

# **Padre Isles Disaster Preparedness and Recovery Program Phase 2 Project Report**



Hurricane Harvey August 25, 2017 (NOAA Photograph)

**Prepared for: Padre Isles Property Owners Association**



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# Padre Isles Disaster Preparedness and Recovery Program – Phase 2 Project Report

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## **1. Project Basis**

Padre Isles is a water-oriented residential development on North Padre Island in Corpus Christi, Texas adjacent to the Gulf of Mexico and the Upper Laguna Madre. An extensive canal system within the developed area is open to the Upper Laguna Madre on the west side of Padre Isles and connects to the Gulf of Mexico via Packery Channel on the east side. The development lies within a high-hazard coastal area with respect to hurricanes and tropical storms.

Development began in 1965 with 8,950 residential/commercial sites planned. More than 5,300 lots have been completed, including nearly 3,100 single-family homes and more than 2,000 multi-family residential units in multiple subdivisions. Other development includes City of Corpus Christi (COCC) fire and police stations, churches and schools, a 9-hole golf course and country club, a water park, and a wide variety of commercial properties. The Padre Isles Property Owners Association (PIPOA) owns and maintains the common grounds within the development.

The PIPOA has initiated a project to identify the potential impacts from a major coastal storm on PIPOA property within Padre Isles and to prepare for post-storm recovery operations. A key area of concern is the potential for storm-related damage to the bulkheads along the canal system. Another is the potential for debris resulting from damage to private homes, docks, boat houses, boats, vehicles, and other sources to be blown or washed into the canals and the need to deal with removal of the debris and associated pollutants. Other concerns include the possibility of sedimentation in the canals and making residents aware of potential storm impacts.

The project is being completed in stages. Stage 1 entailed initial research and analysis to fully identify project needs, define the scope of work necessary to meet those needs, establish baseline data and criteria for the assessments, and describe the follow-on action necessary in the later phases.

Phase 2, covered by this report, addresses:

- The results of a risk assessment process to identify potential impacts to resources within the PIPOA project area
- A review of disaster preparedness and recovery issues
- Recommended preparedness and recovery actions

The Padre Isles project was initiated prior to Hurricane Harvey making landfall in the area on August 25, 2017, but this report was not complete at that time. Descriptions of the impacts from Hurricane Harvey are included as Appendix B to this report.

## **2. Project Concept**

The project focuses on property owned or maintained by the PIPOA and the Padre Isles

Management District (PIMD), a public entity that was created to take ownership of the bulkheads although it has not yet done so. The project does not address private property or resources owned by residents, businesses, or other entities within the development.

The PIPOA owns approximately 32 miles of canal bulkheads along with seven boat ramps, the properties at approximately 50 canal ends, and 13 aerators for the canals.

The PIPOA owns some of the submerged lands in the canals. Some of the submerged land belongs to individual property owners within the development area, and some of it is owned by adjacent developments.

The PIPOA is responsible for maintaining the water depths in all of the canals within the development's boundaries, including the waters on the east side of Lake Padre. For canals that are not wholly within the development boundaries, such as Lake Padre, that responsibility is shared with adjacent developments.

The PIPOA also owns its office building which is located on land leased from the City of Corpus Christi at Billish Park. The City owns that park and three others—Aquarius, Seagull, and Douden—within the Padre Isles boundaries.

The PIPOA maintains several monuments marking key locations within the development, and a variety of office, maintenance, and gardening equipment.

As discussed in the Phase 1 Report, homeowners associations such as the PIPOA are not eligible for Federal disaster recovery assistance under either the Individual Assistance (IA) Program or the Public Assistance (PA) Program administered by FEMA.

The PIMD is a Municipal Management District (MMD) that was created as a special district under the Texas Special District Local Laws Code, Title 4, Chapter 3912. As such, it is an eligible entity for federal post-disaster assistance under the PA Program. The PIMD is authorized by statute to take ownership of the PIPOA canal bulkheads and associated easements but has not yet acted in that regard. The PIPOA is also looking into the possibility that the PIMD's authority to take ownership of the bulkheads would include ownership of the seven boat ramps that are contiguous to the bulkheads. Ownership of those resources by the PIMD could make disaster-related impacts to them eligible for assistance under the PA Program in the future.

### **3. Phase 2 Project Approach**

This phase of the project started with a risk assessment to identify potential impacts to bulkheads, canals, submerged land, and other PIPOA property and Padre Isles infrastructure. The results of that assessment are in Appendix A.

This report includes detailed information that provides the basis for recommended Action Plans that are included in Appendix C. Action Plans are provided for:

- Risk assessment updates



- Evacuation and post-storm reentry into the impacted area
- Planning for damage assessment
- Planning for debris removal from the canals
- Public outreach information for property owners

Also addressed is how post-disaster activities might differ with PIMD ownership of the bulkheads.

## **4. Use of FEMA Guidelines for Planning Purposes**

Although the PIMD does not currently own the bulkheads, that could change in the foreseeable future. In order to maximize the potential for federal disaster recovery assistance following future events, the FEMA PA Program eligibility guidelines were used as the basis for the planning and preparedness actions recommended in this report. Those guidelines also present a sound approach to planning for damage assessment and documentation of pre-storm and post-storm conditions.

It is crucial that all parties understand that the discussions, interpretations, and recommendations in this report and the recommended Action Plans are based on the writer's reading of the applicable FEMA guidelines as they existed in print at the time this report was prepared, along with reasoned efforts to evaluate how the eligibility criteria of the PA Program might be applied to property in Padre Isles. Nothing in this report should be construed as assurance that state and federal disaster recovery agencies will find the disaster impacts discussed here to be eligible for post-disaster funding. FEMA eligibility decisions are based on federal statutes and guidelines that have changed over time and may change again. Eligibility decisions are incident-specific and subject to case-by-case determinations by FEMA staff as to how the guidelines are interpreted and whether or not the eligibility criteria are met.

## **5. Potential PIMD Ownership of Bulkheads and Other Property**

### **5.1. Bulkheads**

The PIMD is authorized by statute to take ownership of the bulkheads and doing so would make the bulkheads eligible for assistance under FEMA's Public Assistance program. It is recommended that the PIPOA transfer ownership of the bulkheads to the PIMD for that purpose.

### **5.2. Boat Ramps**

*The Texas Special District Local Laws Code, Title 4. Development and Improvement, Subtitle C. Development, Improvement, and Management, Chapter 3912. Padre Isles Management District created the PIMD addresses ownership of the canal bulkheads. Section 3912.001 Definitions states:*

*"Bulkhead property" means all bulkheads in the district owned by the district or owned or previously owned by the Padre Isles Property Owners Association, including any associated easements.*

Although the seven boat ramps are not specifically mentioned, it appears reasonable to include them in potential PIMD ownership since they are integral parts of the bulkhead structure.

It is recommended that the PIPOA verify that the boat ramps are included in the property that could be transferred to the PIMD.

### **5.3. Canals**

There is nothing in the statute that specifically mentions the PIMD taking ownership or responsibility for the canals themselves, including the waters or the submerged lands.

The PIPOA's Attorney has advised that the statute that created the PIMD and the Covenants for the PIPOA preclude the PIMD from taking ownership of those resources at present.

PIMD ownership of the canals could make future disaster impacts eligible for federal recovery assistance. It is recommended that the PIPOA look into whether pursuit of that option would be in its best interests.

## **6. FEMA Public Assistance Program Criteria**

FEMA has published the *Public Assistance Program and Policy Guide FP 104-009-2 / April 2017 (PAPPG)* that addresses recovery program issues for public entities including the PIMD. That publication, which is used as the basis for developing the PIPOA recovery plans, is available on the Internet at [https://www.fema.gov/media-library-data/1496435662672-d79ba9e1edb16e60b51634af00f490ae/2017\\_PAPPG\\_2.0\\_508\\_FINAL\(2\).pdf](https://www.fema.gov/media-library-data/1496435662672-d79ba9e1edb16e60b51634af00f490ae/2017_PAPPG_2.0_508_FINAL(2).pdf).

FEMA categorizes actions under the PA Program as being either Emergency Work or Permanent Work with specific eligibility criteria and, in some cases, required timeframes for completing the work. Detailed discussions are included in the PAPPG. Brief summaries are included here to address how the criteria could be applied to PIMD-owned property.

### **6.1. Emergency Work**

FEMA is authorized to provide PA funding for Emergency Work, which is defined as:

Category A – Debris Removal

Category B – Emergency Protective Measures.

Emergency Work is that which must be done immediately to:

- Save lives
- Protect public health and safety

- Protect improved property
- Eliminate or lessen an immediate threat of additional damage

An “immediate threat” is the threat of additional damage or destruction from an incident that can reasonably be expected to occur within 5 years of the incident for which a federal disaster declaration was issued. The threat must have been caused by the declared incident. Among other things, FEMA considers the urgency with which an Applicant pursues the work in evaluating eligibility under the emergency work category.

#### **6.1.1. Emergency Repairs to Canal Bulkheads**

Repairs to canal bulkheads could qualify as emergency work if the damage put improved property contiguous to the bulkheads at substantial risk of further damage from another storm.

#### **6.1.2. Emergency Debris Removal**

Debris removal as emergency work would be that necessary to eliminate risks to public safety and health, prevent additional major damage, or control significant water pollution. Collection of floating debris that presents a risk of further substantial damage and removing hazardous materials from the waterways could fall into that category both to eliminate risks and also to keep the material from drifting throughout the local waterways. Removal of sunken debris in the canals could qualify if it presented a significant risk to public safety and health.

### **6.2. Permanent Work**

Unless it clearly falls into the emergency work category, any work to restore PIMD-owned property would fall under the heading of permanent work.

#### **6.2.1. Bulkhead Repair**

In all likelihood any repairs to the canal bulkheads would have to be undertaken as permanent work. Eligibility for assistance would be based on documentation of the pre-storm condition of the bulkheads and the post-storm condition and evidence that the disaster event directly caused the damage.

#### **6.2.2. Boat Ramp Repair**

Assuming the PIMD takes ownership of the boat ramps, repairing storm-related damage would fall under the heading of permanent work.

#### **6.2.3. Debris Removal from Canal Waters and Canal Bottoms**

The PA Program as described in the PAPPG, Chapter 2:VII.H.2(a) provides that removing debris to “restore the pre-disaster capacity of engineered facilities might be eligible as

Permanent Work if the Applicant can substantiate the pre-disaster capacity and maintenance of that facility". That section addresses "Water Control Facilities" which definition includes, among other things, canals built for recreation purposes. The potential applicability to the PIPOA/PIMD project is addressed below and in the later sections of this report.

Permanent Work includes restoration of facilities that are categorized as:

Category C – Roads and Bridges

Category D – Water Control Facilities

Category E – Buildings and Equipment

Category F – Utilities

Category G – Parks, Recreational, and Other Facilities

Infrastructure that could fall into most if not all of those categories exists within the Padre Isles development; however, most of it is privately owned by individuals, businesses, or the PIPOA, and thus not eligible for recovery assistance. Infrastructure owned by the COCC is not addressed here.

The area of interest to the PIPOA / PIMD is Category D – Water Control Facilities as defined in the PAPPG at Chapter 2:VII.H.2(a). The lists contain elements that might reasonably be applied to the Padre Isles canal system.

*Water Control Facilities (Category D)*

*Water control facilities are those facilities built for the following purposes:*

- *Channel alignment*
- *Recreation*
- *Navigation*
- *Land reclamation*
- *Irrigation*
- *Maintenance of fish and wildlife habitat*
- *Interior drainage*
- *Erosion prevention*
- *Flood control*
- *Storm water management*

*They include:*

- *Dams and reservoirs*
- *Levees and floodwalls*
- *Lined and unlined engineered drainage channels*
- *Canals*
- *Aqueducts*
- *Sediment and debris basins*
- *Storm water retention and detention basins*
- *Coastal shoreline protective devices*

- *Irrigation facilities*
- *Pumping facilities*
- *Navigational waterways and shipping channels*

The criteria might provide a basis for removing storm-generated siltation from the canals to restore their original capacity, i.e. depth:

*(a) Restoring the Capacity of Channels, Basins, and Reservoirs*

*Restoring the pre-disaster carrying or storage capacity of engineered channels, debris and sediment basins, storm water detention and retention basins, and reservoirs may be eligible, but only if the Applicant provides documentation to establish:*

- *The pre-disaster capacity of the facility; and*
- *That the Applicant maintains the facility on a regular schedule.*

The PIPOA has records of past depth surveys and dredging to maintain the design depths that will help satisfy the criteria.

