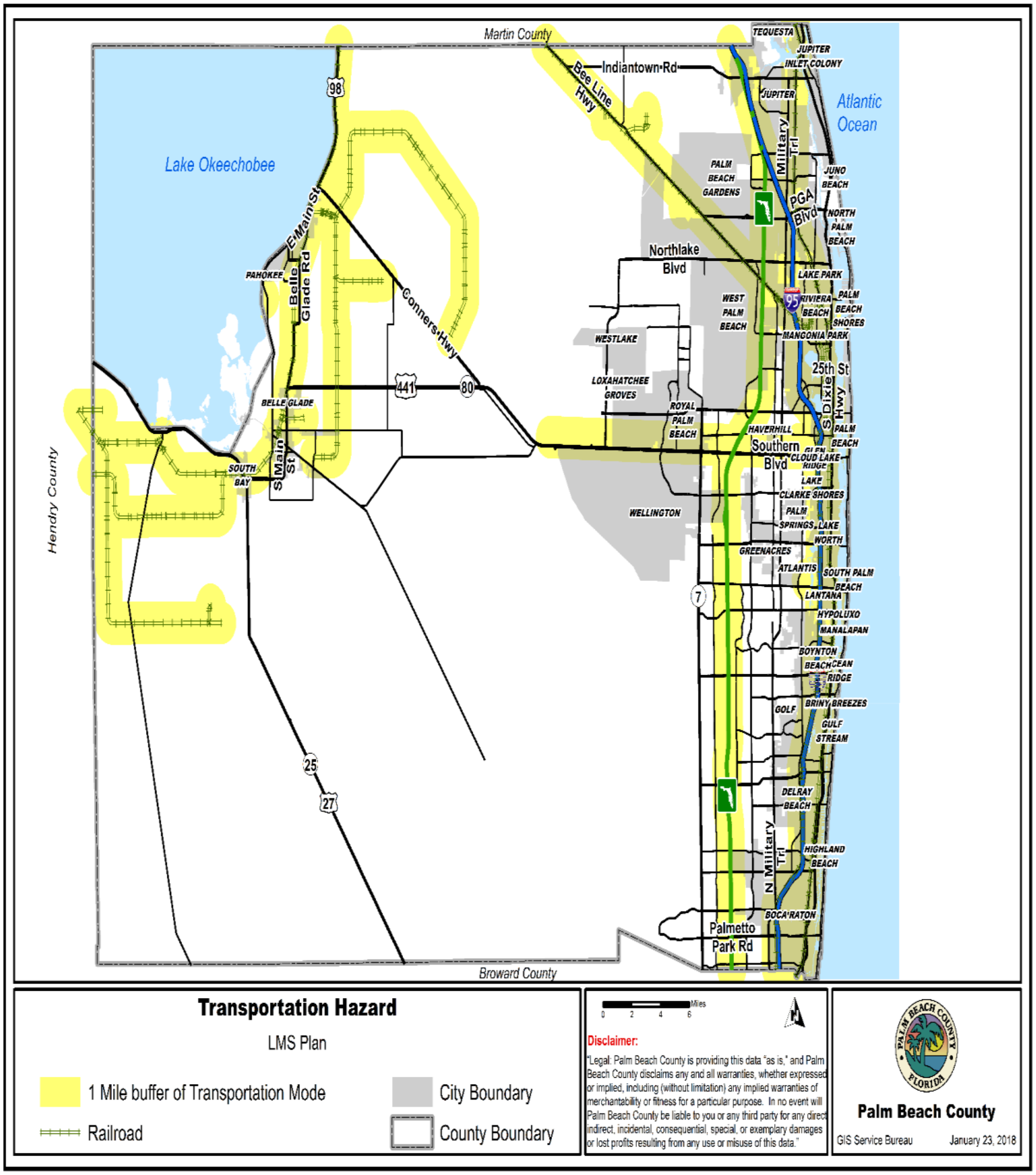

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HIGHLAND BEACH
BOCA RATON
Transportation Hazard
LMS Plan
1 Mile buffer of Transportation Mode
Railroad
City Boundary
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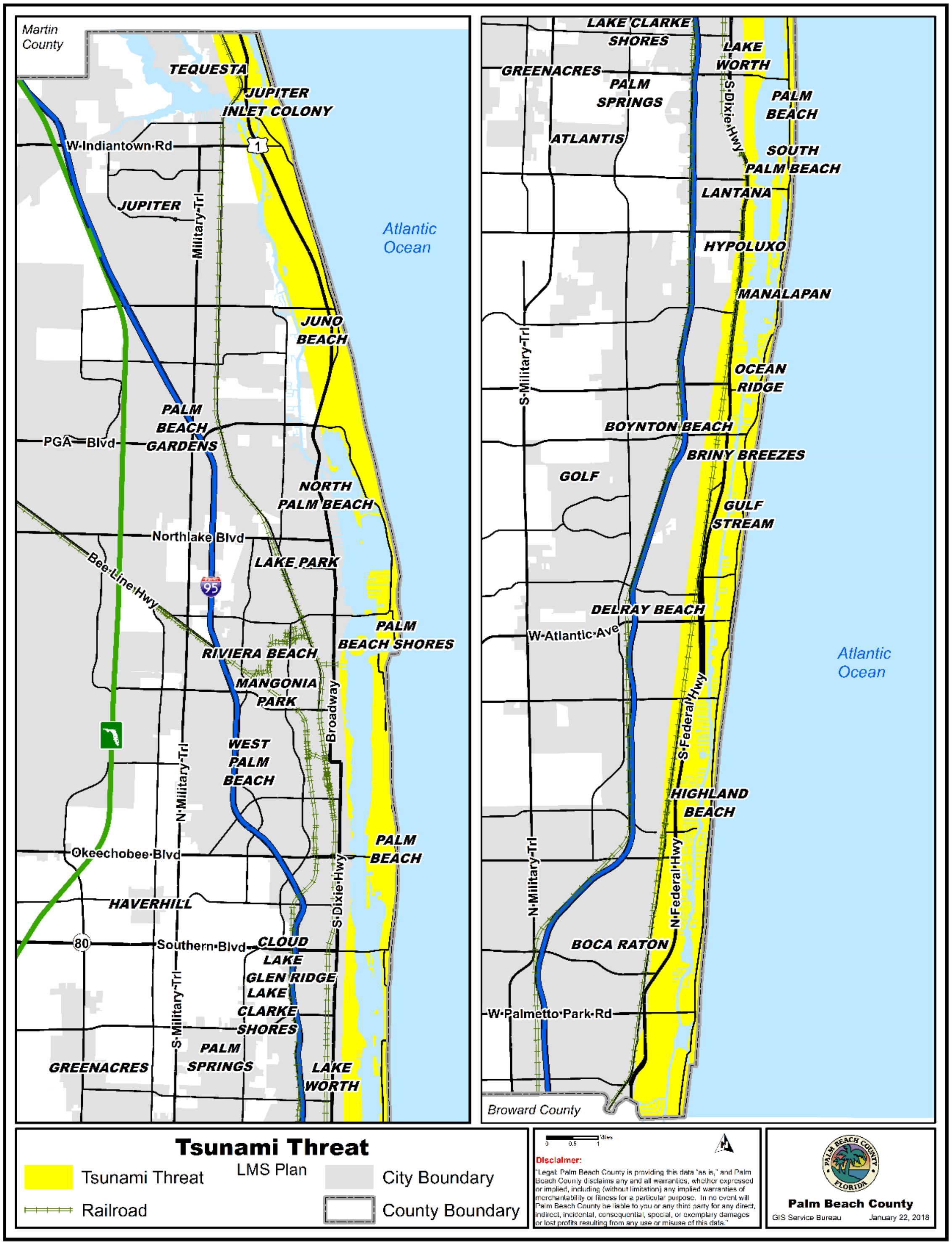
Tsunami Threat
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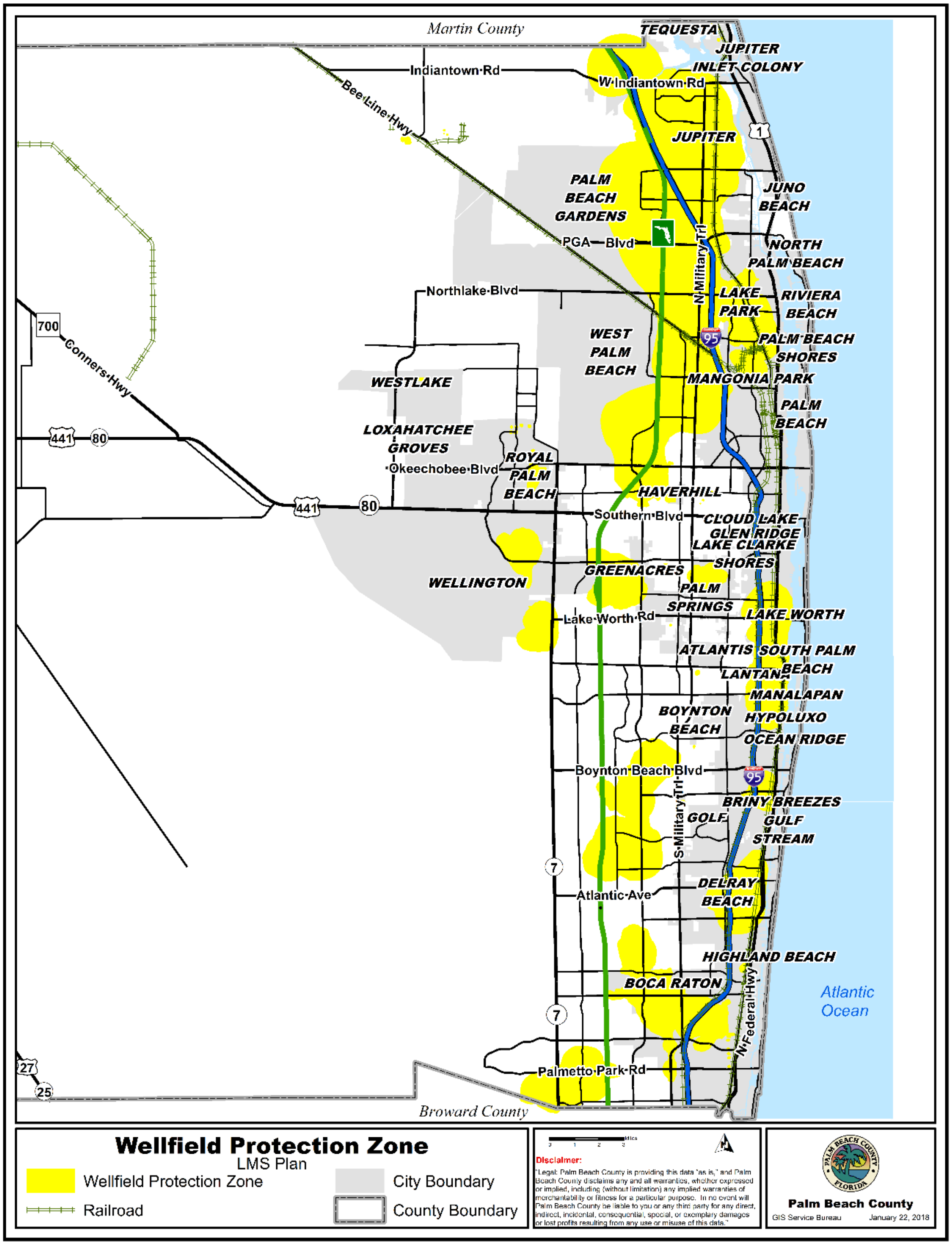
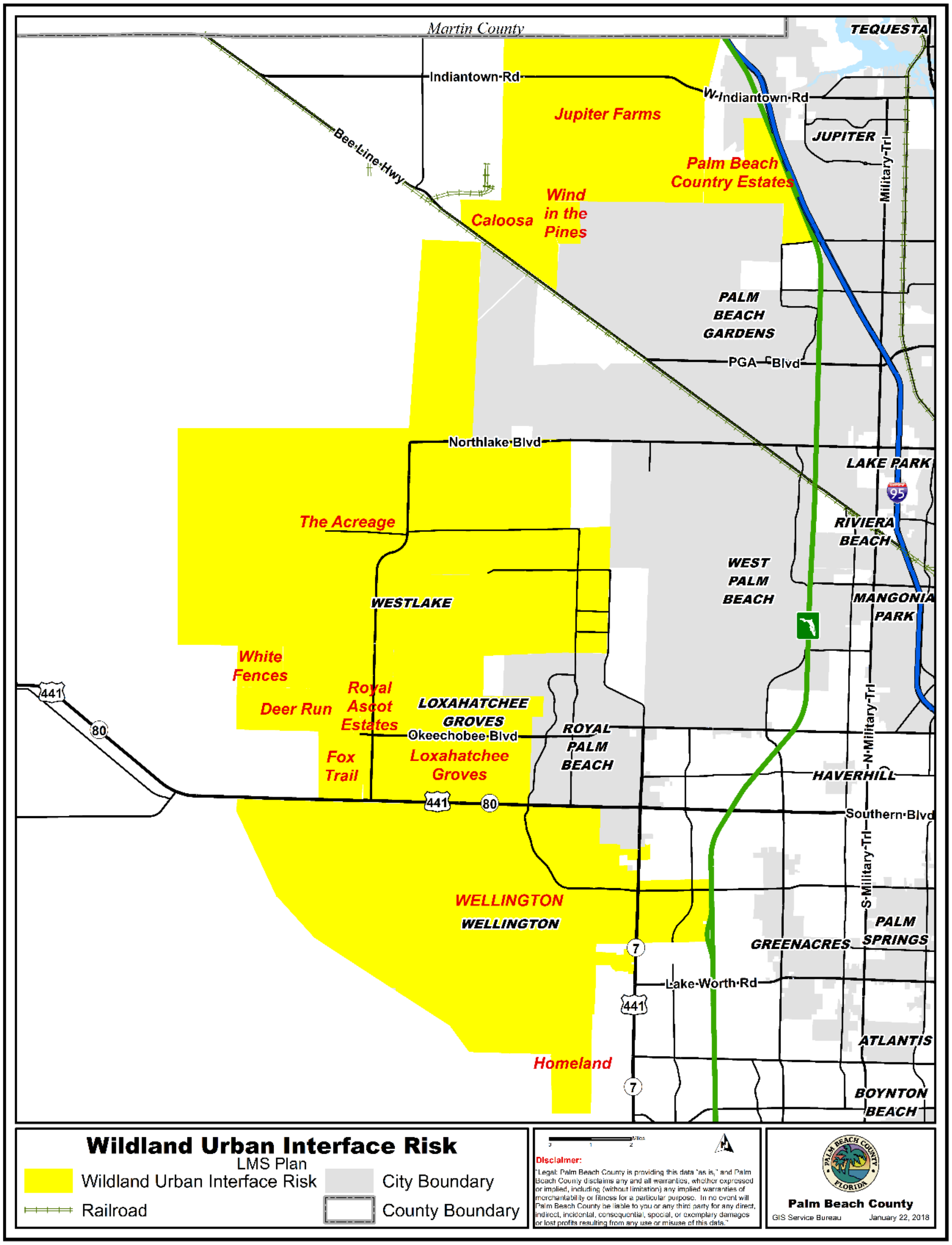
January 22, 2018


Martin County
TEQUESTA
JUPITER INLET COLONY
Indiantown Rd
W Indiantown Rd
Bee Line Hwy
JUPITER
JUNO BEACH
PALM BEACH GARDENS
PGA Blvd
NORTH PALM BEACH
N Military Trl
Northlake Blvd
LAKE PARK
RIVIERA BEACH
700
Conners Hwy
WEST PALM BEACH
PALM BEACH SHORES
MANGONIA PARK
WESTLAKE
PALM BEACH
441
80
LOXAHATCHEE GROVES
Okeechobee Blvd
ROYAL PALM BEACH
HAVERHILL
Southern Blvd
CLOUD LAKE
GLEN RIDGE
LAKE CLARKE SHORES
GREENACRES
WELLINGTON
PALM SPRINGS
LAKE WORTH
Lake Worth Rd
ATLANTIS
SOUTH PALM BEACH
LANTANA
MANALAPAN
BOYNTON BEACH
HYPOLUXO
OCEAN RIDGE
Boynton Beach Blvd
95
BRINY BREEZES
GOLF
GULF STREAM
S Military Trl
7
DELRAY BEACH
Atlantic Ave
HIGHLAND BEACH
BOCA RATON
N Federal Hwy
Atlantic Ocean
27
25
Palmetto Park Rd
Broward County
Wellfield Protection Zone
LMS Plan
Wellfield Protection Zone
City Boundary
Railroad
County Boundary
Disclaimer:
Palm Beach County
GIS Service Bureau
January 22, 2018


Martin County
TEQUESTA
Indiantown Rd
W Indiantown Rd
Bee Line Hwy
Jupiter Farms
JUPITER
Palm Beach
Country Estates
Military Trl
Wind
in the
Pines
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PALM
BEACH
GARDENS
PGA Blvd
Northlake Blvd
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95
The Acreage
RIVIERA
BEACH
WEST
PALM
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WESTLAKE
MANGONIA
PARK
White
Fences
Royal
Ascot
Estates
Deer Run
441
80
LOXAHATCHEE
GROVES
Okeechobee Blvd
ROYAL
PALM
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N Military Trl
Fox
Trail
Loxahatchee
Groves
HAVERHILL
Southern Blvd
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WELLINGTON
WELLINGTON
PALM
SPRINGS
GREENACRES
7
Lake Worth Rd
ATLANTIS
Homeland
BOYNTON
BEACH
Wildland Urban Interface Risk
LMS Plan
Wildland Urban Interface Risk
City Boundary
Railroad
County Boundary
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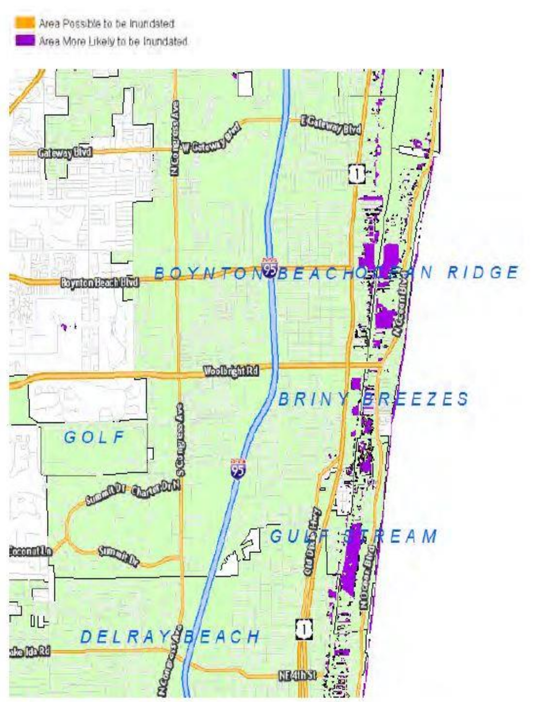
January 22, 2018

2-Foot Sea Level Rise in Palm Beach County - Jupiter Area


2-Foot Sea Level Rise in Palm Beach County - Boca Raton Area


2-Foot Sea Level Rise in Palm Beach County - Boynton Beach Area



# Appendix H: Repetitive Loss Properties

In accordance with the following FEMA requirement, the PBC LMS includes repetitive flood loss structures in its risk assessments:

**Requirement §201.6(c)(2)(ii):** The risk assessment must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged by floods.