One complicating factor is that the PIPOA owns some of the submerged land in the canals, some of that land is owned by individual lot owners, and in some sections ownership is shared with adjacent developments. That could be a factor in recovery activities, especially with regard to cleanup costs for the sections that do not lie wholly within the Padre Isles boundaries. Coordination with property owners and adjacent developments will be necessary in planning for and conducting cleanup operations.

#### **6.2.4. Aerators**

If the PIMD takes ownership of the canals, repairs to aerators would fall under the permanent work category.

#### **6.2.5. Canal-End Property**

The canal-end properties are unimproved lots. In general, unimproved property is not eligible for any type of post-event restoration assistance.

## **7. Preparing for Hurricane Impacts and Recovery Activities**

### **7.1. General**

This section contains information to support the recommended Action Plans in Appendix C. Those plans identify recommended steps for addressing potential storm-related impacts and for preparing for post-storm recovery activities. Issues addressed in the action plans include:

- a. Risk assessment as an ongoing process
- b. Evacuation and entry / reentry issues
- c. Coordination with City of Corpus Christi recovery operations
- d. Condition assessments to be performed periodically, pre-event, and post-event

- e. Damage assessment for canal bulkheads and other property
- f. Debris removal and pollution control in the canals
- g. Siltation in the canals
- h. Waste stream management
- i. Utilities issues
- j. Information for residents
- k. Contracting for debris management / cleanup services

## 7.2. Risk Assessment Action Plan

An initial risk assessment was completed in September 2017 to identify the nature and scope of risks and threats that a major coastal storm presents for the for the Padre Isles development area. The risk assessment considered historical storm information as well as the impacts of Hurricane Harvey. It is addressed in detail in Appendix A.

### 7.2.1. General Risk Summary

This table lists the resources within the Padre Isles development and the nature of the coastal storm risks that could affect them as described in the above-referenced report.

Resource	Risk Element			
	Wind	Rain / Freshwater Flood	Storm Surge / Coastal Flood	Backwash
<b>PIPOA (PIMD) RESPONSIBILITY</b>				
Canal Bulkheads	n	L	H	H
Canal Waters	n	n	H	H
Canal Bottoms	n	n	M	H
Boat Ramps	n	n	H	M
Canal-end Properties	n	L	M	M
Aerators	n	n	H	H
PIPOA Office Building & Equipment	M	L	H	H
Monuments	n	n	L	L
<b>Not PIPOA Responsibility</b>				
Residences	H	L	H	H
Businesses, etc.	H	L	H	H
Streets	n	L	H	H
Parks	n	n	M	M
Seawall at Beach Area	n	n	M	M

n = No or very little impact anticipated  
L = Low levels of damage anticipated  
M = Moderate impact and damage possible  
H = High impact and damage possible

### **7.2.2. Periodic Risk Assessments**

Any substantial change in conditions in and around the Padre Isles development should be cause for review and reevaluation of the risks that property owners, the PIPOA and PIMD included, might face. Changes can result from additional development, from the actual impact of a major coastal storm as occurred with Hurricane Harvey, or just from the passage of time.

At a minimum, an annual review of risk conditions is recommended to identify changes in population, development, or other factors that might bear on the risk the area faces.

## **7.3. Evacuation and Entry / Reentry Action Plan**

It is reasonable to expect that when the Padre Isles project area is at risk from a major storm, the CoCC Mayor or the Nueces County Judge will recommend evacuation or possibly issue a mandatory evacuation order for the area. If that happens, access to the evacuation zone may be restricted or prohibited; persons in the zone could be required leave the area and persons outside the zone could be barred from entering. Evacuation plans are phased to facilitate a smooth progression and minimize traffic problems with the most exposed areas being evacuated first. The Padre Island and Mustang Island communities would be in the first tier of evacuation orders and should prepare accordingly.

The most severe restrictions could be imposed after the event. City and county officials can prohibit access and prevent people from entering the impacted area until those officials determine that the area is safe for entry. Numerous factors are considered in making those determinations and there is no prescribed timeframe for allowing persons to enter the impacted area, but a minimum of three to seven days delay is common.

### **7.3.1. Evacuation Plan**

A comprehensive evacuation plan should be developed to identify the actions that are necessary for the PIPOA staff to protect valuable materials, records, and information. The plan should include a detailed list of all necessary actions and a timeframe for completing each item.

Developing the plan should be a joint effort by the entire staff to ensure that all critical concerns and needs are identified and addressed.

All actions necessary to safeguard vital materials should be documented in checklist form.

The plan should specifically assign responsibilities for each of the actions to the appropriate staff members by title/position, rather than by name. Both primary and backup responsibilities should be included.

The plan should address safeguarding all records, files, electronic equipment, personal property, and valuable items. For materials that will be removed from the PIPOA Office, the plan should clearly note the locations to which those materials will be taken for safekeeping.

The plan should identify communication protocols for advising residents of the situation and encouraging them to heed all warnings, recommendations, and evacuation orders.

The plan should be reviewed and updated annually and each person to whom responsibilities are assigned should be required to acknowledge them in writing.

### **7.3.2. Contact Lists**

The evacuation plan should include current contact information for all persons to whom responsibilities are assigned.

For materials that will be removed for safekeeping, the plan should also include contact information for the locations to which the material will be transported and the individuals to whom it will be entrusted.

The staff should ensure that contact lists and methodology for disseminating information to residents are maintained current to the extent practicable. At a minimum, an annual review prior to the start of hurricane season is recommended.

### **7.3.3. Entry / Reentry Plan**

The PIPOA and the PIMD should identify a person or persons who will be responsible for coordinating the damage assessment process. The “Nueces County Hurricane Reentry Tier Definitions” in the *Nueces County Hurricane Reentry Plan* identify the persons included in each tier for reentry:

*Tier 1: Search and rescue (SAR) and security force operations.* This generally means first responders and select government personnel, and no others.

*Tier 2: Immediate mass care and damage assessment.* The damage assessment personnel in this category are those engaged in official duties for public entities.

*Tier 3- Restoration of essential services, point of distribution (POD) and other support operations.* Insurance adjusters conducting damage assessments for private property (including PIPOA property) are included in this category. Business owners providing critical services also are included.



*Tier 4- Business operators not allowed reentry under Tier 3 and residents. Residents and business owners fall within this tier; the general population does not.*

#### **7.3.4. PIMD Reentry**

As a subdivision of the state, the PIMD can assign a Board or staff member to be the public official in charge of PIMD damage assessment and recovery planning. If done, the PIMD should advise the CoCC EMC in writing of the name and contact information for that person for Tier 2 authorization.

An engineer under contract to the PIMD to conduct an assessment of PIMD-owned property could qualify for entry in Tier 2. To take advantage of that option, the PIMD should contract with an engineer or other qualified professional to provide damage assessment services following a disaster. Then the PIMD should advise the CoCC EMC in writing of the name and contact information for that firm and request authorization for that firm to be listed as eligible for Tier 2 entry. If approved, the CoCC will issue a Tier 2 entry authorization letter for the firm. Persons representing the firm would have to follow the requirements in the County plan regarding markings on company vehicles and documentation of persons assigned to the conduct the work.

#### **7.3.5. PIPOA Reentry**

PIPOA staff and Padre Isles residents fall under Tier 4.

Due to the large population in the development area, one or more representatives of the PIPOA could possibly be included in Tier 3 if the PIPOA implements a recovery plan that includes providing services for residents. One such service could be “point of distribution (POD)” support. That entails identifying a location where relief supplies (water, food, etc.) can be delivered and staged for pickup by impacted residents. POD operations require substantial effort for staging, handling, distribution, security, and documentation, so the PIPOA would have to be prepared for numerous challenges. Another possibility is serving as a contact point for insurance agents and adjusters trying to locate homeowners.

If the PIPOA chooses to take such actions, the PIPOA should so advise the CoCC EMC in writing and request authorization for the PIPOA staff providing those services to be listed as eligible for Tier 3 entry. The letter should include the number of persons that would be needed to provide the services, identify them by PIPOA position rather than by name, and include a PIPOA official’s name and contact information. If approved by the CoCC, each person assigned to those duties would be issued a letter on PIPOA stationery attesting to the assignment and the requirements. Such authorizations would apply only to the individuals assigned to the work, not to family members or other persons.

### **7.3.6. Annual Review and Update**

The Evacuation Plan and the Reentry Plan must be reviewed and updated annually to ensure that all contact information is correct.

Requests for Tier 2 or Tier 3 reentry authorization must be resubmitted annually well in advance of the start of hurricane season which begins June 1 of each year.

Local emergency management officials begin annual hurricane season preparations each spring, and the month of May is generally very busy for them. In light of that, the actions described above should be completed no later than May 1 of each year.

## **7.4. Damage Assessment**

Evaluating damage after a major disaster is a multi-stage process. In general, local damage assessment processes are initiated by city and county government as soon as it is safe to do so. For major impacts or when requested by local government, state agencies assist those efforts. State agencies also conduct damage assessment for state-owned resources such as state highways and the TXDOT-operated ferry system.

Cities conduct the assessments in their jurisdictions and aggregate the results with county officials to document countywide impacts. That information is then coordinated with state agencies. The basis for that process is that federal disaster declarations are issued on a county by county basis. FEMA establishes “Per Capita Impact Indicator and Project Thresholds by Fiscal Year” on a countywide and statewide basis under the Public Assistance program and those threshold values multiplied by current population totals in each county and state determine the scope of federal recovery assistance allowed under the Stafford Act.

State and federal agencies conduct the assessments for infrastructure for which they are responsible.

The Preliminary Damage Assessment (PDA) is undertaken by local government forces assisted in many cases by contractors. The PDA is not a comprehensive investigation of disaster impacts but instead is focused on identifying the magnitude and extent of damage to allow an initial estimate of the amount of damage. It is often referred to as “windshield assessment” since traditionally much of the work was performed by teams driving through impacted areas, to the extent that that is possible, and documenting the damage that they observe. That approach is still employed but it is augmented by aerial observations and most recently by the use of camera-equipped remotely controlled aircraft—i.e. drones—and other modern technology.

The damage assessment process is described in FEMA’s *Damage Assessment Operations Manual* which has been adopted by Texas in the state in the *Texas Emergency Response Plan*. It is available at <https://www.fema.gov/media-library/assets/documents/109040> or [https://www.dps.texas.gov/dem/RegDisasterFinance/doc/disasterassistance/07\\_FEMADamageAssessmentManual.pdf](https://www.dps.texas.gov/dem/RegDisasterFinance/doc/disasterassistance/07_FEMADamageAssessmentManual.pdf).

In general, the scope of damage from a major disaster may be so severe that it will be readily obvious that the FEMA thresholds have been exceeded. In such case, the disaster declaration process could move quickly. For less severe events, it might take longer to document enough event-related damage to show that the thresholds have been reached.

#### **7.4.1. Corpus Christi and Nueces County**

Detailed damage assessments are initiated as soon as conditions and the availability of damage assessment personnel allow. The CoCC and Nueces County will conduct assessments for their respective public property and aggregate the results to document countywide impacts. That information is then coordinated with state agencies. The CoCC and Nueces County have set a goal of completing the PDA within 72 hours.