In addition, PBC's LMS and Community Rating System programs monitor the number and locations of flood prone properties countywide. Currently, there are 337 FEMA-registered repetitive flood loss buildings in the combined jurisdictions of incorporated and unincorporated PBC.

<u>Repetitive Loss Properties</u>

Repetitive loss properties are defined by the National Flood Insurance Program as, "properties with two or more NFIP claims of at least $1,000 in any rolling ten year period". Repetitive-loss properties constitute a significant drain on the resources of the NFIP, costing about $ 200,000,000 annually. Repetitive-loss properties comprise approximately 1 percent of currently insured properties but account for 25 to 30 percent of claims losses. They represent a key target of the NFIP for mitigation, including relocation, elevation, and buyouts.

According to FEMA Repetitive Loss data provided by FEMA Region IV insurance analysts, as of December 31, 2018 PBC has a total of **337** repetitive loss properties. A chart of repetitive loss properties is available in this appendix.

This appendix also includes aggregate data from 1978 to November of 2018 of each municipality as well as unincorporated PBC flood-related losses documented by NFIP. It also includes data from FEMA/NFIP regarding NFIP flood policy information as of November 30, 2018.

## Repetitive Loss Buildings in Palm Beach County

| Community Name | RL Buildings |
|---|---|
| Atlantis | 1 |
| Belle Glade | 0 |
| Boca Raton | 10 |
| Boynton Beach | 18 |
| Briny Breezes | 0 |
| Cloud Lake | 1 |
| Delray Beach | 16 |
| Glen Ridge | 0 |
| Golf | 0 |
| Greenacres | 0 |
| Gulf Stream | 3 |
| Haverhill | 1 |
| Highland Beach | 0 |
| Hypoluxo | 0 |
| Juno Beach | 4 |
| Jupiter | 13 |
| Jupiter Inlet Colony | 0 |
| Lake Clarke Shores | 0 |
| Lake Park | 2 |
| Lake Worth Beach | 12 |
| Lantana | 6 |
| Loxahatchee Groves | 0 |
| Manalapan | 3 |
| Mangonia Park | 2 |
| North Palm Beach | 2 |
| Ocean Ridge | 16 |
| Pahokee | 1 |
| Palm Beach | 90 |
| Palm Beach County | 74 |
| Palm Beach Gardens | 6 |
| Palm Beach Shores | 2 |
| Palm Springs | 10 |
| Riviera Beach | 10 |
| Royal Palm Beach | 0 |
| South Bay | 0 |
| South Palm Beach | 1 |
| Tequesta | 2 |
| Wellington | 2 |
| Westlake | 0 |
| West Palm Beach | 29 |
| Totals: | 279 |

Appendix H (source: FEMA RLP data as of 12/31/2018)

LOSS STATISTICS
FLORIDA
AS OF 11/30/2017

| COUNTY NAME | COMMUNITY NAME | TOTAL LOSSES | CLOSED LOSSES | OPEN LOSSES | CWOP LOSSES | TOTAL PAYMENTS |
|---|---|---|---|---|---|---|
| PALM BEACH COUNTY | ATLANTIS, CITY OF | 29 | 18 | 0 | 11 | 316,370.90 |
| | BELLE GLADE, CITY OF | 8 | 3 | 1 | 4 | 26,837.91 |
| | BOCA RATON, CITY OF | 629 | 208 | 18 | 403 | 2,313,252.56 |
| | BOYNTON BEACH, CITY OF | 584 | 250 | 8 | 326 | 1,644,892.91 |
| | BRINY BREEZES, TOWN OF | 13 | 6 | 0 | 7 | 14,227.77 |
| | CLOUD LAKE, TOWN OF | 7 | 5 | 0 | 2 | 20,317.57 |
| | DELRAY BEACH, CITY OF | 752 | 340 | 7 | 405 | 2,542,937.58 |
| | GLEN RIDGE, TOWN OF | 6 | 4 | 0 | 2 | 8,520.02 |
| | GOLF, VILLAGE OF | 3 | 2 | 0 | 1 | 42,999.54 |
| | GREENACRES, CITY OF | 20 | 6 | 0 | 14 | 42,206.73 |
| | GULF STREAM, TOWN OF | 43 | 20 | 1 | 22 | 126,963.30 |
| | HAVERHILL, TOWN OF | 7 | 6 | 0 | 1 | 70,254.16 |
| | HIGHLAND BEACH, TOWN OF | 89 | 11 | 4 | 74 | 147,732.43 |
| | HYPOLUXO, TOWN OF | 22 | 5 | 0 | 17 | 13,145.43 |
| | JUNO BEACH, TOWN OF | 43 | 22 | 2 | 19 | 314,029.92 |
| | JUPITER INLET COLONY, TOWN OF | 17 | 8 | 0 | 9 | 105,470.23 |
| | JUPITER, TOWN OF | 477 | 225 | 1 | 251 | 3,158,427.09 |
| | LAKE CLARKE SHORES, TOWN OF | 19 | 9 | 0 | 10 | 27,254.62 |
| | LAKE PARK, TOWN OF | 44 | 23 | 0 | 21 | 622,665.46 |
| | LAKE WORTH, CITY OF | 200 | 107 | 3 | 90 | 703,091.32 |
| | LANTANA, TOWN OF | 152 | 83 | 0 | 69 | 1,442,016.22 |
| | MANALAPAN, TOWN OF | 83 | 25 | 2 | 56 | 346,198.38 |
| | MANGONIA PARK, TOWN OF | 13 | 12 | 0 | 1 | 465,502.44 |
| | NORTH PALM BEACH, VILLAGE OF | 108 | 51 | 0 | 57 | 367,768.76 |
| | OCEAN RIDGE, TOWN OF | 192 | 91 | 3 | 98 | 1,298,956.70 |
| | PAHOKEE, CITY OF | 15 | 4 | 0 | 11 | 45,582.20 |
| | PALM BEACH COUNTY * | 3,940 | 1,603 | 57 | 2,280 | 17,625,098.59 |
| | PALM BEACH GARDENS, CITY OF | 304 | 166 | 0 | 138 | 1,466,415.10 |
| | PALM BEACH SHORES, TOWN OF | 58 | 24 | 0 | 34 | 889,658.54 |
| | PALM BEACH, TOWN OF | 1,195 | 672 | 9 | 514 | 13,259,167.40 |
| | PALM SPRINGS, VILLAGE OF | 83 | 36 | 0 | 47 | 182,235.26 |
| | RIVIERA BEACH, CITY OF | 266 | 89 | 4 | 173 | 1,370,397.84 |
| | ROYAL PALM BEACH, VILLAGE OF | 36 | 14 | 0 | 22 | 233,542.42 |
| | SOUTH BAY, CITY OF | 1 | 0 | 0 | 1 | .00 |
| | SOUTH PALM BEACH, TOWN OF | 65 | 31 | 0 | 34 | 1,400,361.95 |
| | TEQUESTA, VILLAGE OF | 75 | 31 | 1 | 43 | 261,270.90 |
| | WEST PALM BEACH, CITY OF | 474 | 277 | 1 | 196 | 3,710,290.10 |

Appendix H: Aggregate Flood Loss Data since 1978 (source: FEMA/NFIP database)

Policy Statistics
Florida
AS OF 11/30/2017

| County Name | Community Name | Policies In-force | Insurance In-force whole $ | Written Premium In-force |
|---|---|---|---|---|
| PALM BEACH COUNTY | ATLANTIS, CITY OF | 379 | 92,285,300 | 106,381 |
| | BELLE GLADE, CITY OF | 123 | 37,678,000 | 56,849 |
| | BOCA RATON, CITY OF | 15,357 | 4,198,937,000 | 5,706,223 |
| | BOYNTON BEACH, CITY OF | 8,885 | 1,912,665,000 | 3,169,413 |
| | BRINY BREEZES, TOWN OF | 67 | 7,976,400 | 49,054 |
| | CLOUD LAKE, TOWN OF | 14 | 3,377,500 | 5,027 |
| | DELRAY BEACH, CITY OF | 8,013 | 2,051,718,700 | 3,916,055 |
| | GLEN RIDGE, TOWN OF | 20 | 5,949,000 | 8,860 |
| | GOLF, VILLAGE OF | 30 | 11,080,000 | 14,620 |
| | GREENACRES, CITY OF | 367 | 95,932,400 | 133,708 |
| | GULF STREAM, TOWN OF | 374 | 116,521,600 | 370,017 |
| | HAVERHILL, TOWN OF | 18 | 5,530,000 | 6,485 |
| | HIGHLAND BEACH, TOWN OF | 4,097 | 984,723,900 | 1,045,935 |
| | HYPOLUXO, TOWN OF | 1,155 | 261,308,000 | 430,588 |
| | JUNO BEACH, TOWN OF | 1,630 | 388,395,000 | 504,600 |
| | JUPITER INLET COLONY, TOWN OF | 125 | 42,859,300 | 50,028 |
| | JUPITER, TOWN OF | 7,605 | 1,931,879,700 | 2,443,015 |
| | LAKE CLARKE SHORES, TOWN OF | 246 | 77,986,700 | 101,682 |
| | LAKE PARK, TOWN OF | 822 | 161,573,700 | 270,898 |

* Unincorporated areas of county only

Policy Statistics
Florida
AS OF 11/30/2017

| County Name | Community Name | Policies In-force | Insurance In-force whole $ | Written Premium In-force |
|---|---|---|---|---|
| PALM BEACH COUNTY | LAKE WORTH, CITY OF | 1,533 | 353,943,900 | 879,351 |
| | LANTANA, TOWN OF | 962 | 216,684,200 | 627,771 |
| | MANALAPAN, TOWN OF | 237 | 74,556,300 | 233,590 |
| | MANGONIA PARK, TOWN OF | 41 | 16,578,400 | 55,227 |
| | NORTH PALM BEACH, VILLAGE OF | 3,925 | 887,138,600 | 1,038,862 |
| | OCEAN RIDGE, TOWN OF | 1,332 | 322,958,300 | 752,896 |
| | PAHOKEE, CITY OF | 70 | 18,426,000 | 29,833 |
| | PALM BEACH COUNTY * | 65,387 | 18,161,037,800 | 23,522,224 |
| | PALM BEACH GARDENS, CITY OF | 3,390 | 1,082,701,300 | 1,408,117 |
| | PALM BEACH SHORES, TOWN OF | 732 | 168,718,200 | 333,119 |
| | PALM BEACH, TOWN OF | 7,672 | 1,988,209,300 | 5,349,358 |
| | PALM SPRINGS, VILLAGE OF | 1,444 | 230,103,600 | 345,982 |
| | RIVIERA BEACH, CITY OF | 5,468 | 1,358,721,900 | 1,743,504 |
| | ROYAL PALM BEACH, VILLAGE OF | 638 | 184,218,600 | 225,393 |
| | SOUTH BAY, CITY OF | 31 | 8,913,700 | 20,909 |
| | SOUTH PALM BEACH, TOWN OF | 1,596 | 340,709,700 | 407,232 |
| | TEQUESTA, VILLAGE OF | 1,324 | 327,388,200 | 438,367 |
| | WEST PALM BEACH, CITY OF | 7,115 | 1,884,597,800 | 2,588,116 |

Appendix H: Flood Policy Data as of 11/30/17 (source: FEMA/NFIP database)

The following pages address CRS requirements of listing Repetitive Loss Properties, by jurisdiction, via occupancy type and value of structure. Also included is total building payments made by property, total contents payments, number of losses, and total amount paid per property (by jurisdiction). All property identifiers have been removed per FEMA/NFIP request.

| Community Name | Occupancy | Building Value | Tot Building Payment | Tot Contents Payment | Losses | Total Paid |
|---|---|---|---|---|---|---|
| ATLANTIS, CITY OF | SINGLE FMLY | 115,298 | 45,045.72 | 2,882.00 | 2 | 47,927.72 |
| BOCA RATON, CITY OF | SINGLE FMLY | 462,749 | 111,830.10 | 35,334.37 | 2 | 147,164.47 |
| BOCA RATON, CITY OF | SINGLE FMLY | 231,990 | 13,137.04 | 0.00 | 3 | 13,137.04 |
| BOCA RATON, CITY OF | SINGLE FMLY | 50,000 | 673.60 | 3,826.66 | 2 | 4,500.26 |
| BOCA RATON, CITY OF | SINGLE FMLY | 190,696 | 22,451.29 | 4,843.04 | 2 | 27,294.33 |
| BOCA RATON, CITY OF | SINGLE FMLY | 301,989 | 10,476.19 | 0.00 | 2 | 10,476.19 |
| BOCA RATON, CITY OF | SINGLE FMLY | 289,438 | 4,669.53 | 0.00 | 2 | 4,669.53 |
| BOCA RATON, CITY OF | SINGLE FMLY | 773,953 | 101,028.25 | 7,475.30 | 2 | 108,503.55 |
| BOCA RATON, CITY OF | SINGLE FMLY | 109,460 | 5,228.35 | 6,466.70 | 2 | 11,695.05 |
| BOCA RATON, CITY OF | SINGLE FMLY | 250,000 | 9,144.40 | 0.00 | 2 | 9,144.40 |
| BOCA RATON, CITY OF | OTHR-NONRES | 119,200 | 662.00 | 11,250.80 | 3 | 11,912.80 |
| BOYNTON BEACH, CITY OF | OTHER RESID | 5,386,966 | 51,960.54 | 0.00 | 2 | 51,960.54 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 225,046 | 126,626.62 | 20,000.00 | 4 | 146,626.62 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 178,089 | 17,779.75 | 3,346.04 | 2 | 21,125.79 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 189,406 | 61,493.54 | 9,945.05 | 4 | 71,438.59 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 98,936 | 4,079.61 | 0.00 | 2 | 4,079.61 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 121,790 | 8,972.85 | 0.00 | 2 | 8,972.85 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 125,093 | 7,989.00 | 0.00 | 2 | 7,989.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 129,855 | 4,210.79 | 0.00 | 3 | 4,210.79 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 99,360 | 23,886.50 | 15,053.64 | 2 | 38,940.14 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 118,971 | 20,566.35 | 11,901.79 | 2 | 32,468.14 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 333,098 | 10,087.48 | 0.00 | 2 | 10,087.48 |
| BOYNTON BEACH, CITY OF | OTHR-NONRES | 892,743 | 59,993.91 | 5,812.86 | 2 | 65,806.77 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 76,800 | 45,991.24 | 12,693.12 | 4 | 58,684.36 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 114,870 | 8,675.27 | 2,999.87 | 2 | 11,675.14 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 53,000 | 4,648.27 | 2,102.45 | 2 | 6,750.72 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 44,000 | 5,204.72 | 2,506.00 | 2 | 7,710.72 |
| BOYNTON BEACH, CITY OF | OTHR-NONRES | 231,120 | 2,116.94 | 9,500.62 | 3 | 11,617.56 |
| BOYNTON BEACH, CITY OF | SINGLE FMLY | 40,500 | 1,989.53 | 4,017.00 | 2 | 6,006.53 |
| CLOUD LAKE, TOWN OF | SINGLE FMLY | 50,000 | 3,115.96 | 860.00 | 2 | 3,975.96 |
| COCOA BEACH, CITY OF | SINGLE FMLY | 275,000 | 12,961.83 | 0.00 | 2 | 12,961.83 |
| COCOA BEACH, CITY OF | SINGLE FMLY | 302,602 | 58,581.83 | 41,984.52 | 2 | 100,566.35 |
| COCOA BEACH, CITY OF | SINGLE FMLY | 697,601 | 33,483.35 | 28,760.75 | 2 | 62,244.10 |
| COCOA BEACH, CITY OF | OTHR-NONRES | 380,520 | 21,950.41 | 0.00 | 3 | 21,950.41 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 101,750 | 5,908.99 | 0.00 | 2 | 5,908.99 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 65,000 | 6,890.85 | 1,197.56 | 2 | 8,088.41 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 120,000 | 7,622.97 | 0.00 | 2 | 7,622.97 |
| DELRAY BEACH, CITY OF | OTHR-NONRES | 2,990,536 | 29,043.55 | 14,552.91 | 3 | 43,596.46 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 111,000 | 2,796.80 | 1,065.24 | 2 | 3,862.04 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 74,600 | 2,328.00 | 500.00 | 2 | 2,828.00 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 1,212,380 | 80,590.63 | 24,593.71 | 3 | 105,184.34 |