The scope of the area impacted and the severity of damage affect how quickly damage assessment can begin. Flooding, debris accumulations, or damage to roads and bridges can impede the process. Downed power lines and other impacts also can delay access to impacted areas. The initial emphasis will be on critical resources and infrastructure necessary to support public safety and health and the overall recovery operations. Also, the CoCC plans call for damage assessment from high ground to low ground, i.e. starting in the core of the city and working to the outlying areas.

Availability of resources also will be a major issue. Damage to CoCC facilities or major citywide impacts that limit the availability of equipment and personnel can delay all aspects of the damage assessment. Also, the larger and more severe the citywide impact, the longer it can take before the entire area can be covered.

#### **7.4.2. Damage Assessment at Padre Isles**

With regard to the Padre Isles project area, accessibility will be a key element in determining when that assessment can take place. Clearing roads for access is crucial to initiating the damage assessment process. The responsibility for the state roads leading into the area rests with TXDOT. The CoCC and Nueces County are responsible for the roads that they maintain.

The CoCC will conduct damage assessment for streets in Padre Isles and for city-owned property such as parks. The CoCC will not conduct damage assessment on behalf of the PIMD or the PIPOA.

Evaluating damage to any PIMD-owned infrastructure and property is the PIMD's responsibility. Since the PIMD is a political subdivision of Texas, any damage to owned property would be considered in the total used for establishing PA Program eligibility and the estimated cost of that damage would have to be provided to the county.

Damage to PIPOA-owned property and infrastructure will not be included in any consideration for the PA Program. The damage assessment for PIPOA property will be the

responsibility of the PIPOA and its insurers. Nonetheless, the damage assessment process must be completed and the PIPOA and PIMD should follow the same path to completion.

#### **7.4.3. Canal Bulkheads**

Evaluating the post-storm condition of the canal bulkheads is the highest priority. The bulkheads should be the primary focus of the preliminary damage assessment process. Severe damage to bulkheads that creates a public safety hazard or a risk of further damage could qualify for Emergency Work to mitigate the risk, if the PIMD takes ownership. If the PIPOA retains ownership, the need for emergency work would have to be addressed to the CoCC for assistance beyond the PIPOA's capabilities.

Non-emergency damage and associated repairs would fall into the Permanent Work category. Evaluating that damage would be done during the detailed damage assessment.

The ongoing bulkhead inspection program will provide a baseline for post-storm condition assessments. The engineers performing the work established a six-level condition rating system ranging from Level 0 – No Damage to Level 5 – Severe Damage. Early reports from that program noted most areas as Levels 1 or 2. Typical damage involves spalling and cracking that is typical of exposed concrete surfaces. Such damage, even if exacerbated by storm impacts, generally is not considered eligible for federal assistance.

In some cases, homes, docks, or other structures extend to or beyond the bulkheads and might prevent a thorough inspection and condition assessment. Where pre-storm conditions cannot be fully documented, eligibility for post-storm assistance generally cannot be substantiated. This constraint should be considered in the PIPOA planning.

In some areas, washouts behind bulkheads were noted in the inspection reports and in some locations tie-back cables have failed. Such damage would likely be classified as pre-existing due to deferred maintenance or pre-event damage and would not be eligible for recovery assistance.

Some significant damage has been noted in way of storm drain outfalls where erosion has damaged the surrounding structures. The storm drain system is maintained by the CoCC. Those conditions would be classified as pre-existing and storm-related impacts that worsen them most likely would not be eligible for recovery assistance.

#### **7.4.4. Boat Ramps**

Since the boat ramps are contiguous to the bulkheads, they should be evaluated as part of the bulkhead inspection process.

#### **7.4.5. Canals**

The canal waters could be impacted by debris or pollutants and immediate containment and removal action might be warranted. In general, debris removal (discussed in more

detail below) will be the responsibility of the PIPOA—or the PIMD it is takes responsibility for maintaining the canals. It is expected that dealing with pollutants such as spilled oil or hazardous materials will be coordinated with state and federal response agencies. Removal of floating debris and pollutants could be eligible for emergency work classification to mitigate risks to public safety and the environment. Removal of pollutants would normally be coordinated with the Texas General Land Office (GLO) and the U.S. Coast Guard (USCG).

Canal bottom impacts could be debris accumulations or siltation. That would not qualify as emergency work unless a severe public threat is present and addressing those impacts would be undertaken later in the recovery phase. For example, removal of sunken boats in Rockport and other areas hit by Hurricane Harvey is being handled by the GLO and USCG and began approximately six weeks after the storm.

#### **7.4.6. Aerators**

Documenting damage to aerator systems should be done at the same time as the canal impact assessments.

#### **7.4.7. PIPOA Building, Office Equipment, and General Property**

Evaluating damage to the building, office equipment, personal property, and miscellaneous general property will be solely the responsibility of the PIPOA and its insurers.

#### **7.4.8. Debris Estimates**

To the extent practicable, the initial damage assessment should include a general description of the types and conditions of debris and an estimate of the volumes. That will help in determining if emergency response action is necessary. The initial assessment need not attempt to investigate potential accumulations of debris that are not readily visible.

If the PIMD takes ownership and maintenance responsibility for the canals and contracts in advance for debris removal, it is possible that a potential cost for removal can be estimated for on the basis of the contract terms. If so, that cost should be included in the damage assessment report.

#### **7.4.9. Damage Assessment Coordinators**

The PIPOA and the PIMD should each identify a person who will be responsible for coordinating the damage assessment process. It could be the same person for both PIPOA and PIMD, or different persons. Persons engaged in damage assessment would fall into these categories under the “Nueces County Hurricane Reentry Tier Definitions” in the *Nueces County Hurricane Reentry Plan*:

*Tier 2: Immediate mass care and damage assessment.* The damage assessment personnel in this category are those engaged in official duties for public entities. An engineer under

contract to the PIMD to conduct an assessment of PIMD-owned property could be included in this category subject to approval of the CoCC.

Tier 3- Restoration of essential services, point of distribution (POD) and other support operations. Insurance adjusters conducting damage assessments for private property (including PIPOA property) are included in this category. Business owners providing critical services also are included.

#### **7.4.10. Action Necessary**

Key steps in preparing for damage assessment operations include:

- a. Document baseline conditions for all owned property to allow comparison of post-storm conditions.
- b. Maintain records of condition surveys and maintenance and repairs.
- c. Identify a person or persons to manage damage assessment on behalf of the PIPOA / PIMD.
- d. Contract with an engineer or other qualified professional capable of performing damage assessment where necessary.
- e. Inform the CoCC in writing of persons who will perform damage assessment and request Tier 2 reentry authorization.

These actions should be completed annually prior to the start of hurricane season.

### **7.5. Debris Management**

The need to plan for debris removal from PIPOA property exists regardless of any potential for post-storm funding assistance. The planning and preparations will be the same whether the PIPOA retains responsibility for the canal waters and bottoms or if the PIMD takes on that ownership and maintenance role. Since PIMD ownership could qualify recovery work for federal disaster assistance, plans should be developed on the assumption that that will happen at some future time.

The impacts of Hurricane Harvey provide a snapshot of the potential scope of debris management needs. That storm made landfall about 30 miles north of the Padre Isles area. Sustained wind speed of 130 mph was recorded in the region but storm surge levels in most areas were less than the 6 to 12 feet forecast, and estimated at 4.5 feet at Padre Isles. Nonetheless, crews working from barges in the canals recovered more than 500 tons of debris.

#### **7.5.1. Types of Debris**

Planning for debris management must start by characterizing the potential debris types and sources and address how removal can be accomplished. It must consider that debris, pollution, and post-storm conditions could present significant public safety and health risks. It must recognize that responsibility for some necessary actions such as dealing with vehicles and boats rests with owners. It must recognize that numerous local, state, and

federal state statutes come into play, especially regarding threats to public health and safety and the environment. It must also consider that recovery resources could be very limited immediately following a disaster, and that initial response actions could be delayed due to limited access or catastrophic damage conditions.

In general, anything that is present on or near the Padre Isles development could become part of the debris stream in a major coastal storm. Virtually anything on land or water in and around the Padre Isles development could be damaged or destroyed in a major storm. In addition to becoming part of the debris stream, those materials could also exacerbate the scope of damage as they are blown or washed into homes and other structures.

Typical storm-generated debris can include all of these items:

- Vegetative material — trees, branches, palm fronds
- Components from buildings — roofs, carports, awnings
- Portable buildings and sheds
- Docks, decks, and boat sheds
- Fencing and landscaping materials
- Construction materials
- Materials from commercial properties
- Items that were on docks, patios, and porches
- Hazardous materials

Surge and waves at landfall can carry large items ashore at landfall, including boats and tanks and materials from offshore structures, which can contribute to damage by battering into structures as well as becoming part of the debris stream. Rising water can lift and carry docks, boats, boat house components, and other materials. Flooding waters can also carry hazardous materials and wastes. Backflowing waters can carry all manner of debris from the impacted areas, including vehicles, trailers, dock boxes, propane and fuel tanks, and much more.

Post-storm debris accumulations could be widespread on streets, on PIPOA property, on private property, and in the canals. Recovery, clean-up, and salvage operations will add greatly to the debris streams and the management challenges.

#### **7.5.2. Streets**

Clearing debris from streets will be done by contractors under the CoCC pre-positioned contract program. For the most part that will entail moving debris into right of way (ROW) areas and other accessible public sites. Removal of that material and debris placed in the ROW by residents generally takes place later in the recovery process. CoCC personnel and contractors will not remove debris from private property, waterways and canals, or sites for which another public entity has responsibility for the cleanup.

Street clearing operations might be delayed by any of several factors. Safety is paramount, and contractors will not enter an impacted area until assured that it is safe to do so. Damage to electrical power and gas service systems could delay entry until those systems are secured. Flooding and damage to roadways could also affect accessibility.

Availability of resources is another consideration. The CoCC has established priorities for clearing roads with the initial emphasis on access to public safety resources and the most heavily impacted areas. It also takes time for contractor forces to be fully mobilized and get debris management operations staffed and outfitted.

#### **7.5.3. PIPOA Property**

Property owned by the PIPOA includes the undeveloped canal-end lots and the canal waters and bottoms. Debris accumulations on the lots would be treated the same as debris on private property. Removal responsibility will rest with the PIPOA which can either arrange for commercial removal or move the material into the ROW for CoCC collection.

The PIPOA maintains the canals and the canal bottoms even though some of the submerged land belongs to individual property owners. Removal and management of floating and sunken debris in the canals is the responsibility of the PIPOA.

Debris removal from PIPOA property including the canals will not be eligible for federal disaster recovery assistance.

#### **7.5.4. PIMD Property**

The PIPOA is considering transferring the ownership of the bulkheads to the PIMD. If that happens, damage to the bulkheads could be eligible for federal disaster recovery assistance.

The PIPOA also is looking into the possibility of transferring ownership of and responsibility for the canals to the PIMD. If that was to happen, removal of both floating and sunken debris could also be eligible for federal assistance.

#### **7.5.5. Office Building and General Property**

The office building and PIPOA-owned equipment and materials are susceptible to potential damage from wind, rain, and storm surge. Damage assessment will be the responsibility of the PIPOA and its insurers. Repairs would be covered only by any insurance policy that is in effect for that type of damage.

The PIPOA Administrator maintains a detailed list of all PIPOA real and personal property such as office equipment, including the computers and peripheral components. That list should be verified and updated as necessary as part of the hurricane preparedness activities.



Preparedness plans should address safeguarding of computers and other valuable equipment, office files and records, and any other items that would be necessary for the PIPOA staff to resume operations following the event, whether at the current office or at a temporary location. Most likely that would entail removing the materials to a site less susceptible to storm impacts. More detailed recommendations are included in the action plan.

#### **7.5.6. Private Property**

The responsibility for dealing with debris on private property rests with the property owner regardless of the source and nature of the debris. Debris moved from private property into the ROW will qualify for removal by the CoCC's debris management contractor provided the criteria established by the CoCC for that program are satisfied. In general, the CoCC will require segregation of wastes and placement in the ROW within specified timeframes.

#### **7.5.7. Debris in the Canals**

Containing and removing debris from the canals presents challenges with respect to access and recovery. As was seen with Hurricane Harvey, some of the materials will be floating, some will be sunken, and some may be hazardous and require special handling. Arranging for access, recovery operations, staging recovered debris (especially vehicles and boats), coordination with property owners, and coordination with regional recovery efforts will require significant effort. Proper handling, management, transportation, disposal, and documentation of debris and hazardous waste will require special equipment, trained personnel, and the permits required by local, state, and federal government.

#### **Accessibility**

In most areas, accessibility from the shore is limited by the structures that extend to and in some cases beyond the bulkheads. In general, only the canal-end lots and boat ramps offer direct access to the canals. Thus, it is expected that much of the debris removal will have to be conducted from the water. Access may be further hampered by damaged structures that have partially or even completely collapsed into the canals.

#### **Floating Debris**

It is expected that floating debris collection will be the first priority in order to minimize risks to the debris contractor forces and equipment, the public, and the environment and to reduce the potential for that debris to be transported by wind or seas out of the canal areas.

Floating debris will consist of a wide range of structural material, household goods, vegetative matter, and other materials. It is expected that much of that debris can be picked up by hand or with mechanical equipment such as knuckleboom cranes from shore

or mounted on boats or small barges. In general, the contractor can be expected to aggregate floating debris in areas where it can be hauled out, such as at the canal ends.

### **Sunken Debris**

Sunken debris will generally be collected from boats or barges. In most cases, it is expected that the work would be done after the majority of the floating debris has been collected. Partially collapsed structures that are connected to shore would not be removed as part of the debris collection process.

### **Boats and Vehicles**

Boats and vehicles remain the responsibility of their owners. That includes the responsibility for removing them from the water when necessary, although in some cases state or federal agencies such as the GLO and USCG may handle the removal to mitigate safety or pollution threats.

Boats adrift but not sunken would not be removed by the contractor. They would be moved to the nearest location where they could be moored securely without hampering the cleanup.

Boats sunk at a dock would not be moved. Sunken boats in the canal that impede the debris removal operations could be lifted out of the water and placed on shore, preferably at a site identified by the PIPOA/PIMD and prepared by the contractor so as to minimize potential pollution. The contractor can be tasked to mark all sunken items that could not be removed. A contractor would not dispose of boats; that responsibility rests with the owners.

Vehicles, golf carts, and other conveyances will generally be handled the same as boats.

### **7.5.8. Disposal Methods**

In general, clean woody debris can be burned or mulched to minimize disposal volumes and costs. Some other types of debris can be recycled, especially metals and plastics. However, much of the debris might have to be transported to a licensed landfill site. Saltwater soaked vegetative material and wood, and chemically treated wood generally must be placed in lined disposal cells at licensed waste sites. Hazardous wastes and recovered pollutants must be disposed of at facilities specifically authorized and equipped to manage them. Mixed wastes, especially those containing household garbage, oil, or hazardous material also must be transported to properly licensed facilities. The PIPOA should consider those requirements when contracting for debris removal.

### **7.5.9. Damaged Structures are not Debris**

It is likely that there will be instances where damaged docks and other structures or equipment, such as boat lifts, will have settled partially into the canals but are still

connected to the land or onshore components of the structures. Those will not be classified as debris.

Removal responsibility rests with the property owners and their insurers. Individual owners could remove such items themselves and move the remnants to the ROW for collection. If removal is done by a commercial entity, then that entity is responsible for proper disposal of the materials.

#### **7.5.10. PIPOA / PIMD Ownership of Debris**

##### **PIMD Ownership**

If the PIMD takes ownership and maintenance responsibility for the canals it is possible that removal of that debris would be eligible as Permanent Work under the PA Program. Unless it presents a significant safety or health hazard, removal of sunken debris would not fall into the Emergency Work category.

##### **PIPOA Ownership**

If the ownership and maintenance responsibilities for the canals remain with the PIPOA, then none of the debris removal work in the canals would be eligible for federal assistance.

Regardless of ownership, the scope of work for dealing with debris in the canals will be the same.

#### **7.5.12. Contracting for Debris Management**

It is assumed that the PIPOA / PIMD will not have the capability to handle the debris management activities themselves and that it will be necessary to engage a qualified contractor to perform all of the necessary work. Contracting for those services should be done in advance in order to assure that the necessary resources will be available when a disaster strikes.

The PIPOA could contract in advance for debris management services following its own purchasing practices. If the PIMD contracts for debris removal, state and federal contracting rules would be applicable. Ensuring that those requirements are satisfied while also minimizing the potential for delaying the start of removal operations are the primary reasons for pre-negotiating contracts for debris management services.

The CoCC has a program wherein it has pre-negotiated a contract for debris, including hazardous materials, removal and management. Crowder-Gulf Disaster Recovery & Debris Management currently holds the contract. Crowder-Gulf's contract does not cover debris removal from the water; the CoCC leaves that work to state agencies. Crowder-Gulf does, however, have extensive experience with debris removal in canals and waterways, including for the City of Bayou Vista in Galveston County following Hurricane Ike and at Key Allegro in Rockport following Hurricane Harvey, with circumstances very similar to those that could be

expected at Padre Isles. There are other companies with similar capabilities and experience.

It is noted that in a letter to the PIPOA dated January 26, 2016, the City's Assistant City Manager noted that if the PIMD had responsibility for debris management in the canals, then it might be possible to integrate the operations into the City program.

## **7.6. Pollutants and Hazardous Materials in Canals**

It is very likely that a wide range of pollutants and hazardous materials will be in the canals and will present a number of challenges for the cleanup operations. They can present public safety and health concerns as well as the possibility of fire or explosion.

### **7.6.1. Types of Materials**

Oils and gasoline can be released from:

- Motor vehicles — cars, trucks, motorcycles, golf carts, etc.
- Power equipment — lawn mowers, etc.
- Electrical equipment with compressors and motors — refrigerators, freezers, etc.
- Boats and boat handling systems
- Stored materials

Hazardous materials can include both household and industrial products and are not limited to this list:

- Propane — small tanks from barbeque grills and large tanks from cooking and heating installations
- Compressed gas cylinders — personal use oxygen tanks, welding and cutting equipment, etc.
- Solvents and similar materials
- Paint and varnish
- Cleaning products — bleach, oxidizers
- Swimming pool chemicals

Biological debris and waste could be present in a number of forms, including but not limited to:

- Garbage — putrefying waste from damage homes and businesses
- Dead fish and animals
- Medical waste including needles and home-health care wastes
- Medications
- Sewage from broken lines and lift stations
- Animal waste

Dealing with those materials will require personnel who are properly trained and equipped and knowledgeable of the many regulatory requirements applicable to cleanup and disposal operations. Experienced debris management contractors can provide those services.

#### **7.6.2. State and Federal Agency Roles**

The canals are part of the navigable Waters of the United States and a number of state and federal agencies have jurisdiction with respect to waterway safety and environmental protection. The lead role rests with the Texas General Land Office (GLO) with respect to oil pollution and with the Texas Commission on Environmental Quality (TCEQ) for hazardous materials and wastes. The GLO also has a program for removal of sunken vessels when those present a risk of pollution; however, in most cases, removal of those vessels is undertaken only on public lands or in conjunction with the U.S. Army Corps of Engineers (USACE) on federal lands. Depending on the situation, other agencies such as the Railroad Commission of Texas (RRCT)—for spills from pipelines and drilling operations—and the Texas Parks and Wildlife Department (TPWD) may also have a role.

The U.S. Coast Guard (USCG), the U.S. Environmental Protection Agency (EPA), and the USACE exercise jurisdiction over navigable waters for a variety of purposes. Typically the USCG and EPA respond when the state resources are not sufficient to meet pollution response needs; in coastal waters, the USCG normally takes the lead. The USACE responds to certain events in federally-maintained waterways.

The agencies typically engage pre-qualified contractors to respond to oil and hazardous waste releases. With respect to pollutants and hazardous debris in the Padre Isles canals, it is expected that the GLO and TCEQ will be the agencies providing response oversight. Their role would be to oversee the work of the cleanup contractors to ensure that applicable state waste handling rules are followed.

Note that response by state or federal agencies does not relieve the owners of the polluting property from responsibility for cleanup. In some case, it is possible that the cleanup costs could be billed to the property owners.

As with other aspects of the response following a major disaster, GLO, TCEQ, USCG, and contractor resources will be constrained by the demands. In the early stages, the response could be as limited as using booms to contain debris and pollutants in the canals until cleanup can be initiated. Response areas will be prioritized by the conditions at the time, and locales such as the Padre Isles canals may have lower priority. In some cases, it could take several days to several weeks or more before response action is initiated.

#### **7.6.3. Removal Operations**

Removal, handling, storage, transportation, and disposal of polluting and hazardous materials must be undertaken in compliance with a host of local, state, and federal guidelines. Persons conducting the work must be properly trained, certified, and equipped

to perform the work safely. If the PIPOA / PIMD chooses to contract for those services, then compliance and management responsibilities must be fully addressed in the contract.

## **7.7. Siltation in Canals**

Storm surge and waves can carry large volumes of sand, silt, and debris ashore. Backflow as the storm passes can carry that material along with soil and debris washed from shoreside property. Large volumes of that material could be deposited in the canals. It is possible that siltation could hamper debris removal operations and thus have to be addressed early in the recovery process.

Investigation of post-event conditions in the canals should be undertaken as soon as practicable. Emphasis should be on identifying any areas where siltation presents a risk to waterway users and any areas where the utility of the canals has been reduced.

If the PIMD takes ownership and maintenance responsibility for the canals, removal of storm-deposited material could be eligible for federal disaster recovery assistance. FEMA eligibility criteria include a requirement to demonstrate that the canals have been maintained on a regular basis. The PIPOA has periodically had the canals dredged and has records of that work.

Documentation of storm-related impacts is dependent on knowing the pre-storm conditions in the canals. The PIPOA / PIMD should establish a regular canal survey program to support a potential claim for PA Program eligibility. Periodic spot check of depths, at least annually prior to the start of hurricane season, should be made part of the maintenance program.

Removal of siltation would follow the same general process as maintenance dredging. The PIPOA / PIMD should plan for the surveys and necessary clearing in advance. It is unlikely that a debris management contractor would be able to provide dredging services to remove accumulations of sand and soil. That action would have to be integrated with the maintenance dredging program for the canals. It is expected that the state and federal permitting requirements and permits issued for maintenance dredging would apply to the post-storm operations.

## **8. Public Awareness Information**

The potential for a hurricane to severely damage homes and businesses should be addressed in the PIPOA's preparedness and recovery plans. The impacts associated with major damage will be felt throughout the development, including debris on streets, on adjoining property, and in the canals

Dealing with storm preparations and impacts for homes and businesses, including post-storm damage assessment, is the responsibility of the property owners. The PIPOA has taken steps to make residents and business operators aware of the risks associated with major storms and to apprise them of sources of information on disaster preparedness and recovery.