| | | | | | | |
|---|---|---|---|---|---|---|
| DELRAY BEACH, CITY OF | SINGLE FMLY | 250,000 | 60,106.00 | 18,073.54 | 5 | 78,179.54 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 142,000 | 5,860.59 | 0.00 | 2 | 5,860.59 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 377,451 | 40,599.91 | 0.00 | 2 | 40,599.91 |
| DELRAY BEACH, CITY OF | OTHER RESID | 347,767 | 72,613.28 | 9,444.79 | 2 | 82,058.07 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 60,000 | 1,980.72 | 8,401.34 | 2 | 10,382.06 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 75,425 | 3,201.10 | 1,138.68 | 2 | 4,339.78 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 351,709 | 19,226.67 | 6,500.00 | 2 | 25,726.67 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 389,760 | 24,908.79 | 581.11 | 3 | 25,489.90 |
| DELRAY BEACH, CITY OF | SINGLE FMLY | 63,140 | 19,686.70 | 830.89 | 3 | 20,517.59 |
| GULF STREAM, TOWN OF | SINGLE FMLY | 531,602 | 12,590.97 | 0.00 | 2 | 12,590.97 |
| GULF STREAM, TOWN OF | SINGLE FMLY | 367,500 | 4,954.38 | 2,943.91 | 3 | 7,898.29 |
| GULF STREAM, TOWN OF | SINGLE FMLY | 250,000 | 9,571.25 | 15,444.52 | 2 | 25,015.77 |
| HAVERHILL, TOWN OF | SINGLE FMLY | 134,360 | 10,833.51 | 18,046.38 | 4 | 28,879.89 |
| JUNO BEACH, TOWN OF | OTHER RESID | 0 | 0.00 | 14,421.53 | 2 | 14,421.53 |
| JUNO BEACH, TOWN OF | ASSMD CONDO | 9,999,999,999 | 47,933.87 | 200.00 | 2 | 48,133.87 |
| JUNO BEACH, TOWN OF | OTHR-NONRES | 0 | 0.00 | 39,122.42 | 2 | 39,122.42 |
| JUNO BEACH, TOWN OF | OTHER RESID | 4,500,000 | 76,470.08 | 0.00 | 4 | 76,470.08 |
| JUPITER, TOWN OF | OTHR-NONRES | 553,638 | 8,244.00 | 47,601.16 | 2 | 55,845.16 |
| JUPITER, TOWN OF | SINGLE FMLY | 23,560 | 13,467.60 | 895.73 | 2 | 14,363.33 |
| JUPITER, TOWN OF | SINGLE FMLY | 235,538 | 116,842.41 | 0.00 | 6 | 116,842.41 |
| JUPITER, TOWN OF | OTHR-NONRES | 486,985 | 78,524.97 | 19,257.48 | 2 | 97,782.45 |
| JUPITER, TOWN OF | ASSMD CONDO | 9,999,999,999 | 42,622.57 | 98,316.09 | 5 | 140,938.66 |
| JUPITER, TOWN OF | SINGLE FMLY | 46,000 | 8,181.24 | 4,331.50 | 2 | 12,512.74 |

| | | | | | | |
|---|---|---|---|---|---|---|
| JUPITER, TOWN OF | SINGLE FMLY | 197,285 | 6,961.86 | 1,347.12 | 2 | 8,308.98 |
| JUPITER, TOWN OF | SINGLE FMLY | 267,588 | 107,429.71 | 28,928.04 | 2 | 136,357.75 |
| JUPITER, TOWN OF | SINGLE FMLY | 96,890 | 33,972.90 | 5,898.33 | 3 | 39,871.23 |
| JUPITER, TOWN OF | SINGLE FMLY | 164,004 | 19,652.60 | 0.00 | 2 | 19,652.60 |
| JUPITER, TOWN OF | OTHR-NONRES | 140,628 | 80,915.05 | 8,699.23 | 5 | 89,614.28 |
| JUPITER, TOWN OF | SINGLE FMLY | 30,000 | 2,672.50 | 4,762.61 | 3 | 7,435.11 |
| JUPITER, TOWN OF | SINGLE FMLY | 334,250 | 34,392.98 | 8,025.68 | 3 | 42,418.66 |
| LAKE PARK, TOWN OF | OTHER RESID | 1,650,000 | 5,169.99 | 0.00 | 2 | 5,169.99 |
| LAKE PARK, TOWN OF | OTHR-NONRES | 75,000 | 0.00 | 178,050.00 | 2 | 178,050.00 |
| LAKE WORTH BEACH, CITY OF | SINGLE FMLY | 202,620 | 35,336.48 | 10,497.50 | 3 | 45,833.98 |
| LAKE WORTH BEACH, CITY OF | OTHR-NONRES | 0 | 0.00 | 4,524.70 | 2 | 4,524.70 |
| LAKE WORTH BEACH, CITY OF | SINGLE FMLY | 182,297 | 34,868.02 | 10,064.65 | 3 | 44,932.67 |
| LAKE WORTH BEACH, CITY OF | SINGLE FMLY | 35,420 | 25,527.52 | 4,211.34 | 3 | 29,738.86 |
| LAKE WORTH BEACH, CITY OF | SINGLE FMLY | 67,000 | 6,599.48 | 151.00 | 3 | 6,750.48 |
| LAKE WORTH BEACH, CITY OF | OTHR-NONRES | 32,700 | 12,985.61 | 7,628.80 | 2 | 20,614.41 |
| LAKE WORTH BEACH, CITY OF | SINGLE FMLY | 50,000 | 8,106.61 | 4,310.18 | 2 | 12,416.79 |
| LAKE WORTH BEACH, CITY OF | SINGLE FMLY | 302,400 | 86,302.70 | 3,846.31 | 2 | 90,149.01 |
| LAKE WORTH BEACH, CITY OF | OTHR-NONRES | 250,000 | 350.00 | 7,030.50 | 3 | 7,380.50 |
| LAKE WORTH BEACH, CITY OF | OTHR-NONRES | 95,000 | 9,699.84 | 0.00 | 3 | 9,699.84 |
| LAKE WORTH BEACH, CITY OF | OTHR-NONRES | 0 | 0.00 | 4,369.50 | 2 | 4,369.50 |
| LAKE WORTH BEACH, CITY OF | SINGLE FMLY | 96,000 | 2,216.42 | 2,279.40 | 2 | 4,495.82 |
| LANTANA, TOWN OF | SINGLE FMLY | 382,000 | 21,631.38 | 4,168.72 | 2 | 25,800.10 |
| LANTANA, TOWN OF | SINGLE FMLY | 67,589 | 1,342.91 | 2,713.92 | 2 | 4,056.83 |

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| LANTANA, TOWN OF | SINGLE FMLY | 461,191 | 249,549.25 | 38,198.12 | 3 | 287,747.37 |
| LANTANA, TOWN OF | OTHR-NONRES | 20,000 | 0.00 | 251,961.87 | 9 | 251,961.87 |
| LANTANA, TOWN OF | OTHR-NONRES | 1,286,089 | 113,393.52 | 17,828.50 | 3 | 131,222.02 |
| LANTANA, TOWN OF | SINGLE FMLY | 212,550 | 17,459.26 | 906.75 | 2 | 18,366.01 |
| MANALAPAN, TOWN OF | OTHR-NONRES | 107,831 | 0.00 | 12,120.84 | 2 | 12,120.84 |
| MANALAPAN, TOWN OF | OTHR-NONRES | 290,000 | 12,658.15 | 0.00 | 4 | 12,658.15 |
| MANALAPAN, TOWN OF | OTHR-NONRES | 445,000 | 8,884.38 | 0.00 | 3 | 8,884.38 |
| MANGONIA PARK, TOWN OF | SINGLE FMLY | 115,500 | 27,089.41 | 537.75 | 2 | 27,627.16 |
| MANGONIA PARK, TOWN OF | OTHR-NONRES | 0 | 0.00 | 458,404.23 | 9 | 458,404.23 |
| NORTH PALM BEACH, VILLAGE OF | ASSMD CONDO | 9,999,999,999 | 42,002.66 | 775.00 | 2 | 42,777.66 |
| NORTH PALM BEACH, VILLAGE OF | SINGLE FMLY | 234,520 | 7,876.42 | 4,478.30 | 2 | 12,354.72 |
| OCEAN RIDGE, TOWN OF | 2-4 FAMILY | 175,940 | 20,675.79 | 0.00 | 2 | 20,675.79 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 70,000 | 22,512.42 | 12,223.50 | 2 | 34,735.92 |
| OCEAN RIDGE, TOWN OF | ASSMD CONDO | 9,999,999,999 | 48,687.79 | 19,805.98 | 2 | 68,493.77 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 118,490 | 45,559.38 | 45,688.55 | 2 | 91,247.93 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 496,705 | 15,851.45 | 2,481.98 | 3 | 18,333.43 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 297,500 | 11,231.44 | 8,200.61 | 2 | 19,432.05 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 0 | 0.00 | 15,382.55 | 2 | 15,382.55 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 618,681 | 28,179.53 | 26,505.39 | 2 | 54,684.92 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 66,119 | 16,649.03 | 11,451.25 | 2 | 28,100.28 |
| OCEAN RIDGE, TOWN OF | 2-4 FAMILY | 105,270 | 12,915.64 | 292.10 | 2 | 13,207.74 |

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| OCEAN RIDGE, TOWN OF | OTHER RESID | 1,771,851 | 47,169.42 | 0.00 | 3 | 47,169.42 |
| OCEAN RIDGE, TOWN OF | 2-4 FAMILY | 202,820 | 53,807.06 | 1,150.50 | 2 | 54,957.56 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 120,600 | 28,747.59 | 24,794.76 | 2 | 53,542.35 |
| OCEAN RIDGE, TOWN OF | 2-4 FAMILY | 110,000 | 64,166.52 | 20,141.33 | 5 | 84,307.85 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 83,224 | 45,469.86 | 2,745.00 | 3 | 48,214.86 |
| OCEAN RIDGE, TOWN OF | SINGLE FMLY | 159,450 | 85,345.69 | 35,798.47 | 3 | 121,144.16 |
| PAHOKEE, CITY OF | SINGLE FMLY | 51,600 | 12,818.20 | 5,505.45 | 2 | 18,323.65 |
| PALM BEACH COUNTY * | SINGLE FMLY | 97,717 | 74,340.11 | 18,267.91 | 3 | 92,608.02 |
| PALM BEACH COUNTY * | SINGLE FMLY | 186,150 | 40,292.58 | 13,776.97 | 2 | 54,069.55 |
| PALM BEACH COUNTY * | SINGLE FMLY | 243,621 | 6,793.53 | 1,119.82 | 2 | 7,913.35 |
| PALM BEACH COUNTY * | SINGLE FMLY | 99,487 | 3,702.17 | 734.02 | 2 | 4,436.19 |
| PALM BEACH COUNTY * | SINGLE FMLY | 375,750 | 4,351.19 | 0.00 | 2 | 4,351.19 |
| PALM BEACH COUNTY * | SINGLE FMLY | 103,860 | 7,400.59 | 606.30 | 2 | 8,006.89 |
| PALM BEACH COUNTY * | SINGLE FMLY | 450,670 | 19,611.83 | 13,522.45 | 2 | 33,134.28 |
| PALM BEACH COUNTY * | SINGLE FMLY | 114,715 | 22,642.27 | 26,170.52 | 2 | 48,812.79 |
| PALM BEACH COUNTY * | SINGLE FMLY | 78,167 | 11,562.11 | 8,028.76 | 2 | 19,590.87 |
| PALM BEACH COUNTY * | SINGLE FMLY | 251,519 | 2,844.81 | 0.00 | 2 | 2,844.81 |
| PALM BEACH COUNTY * | SINGLE FMLY | 406,620 | 21,088.72 | 0.00 | 2 | 21,088.72 |
| PALM BEACH COUNTY * | SINGLE FMLY | 73,260 | 9,013.15 | 1,200.00 | 2 | 10,213.15 |
| PALM BEACH COUNTY * | SINGLE FMLY | 184,790 | 8,216.90 | 2,302.63 | 2 | 10,519.53 |
| PALM BEACH COUNTY * | SINGLE FMLY | 122,919 | 4,288.42 | 1,508.22 | 2 | 5,796.64 |
| PALM BEACH COUNTY * | 2-4 FAMILY | 143,860 | 38,014.40 | 0.00 | 2 | 38,014.40 |
| PALM BEACH COUNTY * | 2-4 FAMILY | 129,252 | 32,749.44 | 8,615.50 | 2 | 41,364.94 |

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| PALM BEACH COUNTY * | 2-4 FAMILY | 51,384 | 25,414.04 | 821.60 | 3 | 26,235.64 |
| PALM BEACH COUNTY * | 2-4 FAMILY | 51,798 | 25,118.21 | 0.00 | 3 | 25,118.21 |
| PALM BEACH COUNTY * | SINGLE FMLY | 60,960 | 32,932.46 | 8,931.05 | 2 | 41,863.51 |
| PALM BEACH COUNTY * | SINGLE FMLY | 135,971 | 27,547.09 | 3,713.98 | 2 | 31,261.07 |
| PALM BEACH COUNTY * | SINGLE FMLY | 115,045 | 22,594.40 | 9,503.67 | 2 | 32,098.07 |
| PALM BEACH COUNTY * | SINGLE FMLY | 131,583 | 21,216.27 | 16,971.20 | 6 | 38,187.47 |
| PALM BEACH COUNTY * | SINGLE FMLY | 111,150 | 35,256.28 | 0.00 | 2 | 35,256.28 |
| PALM BEACH COUNTY * | SINGLE FMLY | 273,376 | 12,241.35 | 2,393.40 | 2 | 14,634.75 |
| PALM BEACH COUNTY * | SINGLE FMLY | 491,219 | 6,552.97 | 0.00 | 2 | 6,552.97 |
| PALM BEACH COUNTY * | SINGLE FMLY | 174,336 | 8,852.03 | 2,527.54 | 2 | 11,379.57 |
| PALM BEACH COUNTY * | SINGLE FMLY | 107,235 | 26,776.86 | 450.00 | 4 | 27,226.86 |
| PALM BEACH COUNTY * | SINGLE FMLY | 244,218 | 31,390.37 | 0.00 | 3 | 31,390.37 |
| PALM BEACH COUNTY * | SINGLE FMLY | 798,879 | 53,672.40 | 37,390.91 | 2 | 91,063.31 |
| PALM BEACH COUNTY * | SINGLE FMLY | 192,470 | 11,483.85 | 8,941.72 | 2 | 20,425.57 |
| PALM BEACH COUNTY * | OTHR-NONRES | 1,850,396 | 81,270.23 | 0.00 | 2 | 81,270.23 |
| PALM BEACH COUNTY * | SINGLE FMLY | 139,616 | 8,311.51 | 2,010.06 | 2 | 10,321.57 |
| PALM BEACH COUNTY * | SINGLE FMLY | 250,000 | 18,881.05 | 5,000.00 | 2 | 23,881.05 |
| PALM BEACH COUNTY * | SINGLE FMLY | 66,208 | 10,619.96 | 9,584.29 | 2 | 20,204.25 |
| PALM BEACH COUNTY * | SINGLE FMLY | 120,185 | 8,625.89 | 836.06 | 2 | 9,461.95 |
| PALM BEACH COUNTY * | SINGLE FMLY | 90,000 | 23,186.54 | 5,000.00 | 3 | 28,186.54 |
| PALM BEACH COUNTY * | SINGLE FMLY | 100,602 | 32,620.33 | 0.00 | 2 | 32,620.33 |
| PALM BEACH COUNTY * | OTHR-NONRES | 191,760 | 60,891.07 | 25,541.78 | 3 | 86,432.85 |
| PALM BEACH COUNTY * | SINGLE FMLY | 170,500 | 27,411.45 | 1,198.66 | 2 | 28,610.11 |

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| PALM BEACH COUNTY * | SINGLE FMLY | 303,680 | 70,787.48 | 0.00 | 2 | 70,787.48 |
| PALM BEACH COUNTY * | SINGLE FMLY | 27,400 | 2,337.01 | 2,083.50 | 2 | 4,420.51 |
| PALM BEACH COUNTY * | SINGLE FMLY | 15,120 | 3,102.02 | 0.00 | 2 | 3,102.02 |
| PALM BEACH COUNTY * | SINGLE FMLY | 91,000 | 22,596.74 | 5,906.73 | 2 | 28,503.47 |
| PALM BEACH COUNTY * | SINGLE FMLY | 157,521 | 41,805.83 | 5,623.52 | 3 | 47,429.35 |
| PALM BEACH COUNTY * | SINGLE FMLY | 248,838 | 13,413.30 | 0.00 | 2 | 13,413.30 |
| PALM BEACH COUNTY * | SINGLE FMLY | 78,700 | 2,401.38 | 1,100.50 | 2 | 3,501.88 |
| PALM BEACH COUNTY * | SINGLE FMLY | 240,460 | 70,873.17 | 18,602.98 | 2 | 89,476.15 |
| PALM BEACH COUNTY * | SINGLE FMLY | 108,000 | 3,792.34 | 3,340.27 | 3 | 7,132.61 |
| PALM BEACH COUNTY * | SINGLE FMLY | 78,883 | 34,447.80 | 26,783.60 | 4 | 61,231.40 |
| PALM BEACH COUNTY * | SINGLE FMLY | 101,200 | 12,291.31 | 16,036.99 | 2 | 28,328.30 |
| PALM BEACH COUNTY * | SINGLE FMLY | 65,200 | 48,115.95 | 19,334.80 | 2 | 67,450.75 |
| PALM BEACH COUNTY * | SINGLE FMLY | 120,960 | 39,867.86 | 14,896.99 | 2 | 54,764.85 |
| PALM BEACH COUNTY * | SINGLE FMLY | 93,755 | 34,745.74 | 14,412.28 | 2 | 49,158.02 |
| PALM BEACH COUNTY * | SINGLE FMLY | 106,500 | 24,223.94 | 20,564.08 | 2 | 44,788.02 |
| PALM BEACH COUNTY * | SINGLE FMLY | 71,995 | 28,367.31 | 4,267.50 | 2 | 32,634.81 |
| PALM BEACH COUNTY * | SINGLE FMLY | 250,000 | 12,102.11 | 25,786.35 | 3 | 37,888.46 |
| PALM BEACH COUNTY * | SINGLE FMLY | 79,294 | 7,017.04 | 0.00 | 2 | 7,017.04 |
| PALM BEACH COUNTY * | SINGLE FMLY | 250,000 | 42,501.35 | 5,256.06 | 2 | 47,757.41 |
| PALM BEACH COUNTY * | SINGLE FMLY | 195,932 | 9,839.43 | 1,710.96 | 2 | 11,550.39 |
| PALM BEACH COUNTY * | SINGLE FMLY | 136,800 | 36,206.47 | 14,140.32 | 2 | 50,346.79 |
| PALM BEACH COUNTY * | SINGLE FMLY | 263,135 | 63,325.04 | 7,333.58 | 2 | 70,658.62 |
| PALM BEACH COUNTY * | SINGLE FMLY | 75,000 | 21,078.28 | 23,952.04 | 2 | 45,030.32 |