## 8.1. Key Points to Consider in Preparing for Hurricane Season

The following points should be emphasized for residents in the PIPOA's outreach activities for hurricane season preparations:

- a. Hurricane season runs from June 1 to November 30 of each year. The peak part of the season is mid-September.
- b. The peak period of the hurricane season in Texas is July, August, and September—typical summer vacation months for many people. It is possible that a significant number of residents will not be present to prepare their property for an impending storm landfall. The PIPOA should remind residents to plan accordingly.
- c. The NWS now issues forecasts for wind and surge independently. Definitions to know are:
  - Hurricane Watch — Tropical Storm-force winds are possible within the next **48 hours**
  - Hurricane Warning — Tropical Storm-force winds are expected within the next **36 hours**
  - Surge Watch — Damaging storm surge is possible within the next **48 hours**
  - Surge warning — Damaging storm surge is expected within the next **36 hours**
- d. Residents should be aware of the City's evacuation and re-entry processes. A mandatory evacuation order could be issued by the Mayor or the County Judge and that could severely limit the availability of local government, emergency response, medical, and some business services. Persons in the evacuation zone could be required to leave and persons outside could be barred from entering. Following a disaster, access to the affected area could be prohibited or severely restricted even if that area wasn't subject to an evacuation order.
- e. Homes and their appurtenances should be thoroughly inspected prior to the start of hurricane season. Older homes and structures might have been built to code standards that are less stringent than those currently in place or might have suffered deterioration over time or from the elements.
- f. Potential hurricane / tropical storm impacts could include extreme and prolonged wind, rainfall, storm surge, and wave action. Thorough inspections should also be made after a storm passes to verify that the structure is still sound and didn't suffer hidden damage.
- g. Pre-storm preparation is crucial to minimizing damage to property and threats to the community. Properly securing or removing outdoor items is among the highest priorities. Vehicles, boats, other motorized equipment are of particular concern.
- h. Rising water and waves can cause uplifting of docks and decks. Those structures and anything on or attached to them can be torn free or damaged.

- i. Any major storm could result in long-term electrical power outages, up to several weeks or more.
- j. A major concern with loss of electrical power is spoilage of food left in refrigerators and freezers which can present a host of problems for home cleanup. Rotting food can necessitate disposal of the refrigerators and freezers which presents additional challenges for debris removal operations.
- k. Evaluation of damage to private property is the responsibility of the property owners and their insurers. Limited aid may be available from FEMA, but generally that occurs only in cases of major damage.
- l. Post-storm conditions can present a wide range of public safety and health concerns from debris, pollutants, hazardous materials, wildlife and other sources, such as:
  - 1. Downed power lines which could be energized from improperly installed private generators even if primary power supplies have been secured.
  - 2. Debris accumulations on streets, public ROWs, private property, and in the canals. Some of the hazards are jagged tree branches, sharp edges of metal panels, exposed nails, and broken glass.
  - 3. Hazardous materials such as oil, gasoline, solvents, paints, swimming pool chemicals, etc. could present contact, vapor inhalation, and fire risks.
  - 4. Propane tanks from grills and cooking/heating systems and compressed gas cylinders including personal use oxygen tanks can present significant risk or explosion or fire.
  - 5. Medical waste, including needles and home-health care wastes can be especially hazardous.
  - 6. Sewage, animal waste, and putrefying household garbage could be present anywhere in the damage zone.
  - 7. Wildlife such as snakes, rats, coyotes, and skunks washed ashore, stranded, or scavenging, along with feral cats and dogs present a wide range of risks.

## **8.2. Sources of Hurricane Preparedness Information**

### **8.2.1. Corpus Christi – Nueces County Emergency Alert Program**

<http://cctexas.com/services/public-safety/sign-alerts-and-notices>

The alert program enables citizens to get time-sensitive information on severe weather, evacuations, unexpected road closures, and other important community news directly from local officials. Information can be delivered by home, mobile or business phone, email, or text. For emergency notifications, use the “Reverse Alert” tab.

### **8.2.2. City of Corpus Christi Emergency Management Office**

<http://www.cctexas.com/departments/fire-department/hurricane-preparedness>



### **8.2.3. NWS Corpus Christi**

[www.weather.gov/corpuschristi](http://www.weather.gov/corpuschristi)

Main telephone numbers: 361-289-0725 or 888-579-9731

24-hour information line 361-289-0959

### **8.2.4. National Hurricane Center**

Main web page: <http://www.nhc.noaa.gov/>

Hurricane information site: [www.hurricanes.gov](http://www.hurricanes.gov)

### **8.2.5. Alerts and Warnings**

[https://www.fema.gov/media-library-data/1440448868597-c0112a8bd0aa1c4a62ed44ba68b24d3f/Alerts and Warnings 508 20150824.pdf](https://www.fema.gov/media-library-data/1440448868597-c0112a8bd0aa1c4a62ed44ba68b24d3f/Alerts%20and%20Warnings%20508%2020150824.pdf)

### **FEMA Mobile Alerts App**

<https://www.fema.gov/mobile-app>

### **8.2.6. Preparing for a Hurricane**

These sites explain what actions to take when you receive a hurricane watch or warning alert for your area.

<https://www.ready.gov/hurricanes>

<http://hurricanes.gov/prepare>

### **8.2.7. Preparing your home to withstand a hurricane**

<http://www.flash.org/>

<http://www.greathurricaneblowout.org/>

<http://hurricanestrong.org> - Federal Alliance for Safe Homes Hurricane Resiliency Portal

### **8.2.7. Pets**

<https://www.fema.gov/media-library/assets/documents/108455>

[https://www.fema.gov/media-library-data/1441295898642-f6235d20cfe4027657f2f4e457746bd2/2Pet Preparedness Infographic.pdf](https://www.fema.gov/media-library-data/1441295898642-f6235d20cfe4027657f2f4e457746bd2/2Pet%20Preparedness%20Infographic.pdf)

### **8.2.8. Flood Insurance**

National Flood Insurance Program website: <http://floodsmart.gov>

<https://www.fema.gov/news-release/2017/08/09/flood-insurance-good-investment-and-chance-weather-disaster>









**Appendix A – Risk Assessment**

**Risk Assessment Results**

This report describes the risks and the potential impacts to the Padre Isles bulkheads, canals, submerged land, and other property and infrastructure associated with major coastal storms.

The following discussions represent the conditions that existed at the time this report was prepared and initial recommendations based on the information available at the time. It is expected that these issues will be revisited over time as planning for disaster recovery following Hurricane Harvey recovery takes place, and actions in progress, such as an ongoing condition assessment of the canal bulkheads, are completed.

**1. General**

The City of Corpus Christi (CoCC) includes the project area in its citywide risk assessment, disaster preparedness, response, and recovery planning activities, but has not undertaken site-specific assessments for the Padre Isles area. The responsibility for assessing the risk potential in the Padre Isles project area and the steps necessary to minimize that risk rests with the property owners, including the PIPOA and PIMD. The PIPOA has initiated this project on behalf of all of the owners within the Padre Isles development.

The nature of the risks faced by the Padre Isles community has not changed appreciably over time; however, the extent of the exposure to those risks and the potential scope and severity of adverse impacts have increased greatly. In order to stay aware of the potential impacts, the risk assessment process should be revisited regularly.

This report addresses the preparedness phase, including steps that can be taken to reduce potential disaster impacts. It also addresses the post-event recovery phase and steps that will be necessary to deal with debris and damage to PIPOA and PIMD property.

**1.1. Coastal Storm**

The primary risk to Padre Isles is a major coastal storm with three key elements—extreme wind, extreme rainfall, and coastal flooding from storm tides, storm surge, and waves.

Storm-related threats and vulnerabilities have been identified by reviewing the coastal storm history for the area and the potential storm surge levels predicted by the National Oceanic and Atmospheric Administration (NOAA).

**1.2. Storm History**

Phase 1 of the project addressed the storm impact history for the PIPOA project area and impacts from major storm and identified the potential for storm surge flooding. That work was completed prior to Hurricane Harvey making landfall at Rockport, TX, just north of Corpus

## **Padre Isles Disaster Preparedness and Recovery Program – Phase 2 Project Report**

### **Appendix A – Risk Assessment**

Christi on August 25, 2017 as a Category 4 storm with sustained winds of 130 mph and gusts to 150 mph. Hurricane Harvey was the first Category 4 storm to hit Texas since Hurricane Carla in 1961. Prior to Hurricane Harvey, the last major storm to impact the Corpus Christi area was Hurricane Celia in August 1970.

In general, there is little historical storm information available prior to 1970 and only limited information from 1970 until 2017.

Hurricane Celia was a high-end Category 3 storm with sustained winds of 125 mph, measured at Corpus Christi International Airport, and 130 mph measured at Aransas Pass. Storm surge levels were recorded as 9.2 feet at Port Aransas and 7.9 feet at Mustang Island. Development in the Padre Island – Mustang Island area when Celia struck was very limited and the overall population in the Coastal bend was considerably smaller than today. Even so, Celia was responsible for damages totaling \$930 million (USD 1970) and blamed for 28 fatalities

Other storms had even higher surge levels. The storm surge record for the Corpus Christi area is the Gulf Hurricane of 1919 with surge levels reportedly ranging from 12 feet to more than 15 feet. And National Weather Service (NWS) records for Hurricane Carla in 1961 found at indicate that the surge level in the PIPOA project area was 9.8 ft.

Hurricane Allen in August 1980 made landfall just north of Brownsville. Tropical storm or hurricane force winds occurred from July 31 to August 11, 1980. Data available from the NWS at [http://www.weather.gov/crp/tropical\\_cyclone\\_tracks](http://www.weather.gov/crp/tropical_cyclone_tracks) notes that the wind speed decreased from 187 mph (165 knots) at sea—one of the strongest storms on record—to 114 mph (100 knots) at landfall. Storm surge of 12 feet was recorded locally. That information also notes that an aerial survey the day after landfall showed numerous cuts and washouts along a 50 mile stretch of Padre Island north of where the storm's center made landfall and that so much water crossed the island that levels in the Laguna Madre were much higher than might be expected. Rainfall totals of 10" to 15" were recorded along the coast along with reports of as many as 34 tornadoes.

No surge measurements were recorded at Padre Isles during Hurricane Allen; however, information available from a hurricane information site at [http://hurricanecentral.freesevers.com/Prelim\\_Reports/1980\\_Allen.htm](http://hurricanecentral.freesevers.com/Prelim_Reports/1980_Allen.htm) notes that storm tides reached 5 feet as far north as Louisiana. PIPOA records indicate that at the peak of the storm, winds could have reached 120 mph. Wave impacts also were noted. Damage to canal bulkheads occurred at end of the south channel and the bridge at Gypsy Street was destroyed by waves pushed up the channels.

Hurricane Bret in 1999 developed in the Bay of Campeche and reached Category 4 strength in less than 96 hours with 145 mph winds. It was a small, compact fast moving storm that ran up the coast and made landfall well south of Corpus Christi. Surge impacts were primarily beach erosion on the barrier islands, with no substantive impacts in the Corpus Christi area. Wind impacts were generally damage to trees and some older structures.

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Hurricane Ike in September of 2008 made landfall in Galveston. Tropical storm force or higher winds persisted from September 1 to September 13, 2008 and reached Category 4 strength. That storm made landfall in Galveston with storm surge of 15 feet. The Corpus Christi area was on the weak side of the wind and surge, yet it still produced storm surge of nearly 4 feet in the project area and tide levels of more than 5 feet at the Bob Hall Pier with slightly lower levels at Packery Channel. Those waters overtopped canal bulkheads and docks on the Laguna Madre side of Padre Isles.

Based on this history, it is reasonable to conclude that a strong tropical storm could have impacts in the project area and a hurricane could generate surge levels of 5 feet to more than 12 feet depending on how long storm force winds persist and where landfall occurs. That is consistent with the levels determined by modern surge height prediction methodology.

The surge prediction for Hurricane Harvey was 6 to 12 feet, and those levels were reached in some areas, with reports of up to 6.0 feet at Packery Channel and up to 8.0 feet at Port Aransas. Surge levels in bay areas further up the coast were even higher with 7.5 feet reported at Bayside and 12.5 feet at the Aransas National Wildlife Refuge (ANWR). Hurricane Harvey's impacts are discussed in detail in Appendix B.

## **2. Risks**

### **2.1. Basis for Assessment**

Hurricane Harvey provides a sound basis for identifying potential risks at Padre Isles. The storm made landfall approximately 30 miles to the north of Padre Island which helped to spare much of Corpus Christi from the most severe effects. The rest of the coastal bend area fared much worse. The cities of Port Aransas, Aransas Pass, Rockport, and Fulton as well as unincorporated areas within San Patricio County and Aransas County were especially hard hit. Major damage also occurred further up the coast, including at Port Lavaca, and far inland, eventually inundating the Houston area.