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| PALM BEACH COUNTY * | SINGLE FMLY | 227,300 | 14,515.20 | 0.00 | 2 | 14,515.20 |
| PALM BEACH COUNTY * | SINGLE FMLY | 250,000 | 53,571.58 | 21,486.99 | 2 | 75,058.57 |
| PALM BEACH COUNTY * | SINGLE FMLY | 225,682 | 40,834.35 | 5,756.46 | 2 | 46,590.81 |
| PALM BEACH COUNTY * | SINGLE FMLY | 160,000 | 14,525.51 | 21,657.60 | 3 | 36,183.11 |
| PALM BEACH COUNTY * | SINGLE FMLY | 69,000 | 4,003.92 | 817.71 | 2 | 4,821.63 |
| PALM BEACH COUNTY * | SINGLE FMLY | 159,546 | 34,572.40 | 16,606.16 | 5 | 51,178.56 |
| PALM BEACH COUNTY * | SINGLE FMLY | 48,800 | 14,796.15 | 2,152.57 | 2 | 16,948.72 |
| PALM BEACH COUNTY * | SINGLE FMLY | 145,945 | 146,933.16 | 91,715.91 | 5 | 238,649.07 |
| PALM BEACH COUNTY * | 2-4 FAMILY | 53,600 | 25,325.66 | 4,048.53 | 3 | 29,374.19 |
| PALM BEACH COUNTY * | SINGLE FMLY | 57,513 | 22,382.22 | 15,754.31 | 2 | 38,136.53 |
| PALM BEACH COUNTY * | SINGLE FMLY | 57,300 | 14,111.64 | 0.00 | 3 | 14,111.64 |
| PALM BEACH COUNTY * | SINGLE FMLY | 111,810 | 69,490.84 | 17,965.39 | 3 | 87,456.23 |
| PALM BEACH GARDENS, CITY OF | SINGLE FMLY | 239,360 | 4,028.08 | 0.00 | 2 | 4,028.08 |
| PALM BEACH GARDENS, CITY OF | SINGLE FMLY | 100,531 | 4,884.55 | 811.50 | 2 | 5,696.05 |
| PALM BEACH GARDENS, CITY OF | SINGLE FMLY | 180,056 | 43,856.76 | 26,445.16 | 3 | 70,301.92 |
| PALM BEACH GARDENS, CITY OF | SINGLE FMLY | 177,435 | 4,579.48 | 0.00 | 2 | 4,579.48 |
| PALM BEACH GARDENS, CITY OF | SINGLE FMLY | 592,381 | 34,002.32 | 883.85 | 2 | 34,886.17 |
| PALM BEACH GARDENS, CITY OF | SINGLE FMLY | 250,000 | 16,667.43 | 2,208.41 | 2 | 18,875.84 |
| PALM BEACH SHORES, TOWN OF | SINGLE FMLY | 89,700 | 7,073.42 | 5,838.79 | 2 | 12,912.21 |

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| PALM BEACH SHORES, TOWN OF | ASSMD CONDO | 9,999,999,999 | 189,780.44 | 19,796.41 | 3 | 209,576.85 |
| PALM BEACH, TOWN OF | OTHER RESID | 1,275,875 | 29,662.83 | 0.00 | 2 | 29,662.83 |
| PALM BEACH, TOWN OF | 2-4 FAMILY | 1,020,330 | 24,489.74 | 0.00 | 4 | 24,489.74 |
| PALM BEACH, TOWN OF | 2-4 FAMILY | 1,020,700 | 16,736.56 | 0.00 | 2 | 16,736.56 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 487,556 | 8,194.07 | 0.00 | 2 | 8,194.07 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 151,574 | 96,389.89 | 40,966.33 | 2 | 137,356.22 |
| PALM BEACH, TOWN OF | 2-4 FAMILY | 76,525 | 16,332.48 | 6,104.23 | 3 | 22,436.71 |
| PALM BEACH, TOWN OF | OTHER RESID | 686,904 | 55,010.74 | 0.00 | 2 | 55,010.74 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 462,880 | 75,214.39 | 4,169.95 | 5 | 79,384.34 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 361,760 | 111,682.08 | 0.00 | 2 | 111,682.08 |
| PALM BEACH, TOWN OF | OTHER RESID | 250,000 | 7,691.77 | 0.00 | 2 | 7,691.77 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 387,506 | 43,582.79 | 2,204.32 | 4 | 45,787.11 |
| PALM BEACH, TOWN OF | OTHER RESID | 5,782,060 | 44,489.85 | 0.00 | 3 | 44,489.85 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 94,026 | 20,592.61 | 0.00 | 2 | 20,592.61 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 2,081,419 | 306,893.41 | 100,000.00 | 3 | 406,893.41 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 276,100 | 19,581.81 | 35,440.26 | 2 | 55,022.07 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 540,000 | 13,220.11 | 3,699.81 | 2 | 16,919.92 |
| PALM BEACH, TOWN OF | 2-4 FAMILY | 731,823 | 33,568.05 | 0.00 | 2 | 33,568.05 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 776,055 | 28,932.79 | 183.76 | 2 | 29,116.55 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 457,166 | 4,776.47 | 0.00 | 2 | 4,776.47 |
| PALM BEACH, TOWN OF | 2-4 FAMILY | 1,020,700 | 23,805.36 | 0.00 | 2 | 23,805.36 |
| PALM BEACH, TOWN OF | ASSMD CONDO | 9,999,999,999 | 15,388.48 | 0.00 | 2 | 15,388.48 |

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| PALM BEACH, TOWN OF | SINGLE FMLY | 300,000 | 192,857.69 | 22,047.28 | 4 | 214,904.97 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 245,000 | 42,516.89 | 29,733.14 | 2 | 72,250.03 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 246,240 | 82,912.95 | 50,000.00 | 2 | 132,912.95 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 368,283 | 188,673.10 | 132,993.34 | 5 | 321,666.44 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 257,750 | 88,300.86 | 47,526.00 | 4 | 135,826.86 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 515,550 | 269,112.63 | 112,027.59 | 3 | 381,140.22 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 255,085 | 164,159.17 | 56,247.73 | 5 | 220,406.90 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 26,500 | 5,635.31 | 3,540.17 | 2 | 9,175.48 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 408,000 | 177,203.74 | 72,034.52 | 3 | 249,238.26 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 241,916 | 20,080.18 | 0.00 | 2 | 20,080.18 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 7,700,000 | 31,721.17 | 10,241.95 | 3 | 41,963.12 |
| PALM BEACH, TOWN OF | OTHER RESID | 855,000 | 12,271.98 | 0.00 | 5 | 12,271.98 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 277,129 | 39,998.88 | 69,300.69 | 3 | 109,299.57 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 267,385 | 43,346.96 | 26,252.84 | 6 | 69,599.80 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 597,934 | 15,417.80 | 7,477.19 | 2 | 22,894.99 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 330,000 | 74,875.35 | 34,159.50 | 4 | 109,034.85 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 173,972 | 8,052.61 | 0.00 | 2 | 8,052.61 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 285,000 | 23,410.66 | 15,286.94 | 2 | 38,697.60 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 305,320 | 37,140.24 | 54,393.63 | 3 | 91,533.87 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 198,516 | 6,338.90 | 0.00 | 2 | 6,338.90 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 364,238 | 21,299.24 | 50.00 | 4 | 21,349.24 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 70,000 | 29,488.00 | 0.00 | 2 | 29,488.00 |
| PALM BEACH, TOWN OF | OTHER RESID | 50,000 | 11,160.42 | 0.00 | 2 | 11,160.42 |

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| PALM BEACH, TOWN OF | OTHER RESID | 250,000 | 8,342.08 | 0.00 | 2 | 8,342.08 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 10,000 | 205.00 | 4,047.00 | 2 | 4,252.00 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 152,935 | 59,680.99 | 24,116.41 | 6 | 83,797.40 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 160,347 | 11,783.70 | 0.00 | 2 | 11,783.70 |
| PALM BEACH, TOWN OF | OTHER RESID | 4,284,529 | 210,896.86 | 2,805.51 | 4 | 213,702.37 |
| PALM BEACH, TOWN OF | OTHER RESID | 13,137,071 | 284,760.48 | 20,451.38 | 3 | 305,211.86 |
| PALM BEACH, TOWN OF | OTHER RESID | 5,266,648 | 188,274.39 | 17,996.84 | 3 | 206,271.23 |
| PALM BEACH, TOWN OF | OTHER RESID | 19,000,000 | 405,705.75 | 117,762.42 | 8 | 523,468.17 |
| PALM BEACH, TOWN OF | OTHER RESID | 23,561,211 | 119,977.59 | 6,915.30 | 5 | 126,892.89 |
| PALM BEACH, TOWN OF | OTHER RESID | 10,416,743 | 42,478.11 | 0.00 | 2 | 42,478.11 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 4,446,204 | 13,262.41 | 0.00 | 3 | 13,262.41 |
| PALM BEACH, TOWN OF | OTHER RESID | 3,624,000 | 463,024.76 | 19,476.11 | 2 | 482,500.87 |
| PALM BEACH, TOWN OF | OTHER RESID | 250,000 | 16,165.17 | 0.00 | 2 | 16,165.17 |
| PALM BEACH, TOWN OF | OTHER RESID | 250,000 | 23,814.03 | 0.00 | 2 | 23,814.03 |
| PALM BEACH, TOWN OF | OTHER RESID | 5,817,600 | 11,036.06 | 0.00 | 2 | 11,036.06 |
| PALM BEACH, TOWN OF | OTHER RESID | 19,045,280 | 19,383.34 | 0.00 | 2 | 19,383.34 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 717,440 | 45,059.46 | 4,413.98 | 2 | 49,473.44 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 233,941 | 117,415.40 | 74,223.53 | 6 | 191,638.93 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 186,600 | 22,589.43 | 23,271.49 | 2 | 45,860.92 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 300,000 | 7,032.04 | 0.00 | 2 | 7,032.04 |
| PALM BEACH, TOWN OF | OTHER RESID | 1,860,480 | 26,471.63 | 0.00 | 2 | 26,471.63 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 182,431 | 26,965.42 | 0.00 | 2 | 26,965.42 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 7,900 | 0.00 | 7,339.34 | 2 | 7,339.34 |

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| PALM BEACH, TOWN OF | OTHR-NONRES | 492,030 | 168,732.36 | 91,612.99 | 3 | 260,345.35 |
| PALM BEACH, TOWN OF | OTHER RESID | 179,125 | 18,610.44 | 9,639.60 | 2 | 28,250.04 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 250,000 | 22,449.38 | 0.00 | 2 | 22,449.38 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 666,619 | 86,974.49 | 8,514.49 | 4 | 95,488.98 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 312,484 | 26,901.43 | 8,258.89 | 3 | 35,160.32 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 366,600 | 82,242.44 | 15,239.87 | 2 | 97,482.31 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 136,719 | 16,270.35 | 0.00 | 5 | 16,270.35 |
| PALM BEACH, TOWN OF | ASSMD CONDO | 9,999,999,999 | 4,153.95 | 3,133.33 | 3 | 7,287.28 |
| PALM BEACH, TOWN OF | OTHER RESID | 19,068,120 | 171,700.61 | 5,215.13 | 5 | 176,915.74 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 14,000 | 33,148.95 | 0.00 | 2 | 33,148.95 |
| PALM BEACH, TOWN OF | OTHER RESID | 25,853,180 | 18,185.35 | 0.00 | 2 | 18,185.35 |
| PALM BEACH, TOWN OF | OTHR-NONRES | 320,453 | 9,436.80 | 0.00 | 2 | 9,436.80 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 269,735 | 8,815.16 | 0.00 | 2 | 8,815.16 |
| PALM BEACH, TOWN OF | ASSMD CONDO | 9,999,999,999 | 78,905.23 | 43,106.37 | 4 | 122,011.60 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 400,000 | 54,361.44 | 376.00 | 2 | 54,737.44 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 128,000 | 9,015.91 | 1,023.00 | 3 | 10,038.91 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 203,500 | 152,220.76 | 103,557.16 | 3 | 255,777.92 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 404,663 | 152,507.67 | 76,436.00 | 9 | 228,943.67 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 200,000 | 2,339.20 | 425.00 | 2 | 2,764.20 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 208,947 | 135,785.32 | 50,510.34 | 2 | 186,295.66 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 183,107 | 55,821.51 | 22,994.91 | 3 | 78,816.42 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 198,940 | 21,690.90 | 4,856.10 | 3 | 26,547.00 |
| PALM BEACH, TOWN OF | SINGLE FMLY | 509,000 | 35,757.89 | 25,955.91 | 4 | 61,713.80 |

| | | | | | | |
|---|---|---|---|---|---|---|
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 161,949 | 120,172.66 | 15,604.95 | 4 | 135,777.61 |
| PALM SPRINGS, VILLAGE OF | 2-4 FAMILY | 108,097 | 9,903.44 | 0.00 | 2 | 9,903.44 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 125,000 | 18,923.38 | 13,854.10 | 2 | 32,777.48 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 36,600 | 737.88 | 2,633.88 | 2 | 3,371.76 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 96,568 | 30,819.37 | 17,721.58 | 3 | 48,540.95 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 100,137 | 21,633.15 | 18,728.10 | 3 | 40,361.25 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 59,339 | 27,962.92 | 13,099.48 | 2 | 41,062.40 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 122,268 | 30,689.94 | 1,103.48 | 2 | 31,793.42 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 149,928 | 28,669.76 | 15,713.99 | 2 | 44,383.75 |
| PALM SPRINGS, VILLAGE OF | SINGLE FMLY | 112,200 | 12,960.48 | 5,491.15 | 2 | 18,451.63 |
| RIVIERA BEACH, CITY OF | OTHER RESID | 56,792,275 | 422,873.19 | 0.00 | 2 | 422,873.19 |
| RIVIERA BEACH, CITY OF | OTHER RESID | 14,221,700 | 14,760.01 | 0.00 | 2 | 14,760.01 |
| RIVIERA BEACH, CITY OF | SINGLE FMLY | 58,320 | 18,671.82 | 6,279.09 | 2 | 24,950.91 |
| RIVIERA BEACH, CITY OF | SINGLE FMLY | 85,573 | 14,636.77 | 7,605.36 | 2 | 22,242.13 |
| RIVIERA BEACH, CITY OF | SINGLE FMLY | 167,471 | 21,631.17 | 10,856.66 | 2 | 32,487.83 |
| RIVIERA BEACH, CITY OF | SINGLE FMLY | 244,500 | 17,733.59 | 6,832.53 | 3 | 24,566.12 |
| RIVIERA BEACH, CITY OF | SINGLE FMLY | 117,125 | 21,528.44 | 11,117.38 | 2 | 32,645.82 |
| RIVIERA BEACH, CITY OF | SINGLE FMLY | 74,126 | 6,948.74 | 0.00 | 3 | 6,948.74 |
| RIVIERA BEACH, CITY OF | OTHR-NONRES | 800,000 | 231,255.64 | 69,270.04 | 2 | 300,525.68 |
| RIVIERA BEACH, CITY OF | OTHER RESID | 235,225 | 14,353.09 | 0.00 | 2 | 14,353.09 |
| SOUTH PALM BEACH, TOWN OF | OTHER RESID | 20,033,791 | 1,052,986.83 | 168,653.14 | 5 | 1,221,639.97 |
| TEQUESTA, VILLAGE OF | SINGLE FMLY | 289,000 | 20,021.88 | 180.24 | 2 | 20,202.12 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TEQUESTA, VILLAGE OF | SINGLE FMLY | 60,000 | 3,756.05 | 2,683.73 | 3 | 6,439.78 |
| WELLINGTON, VILLAGE OF | SINGLE FMLY | 452,100 | 6,633.80 | 16,544.57 | 2 | 23,178.37 |
| WELLINGTON, VILLAGE OF | SINGLE FMLY | 4,291,500 | 13,947.93 | 10,542.52 | 2 | 24,490.45 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 131,160 | 17,763.52 | 8,566.83 | 4 | 26,330.35 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 11,100 | 7,974.99 | 808.01 | 2 | 8,783.00 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 105,900 | 14,770.83 | 0.00 | 2 | 14,770.83 |
| WEST PALM BEACH, CITY OF | 2-4 FAMILY | 115,380 | 57,635.56 | 22,898.70 | 3 | 80,534.26 |
| WEST PALM BEACH, CITY OF | 2-4 FAMILY | 244,613 | 65,285.45 | 0.00 | 2 | 65,285.45 |
| WEST PALM BEACH, CITY OF | 2-4 FAMILY | 95,040 | 9,215.07 | 496.33 | 2 | 9,711.40 |
| WEST PALM BEACH, CITY OF | 2-4 FAMILY | 118,680 | 42,358.25 | 0.00 | 2 | 42,358.25 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 641,313 | 23,202.92 | 0.00 | 4 | 23,202.92 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 0 | 0.00 | 3,467.90 | 2 | 3,467.90 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 250,000 | 17,123.70 | 0.00 | 2 | 17,123.70 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 210,000 | 4,648.37 | 576.05 | 2 | 5,224.42 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 528,279 | 29,738.62 | 9,171.30 | 4 | 38,909.92 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 59,550 | 38,974.78 | 7,046.95 | 2 | 46,021.73 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 1,608,000 | 124,404.58 | 0.00 | 2 | 124,404.58 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 3,789,807 | 20,881.09 | 0.00 | 2 | 20,881.09 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 0 | 0.00 | 5,805.58 | 2 | 5,805.58 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 245,485 | 71,319.54 | 0.00 | 2 | 71,319.54 |
| WEST PALM BEACH, CITY OF | 2-4 FAMILY | 140,420 | 83,110.85 | 5,175.00 | 2 | 88,285.85 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 363,000 | 17,728.54 | 10,689.98 | 2 | 28,418.52 |
| WEST PALM BEACH, CITY OF | OTHR-NONRES | 200,000 | 27,094.60 | 0.00 | 2 | 27,094.60 |

| | | | | | | |
|---|---|---|---|---|---|---|
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 160,650 | 41,301.08 | 3,171.77 | 6 | 44,472.85 |
| WEST PALM BEACH, CITY OF | 2-4 FAMILY | 83,250 | 7,700.23 | 0.00 | 2 | 7,700.23 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 129,492 | 23,980.97 | 6,408.04 | 2 | 30,389.01 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 55,965 | 55,063.14 | 0.00 | 4 | 55,063.14 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 57,200 | 40,725.79 | 0.00 | 4 | 40,725.79 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 182,600 | 46,596.42 | 698.78 | 2 | 47,295.20 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 72,250 | 1,012.56 | 14,263.90 | 2 | 15,276.46 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 220,106 | 8,499.24 | 1,908.72 | 2 | 10,407.96 |
| WEST PALM BEACH, CITY OF | SINGLE FMLY | 433,128 | 47,622.31 | 35,904.57 | 4 | 83,526.88 |

Appendix H: FEMA RLP Data by jurisdiction as of 11/30/2017

# Appendix I: Project Scoring Examples

This appendix addresses the following FEMA requirement:

**Requirement: §201.6(c)(3)(iii):** The mitigation strategy section shall include an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This appendix supports the above FEMA requirement by providing a few examples of PBC's current project scoring process using the criteria established at the program's inception. This process is used as the basis for ranking (prioritizing) proposed projects. In order for a mitigation project to be eligible for federal monies there must be a Benefit Cost Analysis completed with results of a ratio greater than one (1). This appendix illustrates the current scoring process through four examples:

- EXAMPLE 1: Community A - Library Wind Retrofit
- EXAMPLE 2: Community B - RV Park Flooding Prevention
- EXAMPLE 3: Community C - Hardening of an EOC; and
- EXAMPLE 4: Community D - Initiation of a Burn Program to Prevent Wildfire losses in the Urban Interface

<u>EXAMPLE 1: COMMUNITY A - LIBRARY RETROFIT</u>

Community A is a well-to-do community centered along the beach and on the Intracoastal Waterway. They have recently completed a large and very nice public library located on the Intracoastal Waterway. The library has many windows and a picturesque view of the waterway. The building itself is engineered to withstand category 5 hurricane force winds, but it is located in an area that can expect a five (5) foot above mean high tide storm surge during storms rated at category 3 or higher. A storm surge of this magnitude will flood the bottom floor of this library to a depth of two (2) feet. Equipment and books threatened by such an event are valued at an estimated $200,000. It will cost approximately $60,000 to raise the books and equipment in this library three (3) feet above their current level. This would eliminate the $60,000 of exposure in all but the most catastrophic hurricanes of category 5 strength, achieving and an estimated 80% reduction in potential losses.

Applying the Benefit/Cost formula:

($200,000 - $40,000) / $ 60,000 = 2.67 Benefit/Cost Ratio therefore, this is a viable project.

Applying the Scoring Criteria (See Attached Score Sheet) this project would be scored as follows:

COMMUNITY BENEFIT

This is a Damage Reduction activity and is awarded 10 points here.

Libraries are considered secondary critical facilities and six (6) points are awarded here.

In terms of Community Exposure, $200,000 is considered moderate and the frequency of the hazard this project mitigates for, Category 3 or higher storm surge, is low. Therefore Moderate (M) Exposure (E) + Low (L) Frequency (F) = four (4) points under category; and

Cost Effectiveness in terms of the Benefit/Cost Ration is 2.67; therefore, 12 points are awarded here.

This project's score under Community Benefit is 32.

COMMUNITY COMMITMENT

This project is not contained within a specific policy of Community A's Comprehensive Growth Management Plan, but this type of mitigation is addressed as a broad goal in the Coastal Management Element of that plan. Five (5) points are awarded under this category.

Although libraries are considered secondary critical facilities this project is not part of any emergency management plan. It is, however, part of the Library Department's long -term strategic plan, which has been officially adopted by the City Council. Ten points are awarded here.

While there is considerable public support for the library in general, and there is every reason to believe there would be widespread public support for this mitigation project if it was presented to the public, this has not yet been done. Most of the citizens of Community A are not aware of the potential problem this mitigation project addresses. No points can be awarded here at this time. (Community A could change this score by holding public workshops on the problem and soliciting voter response questionnaires or other methods.).

This projects score under Community Commitment is 15 points.

PROJECT IMPLEMENTATION

There are no regulatory problems with this project and five (5) points are awarded here.

Although the exposure is clearly visible, there has not been a severe hurricane since this library was constructed and therefore there is no history of loss or repetitive loss for this structure. Flood hazard mitigation money available now is directed toward structures suffering repetitive losses, and consequently no funds are immediately available. FEMA and other funding sources are being reviewed and it is believed that funds for this type of mitigation project will be available within the next one (1) to two (2) years. This project is awarded six (6) points in this category.

Community A is an affluent community and despite the fact that the public is currently unaware of this problem, the City Council feels confident enough of public support to commit a 50% match, or $30,000 toward this mitigation effort. The project is awarded five (5) points here; if funding were to become available, this project could accomplish its objective of raising library books and equipment above the category 3 storm surge level in less than one year. The project is awarded five (5) points here.

This project's score under Project Implementation is 21 points.

The Final Score for this proposed mitigation project is 68 points.

EXAMPLE 2: COMMUNITY B - RV PARK FLOODING PREVENTION

Community B has a large RV park with very poor drainage. Every time there is a minimal rain event the area floods, causing significant danger and health hazards to the residents in terms of flooded power outlets and sewage-contaminated standing water. These events also cause the town and county considerable expense and inconvenience such as traffic problems, emergency services disruption, and clean-up. This type of flooding happens approximately eight times per year with an estimated expense to the town and county of $3,000 per event. Correcting this problem will require a substantial reworking of the local drainage system. The estimated cost for this mitigation effort is $400,000.

If the flooding this project is designed to correct occurs eight times a year at a cost of $3,000 per event to the town and county in terms of police, fire/rescue, and utility worker time involvement, then Community B has a documented exposure of $24,000 per year to this hazard. If we assume the life expectancy of a drainage project to be 30 years, the potential savings to the town and county could be as high as $720,000. A reduction in the frequency of these flooding events by 90% would make the Benefit/Cost ratio on this project:

($720,000 - $72,000) / $400,000 = 1.62 Benefit/Cost Ratio therefore, this is a viable project.

Applying the Scoring Criteria (See Attached Score Sheet) this project would be scored as follows:

COMMUNITY BENEFIT

This project is a Damage Reduction project and is awarded 10 points here.

This project addresses a problem within an RV park where there are no permanent residents. It does not address critical elements of the community infrastructure and must be considered as addressing only public convenience considerations. Award four (4) points here.

Based on individual flooding events the community's exposure is low, but when considered over time this exposure becomes much higher. Points are awarded under this criterion based on a Medium Exposure and a High Frequency of occurrence. Nine (9) points are awarded here.

The cost effectiveness based on the Benefit/Cost ratio for this project is 1.62; therefore, eight (8) points are awarded here.

Total project score under Community Benefit is 31 points.

COMMUNITY COMMITMENT

This proposed project is contained within a broad mitigation goal under the Coastal Element of Community B's CGMP, but Community B has developed a proposed specific Policy amendment directed toward this type of drainage system retrofit. The project is awarded eight (8) points here.

This project is also contained within the Flood Plain Management Plan for Community B, which has been officially adopted. Award 10 points in this category.

This problem has been the subject of numerous letters and editorials in the local paper. It has also been the subject of one (1) advertised public meeting. Award five (5) points here.

Total project score under Community Commitment = 23 points

PROJECT IMPLEMENTATION

This project requires a considerable amount of construction work. While it is consistent within the local regulatory framework, there are regional and possibly national issues that will have to be addressed. Since the project will be discharging stormwater runoff into some body of water, there will be water quality issues that must be dealt with. If Federal money is used, an NPDES review will be required. While all these issues can be addressed, they will delay implementation of the project and increase its cost. Award only one (1) point under this criterion.

Currently, there are no identified sources for funding for this project. Once the LMS is adopted it is believed the Federal Government will make available, through the State DEM some funds to implement priority mitigation projects. These funds may be available within one (1) to two (2) years. Award six (6) points under this criterion.

While Community B is relatively affluent, they are not in a position to match more than 10% or $40,000 on a project of this magnitude. Award one (1) point under this criterion.

If funding were immediately available for this project it would take approximately three (3) years before this project could be permitted, bid, constructed, and operational. Award three (3) points under this criterion.

Total project points under Project Implementation = 11

The Final Score for this proposed mitigation project is 65 points.

EXAMPLE 3: COMMUNITY C - DEVELOP A HARDENED EOC
Community C has no hardened Emergency Operations Center. They presently base their emergency management personnel in city office buildings that are highly vulnerable to both flooding and wind damage. They have an estimated $300,000 worth of computer, communications, and emergency response equipment housed within these vulnerable facilities. The county provides Community C with its Fire/Rescue services and is presently building a new, hardened fire station to serve this section of the county. County Fire/Rescue Services have offered to provide Community C space within their new building, but Community C will have to have this space fitted for Emergency Management Operations. Fitting this space and moving Community C's existing equipment into it will cost Community C an estimated $60,000. By undertaking this move, Community C should reduce the exposure to its physical assets by 95%, as well as position its Emergency Management personnel in a much safer environment.

Applying the Benefit/Cost formula shows:

($300,000 - $15,000) / $ 60,000 = 4.75 Benefit/Cost Ratio therefore, this is a viable project.

Applying the Scoring Criteria (See Attached Score Sheet) to this project would be scored as follows:

COMMUNITY BENEFIT

Although not its specific aim, this project may be classified as a Damage Reduction activity. Award 10 points under this criterion.

This project addresses hardening of a Primary Critical Facility. Award 10 points here.

The currently utilized location of emergency management operations is highly vulnerable to severe tropical storms, hurricanes, or tornadoes and all these types of storms occur with medium frequency. Thus, we have a High Exposure = Medium Frequency = eight (8) points for this criterion.

The cost effectiveness for this proposed project expressed as the Benefit/Cost Ration is 4.75, thus 20 points are awarded in this criterion. Total Community Benefit Points = 48

COMMUNITY COMMITMENT

The concept of developing a hardened EOC for Community C is expressed in both a goal and a specific Policy of their CGMP. Award 10 points under this criterion.

Development of a permanent, protected EOC is also contained with Community C's Emergency Management Plan. Award 10 points under this criterion.

There is no real public support for, or opposition to, this project. Although it is believed the public would be highly supportive of this project if it were presented to them, they are at this time unaware of the problem. No points can be awarded in this criterion.

Total Community Commitment points = 20

PROJECT IMPLEMENTATION

There are no regulatory problems with this proposed project. Award five (5) points here.
There is an identified funding source through the State Division of Emergency Management for the project at this time. Award 10 points here.

Community C will match with funds and in-kind services 20% of the cost of this project. Award two (2) points for this criterion.

This project can be accomplished as soon as the new fire station is ready for occupancy in approximately six months. Award five (5) points here.

Total Project Implementation Points = 22 points

The Final Score for this proposed mitigation project is 90 points.

EXAMPLE 4: COMMUNITY D - INITIATION OF A CONTROLLED BURNING PROGRAM TO PREVENT WILDFIRE LOSSES IN THE URBAN INTERFACE ZONE.

Community D has a large agricultural, ranching, and undeveloped land component within its jurisdiction. The community wishes to undertake a controlled burning program along the urban interface zone, but to do this it will have to upgrade its fire control equipment, pass a new controlled burning ordinance, and get the required permission from the forestry and environmental services. The cost of initiating this new program is estimated to be $200,000 including the necessary upgrading of fire control equipment. Community C has an exposure, based on tax role data, of $3 million within the area where wildfire is considered a threat. Controlled burning would reduce the potential risk of wildfire by 60%.

Applying the Benefit/Cost formula shows:

($3,000,000 - $1,200,000) / $200,000 = 9.0 Benefit/Cost Ratio therefore, this is a viable project.

Applying the Scoring Criteria (See Attached Score Sheet) to this project would be scored as follows:

COMMUNITY BENEFIT

This is a Preparedness Against Hazard project, so three (3) points are awarded here.

There are primary critical facilities located in the area threatened by wildfire so this project does mitigate for threats to critical elements of the community’s infrastructure. Award 10 points here.

The community has a high exposure to wildfire ($3 million) and wildfires have occurred with moderate frequency recently in south Florida. Award eight (8) points for this criterion.

The project has a Benefit/Cost Ratio of 9.0. Award 20 points under this criterion.

Total Community Benefit Points = 41 points

<u>COMMUNITY COMMITMENT</u>

Controlled burning is currently expressed as a broad Goal under Community D's CGMP, but it is the subject of a specific Policy amendment that has been proposed. Award eight (8) points here.

Controlled burning is not addressed in any existing emergency management plans, but following last summer's wildfire outbreaks, controlled burning plans have been developed and proposed. Award six (6) points under this criterion.

The danger of wildfire and the desirability of a controlled burn program have been the subjects of two publicly advertised meetings and a considerable number of letters and written comments from the public at-large. Award five (5) points for this criterion.

Total Community Commitment points = 19

<u>PROJECT IMPLEMENTATION</u>

The proposed controlled burn ordinance will have to be adopted by the City Council. Various permits will have to be obtained from the county and Division of Forestry when controlled burning is actually to take place, but these are not considered regulatory obstacles to the program itself. The only area of non-regulatory compliance is an issue in passing the ordinance creating the program itself. Award four (4) points for this criterion.

The county and the City have agreed to put up the funding for this program so funds will be available as soon as the program has been legally adopted by Community D. Award 10 points here.

Community D will match 50% of the funds required for this program. Award five (5) points here.

Once the program is in place, it will begin to accomplish its stated goals immediately. Award five (5) points here.

Total Project Implementation Points = 24 points

The final score for this proposed mitigation project is 84 points.

# PALM BEACH COUNTY
## LMS PROJECT/INITIATIVE SCORING SHEET

**Project Title:**

**Sponsor:**

OFFICIAL USE ONLY
PROJECT #
Reviewer:

| MEASURED CRITERIA | POINTS AVAILABLE | POINTS AWARDED |
|---|---|---|
| Community Benefit | 50 | |
| Project Implementation | 25 | |
| Community Commitment | 25 | |
| PROJECT / INITIATIVE FINAL SCORE | | |

| COMMUNITY BENEFIT | AVAILABLE POINTS | SCORING INSTRUCTION | AWARDED POINTS |
|---|---|---|---|
| **Community Benefit**–What benefit does the community derive from this effort? How and to what extent does this mitigation project benefit the citizens of a community? | 5 | Damage Reduction =5<br>Mapping and Regulatory = 4<br>Preparedness Against Hazard = 3<br>Public Information = 2<br>Other = 1<br>No Benefit = 0 | |
| **Project Benefit** - Does the project address critical elements of the community infrastructure? | 10 | Primary Critical Facilities = 10<br>Storm Water/Flooding = 8<br>Secondary Critical Facilities = 6<br>Public Convenience Facilities = 4<br>Residential Structures = 2<br>No Benefit = 0 | |
| **Community Exposure** - Does the project mitigate a frequently occurring problem or a problem to which a community is particularly vulnerable?<br><br>H = High<br>M = Medium<br>L = Low<br>E = Exposure<br>F = Frequency of occurrence | 10 | HE + HF = 10<br>HE + MF = 8<br>HE + LF = 6<br>ME + HF = 9<br>ME + MF = 7<br>ME + LF = 4<br>LE + HF = 5<br>LE + MF = 2<br>LE + LF = 1<br>No Exposure + No Frequency = 0 | |
| **Cost Effectiveness** - What is the benefit/cost ratio of the project applying the following Benefit/Cost ratio formula:<br><br>(Loss Exposure ($) Before Project−Loss Exposure ($) After Project)÷ Cost of the Project | 20 | Benefit/Cost ratio = 4.0 or greater =20 points<br>Benefit/Cost Ratio = 3.0 to 3.9 = 16 points<br>Benefit/Cost ratio = 2.0 to 2.9 = 12 points<br>Benefit/Cost ratio = 1.0 to 1.9 = 8 points<br>Benefit/Cost ratio = < 1.0 = 0 points | |
| **Area Benefit** – How many people stand to benefit from the project implementation? | 5 | Multiple Jurisdictions = 5<br>Community = 3<br>Neighborhood = 1<br>No Benefit = 0 | |
| TOTAL COMMUNITY BENEFIT POINTS | 50 | POINTS AWARDED | |

Page 1 of 3

PALM BEACH COUNTY
LMS PROJECT/INITIATIVE SCORING SHEET

| PROJECT IMPLEMENTATION | AVAILABLE POINTS | SCORING INSTRUCTION | AWARDED POINTS |
|---|---|---|---|
| **Containment within the Existing Comprehensive Growth Management Plan or Equivalent Plan–** Is the project or initiative consistent with or incorporated within the existing Comprehensive Growth Management Plan or equivalent document? | 10 | Contained within a specific Policy/Plan = 10<br>Contained in "Goal" with proposed Policy/Plan amendment = 8<br>Contained within a broad "Goal" = 5<br>Contained in a proposed Amendment = 3<br>Not in conflict with any Policy/Plan = 1<br>No Plan =0 | |
| **Containment within an Existing Emergency Management Plan / Other Functional Plan Developed by an Official Local Governmental Entity/Organization** - Has this project or initiative already been proposed as a management initiative or structural improvement in any emergency plan or proposed or adopted by County\local jurisdictions or entity? | 10 | Officially adopted = 10<br>Proposed/Not officially adopted = 6<br>Not in conflict with any plan = 2<br>No Plan = 0 | |
| **Consistency with Existing Regulatory Framework** - Is the project consistent with existing legal and regulatory and environmental/cultural framework? | 5 | No regulatory issues = 5<br>Local issues = 4<br>Regional issues = 3<br>State issues = 2<br>Federal issues = 1<br>No Consistency = 0 | |
| TOTAL PROJECT IMPLEMENTATION POINTS | 25 | TOTAL POINTS AWARDED | |

## PALM BEACH COUNTY
## LMS PROJECT/INITIATIVE SCORING SHEET

| COMMUNITY COMMITMENT | AVAILABLE POINTS | SCORING INSTRUCTION | AWARDED POINTS |
|---|---|---|---|
| **Public Support** - Is there demonstrated public support f or this project or recognition of this problem? | 5 | Has this project or problem been the subject of:<br><br>A) An Advertised Public Meeting = 3<br><br>B) Written evidence of public support = 2<br><br>Both A and B = 5<br><br>No evidence of public support = 0 | |
| **Funding Availability** – Is there a funding source readily available? | 10 | Funds available Now = 10<br>1 year = 8<br>2 years = 6<br>3 years = 4<br>4 years = 2<br>5 years = 1<br>5+ years = 0 | |
| **Matching Funds** - Are matching funds or in-kind services available for this project? | 5 | 50 % or more = 5<br>40 to 49 % = 4<br>30 to 39 % = 3<br>20 to 29 % = 2<br>1 to 20 % = 1<br>0% = 0 | |
| **Timeframe for Accomplishing Objectives** - How long will it take for the proposed mitigation project to accomplish its stated goals? | 5 | 1 year = 5<br>2 years = 4<br>3 years = 3<br>4 years = 2<br>5 years = 1<br>5+ years = 0 | |
| TOTAL COMMUNITY COMMITMENT POINTS | 25 | POINTS AWARDED | |

NOTES:

Rev. 2/11/2016

# Appendix J: NFIP and CRS Status and Activities

This appendix is intended to provide current data and information on NFIP and CRS status and activities countywide in fulfillment of the following FEMA requirement:

**Requirement: §201.6(c)(3)(ii):** The mitigation strategy must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

The tables on the following pages provide summaries of NFIP and CRS status by jurisdiction. Sources for summary tables were compiled from the following locations on FEMA's NFIP website:

- https://www.fema.gov/media-library-data/1476294162726-4795edc7fe5cde0c997bc4389d1265bd/CRS_List_of_Communites_10_01_2016.pdf (CRS Class Information for PBC)
- https://www.fema.gov/media-library-data/1493922774199-5d4a9a625dd3b1b90c31577c33a24f61/10-5-2017.Consolidated.pdf (FIRM Map latest updates for PBC)
- https://bsa.nfipstat.fema.gov/reports/1040.htm (Flood Losses since 1978 in PBC)
- https://bsa.nfipstat.fema.gov/reports/1011.htm (Policies in-force in PBC)

The number and value of NFIP insurance policies in effect, total losses, and claims activity from CRS participation are included on a jurisdiction-by-jurisdiction basis. As of this writing, 28 out of 39 jurisdictions are participating in CRS. Currently the CRS program is generating close to $5 million in insurance premium savings countywide on an annual basis.