Locally, homes, business, hotels, apartment buildings, storage facilities, government buildings, school facilities, churches, airports, marinas, docks and piers, and other structures suffered massive wind damage including roofs—and in some cases entire upper floors—torn off, and walls collapsed. Initial estimates are that more than half of the structures in some communities have been destroyed. Storm surge 4 feet above ground flooded many homes, punched holes through walls and garage doors on lower portions of larger houses, and carried vehicles, trailers, and boats well inland. Roads were inundated with severe erosion damage in some cases.

Port Aransas and Rockport have developed areas similar to those in the Padre Isles area, including large waterfront developments. Elevations range from approximately 7 feet to 11 feet in many areas. Homes vary in age from very old, including some historic structures, to very recent new construction. The same is true for commercial buildings which ranged from

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conventional frame and brick construction to engineered metal buildings and a wide variety of other types of structures. Material conditions and structural adequacy also varied widely as did performance. Some structures failed due to hurricane winds and others clearly were damaged by tornadoes. Storm surge was minor to moderate along the Aransas Bay side of the peninsula, but much higher with catastrophic impacts along the inland Copano Bay side. The largest waterfront developments in the region such as City by the Sea just south of Rockport and Key Allegro in Rockport suffered the full range of impacts, including several homes completely collapsed into the water in Key Allegro.

Other impacts included numerous sunken boats throughout the region, with resultant pollution incidents and significant risks to navigation and public safety. In the Rockport public harbors alone, the Texas General Land Office (GLO) and the U.S. Coast Guard (USCG) acted together to remove close to 50 sunken vessels. That work began about six weeks after the storm, as soon as overall response and recovery demands allowed, with approximately half of the wrecks cleared in the first two weeks; work continued at the time this report was prepared.

The impacts observed at Padre Isles include storm surge levels as high as 4.5 feet which overtopped the canal bulkheads and resulted in substantial damage to docks in some areas. Wind levels in the area were reported by the NWS to be estimated at 74 - 87 mph, Category 1 hurricane strength. Wind damage to structures generally was limited to older homes.

Initial debris clearing work in the canals entailed barge crews recovering more than 500 tons of mixed debris without reports of any major public health or safety impacts.

## **2.2. Wind**

### **2.2.1. Wind Impacts**

Modern building codes typically require design and construction to recognized standards that reflect the risk category for the geographic area. However, current codes often are more stringent than those in the past with respect to design wind speed, so buildings in an area that has developed over a long period of time most likely will not be comparable in terms of wind resistance. Other factors also come into play, including whether or not the structure benefitted from professional engineering or architectural design, how well it was built, and how it has been maintained and/or modified over time.

Another element of wind impact is directional. Tropical storm winds circulate in a counterclockwise pattern. The direction from which winds blow in relation to an individual structure or resource will vary with the angle of the storm's approach and again as the storm passes. At and near the landfall location, winds can change direction by 180 degrees as a storm passes and resources that stood up to the initial winds can be damaged or destroyed by winds that suddenly come from the opposite direction. This is especially true for trees that are continuously exposed to prevailing onshore winds under normal conditions. This type of damage was observed at and around Rockport where the storm made landfall. The reversing



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wind flow also affected surge levels in bays, pushing water from the open north ends to the landlocked south ends at Bayside and elsewhere.

An additional concern is that the winds in the eye wall of a hurricane can be significantly stronger than the observed sustained. Also, tornadoes often occur with hurricanes, producing winds far above hurricane strength as was observed at and around Rockport.

#### 2.2.2. Hurricane Wind Speeds and Effects

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. The potential impacts of hurricane force winds as described by NOAA at <http://www.nhc.noaa.gov/aboutsshws.php?large> are:

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	<b>Devastating damage will occur:</b> Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	<b>Catastrophic damage will occur:</b> Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher	<b>Catastrophic damage will occur:</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for

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Category	Sustained Winds	Types of Damage Due to Hurricane Winds
	252 km/h or higher	weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

A more detailed description is available at [http://www.nhc.noaa.gov/pdf/sshws\\_table.pdf](http://www.nhc.noaa.gov/pdf/sshws_table.pdf).

In general, most plans anticipate that evacuation due to wind threats is not necessary for storms of Category 2 strength or lower. This is borne out to some extent by the fact that some of the most destructive storms in recent history, including Hurricanes Katrina and Ike with their massive storm surges, had wind speeds in the Category 2 range at landfall and wind damage was relatively minor.

### 2.2.3. Risks for Padre Isles

A hurricane making landfall at or just south of the Padre Isles area could result in damage there on the scale that Hurricane Harvey caused throughout the region.

The ability of a structure to withstand direct winds is highly variable. Every structure subject to hurricane force wind will have to be evaluated individually to gain a reasonably accurate understanding of the risk from wind. In general, only carefully designed and constructed safe rooms and designated storm shelters should be considered as assuring protection from hurricane force winds. At the time of this report, there are no designated shelters in Padre Isles.

Wind-blown debris, which could include large pieces of damaged structures as well as unsecured outdoor items such as furniture and materials used in landscaping, has the potential to cause substantial damage. The potential for this type of impact in Padre Isles is high.

Trees and structures such as poles and masts can be blown over onto buildings. The nature of the Padre Isles area, with limited tree coverage, serves to reduce that element of the risk.

### 2.3. Rainfall

Rainfall totals in the project area during past storm events have been in the range of 10 to 15 inches. Rainfall totals in other Texas coastal areas have greatly exceeded that range. In some cases, the rain continued for several days, and for slow moving storms it could be even longer. Rainfall events before and after a storm's passage can aggravate the impacts. For example, in the Lower Rio Grande Valley, Hurricane Dolly which produced more than 20" of rain in some areas, was preceded by a very heavy rainfall event approximately two weeks before passage and followed by another event about two weeks afterward. Rainfall from Hurricane Harvey was reported to be as much as 25 inches in some of the local areas.

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It is anticipated that rainwater flooding impacts will be minor due to the level nature of the developed area. Drainage to canals should limit the impact to short-term pooling of rainwater on streets.

A substantive risk of prolonged rainfall is erosion or weakening of the soil around structures which in turn could make those more susceptible to wind impacts. Erosion at drainage points, especially unprotected soil along the edges of paved areas, is another area of concern. Also, heavy rain could aggravate damage caused by wind that breaches the watertight envelope of a building. Still, rainfall is expected to be the least damaging element of a major storm.

### **2.4. Coastal Flood: Storm Surge, Tide, and Wave Impact**

#### **2.4.1. Potential Impacts**

Coastal flooding, primarily the saltwater intrusion associated with storm surge, is the greatest risk element of a hurricane. That is especially true for the Padre Isles area which is exposed to the Gulf of Mexico and also to the Upper Laguna Madre.

Damage mechanisms can include:

- Surge impact—the force exerted by an enormous volume of moving water on everything in its path
- Wave impacts on structures, buildings, infrastructure such as roads, and land surfaces from wind-driven waves on top of the surge
- Over-topping of bulkheads
- Flooding of coastal property
- Surge- and wave-borne debris
- Erosion of soils behind the bulkheads
- Erosion at bulkhead toes
- Backwash impacts

#### **2.4.2. Base Flood Elevations**

The definition of Base Flood Elevation (BFE) provided on FEMA's website at <https://www.fema.gov/base-flood-elevation> is:

*The computed elevation to which floodwater is anticipated to rise during the base flood. Base Flood Elevations (BFEs) are shown on Flood Insurance Rate Maps (FIRMs) and on the flood profiles.*

*The BFE is the regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure's elevation determines the flood insurance premium.*

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BFE is referenced to mean sea level (MSL).

As shown on both current and proposed FEMA and Nueces County floodplain maps, the entire project area lies in the 100-year floodplain. BFEs range from 8.0 to 11.0 feet in most of the developed areas, with lower elevations in some of the open land areas.

PIPOA records indicate that elevations for lots within the development range from 7.5 feet to 13.5 feet above MSL. Measurements obtained from Google Earth maps show that the residential lots generally are 8.0 feet to 11.0 feet above MSL in most locations. Since 1981 when the area was annexed into the City of Corpus Christi, minimum residential elevations of 11.0 feet above MSL have been required.

### **2.4.3. Storm Surge Predictions**

NOAA defines storm surge as “the abnormal rise of water generated by a storm, over and above the predicted astronomical tides”. The National Oceanic and Atmospheric Administration (NOAA) has developed the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model to predict what it describes as near-worst-case storm surge levels for each hurricane intensity category. National Storm Surge Hazard Maps showing predicted surge heights can be found on the Nation Weather Service (NWS) Corpus Christi website at <http://noaa.maps.arcgis.com/apps/MapSeries/index.html?appid=d9ed7904dbec441a9c4dd7b277935fad&entry=1>. A detailed discussion of this topic is included in the Phase 1 report.

It is important to note that the predicted surge levels are “near worst-case” depths over land. Actual surge levels during any storm event will vary with storm intensity, duration, speed of advance, position relative to the resource, and other factors. For risk assessment purposes, using the predicted levels helps to ensure that planning and preparation will address the full range of potential impacts.

The NOAA SLOSH maps illustrate the predicted surge levels in the PIPOA project area for Category 1 through Category 5 hurricanes. They show these likely storm surge levels for the Padre Isles area:

- Category 1     Surge most likely will overtop canal bulkheads and seawalls but would rise above ground level only in the lowest parts of the development
- Category 2     Surge levels as much as 3 feet above ground in most of the development
- Category 3     Surge levels of 3 feet to more than 6 feet above ground in most of the project area
- Category 4     Surge levels greater than 9 feet across most of the project area
- Category 5     Surge could cover the entire project area to a depth of 9 feet or more

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The risk could develop well before hurricane landfall as water is pushed toward the coast, especially with a large, slow-moving storm, tracking directly toward the area. Damage could result from flooding due to high tides and storm surge and also from waves generated on top of the surge waters, especially as the storm nears the coast.

#### **2.4.4. Surge-borne Debris**

Storm surge waters could contain significant amounts of sand and floating debris, including boats and materials from offshore industrial installations—anchor buoys and tanks are among the items that have been found on South Texas beaches. As the surge makes landfall, it will pick up additional material from the land it washes over, with the volume growing as the surge pushes further inland. There are numerous examples of surge borne debris causing extensive damage including destruction of structures that would likely have survived had they not been impacted by large items like barges and boats. The debris could be deposited on land as well as in the canals.

#### **2.4.5. Waves**

Predicted storm surge levels do not consider the very likely possibility of large waves on top of the surge. Wave action can increase the potential for damage because the wave height would be added on top of the surge. Wave impacts would be greatest in the near-beach zone; but as was encountered in Padre Isles during Hurricane Allen, waves can push far up channels or along other water paths.

#### **2.4.6. Backwash**

After the storm passes, the retreating floodwaters will naturally flow seaward and might also be driven by the reversed direction winds that occur as the storm moves on shore. The backwash waters could carry very large volumes of debris from the areas inundated by the storm surge.

#### **2.4.7. Utilities Issues**

Widespread damage to utility systems is commonplace with major coastal storms. Impacts can include direct damage to electrical distribution systems including substations, towers, poles, and transmission lines. Padre Isles was without power for several days following Hurricane Harvey, while Rockport was without power for more than two weeks.

Damage to water and gas distribution also is common, especially for piping run on causeways and bridges. For all services, both aboveground and buried system components are at risk from storm surge. Systems can also be knocked out as a result of loss of electric power. Loss of water service and/or electricity could render sewage systems inoperative and also affect emergency response capabilities.

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In many cases services are unavailable after a storm even for areas that did not sustain severe damage themselves as systems may have to be shut down over a large area until damage in heavily impacted zones can be isolated.

Utilities impacts are a major consideration in a city or county government decision to allow entry into a storm-impacted area.