As of this writing, the County's CRS program has been evaluated in April 2017. It has been retained as a Class 5 CRS rating through 2019. However, a final score is yet to be distributed. This information is maintained at the EOC by the CRS Coordinator.

| Community ID | Name | Policies in Force | Class Rating | Map Date | Entry Date |
|---|---|---|---|---|---|
| 120192 | PALM BEACH COUNTY * | 65,387 | 5 | 10/5/2017 | 2/1/1979 |
| 120193 | ATLANTIS, CITY OF | 379 | 7 | 10/5/2017 | 11/1/1978 |
| 120195 | BOCA RATON, CITY OF | 15,357 | 8 | 10/5/2017 | 5/15/1978 |
| 120196 | BOYNTON BEACH, CITY OF | 8,885 | 7 | 10/5/2017 | 1/3/1979 |
| 120198 | CLOUD LAKE, TOWN OF | 14 | 6 | 10/5/2017 | 5/15/1978 |
| 125102 | DELRAY BEACH, CITY OF | 8,013 | 8 | 10/5/2017 | 4/9/1971 |
| 120200 | GLEN RIDGE, TOWN OF | 20 | 10 | 10/5/2017 | 5/15/1978 |
| 125109 | GULF STREAM, TOWN OF | 374 | 10 | 10/5/2017 | 11/24/1972 |
| 125111 | HIGHLAND BEACH, TOWN OF | 4,097 | 10 | 10/5/2017 | 10/16/1970 |
| 120207 | HYPOLUXO, TOWN OF | 1,155 | 8 | 10/5/2017 | 5/15/1978 |
| 120208 | JUNO BEACH, TOWN OF | 1,630 | 5 | 10/5/2017 | 12/1/1978 |
| 125119 | JUPITER, TOWN OF | 7,605 | 5 | 10/5/2017 | 9/22/1972 |
| 120211 | LAKE CLARKE SHORES, TOWN OF | 246 | 8 | 10/5/2017 | 11/1/1978 |
| 120212 | LAKE PARK, TOWN OF | 822 | 8 | 10/5/2017 | 9/15/1978 |
| 120213 | LAKE WORTH BEACH, CITY OF | 1,533 | 8 | 10/5/2017 | 12/1/1978 |
| 120214 | LANTANA, TOWN OF | 962 | 9 | 10/5/2017 | 3/12/1971 |
| 120215 | MANALAPAN, TOWN OF | 237 | 8 | 10/5/2017 | 10/30/1970 |
| 120216 | MANGONIA PARK, TOWN OF | 41 | 10 | 10/5/2017 | 3/1/1978 |
| 120217 | NORTH PALM BEACH, VILLAGE OF | 3,925 | 7 | 10/5/2017 | 8/15/1978 |
| 125134 | OCEAN RIDGE, TOWN OF | 1,332 | 7 | 10/5/2017 | 4/9/1971 |
| 120220 | PALM BEACH, TOWN OF | 7,672 | 7 | 10/5/2017 | 5/15/1978 |
| 120221 | PALM BEACH GARDENS, CITY OF | 3,390 | 10 | 10/5/2017 | 1/3/1979 |
| 125137 | PALM BEACH SHORES, TOWN OF | 732 | 8 | 10/5/2017 | 6/25/1971 |
| 120223 | PALM SPRINGS, VILLAGE OF | 1,444 | 8 | 10/5/2017 | 3/1/1978 |
| 125142 | RIVIERA BEACH, CITY OF | 5,468 | 9 | 10/5/2017 | 9/22/1972 |
| 120227 | SOUTH PALM BEACH, TOWN OF | 1,596 | 9 | 10/5/2017 | 5/15/1978 |
| 120228 | TEQUESTA, VILLAGE OF | 1,324 | 7 | 10/5/2017 | 6/11/1971 |
| 125157 | WELLINGTON, VILLAGE OF | 676 | 6 | 10/5/2017 | 1/3/2001 |
| 120229 | WEST PALM BEACH, CITY OF | 7,115 | 6 | 10/5/2017 | 3/1/1979 |
| | CRS Chart - Appendix J | | | | |

*Unincorporated areas of the county only

Note: All PBC FIRM Maps were officially updated as of 10/5/2017. Entry date is the date the municipality entered the NFIP program.

Source: as of 11/30/18 from NFIP Website https://bsa.nfipstat.fema.gov/reports/1011.htm

| Name | Policies in Force | Total Losses | Total Losses Paid |
|---|---|---|---|
| PALM BEACH COUNTY * | 50,725 | 3,982 | $18,312,549.68 |
| ATLANTIS, CITY OF | 295 | 29 | $316,370.90 |
| BELLE GLADE, CITY OF | 169 | 9 | $26,837.91 |
| BOCA RATON, CITY OF | 15,972 | 637 | $3,520,222.52 |
| BOYNTON BEACH, CITY OF | 7,849 | 586 | $1,808,039.14 |
| BRINY BREEZES, TOWN OF | 61 | 6 | $14,227.77 |
| CLOUD LAKE, TOWN OF | 19 | 7 | $20,317.57 |
| DELRAY BEACH, CITY OF | 7,681 | 755 | $2,605,335.07 |
| GLEN RIDGE, TOWN OF | 26 | 6 | $8,520.02 |
| GOLF, VILLAGE OF | 24 | 3 | $42,999.54 |
| GREENACRES, CITY OF | 503 | 20 | $42,206.73 |
| GULF STREAM, TOWN OF | 355 | 43 | $215,581.04 |
| HAVERHILL, TOWN OF | 30 | 7 | $70,254.16 |
| HIGHLAND BEACH, TOWN OF | 4,120 | 90 | $443,273.13 |
| HYPOLUXO, TOWN OF | 1,341 | 22 | $13,145.43 |
| JUNO BEACH, TOWN OF | 1,722 | 43 | $566,945.73 |
| JUPITER INLET COLONY, TOWN OF | 127 | 17 | $105,470.23 |
| JUPITER, TOWN OF | 8,872 | 480 | $3,251,400.08 |
| LAKE CLARKE SHORES, TOWN OF | 211 | 19 | $27,254.62 |
| LAKE PARK, TOWN OF | 861 | 44 | $622,665.46 |
| LAKE WORTH BEACH, CITY OF | 1,442 | 200 | $747,811.11 |
| LANTANA, TOWN OF | 1,167 | 153 | $1,442,016.22 |
| MANALAPAN, TOWN OF | 239 | 83 | $552,485.98 |
| MANGONIA PARK, TOWN OF | 48 | 13 | $465,502.44 |
| NORTH PALM BEACH, VILLAGE OF | 3,963 | 110 | $367,768.76 |
| OCEAN RIDGE, TOWN OF | 1,237 | 193 | $1,403,890.71 |
| PAHOKEE, CITY OF | 169 | 15 | $45, 582.20 |
| PALM BEACH, TOWN OF | 7,521 | 1,201 | $13,635,675.85 |
| PALM BEACH GARDENS, CITY OF | 4,711 | 307 | $1,500,704.43 |
| PALM BEACH SHORES, TOWN OF | 736 | 58 | $889,658.54 |
| PALM SPRINGS, VILLAGE OF | 1,291 | 83 | $182,235.26 |
| RIVIERA BEACH, CITY OF | 5,311 | 267 | $1,447,709.46 |
| ROYAL PALM BEACH, VILLAGE OF | 1,093 | 36 | $233,542.42 |
| SOUTH PALM BEACH, TOWN OF | 1,735 | 65 | $1,400,361.95 |
| TEQUESTA, VILLAGE OF | 1,342 | 75 | $261,270.90 |
| WELLINGTON, VILLAGE OF | 676 | 0 | $0.00 |
| WEST PALM BEACH, CITY OF | 8,021 | 477 | $3,715,504.48 |

*Unincorporated areas of the county only
Source: As of 09/30/18 from NFIP Website https://bsa.nfipstat.fema.gov/reports/1040.htm

Palm Beach County and its municipalities will continue their commitment to NFIP by continuing to:

- Enforce the Floodplain Management Ordinance that regulates new development and substantial improvements in the special flood hazard areas.
    - Inform the community by news releases and open public meeting
    - Community Outreach
    - County Public TV

- Maintain elevation certificates on file for all new construction in the SFHAs or for substantial improvements to properties in the SFHA.
    - “Doing Business with the County” seminars geared toward construction industry and builders

- Use best available (flood map) data for issuing construction permits.
    - Public Education Seminars
    - Updated mapping provided to each municipality
    - Mapping placed in all county libraries

- Maintain public records and make them available for review.
    - Community outreach
    - News releases and county public TV

- Maintain records pertaining to LOMAS, and LOMRS, etc.

- Provide information related to flood hazards, flood maps, etc., to the public upon request.

- Continue community outreach efforts for compliance with the community rating system program.
    - Integrate new NFIP information and mapping into already existing strong community presentations
    - Incorporate Flooding information into every Emergency Management presentation through its Speaker’s Bureau, extending the reach of flood/CRS/NFIP information to the public.

- Continue to promote flood insurance to property owners.

  - Increase and continue outreach presentations to community and home owners associations
  - Incorporate flood insurance outreach into every emergency management presentation, increasing the reach of the message throughout the county and municipalities.

- Maintain flood hazard publications at the main branch of the library.

- Where feasible, continue to identify/acquire land in the SFHA open space/preservation.

- Promote hazard flood mitigation to the public.
  - LMS posted on the County website
  - Grant information posted on County website
  - Integrate into outreach presentation

- Continue drainage maintenance and drainage system improvement projects.
  - Encourage more drainage projects throughout the county in all LMS meetings

- Continue floodplain management activities and maintain a Class 5 Rating.

- Adopt and enforce the floodplain management plan
  - Schedule quarterly meetings with CRS User Group and invite all 39 municipalities
  - Provide continued education and best practices to all municipalities

- Provide a robust community assistance program
  - Community outreach presentations
  - Town hall meetings in different municipalities
  - Press releases and TV programs
  - Telephone information Hotline Floodplain and Mapping questions
  - New map pick up information

- Outreach to municipalities not participating in the CRS/NFIP
  - Provide continued outreach, best practices to municipalities that are not part of the CRS/NFIP
  - Document each municipality not a participant in the CRS/NFIP and continue providing them with best practices incentives to participate
  - Ensure that municipalities not participating in the CRS/NFIP are members of the LMS working group, allowing them still to receive mitigation information

The following is the latest annual progress report for the County CRS Floodplain Management Plan (2017):

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PALM BEACH COUNTY COMMUNITY RATING SYSTEM FLOODPLAIN MANAGEMENT PLAN PROGRESS REPORT 2017

Palm Beach County, Florida NFIP Number 120192

1. Name of the CRS Floodplain Management Plan
   ***Unified Local Mitigation Strategy***
   Note: An increasing number of municipalities are preparing Floodplain Management Plans in accordance with the CRS Coordinator's Manual Activity 500 – Flood Damage Reduction Activities, specifically, Activity 510 – Floodplain Management Planning. Several of the communities have completed or are in various stages of completing their Floodplain Management Plans according to the 10 step process identified in the manual. Palm Beach County (PBC) Division of Emergency Management is currently in discussions with the Planning Division and the Building Division of the Planning, Zoning and Building Department in an effort to identify the resources necessary to accomplish this planning initiative. PBC anticipates completion of the planning imitative prior to the next audit. Currently there are 17 municipalities that use the LMS for their floodplain management plan in addition to unincorporated Palm Beach County.

2. Date Adopted
   - Original adoption: September 30, 1999
   - Revised Plan approved by FEMA: November 2004
   - Revised Plan approved by FEMA: January 2010
   - Revised Plan approved by FEMA February 2015

3. Location where copies are available for review
   Palm Beach County
   Division of Emergency Management Emergency
   Operations center
   20 South Military Trail
   West Palm Beach, Fl 3415

   Contact: Shane Ratliff, LMS Coordinator, Planning Section

   Also posted on the internet at the following address:

   http://discover.pbcgov.org/publicsafety/dem/Publications/Local-Mitigation-Strategy.pdf#search=LMS

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4. Summarize any flooding that occurred during 2017.

Palm Beach County (PBC) along with all of South Florida Subtropical Climate has two seasons, a dry season, roughly from December through mid to late May, and a wet season from approximately June through October. Palm Beach County averages over 60 inches of rain a year and more than 130 rain days, with most of it coming between the months of June and November. Virtually flat, with most areas at or only slightly above sea level, even moderate rains can accumulate quickly. The area's high hydrologic variation, low physical relief, and limited storage and conveyance capacities, make water management very challenging. Actions by local and regional water management authorities range from enforcing water restrictions during dry periods to precautionary or emergency flood management during wet periods and storm events.

This year will likely be remembered as a year of extremes. A strong La Nina dominated South Florida's weather at the beginning of the year bringing drought conditions, which led to an active fire weather season. The wet season was highlighted by above average rainfall and several tropical systems, including hurricane Irma which made landfall in Marco Island. The end of the year has brought a return of La Nina conditions, resulting in warm and dry conditions for November and December.

During this past year

Summary 2017 Rainy Season

The South Florida rainy season of 2017 was a wet season across most of the area. The wet conditions mostly did not come from tropical cyclones as only one affected the area in early September, which was Major Hurricane Irma that came onshore near Everglades City, but from stalled fronts over South Florida in June. South Florida saw between 120 to 180 percent of normal rainfall for the rainy season. The only airport that saw near normal rainfall for the wet season of 2017 was at West Palm Beach International Airport which was around 35 inches.

June was the wettest month of the wet season of 2017, while the rest of the wet season from July through October was near or just above normal for rainfall. South Florida saw

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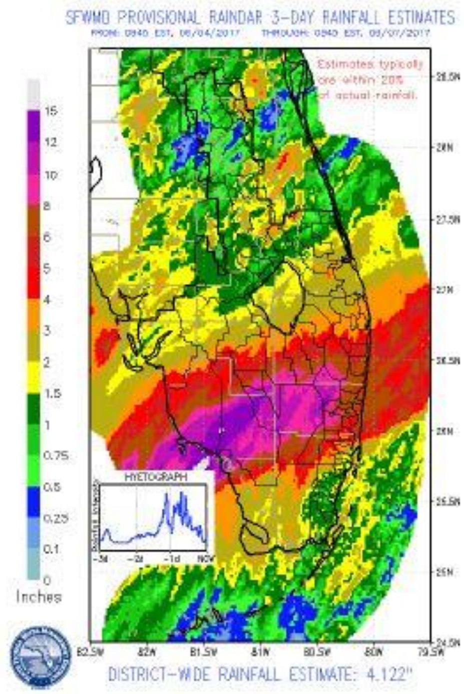
between 150 to 200 percent of normal rainfall over the metro areas with 200 to 220 percent over the interior areas for the month of June. Rainfall amounts was between 10 to 15 inches over most of South Florida in June.




In June, a disturbance meandering across the Gulf of Mexico in combination with an upper level low pressure over the western Gulf of Mexico led to nearly a week of heavy rainfall across South Florida. The heaviest rainfall fell in the corridor from Marco Island and southern Collier northeast into Broward and southern Palm Beach counties. Some locations in this swath saw single-day rainfall amounts in excess of 10 inches, with a few locations as much as 15 inches, resulting in 3-day event totals of 15 to 20 inches over the entire swath. Elsewhere, rainfall amounts ranged from around 4 inches across southern Miami- Dade to 7 to 8 inches over the rest of South Florida.

This storm set a record rainfall in Palm Beach County. The rain storm broke a 1904 record set in West Palm Beach with 4.18 inches of rain falling. During the week of June 3-9, 2017, over eight and one half inches (8.54 inches) of rain fell causing street flooding. Although almost 9 inches of rain fell during the week, the county did not experience flooding inside houses, as the flood control measures were successful in handling the rain amounts, although street flooding was common.

| Location (Beginning of Period of Record) | 2017 Rainfall (inches) | Departure from Normal | Rank (top 20) |
|---|---|---|---|
| Canal Point | 61.76 | +9.34 | 14th Wettest |
| Juno Beach | 66.40 | +1.56 | 9th Wettest |
| Palm Beach Gardens | 68.55 | +7.39 | 3rd Wettest |
| Palm Beach Int'l Airport (1888) | 59.13 | -2.89 | |

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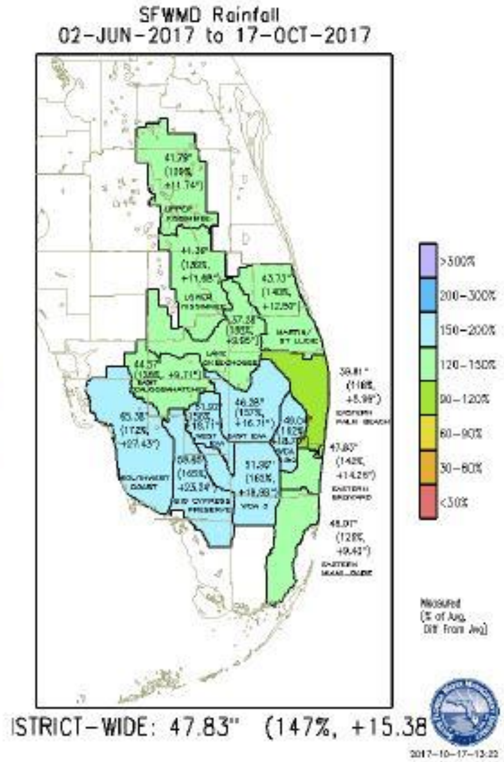
Together Emergencies Are Managed

**Other areas with high rainfall amounts include:**

- 1 mile south of Boca West, 11.16 inches
- 1 mile southwest of Delray Beach, 10.85 inches
- 2 miles south-southeast of Boca West, 10.47 inches
- 3 miles northeast of Boca Raton, 9.90 inches
- Boynton Beach , 7.31 inches
- Lake Worth, 7.17 inches
- 2 miles west-northwest of Delray Beach, 7.13 inches
- 2 miles east-northeast of Lake Worth, 7.06 inches
- 3 miles north-northeast of Boynton Beach, 5.98 inches
- 1 mile south of Juno Beach, 5.59 inches
- Royal Palm Beach, 5.57 inches
- 2 miles northwest of West Palm Beach, 4.76 inches
- 2 miles west-southwest of Jupiter, 4.74 inches
- 3 miles east-northeast of Riviera Beach, 4.42 inches
- 2 miles east of Royal Palm Beach, 4.42 inches
- Jupiter, 3.59 inches
- Juno Beach, 2.32 inches




*Vehicles attempt to navigate Boca Chase Drive near Waterberry Drive in western Boca Raton, Florida on June 7, 2017. (Allen Eyestone / The Palm Beach Post)*

July was also a wet month where 5 to 10 inches fell over the metro areas and around 10 inches fell over the interior areas. This rainfall was about 110 to 120% of normal rainfall for the month.