### **3. Padre Isles Resources at Risk**

The risks faced by Padre Isles from major coastal storms have not changed appreciably over time; however, the scope of potential impacts has increased greatly. The limited extent of development in 1970 minimized the potential for extensive damage and up until Hurricane Harvey the storms occurring since that time did not have significant impacts in the area. Population growth and development levels are much higher now. Older structures likely were to codes and standards less stringent than those in force today. Usage and deterioration over time could lessen their resistance to the elements they were designed to withstand at the time of construction.

The primary access route is S. Padre Island Drive / Park Road 22 via the JFK Causeway. The causeway was rebuilt and raised in 2003 but is still susceptible to damage from storm surge and waves and from drifting vessels. On the island side, the road is susceptible to flooding from even a minor hurricane. The other access, via Aransas Pass and Port Aransas is dependent on the state run ferry system which will be taken out of service well before landfall and could remain out of service after the storm passes. Even with ferries operating, Hwy. 361 along the length of Mustang Island could be severely impacted by overwash and sand coverage from surge and waves. Damage to the ferry system did occur during Hurricane Harvey and that delayed the resumption of services after the storm.

#### **3.1. Residential Property**

##### **3.1.1. Potential Flooding**

In a Category 1 hurricane, it is likely that the canal bulkheads, with heights of 4.5 feet above mean sea level (MSL), would be overtopped. Residential lots most likely would not be inundated although that possibility cannot be ruled out entirely.

In a Category 2 hurricane, most of the residential lots in Padre Isles will be at risk of being inundated. In addition, a Category 2 hurricane would likely make all roads into and out of the project area impassable. Park Road 22 and S. Padre Island Drive could be covered by as much as 3 feet of water and State Hwy. 361 could be inundated to a depth of 6 feet.

In a Category 3 hurricane, all of the developed area will be at risk of inundation.

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### 3.1.2. Hurricane Harvey Impacts

The predicted storm surge level for Hurricane Harvey was 6 to 12 feet. Although the surge was not that high at Padre Isles—maximum observed level was estimated at 4.5 feet—it did reach that level in other areas and it could have done so at Padre Isles if the storm had made landfall further south. The path of the storm and the speed of advance helped to minimize the surge height; landfall further south would have caused higher surge levels. As such, planning should be based on the potential worst case condition for each category of storm.

### 3.2. PIPOA / PIMD Property

#### 3.2.1. Risk Summary

This table lists the resources within the Padre Isles development for which the PIPOA / PIMD has responsibility and the coastal storm risks that could affect them.

Resource	Risk Element			
	Wind	Rain / Freshwater Flood	Storm Surge / Coastal Flood	Backwash
<b>PIPOA (PIMD) RESPONSIBILITY</b>				
Canal Bulkheads	n	L	H	H
Canal Waters	n	n	H	H
Canal Bottoms	n	n	M	H
Boat Ramps	n	n	H	M
Canal-end Properties	n	L	M	M
Aerators	n	n	H	H
PIPOA Office Building & Monuments	M	L	H	H
<b>Not PIPOA Responsibility</b>				
Residences	H	L	H	H
Businesses, etc.	H	L	H	H
Streets	n	L	H	H
Parks	n	n	M	M
Seawall at Beach Area	n	n	M	M

n = No or very little impact anticipated

L = Low levels of damage anticipated

M = Moderate impact and damage possible

H = High impact and damage possible

#### 3.2.2. Canal Bulkheads

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There are approximately 32 miles of bulkheads bounding the canals; all of the waterfront lots are bounded by bulkheads on at least one side. In some areas, the Padre Isles bulkheads abut similar bulkheads at adjacent developments.

The bulkheads are constructed of concrete with the tops approximately 4.5 feet above MSL. They are susceptible to damage from storm surge, wave action during a storm, and backwash of surge waters from direct impact, erosion at the toe of the wall, and erosion behind the walls. They could also be impacted by extremely heavy rainfall that could weaken the soil supporting the walls or cause erosion behind them.

During Hurricane Allen in 1980, waves pushed up the south channel damaging bulkheads at the channel end and destroying the Gypsy Street bridge. During Hurricane Harvey in 2017, only minor erosion damage occurred.

A condition assessment of the bulkheads is in progress at the time of this report. It is expected that the assessment will identify any structural or integrity deficiencies or discontinuities in the bulkheads and the PIPOA has indicated that repairs will be made wherever necessary. The results will help to identify any areas deemed susceptible to potential storm damage. The assessment results will also help in determining if damage mitigation measures might be warranted.

The condition assessment and documentation of any repairs will establish a baseline condition for the bulkhead system that will be the basis for post-storm damage evaluations.

#### **3.2.3. Canal Waters**

The PIPOA is responsible for the canals within the PIPOA development boundaries including water quality, debris removal, and maintaining suitable depth for navigation. Some of the canal sections are owned jointly with adjacent developments.

Storm-related risks include debris being washed or blown in to the waters, pollution from that debris and onshore sources, and siltation. The types of debris and the associated hazards to persons and the environment are addressed in detail in the action plan portion of this report.

In general, any material or item that is part of or is present at a residence, business, dock, other site, or in the water in or near the project area could end up in the canals. Boats and vehicles, including golf carts and other smaller vehicles, present a range of potential impacts, especially pollution from fuel, oil, and batteries. A wide variety of hazardous or dangerous waste from homes, garages, boat moorings, shops, and businesses will be of special concern, as will untreated sewage from damaged lines and lift stations.

Debris removal and pollution cleanup in the canals will be challenging, largely because of limited accessibility from land. In some areas, such as at canal ends, collected debris can be removed using shoreside equipment; however, it is expected that much of the work will have to



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be performed from floating equipment. Collecting and containing debris and spilled materials on the water could be hampered by limited access and the narrow widths of some canal segments. Identifying and preparing staging areas for collecting and managing debris also will be necessary.

#### **3.2.4. Canal Bottoms**

Some of the debris blown or washed into the canals will accumulate at the bottom of the canals, impacting water depths and possibly creating public safety risks. Locating and removing those accumulations must be part of the debris management operations.

Water depths are at risk from sand and soil carried by storm surge, waves, and backwash water flow. Siltation could reduce canal depths in at least the most exposed locations, hampering the recreational navigation activities for which the canals were constructed. Siltation also could hamper access for vessels engaged in post-storm recovery operations.

Documentation of maintenance of the canal depths, including survey reports and dredging records will provide a basis for post-storm condition assessments and are necessary for possible future efforts to meet the FEMA eligibility criteria for water control systems.

#### **3.2.5. Boat Ramps**

Padre Isles has 7 boat ramps, 6 of which have parking areas for boat trailers.

The boat ramps are contiguous to the bulkheads with similar susceptibility to damage. They are included in the bulkhead condition assessment program.

#### **3.2.6. Canal-End Property**

The PIPOA owns approximately 50 parcels of land at the ends of canals throughout the development. Other than the canal bulkheads, there are no structures on any of the properties. With the exception of some vegetative plantings, the properties are unimproved.

Potential damage is limited to erosion from flooding or extreme rainfall or associated with bulkhead damage.

#### **3.2.7. Aerators**

The PIPOA owns 13 aerators for canal waters. The aerators are located on private property throughout the development for which PIPOA pays the property owners rent.

The aerator pumps, piping, and electrical components could be damaged to varying degrees by storm surge flooding. The most significant risk is to electric motors and controllers, although pumps, piping, and pump houses also could be damaged.

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#### **3.2.8. PIPOA Office Building and General Property**

The office building and its contents are owned and maintained by the PIPOA. The PIPOA also owns garden plot containers and fences around them at Douden Park, and an assortment of general maintenance equipment.

The building and PIPOA-owned equipment and materials are susceptible to the same potential damage from wind, rain, and storm surge as residences and commercial buildings.

#### **3.2.9 Monuments**

The PIPOA-owned monuments are signs and location markers at Park Road 22 and Aquarius St., Whitecap Blvd., Sea Pines Dr., and the PIPOA Office. They are susceptible to damage from wind and flooding.

### **3.3. Property that is not PIPOA's Responsibility**

Brief summaries of the risks are included here to complete the picture of potential impacts in the Padre Isles area. That property is not discussed further in this report.

#### **3.3.1. Residences and Businesses**

Residences and their appurtenances such as docks and boat houses, businesses, and other structures in the Padre Isles development area will be at risk from wind and rain from a tropical storm or a Category 1 hurricane. They will also be at risk for flooding due to storm surge from even a Category 2 hurricane. Those structures are the primary sources of debris on the streets and in the canals.

The peak of the hurricane season in Texas is July, August, and September—typical summer vacation months for many people. It is possible that a significant number of residents will not be present to prepare their property for an impending storm landfall adding to the potential for damage and debris.

#### **3.3.2. Streets**

Typical impacts to roads and streets can include debris accumulations, sand and soil accumulations from overwashing by flood water and wave action, displacement of pavement, undermining, or weakening of support base due to standing water. Traffic control systems, guardrails, and other infrastructure can also be damaged.

Flooded roads and streets can delay entry by recovery forces, and debris and damage can hamper damage assessment and recovery operations.

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The CoCC maintains the streets and is responsible for clearing the streets and for removing storm-generated debris from the public right of ways (ROW), including debris from private property that is placed in the ROW during cleanup.

#### **3.3.3. Parks**

There are four parks within the Padre Isles boundaries, all owned and maintained by the CoCC which will handle cleanup and restoration.

#### **3.3.4. Seawall at Beach**

A seawall is in place to seaward of property in the Lake Padre element of the development on the east side of S. Padre Island Drive/Park Road 22 bounded by Packery Channel and Padre Balli Park. The seawall is privately owned by the property owners behind the seawall, mostly multifamily developments, i.e. hotels and condominiums.









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**Appendix B – Hurricane Harvey Impacts**

**Hurricane Harvey August 25, 2017**

The primary source for this information is the NOAA/National Weather Service (NWS) Corpus Christi website at [http://www.weather.gov/crp/hurricane\\_harvey](http://www.weather.gov/crp/hurricane_harvey). That website contains an overview of the hurricane's impacts, statistics, radar and satellite data, winds, storm surge, rainfall, and data on the storm conditions over its duration. In addition to detailed information on the storm and its impacts, it includes links to photographic records and other data sources.

## **1. Hurricane Harvey Development**

Hurricane Harvey began as a tropical wave off the west coast of Africa Sunday August 13, 2017. The system tracked across the Atlantic Ocean toward the Eastern Caribbean Sea and developed into a tropical storm on August 17. The storm weakened crossing the Caribbean and moved ashore on the Yucatan Peninsula on August 22.

The National Hurricane Center began issuing advisories and forecasts on Tropical Cyclone Nine Thursday morning, and Tropical Storm Harvey Thursday afternoon. Tropical Storm Warnings were issued that afternoon for Martinique, St. Lucia, Barbados, and St. Vincent and the Grenadines. Tropical Storm Harvey impacted the Windward Islands on Friday, August 18<sup>th</sup>, entering the Eastern Caribbean Sea as a minimal tropical storm, and eventually weakening to a tropical wave late Saturday evening. Although there was some potential for the remnants of Harvey to reorganize into a tropical cyclone, a tropical cyclone failed to form as the remnants of Harvey moved into the Yucatan Peninsula on Tuesday morning, August 22<sup>nd</sup>. The next day it moved into the Bay of Campeche and reformed as a tropical depression. The National Hurricane Center expected it to develop into a strong tropical storm or at most a Category 1 hurricane. However, with very warm waters in the Bay of Campeche and the western Gulf of Mexico and weak wind shear conditions, the storm intensified quickly and was expected to make landfall along the middle Texas coast. It grew into a Category 3 major hurricane by the afternoon of August 25 and reached Category 4 strength with winds in excess of 130 mph and an incredibly low barometric pressure of 938 mb. It made landfall at Rockport, TX the evening of August 25 with winds gusting to 150 mph.

In addition to the devastating winds that would cause catastrophic damage, the storm was expected to stall once it moved inland and meander over south and southeast Texas for days with extreme rainfall. As with the wind, that expectation was exceeded.