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August was a normal month for rainfall across South Florida where 5 to 10 inches fell across the area. However, September was a wet month again, with 10 to 15 inches of rain fell across the area. This was in the 150 to 200% range of normal for rainfall. Most of this rain fell during major Hurricane Irma.

Hurricane Irma

Hurricane Irma formed from an African Easterly Wave. It became a tropical storm on August 30th and a hurricane on the 31st. By the time Hurricane Irma struck Barbuda in the northern Leeward Islands around 2 a.m. on Wednesday, September 6th, it was a Category 5 hurricane with 185 mph winds.

From Friday evening September 8th through Saturday afternoon September 9th, Irma moved along the northern coast of Cuba. Interaction with land caused Irma to weaken from a Category 5 to a Category 3 before it began to pull away from the northern coast of Cuba late Saturday afternoon.

On Sunday morning, September 10th, Irma strengthened to a Category 4 hurricane as it accelerated toward the Florida Keys. The eye made landfall in Cudjoe Key as a 130 mph Category 4 storm at 9:10 a.m. The center of Irma then made landfall in Marco Island at 3:35 p.m. that afternoon as a Category 3 storm with 115 mph winds. The center moved into central Florida overnight and into northern Florida later on Monday as it weakened.

For the most part, South Florida sustained heavy damage to trees and fences. The majority of South Florida lost power. For the east coast metro areas of Miami-Dade, Broward and Palm Beach Counties, about 95% of the power was restored within 1 week after the hurricane.

**Meteorological Information**

Wind

Irma was the first major (Category 3 or higher) hurricane to make landfall in South Florida since Wilma of 2005. The east coast metro areas of Miami-Dade, Broward, and Palm Beach Counties experienced sustained winds of strong tropical force (most of Miami, Ft. Lauderdale, and West Palm Beach saw sustained winds that peaked in the 50-73 mph range.) Most of metro Miami-Dade, Broward, and Palm Beach experienced wind gusts peaking in the 80-100 mph range. Very few isolated spots had gusts over 100 mph, in the 100-111 mph range.

Storm Surge

In Palm Beach County little significant inundation occurred.

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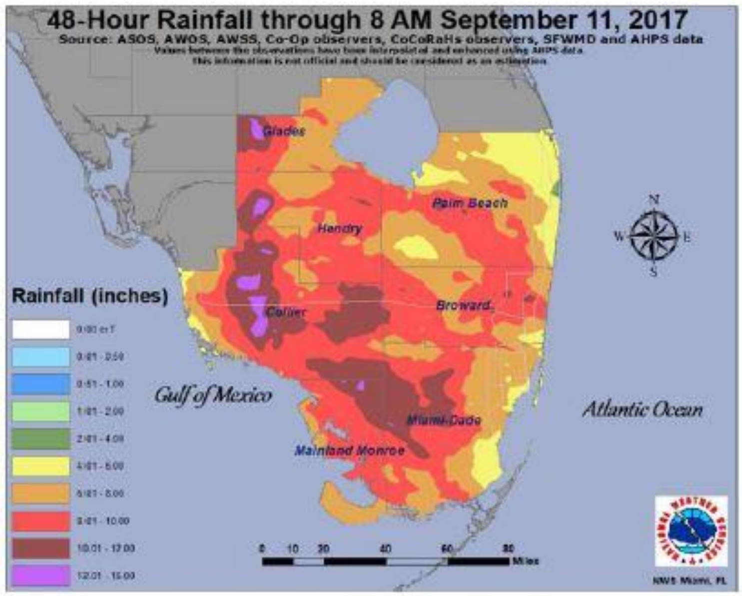
Rainfall

For the majority of locations where most of the population lives in South Florida, rainfall amounts averaged from 6 to 10 inches in association with Irma.




Southern Palm Beach County on average received the most rain as the chart below shows:

| Location | Amount | Time/Date |
|---|---|---|
| **W Boca Raton** | 9.24 in | 0800 AM / 09/11 |
| **W Boca Raton Equestrian** | 9.00 in | 1132 AM / 09/11 |
| **WNW Aberdeen Golf Course** | 8.96 in | 0816 AM / 09/11 |
| **Aberdeen Golf Course** | 8.68 in | 0700 AM / 09/11 |
| **Loxahatchee** | 8.08 in | 1105 AM / 09/11 |
| **Lake Harbor** | 7.75 in | 1105 AM / 09/11 |
| **Boynton Beach** | 7.56 in | 0700 AM / 09/11 |
| **NNW Boca Raton** | 7.36 in | 1141 AM / 09/11 |
| **Jupiter** | 7.35 in | 1154 AM / 09/11 |
| **N Florida Gardens** | 6.61 in | 0800 AM / 09/11 |
| **S Juno Beach** | 6.47 in | 0700 AM / 09/11 |

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Together Emergencies Are Managed

| Location | Amount | Time/Date |
|---|---|---|
| W Jupiter | 6.32 in | 0800 AM / 09/11 |
| SSE South Bay | 6.03 in | 0800 AM / 09/11 |
| NW Haverhill | 5.90 in | 1155 AM / 09/11 |
| North Palm Beach | 5.64 in | 0800 AM / 09/11 |
| W. Palm Beach Canal At S-352 | 5.59 in | 0800 AM / 09/11 |
| Boynton Beach | 5.39 in | 0800 AM / 09/11 |
| Lantana | 5.05 in | 0700 AM / 09/11 |
| S Boca Raton | 4.65 in | 0802 AM / 09/11 |
| WNW Belle Glade | 4.46 in | 0800 AM / 09/11 |
| S Delray Beach | 4.12 in | 0800 AM / 09/11 |
| NE Lake Worth | 4.07 in | 0700 AM / 09/11 |
| Lake Worth | 3.92 in | 0800 AM / 09/11 |

Although some areas had significant amount of rainfall from Hurricane Irma, all sections of the water management system worked well as no flooding inside homes was reported.

King Tide Flooding

During the beginning of October 2017, the National Weather Service issues 8 iNWS Alerts concerning Coastal Flood as the King Tide affected coastal communities in all of South Florida including Palm Beach County. From October 2-8, the NWS issued daily briefings on the King Tide potential, noting that flooding would likely occur on coastal roads, parking lots, and docks in vulnerable areas during the times of high tide. The NWS also indicated high tides would hit late 10/9 and then on again between 9:30 a.m. and 11 a.m. Saturday, 10/10/17

Tidal flooding continued this week to plague an area of Delray Beach that's regularly hit. On October 8th, Delray Beach's Marine Way along the Intracoastal Waterway just south of the Atlantic Avenue Bridge water was ankle-deep much of which seeped into homes in the neighborhood.

In West Palm Beach, Flagler Drive, along the Intracoastal has often been affected by king tide flooding and puddling. Water from the Intracoastal Waterway flooded Lake Trail in Palm Beach and Flagler Drive in West Palm Beach at high tide Thursday, October 5, 2017.

"As part of a $25 million capital stormwater facilities improvement program, the city is in the process of installing tidal valves and other projects to limit flooding along our waterfront," the city said in a prepared statement. "The city has already installed a tidal

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valve at Pershing Way to protect the lift station there from tidal flooding. This tidal valve will not allow water from high tides to flow back into the streets." The city also said it has also conducted a Stormwater Master Plan to fight sea level rise, claiming it has saved residents more than $20 million on insurance premiums by identifying areas that should be outside flood plains.

A Note: Concerning the NFIP Maps in Palm Beach County

PBC received the drafts of its Flood Insurance Rate Maps and was in the Appeals period of the process for the majority of the year. A special Map Review Committee made up of approximately 60 representatives of the County's Flood Mitigation Technical Advisory Committee, representatives from South Florida Water Management District and Water Control Districts, the technical Subcommittee of the League of Cities, county officials, and municipal representatives reviewed the maps and reported technical concerns to FEMA and their contractor AECOM. The maps became final in early October.

5. What impact did the flooding have on repetitive loss areas?

   As of this writing, we have not received any reports of flooding from repetitive loss property area owners. Any flooding occurring this year in unincorporated PBC was minor street flooding due to the rate of rainfall versus the rate of storm water drainage, while no structures were reported flooding during any unusual rain events.

6. List each element of the plan and note how much was accomplished during the previous year.

   Major progress in the LMS program during this reporting period includes:
   - Changes in the LMS steering Committee membership to meet changing needs and gain a new perspective including a new LMS Chair.
   - Reconvened the Hazard and Vulnerability Analysis Subcommittee to oversee and advise the creation of the "Risk Assessment by Hazard and Vulnerability to People, Property, environment, and Government Operations" and changes in Vulnerability Risk Assessment and Impact Analyses of the LMS.
   - Development and implementation of a new, streamlined, and more user friendly project scoring and prioritization process, and digitalizing the project utilizing the Division's WebEOC portal
   - The LMS newsletter, published the winter, summer and fall of 2017.
   - The Planning Section is updating the Dike Breach Hazard Specific Plan to

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included annexes for both the Herbert Hoover Dike and the Corbett Berm

- Hazard and mitigation analyses of nearly 40 hazards. These hazards include natural, human caused and technological. A new risk assessment was added to the analyses.
- Completed the Flood Hazard Specific Plan, addressing storm surge, coastal flooding, inland flooding, Sea Level Rise, dike breach, Tsunamis, rogue waves, and severe weather.

7. Were any objectives not reached or are implementation behind schedule? If so, state why.

   Updates and revisions to the Local Mitigation Strategy Plan are on schedule. The LMS Update Writing and Revision Committee is meeting and will prepare a draft of the 2020 LMS for presentation to the LMS Steering Committee, the Working Group and the public

8. Should new projects be started or should any of the recommendations or objectives be revised?

   The LMS Prioritized Project List (PPL) was reviewed and updated in the autumn of 2017. Unincorporated Palm Beach County currently does not have any flood mitigation projects on the list, but plan on future submissions.

   Projects on the list for than more than five (5) years at the time of bi-annual reviews are being reviewed, and if necessary, either updated or purged. New projects are considered and scored twice a year during the scheduled project evaluation dates in May and December.

9. Progress Reports discussed and/or made available at a public meeting.

   The status of all mitigation projects and success stories are reported and discussed at quarterly LMS Working Group and Steering Committee meetings (open to the public.) An update to the website includes the number of new and existing projects. The PPL is posted on the DEM website at least twice each year in May and December.

   All general meetings are publicized through media releases and posted announcements. See Attachment 1 for two such examples.

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10. We have provided copies of this report to our governing board and local media.

    The governing board for the CRS is the LMS Steering Committee. Copies of this progress report have been provided to members of the Steering Committee and have been posted to the homepage of the Palm Beach County Division of Emergency Management website for public review and comment. A media release announcing the report and its posting has been executed. The report will be submitted to the governing board.

    *Information Contacts: Brian Hanley, CRS Coordinator at (561) 712-6325; Shane Ratliff, LMS Coordinator (561) 712-6483*

    As part of this annual progress report preparation process, the LMS Coordinator requested an update on the status of all active county flood mitigation projects from the state. That status information is being submitted to ISO as part of the CRS recertification process and is available upon request at (561) 712-6325.

    This report has been released to the media via the county's Public Affairs Department and posted on the Division of Emergency Management's website

The following is the annual progress report for the County CRS Floodplain Management Plan (2015-16):

PALM BEACH COUNTY COMMUNITY RATING SYSTEM
FLOODPLAIN MANAGEMENT PLAN
PROGRESS REPORT 2015-2016

Palm Beach County, Florida
NFIP Number 120192

1. Name of the CRS Floodplain Management Plan
   *Unified Local Mitigation Strategy*
   Note: An increasing number of municipalities are preparing Floodplain Management Plans in accordance with the CRS Coordinator's Manual Activity 500 – Flood Damage Reduction Activities, specifically, Activity 510 – Floodplain Management Planning. Several of the communities have completed or are in various stages of completing their Floodplain Management Plans according to the 10 step process identified in the manual. Palm Beach County (PBC) Division of Emergency Management is currently in discussions with the Planning Division and the Building Division of the Planning, Zoning and Building Department in an effort to identify the resources necessary to accomplish this planning initiative. PBC anticipates completion of the planning imitative prior to the next audit.

2. Date Adopted
   - Original adoption: September 30, 1999
   - Revised Plan approved by FEMA: November 2004
   - Revised Plan approved by FEMA: January 2010
   - Revised Plan approved by FEMA February 2015

3. Location where copies are available for review
   Palm Beach County Division of Emergency Management
   Emergency Operations center
   20 South Military Trail
   West Palm Beach, Fl 33415

   Contact: Gustavo Vilchez, LMS Coordinator, Planning Section

   Also posted on the internet at the following address:
   http://www.pbcgov.com/dem/publications/pdf/2015LMSPlan.pdf

4. Summarize any flooding that occurred during 2015-2016.

   Palm Beach County (PBC) along with all of South Florida Subtropical Climate has two seasons, a dry season, roughly from December through mid to late May, and a wet season from approximately June through October. Palm Beach County averages over 60 inches of rain a year and more than 130 rain days, with most of it coming between the months of June and November. Virtually flat, with most areas at or only slightly above sea level, even moderate rains can accumulate quickly. The area's high hydrologic variation, low physical relief, and limited storage and conveyance capacities, make water management very challenging. Actions by local and regional water management authorities range from enforcing water restrictions during dry periods to precautionary or emergency flood management during wet periods and storm events.

During this past year

Fall 2015:

The dry season began according to the National Weather Service (NWS) in mid-October. Due to a very strong El Nino, the dry season was predicted to be more active than normal and to include a potential for severe weather episodes. The NOAA Climate Prediction Center's outlook for December to February was an above average amount of rainfall in the county.

Winter 2016:

El Nino impact resulted in a wetter than normal rainfall for PBC. Severe storms and increased rainfall were more prevalent during the winter as a result. Canal Point had 10.55 inches of rain, a departure of +8.4 inches form normal, and Palm Beach Gardens area had 8.40 inches, and PBIA registered the 5th wettest month on record with 9.9 inches of rain, and South Bay/Okeelanta registered 11.47 inches.

During January, an EF-0 tornado (windspeeds of 65 to 85 mph) touched down in southern Palm Beach County affecting Delray Beach and Boynton Beach The tornado initially touched down near the intersection of 3rd St and SW 27th Ave in Delray Beach and traveled northeast causing minor roof damage to a church in Delray Beach, and vegetative damage.

Number of days with measureable rainfall was much higher than normal; especially across the east coast metro areas where anywhere from 36 to 43 days of rain were observed compared to the normal of 21 to 23 days. However, other than minor street flooding, the drainage system in PBC worked well.

Spring 2016

The dry pattern which began in late February persisted throughout the spring, with many areas recording less than an inch of rain for the month of April, but Despite a dry period in March and April, dry season rainfall was above average at all South Florida observing sites.

Some years, the rainy season begins abruptly; triggered by a large-scale weather system such as low pressure systems near or over Florida. Other years, the onset can be quite subtle and dependent on gradual wind shifts and weather pattern changes which can take weeks to develop. Therefore, the beginning of the rainy season is usually a transition period rather than a sharp onset date. Mid May usually begins the wet or rainy season in PBC. The NWS identified the start of the wet season to be May 16th.

The rainy season usually has three phases:

- Late May through early July ("stormiest" part of the season). Severe weather impacts, including strong and damaging winds, tornadoes, excessive lightning, hail, and flooding are most likely to occur during this period.
- Early July through mid-August (hotter with intermittent dry periods).
- Late August through mid-October (higher rainfall variability due to potential tropical systems and early-fall cold fronts).

Summer 2016

The weather in the summer of 2016 followed the trend set by the NWS. Rainfall has been above normal over most of the interior, Everglades and Lake Okeechobee area, with below normal rainfall so far this rainy season along coastal PBC.

Overall, flooding has been limited to minor street flooding, and no significant flooding due to climatic rainfall.

King Tide Flooding

However, the King Tides in 2015 produced some coastal flooding. The fall tides, typically the highest of the year, have been even higher this week because they coincide with the supermoon — so named because the moon is at its closest point to earth this year. The City of Delray Beach's response to the King Tide flooding events by adding three flex valves into some sea walls to allow fresh water to exit which preventing saltwater from entering the city drainage systems. Lantana and Boynton Beach also experienced some flooding due to the tides.

Note:

PBC received the drafts of its Flood Insurance Rate Maps and is currently in the Appeals period of the process. A special Map Review Committee made up of approximately 60 representatives of the County's Flood Mitigation Technical Advisory Committee, representatives from South Florida Water Management District and Water Control Districts, the technical Subcommittee of the League of Cities, county officials, and municipal representatives reviewed the maps and reported technical concerns to FEMA and their contractor AECOM. FEMA has visisted the County twice and continues to work with the technical group to optimize the accuracy of the maps including omitted improvements and incorrect operational assumptions. The County is spearheading an initiative to create LIDAR maps for consideration by FEMA with flights scheduled for late fall, early winter 2016 to coincide with the dry season when cloud cover should be minimal to increase the effectiveness of the LIDAR.

5. What impact did the flooding have on repetitive loss areas?

   As of this writing, we have not received any reports of flooding from repetitive loss property area owners. Given any flooding occurring this year in unincorporated PBC was minor street flooding due to the rate of rainfall versus the rate of storm water drainage, while no structures were reported flooding during any unusual rain events.

6. List each element of the plan and note how much was accomplished during the previous year.
   Major progress in the LMS program during this reporting period includes:
   - Changes in the LMS steering Committee membership to meet changing needs and gain a new perspective including a new LMS Chair.
   - Reconvened the Hazard and Vulnerability Analysis Subcommittee to oversee and advise the creation of the "Risk Assessment by Hazard and Vulnerability to People, Property, environment, and Government Operations" and changes in Vulnerability Risk Assessment and Impact Analyses of the LMS.
   - Development and implementation of a new, streamlined, and more user friendly project scoring and prioritization process, and digitalizing the project utilizing the Division's WebEOC portal.
   - The LMS newsletter, published the Winter, 2016 and Summer 2016 editions. The next newsletter is due to be published in Autumn 2016.
   - The Planning Section is updating the Dike Breach Hazard Specific Plan to included annexes for both the Herbert Hoover Dike and the Corbett Berm
   - Hazard and mitigation analyses of nearly 40 hazards. These hazards include natural, human caused and technological. A new risk assessment was added to the analyses.
   - Completed the Flood Hazard Specific Plan, addressing storm surge, coastal flooding, inland flooding, Sea Level Rise, dike breach, Tsunamis, rogue waves, and severe weather.

7. Were any objectives not reached or are implementation behind schedule? If so, state why.

   Updates and revisions to the Local Mitigation Strategy Plan are on schedule. The LMS Update Writing and Revision Committee is meeting and will prepare a draft of the 2020 LMS for presentation to the Working Group and Steering Committees as well as the public

8. Should new projects be started or should any of the recommendations or objectives be revised?

   The LMS Prioritized Project List (PPL) was reviewed and updated in the Spring of 2016. Palm Beach County currently does not have any flood mitigation projects on the list, but plan on future submissions.

   Projects on the list for than more than five (5) years at the time of bi-annual reviews are being reviewed, and if necessary, either updated or purged. New projects are considered and scored twice a year during the scheduled project evaluation dates in May and December.

9. Progress Reports discussed and/or made available at a public meeting.
   The status of all mitigation projects and success stories are reported and discussed at quarterly LMS Working Group and Steering Committee meetings (open to the public.) An update to the website includes the number of new and existing projects. The PPL is posted on the DEM website at least twice each year in May and December.

   All general meetings are publicized through media releases and posted announcements. The press release for the last Working Group meeting held (June 22, 2016) is attached.

10. We have provided copies of this report to our governing board and local media.

    The governing board for the CRS is the LMS Steering Committee. Copies of this progress report have been provided to members of the Steering Committee and have been posted to the homepage of the Palm Beach County Division of Emergency Management website for public review and comment. A media release announcing the report and its posting has been executed. The report will be submitted to the governing board.

    *Information Contacts: Brian Hanley, CRS Coordinator at (561) 712-6325; Gustavo Vilchez, LMS Coordinator (561) 712-6483*

    As part of this annual progress report preparation process, the LMS Coordinator requested an update on the status of all active county flood mitigation projects from the state. That status information is being submitted to ISO as part of the CRS recertification process and is available upon request at (561) 712-6325.

    This report has been released to the media via the county's Public Affairs Department and posted on the Division of Emergency Management's website

**Action Plan and Recommendations**

**Municipal Integration of Mitigation Measures**

The following section identifies how the participating municipalities have incorporated mitigation into their planning processes, policies and/or ordinances. The municipalities continuously strive to expand and improve upon their mitigation measures as illustrated below and with the extensive listing of mitigation projects identified in Appendix E. The list below also represents the municipalities and agencies that are expected to adopt the LMS2020.

| *Municipality* | *Resolution* | *Date LMS Adopted* |
|---|---|---|
| Palm Beach County (unicorporated) | R2014-1968 | December 16, 2014 |
| City of Atlantis | 14-29 | November 19, 2014 |
| City of Belle Glade | 2014-3130 | December 1, 2014 |
| City of Boca Raton | 133-2014 | November 25, 2014 |
| City of Boynton Beach | R14-110 | November 5, 2014 |
| Town of Briny Breezes | 2014-30 | November 20, 2014 |
| Town of Cloud Lake | 2014-07 | November 13, 2014 |
| City of Delray Beach | 67-14 | December 9, 2014 |
| Town of Glen Ridge | 2014-3 | November 5, 2014 |
| City of Green Acres | 2014-31 | November 17, 2014 |
| Village of Golf | 2014-12 | November 19, 2014 |
| Town of Gulf Stream | 14-17 | December 12, 2014 |
| Town of Haverhill | 2014-11 | November 13, 2014 |
| Town of Highland Beach | 14-009R | December 2, 2014 |
| Town of Hypoluxo | 14-439 | November 19, 2014 |
| Town of Juno beach | 2014-05 | December 10, 2014 |
| Town of Jupiter | 2-15 | January 20, 2015 |
| Jupiter Inlet Colony | 2014-10 | December 8, 2014 |
| Town of Lake Clarke Shores | 14-28 | November 6, 2014 |
| Town of Lake Park | 01-01-15 | January 7, 2015 |
| City of Lake Worth Beach | 05-2015 | January 6, 2015 |
| Town of Lantana | R-14-2014 | November 24, 2014 |
| Town of Loxahatchee Groves | 2015-07 | January 26, 2015 |
| Town of Manalapan | 4-2014 | September 23, 2014 |
| Town of Mangonia Park | 2014-13 | December 2, 2014 |
| Village of North Palm Beach | 2014-85 | November 13, 2014 |
| Town of Ocean Ridge | 2014-16 | December 1, 2014 |
| City of Pahokee | 2014-53 | November 25, 2014 |
| Town of Palm Beach | 2-2015 | January 13, 2015 |
| City of Palm Beach Gardens | 70-2014 | December 4, 2014 |
| Town of Palm Beach Shores | R-17-14 | December 15, 2014 |
| Village of Palm Springs | 2014-66 | December 11, 2014 |

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|---|---|---|
| Village of Royal Palm Beach | 14-43 | November 20, 2014 |
| City of Riviera Beach | 10-15 | January 21, 2015 |
| City of South Bay | 44-2014 | November 18, 2015 |
| Town of South Palm Beach | 02-2014 | January 13, 2015 |
| Village of Tequesta | 7-15 | January 26, 2015 |
| Village of Wellington | R2014-67 | January 13, 2015 |
| City of West Palm Beach | 2-15 | January 5, 2015 |
| South Florida Water Management District | Board Approval | December 14, 2014 |
| Indian Trail Management District | Board Approval | January 12, 2015 |
| Northern Palm Beach Improvement District | Board Approval | December 15, 2014 |

Incorporation of Existing Policies, Ordinances, and Programs

Since the implementation of the LMS, the PBC LMS Coordinator and Chairman of the LMS Working Group along with Working Group members were invited to participate and assist by reviewing municipality and water district local policies, ordinances, and programs to better identify areas where areas of mitigation principals may be aligned.  Numerous planning agencies and documents were reviewed and addressed the needs of mitigation actions and recommended how often the local plans may be reviewed or updated into planning factors to assess countywide hazards and risks.  They remain successful to discuss, review, and identify areas were PBC as a whole community can be more effective approach to mitigation and resiliency.

The incorporation of municipality and district plans includes reviews of the following:

- Southeast Florida Regional Climate Action Plan
- Palm Beach County Comprehensive Plan (PBC Planning, Zoning, and Building)
- Palm Beach County Comprehensive Emergency Management Plan
- Florida Administrative Code 9J-2.0256

Periodic reviews and revisions of the local government ordinances, policies, and programs must occur no less than once every other year.  Each municipality that has not yet done so should adopt a floodplain management ordinance and participate in the Community Rating System (CRS) program.  At the present time, the PBC LMS serves as a Floodplain Management Plan when adopted by a municipality or water management district.

After review of the activities in CRS Step 7, located in Sections 3.1.4, 2.1.1.1, and appendices E, J, and L, the committee recommends the following actions and assigns the following priorities for those actions:

| Activity | Recommended Action | How to Fund | Responsible Party | Priority | Timeline |
|---|---|---|---|---|---|
| Prevention | Each jurisdiction re-evaluate their | None needed | Jurisdictional building officials | 1 | Before the next LMS |

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|---|---|---|---|---|---|
| | building code with the goal of ensuring a minimum 18-inch freeboard in place, with the goal of raising this requirement to 24 inches in the near future to prevent floods | | and CRS program managers | | update cycle |
| Prevention | Each jurisdiction re-evaluate their stormwater management regulations and adjust (as necessary) the overall volume of future development/ redevelopment of stormwater drains to handle increasing amounts of water as seen through frequent storms during the wet season and the potential for sea-level rise through the year 2040 to prevent floods | HMGP and FMA grants, Capital Improve funds | Jurisdictional stormwater managers and engineering departments | 2 | Before the next LMS update cycle |
| Prevention | Each jurisdiction should review their comprehensive or land-use plan and consider the effects of more frequent storms and sea-level rise in future editions in order to avoid flooding conditions | None needed | Jurisdictional administrators and land-use experts | 3 | By the next update of these documents |
| Property Protection | Each jurisdiction should put procedures in place to sponsor private | HMGP, FMA, and PDM federal grant funding, as | Grants management in cooperation with jurisdictional | 2 | 12/2023 |

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|---|---|---|---|---|---|
| | homeowners in their communities with repetitive loss or severe repetitive loss in obtaining grant funds for acquisition projects using available funding streams | well as HLMP state mitigation funds | legal and engineering departments | | |
| Property Protection | Each jurisdiction should put procedures in place to sponsor private homeowners in their communities with repetitive loss and severe repetitive loss properties in obtaining grants for home elevation projects using available funding streams | HMGP, FMA, and PDM federal grant funding, as well as HLMP state mitigation funds | Grants management in cooperation with jurisdictional legal and engineering departments | 1 | 12/2023 |
| Natural Resource Protection | Each jurisdiction should inventory current natural areas and strive to acquire more areas to provide more natural beneficial flooding protection | Environment grants, FMA grants | Environmental department in conjunction with land-development /zoning boards | 2 | 1/2025 |
| Natural Resource Protection | Each jurisdiction should plan to strategically acquire natural lands around newly-identified neighborhoods during growth periods to allow for some natural protection against flooding | Environment grants, FMA grants | Environmental department in conjunction with land-development /zoning boards | 1 | 12/2024 |

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|---|---|---|---|---|---|
| Emergency Services Activities | Each jurisdiction should acquire the capabilities offered by County DEM to allow for them to operate and function on the mass notification system within their jurisdictional boundaries to alert residents to all-hazards including flash flooding and hurricanes | No cost/free to municipalities within PBC | Municipal administrators, police chiefs, fire chiefs, emergency managers | 2 | 12/2021 |
| Emergency Services Activities | Each jurisdiction should participate in a minimum of one (1) annual exercise of emergency communications systems, with the most readily identifiable exercise being the annual statewide hurricane exercise (HURREX) to ensure communications capabilities during a flooding or any other hazard situation | None needed | Emergency Managers from each jurisdiction | 1 | Annually during the first week of May |
| Public Information Activities | Each jurisdiction should participate in a stakeholders (STK) event annually to maximize exposure of CRS and the NFIP to the citizens of their respective jurisdictions. | Minimal funding for handouts, information, and potential overtime/comp time for the event | CRS Coordinators from each jurisdiction, led by the PBC CRS who sets up the event annually | 2 | May/June Annually |

| | | | | | |
|---|---|---|---|---|---|
| Public Information Activities | Each jurisdiction should develop a Program for Public Information (PPI) to maximize public information coordination and activities related to CRS/flooding in their respective jurisdiction | No funding needed other than the members time to attend meetings and develop a PPI | CRS Coordinators from each jurisdiction | 3 | 6/2022 |
| Public Information Activities | Each jurisdiction should maintain a supply of CRS materials/handouts for use in all public outreach events, including information on hurricane/flood preparedness, NFIP, evacuation zones, and mass notification systems. | General funds or a small grant for printing costs of any localized handouts. FEMA handouts are available for free | CRS Coordinator from each jurisdiction in cooperation with their public information or public affairs department | 1 | 12/2021 |

**Priorities are listed 1 – 3 depending on availability of funds and staffing*

# Appendix K: Mitigation Assessment Teams (MATs)

Should PBC be impacted by a natural disaster deemed by FEMA to be of national significance, teams of technical specialists, referred to as Mitigation Assessment Teams (MATs), might be mobilized by FEMA, in conjunction with State and local officials, to conduct on-site qualitative engineering analyses to assess damage to government offices, homes, hospitals, schools businesses, critical facilities and other structures and infrastructure. The purpose of the assessment would be to determine the causes of structural failures (or successes) and to evaluate the adequacy of local building codes, practices, and construction materials for the purpose of improving future performance. They also might use the opportunity to review the effectiveness of previous mitigation projects.

Most frequently, MATs would be mobilized by FEMA's Directorate in response to joint federal, state, and local requests for technical support.

The technical make-up of MATs will depend largely on the nature and extent of damage incurred. Disciplines most commonly represented are likely to include: civil and coastal engineering, hydraulics, architecture, construction, and building code development and enforcement. If the damage is severe, representatives from FEMA Headquarters, Regional Office engineers, representatives from other Federal agencies and academia, and experts from the design and construction industry may also participate. State representatives would be dispatched by the FDEM Mitigation Bureau. The County would be expected to provide local team members and support services as defined below.

At the county level, during activations, the Operations Section Chief will be responsible for coordinating with the Logistics Section to arrange for local personnel, equipment, vehicles, data, and other resources necessary to support MAT assessments. Once staffed and equipped, MAT activities will be closely supported by the Damage Assessment and Impact Assessment Units of the Operations Section under the direction of the Operations Section Chief. Most likely FEMA and State representatives will bring personal resources such as laptop computers, cell phones, GPS, etc. with them in their Go Bags, however, backup inventories and sources for local resources will be maintained.

According to NIMS/ICS task force guidelines, federal and state MATs may choose to coordinate their activities with local law enforcement homeland security units who commonly perform critical infrastructure and key resource (CI/KR) field assessments within the County. This temporary disaster response task force may also include special operations personal from the fire service as necessary. Non-sensitive information from local law enforcement's established database will be shared to the fullest extent possible with the MATs. Any exchange of information associated with this initiative will limited so as not to compromise local law enforcement's tactical or strategic capabilities or the region's efforts in CI/KR programs in support of the National Infrastructure Protection Plan (NIPP).

Lists of needed resources will be prepared by the Operations Manager and given to the Logistics Manager who will be responsible for maintaining the inventories at the EOC or other PBC facilities and ensuring equipment is secured, available, and ready for deployment. Access to special or emergency resources beyond the working inventory, may be available through the Purchasing Unit, through the ESF18 (Business & Industry) functions at the regional and state levels, through WebEOC source lists, or through private sector partners party to the Business Continuity Information Network (BCIN). The BCIN is a web-based service available to local businesses, county emergency management, and organizations that assist businesses to gather and share critical information that support continuity efforts before, during and after a disaster. Available year round as a public service, this trusted, business-to-business, community network provides participating companies a tool to track their key employees and supply chain status, and locate needed recovery goods and services.

The County will provide appropriate public sector and private sector technical, operational, logistical, administrative, and planning expertise necessary to support the mitigation assessment mission. The Logistics Section will maintain lists of emergency contacts.

Depending on the geographic distribution and severity of damage throughout the PBC, the MAT might establish its base(s) of operation at the EOC or at sites near any or all of the six Emergency Operating Areas (EOAs).

The MATs may work in conjunction with Damage Assessment Teams or independently, based on need, time priorities and the availability of State and FEMA MAT personnel.

The mission of the MATs is to learn exactly what happened and why, and how to reduce disaster damage in the future. Key questions include:

- How did buildings perform?
- Did winds exceed building codes?
- Did flood damages go beyond special flood hazard areas?
- Were building codes followed and enforced?
- Were construction materials sufficient to withstand wind and water damages?
- Were protective measures such as shutters used?
- Were local, State, and Federal building standards and ordinances sufficient?

PBC is the largest county by area in the U.S. east of the Mississippi River. Most of its population and development are heavily concentrated in the eastern corridor within 12 miles of the coastline. The County's emergency management planning is based on the assumption that the County may not be serviced effectively by a single EOC location. Consequently, the County has been divided into six Emergency Operations Areas, each of which is equipped to function on its own before, during and after a disaster. Pre -equipped field response trailers are available for deployment year round. Where lead times are sufficient, resources will be pre-staged. Mitigation assessment resources may not be available for all EOAs concurrently, in which case the Operations Section Chief will work with the MAT to identify priorities and will request additional resources through Logistics.

If available local personnel resources are insufficient, the County may be able to draw mutual aid support from neighboring counties on an as needed basis. The Logistics and Operations Sections may also coordinate with FDEM, as necessary and appropriate, to arrange for field support from organizations such as the International Code Council.

Based on a comprehensive analysis of assessment data compiled in the field, the teams will prepare recommendations regarding construction codes and standards, building design, and best practices that PBC, its municipalities and the construction industry can use to reduce future disaster damage. Throughout the process, the MAT will consult with partnering government agencies and supporting private sector organizations to ensure consensus on each phase of the investigation, including methodology, data collection, and analysis. This will help to ensure the MAT's final recommendations represent the most current and best available data and technical expertise. Once consensus is reached, FEMA will issue a series of "Recovery Advisories" that will provide initial guidance on building issues and best practices that can be used in the reconstruction process. FEMA will also publish a comprehensive report that provides local decision makers with information and detailed technical recommendations for improving building construction and design, building code policy and enforcement, and mitigation activities that can limit or eliminate damages in future disasters.

MAT observations and recommendations submitted to the LMS will provide a basis for future mitigation strategies, initiatives, and projects and the optimum uses of mitigation assistance funds.

The DEM recovery branch will provide oversight. The recovery and post-disaster coordinator from the recovery branch along with the LMS Coordinator will facilitate and coordinate the application process and serve as a primary communication link with funding agencies.

Public information will be coordinated through the Joint Information Center (managed by ESF-14), based on cleared information provided by the MATs and Disaster Recovery Centers. Longer-term, information will be integrated into media releases, LMS and CRS outreach activities, public presentations, presentations at professional conferences, training curricula, etc.

Mitigation assessment activities are integral to assessing the mitigation program. DEM coordinates with the Inspections Section of the County's Building Department regarding these. Many of the 39 municipalities of the County have their own building departments, officials, and procedures and will be an important part of future procedure development processes. Several of these departments can draw from their damage assessment experiences following Hurricane Andrew in 1992, and their experiences following Hurricane Irma in 2017, which affected PBC. Organizations such as the PBC Builder's Association and the Building Code Advisory Board of PBC may also be consulted regarding these activities.

## Appendix L: LMS Coordination and Documentation (Separate Appendix due to large volume of meeting minutes and sign-in sheets)

This appendix may be accessed by contacting The Palm Beach County Division of Emergency Management during business hours. This information is open to public inspection.

## Appendix M: Critical Facilities (separate Appendix due to being exempt from disclosure pursuant to Florida Statute §119.071(3)).