### **1.1. Wind**

As the storm approached the coast, the NWS office in Corpus Christi issued a rare Extreme Wind Warning—Hurricane Harvey would have winds in the eyewall between 115 and 130 mph.

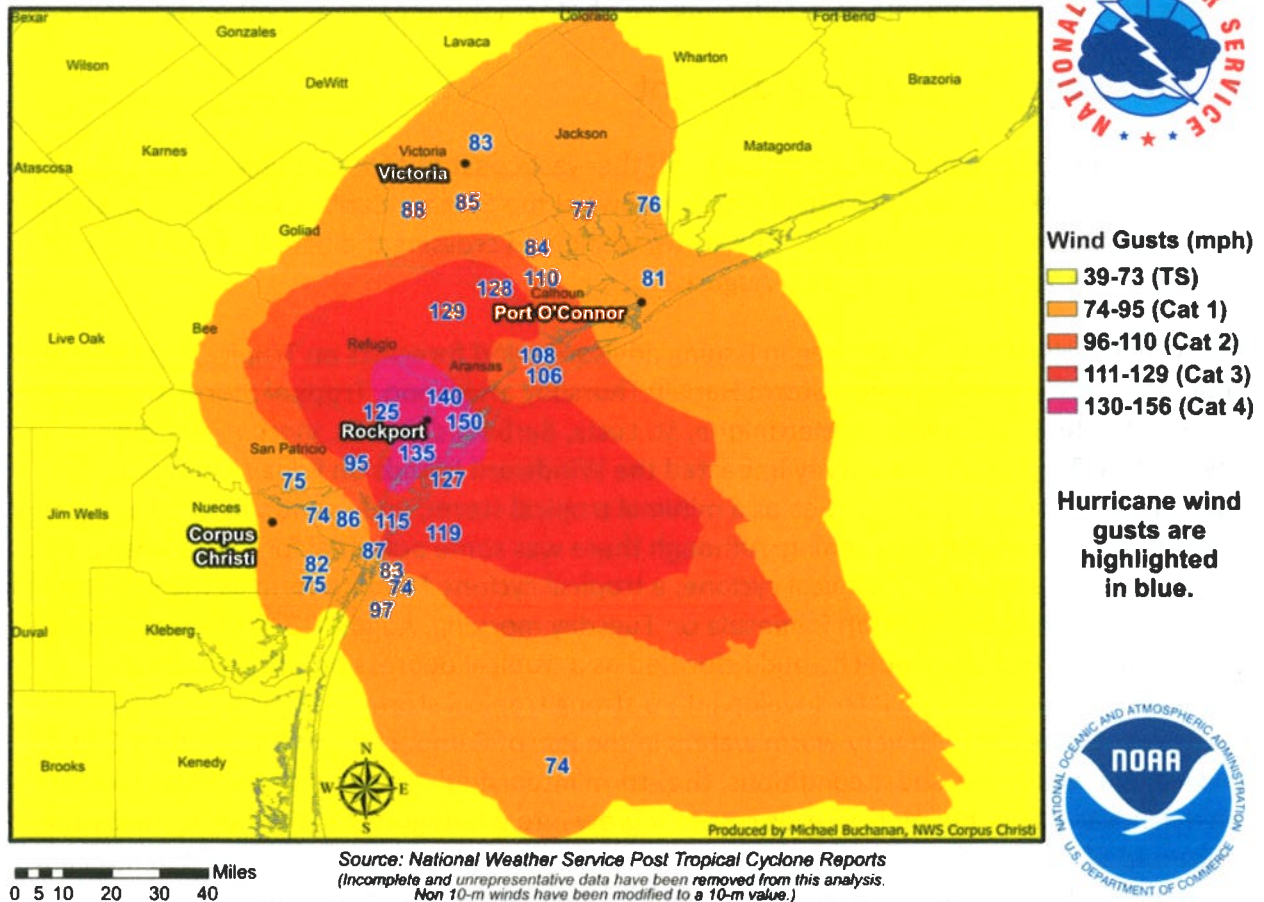
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The storm made landfall on San Jose Island and then crossed Aransas Bay and struck Rockport and Fulton around 10 PM CDT.

The post-storm wind data published by the NWS at [http://www.weather.gov/crp/hurricane\\_harvey](http://www.weather.gov/crp/hurricane_harvey) shows a substantial range of hurricane force wind velocities ranging from Category 1 to Category 4.

#### Hurricane Harvey Peak 10-meter Wind Gusts - Aug 25-29, 2017



The NWS Overview at the above website notes that many weather observation stations in South Texas were disabled before they could record the highest wind speeds; thus, some of the reported speeds may have been underestimated, especially in areas near the coast and close to the eyewall. The speeds shown above are for peak gusts. Summaries posted at the NWS website indicated that at the time the NWS summary was prepared, a peak speed of 132 mph had been reported 2 miles ENE of Port Aransas and a Copano Village station (on the west side of Rockport) reported a peak of 125 mph. Subsequent NOAA reports indicate that sustained winds exceeded 130 mph throughout the area and gusts reached 145 mph. Reports from other sources put sustained winds as high as 140 mph and gusts to 155 mph. Overall, the graphic above presents the best record of wind impacts.



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The NWS data indicates that the Padre Isles area experienced winds in the Category 1 to possibly low Category 2 strength, while Category 3 winds impacted areas just north of Corpus Christi Bay and Category 4 winds hit Aransas Pass and Rockport. The severity of wind-related impacts experienced in each of those communities generally validates that data — ranging catastrophic damage in Rockport to limited damage in Corpus Christi.

#### **1.2. Storm Tide and Surge**

The highest observed storm surge levels were reported at the Aransas National Wildlife Refuge (ANWR) with water more than 12 feet above ground level, at Port Lavaca with more than 10 feet, and at least 6 feet in Port Aransas. Elsewhere across South Texas, storm tide levels were from near 3 to 6 feet above ground level at Seadrift, Port O'Connor, Holiday Beach, Copano Village, and Lamar.

The NWS website includes “preliminary estimates of peak inundation” which reflect surge levels above ground both as documented by NWS gages and as subsequently reported from a post-storm survey.

<b>Hurricane Harvey Storm Surge</b>	<b>Surge Level — feet above ground level</b>	
<b>Location</b>	<b>NWS Gage</b>	<b>Post-storm Survey</b>
Padre Island National Seashore (PINS)	3.5	—
Bob Hall Pier	2.9	—
Packery Channel	4.6	6.0
Port Aransas	5.2	8.0
Rockport area, Aransas Bay	1.9	4.0
Rockport Area, Copano Bay	4.0	5.0
Bayside	—	7.5
Aransas National Wildlife Refuge	—	12.5
Seadrift	5.5	—
Port Lavaca	6.6	—

#### **1.3. Rainfall**

Hurricanes and major tropical storms often produce torrential rainfall and flooding, and Hurricane Harvey was exceptional in that regard. The storm stalled over south/southeast Texas for days. Luckily, the areas so devastated by Harvey’s wind and surge were spared, with rainfall stopping as the storm lost strength and moved up the coast.

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Rainfall in the Padre Isles project area was reported as totaling 6" to 7". Throughout the Coastal Bend the totals were 10' to 15" and in some cases more. In the Rockport and Lamar areas, 15" to 20" totals were reported and nearby areas reached 25" as the storm passed.

As the storm moved up the coast and stalled, southeast Texas received in excess of 25" of rain—with some areas receiving more than 50" of rain overall—resulting in massive flooding throughout the region. Some areas received more than 40" in less than 48 hours. Cedar Bayou in Houston received 51.88"—a new record for North America.

## **2. Storm Impacts**

### **2.1. Regional Impacts**

In all, 33 three counties in Texas were impacted severely enough to receive Presidential disaster declarations. Aransas County—including the cities of Rockport, Fulton, and Aransas Pass—sustained catastrophic damage. Homes, business, hotels, apartment buildings, government buildings, school facilities, churches, marinas, docks and piers, and other structures suffered massive wind damage with many completely destroyed. The Aransas County Courthouse was destroyed and Rockport City Hall lost its roof as did several hotels. Several homes in the Key Allegro waterfront subdivision collapsed into the water. In Copano Village, Holiday Beach, and Lamar, just north of Rockport almost every structure was damaged or destroyed by wind or storm surge. Major damage also occurred in parts of San Patricio and Nueces Counties with equally devastating impacts Port Aransas. Major damage occurred in every community from Aransas Pass north along the coast to Port Lavaca, and inland to Cuero, Gonzalez, and beyond.

#### **2.1.1. Infrastructure Damage**

Major damage occurred to virtually all elements of the regional infrastructure. Marine impacts included large a drill rig breaking free of its moorings near Port Aransas and two large tugs in that area being sunk. Shipping channels sustained shoaling from sedimentation and a wide variety of debris accumulated.

Power lines, poles, and substations were destroyed throughout the region. Representative of the magnitude of damage is that every pole and line along 31 miles of Hwy 35 between Rockport and Tivoli had to be replaced, along with at least one electric power substation. In many areas downed lines and poles blocked roads for more than a week. Rockport was without power for more than two weeks and some areas were so badly damaged that they were without power more than five weeks after the storm. The lack of power rendered the municipal sewer system inoperable as the electrically-powered lift station pumps and other equipment could not be operated. The prolonged outages also affected the ability of property owners to start cleanup and recovery of their property and added to overall losses. Widespread damage to water lines also occurred.

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Storm surge inundated many coastal areas covering many roads several feet deep and causing extensive damage in some cases. In Aransas County impacts at several bridges resulted in prolonged road closures. Highway 361 along a 10-mile stretch from near Mustang Island State Park to Port Aransas was covered with water several feet deep.

### **2.1.2. Focus on Residential Damage**

Damage to single-family and multi-family homes ranged from minor to catastrophic throughout the region. In general, newer construction consistent with modern building codes fared well. Older structures, especially where lack of maintenance or other conditions had taken a toll, fared less well.

Consistent with the purposes of this report, only residential damage is addressed below.

## **2.2. Padre Isles Area**

Observations by residents who stayed through the storm included reports that the effects were felt mostly from wind and from surge from the Laguna Madre side of the development, more than from the Gulf of Mexico side. Similar observations were report for Port Aransas.

### **2.2.1. Wind Damage**

Wind damage to structures generally was limited to older homes. While no specific reports were provided by PIPOA representatives, general information indicates that wind damage was limited to older, more exposed structures.

### **2.2.2. Storm Surge**

Storm surge records for sites closest to Padre Isles were 2.9 feet at the Bob Hall Pier, and 4.6 to 6.0 ft at Packery Channel where the jetties and surrounding area were heavily damaged.

At Padre Isles the canal bulkheads with elevations of approximately 4.5 feet were overtopped; however, surge levels were such that residential lots were not inundated to the point of flooding homes. Soil behind the bulkheads was severely eroded, but bulkhead damage was very limited.

Water levels in canals rose and waves of 4 to 5 feet were reported in areas on the Laguna Madre side of the development as the storm passed and winds drove water in from the west side of the island. Structural damage at Padre Isles included impacts to docks and other structures at the water's edge due largely to uplifting and wave action. Major surge damage to homes was not reported.

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### **2.2.3. Debris Removal**

Reportedly approximately 500 tons of debris was removed from the canals. No major health or safety hazards were reported due to debris.

### **2.2.4. Overall Modest Impact**

Overall, the damage at Padre Isles was modest by comparison to the communities that received the full force of the storm. Had Hurricane Harvey made landfall just south of Corpus Christi instead of just to the north, Padre Isles would have been more exposed to the strongest wind and surge and the damage could have been far worse. Identifying potential impacts under that scenario could be beneficial in planning and preparedness for future hurricanes, and such impacts occurred in Rockport.

## **3. Key Allegro, Rockport**

The Key Allegro waterfront community on Aransas Bay in Rockport is similar to the Padre Isles area in many respects with bayfront and canal-front property accessed by channels from Aransas Bay. The development is essentially an island that extends into Aransas Bay like a peninsula oriented west-to-east. The project consists predominantly of reclaimed land, connected to the mainland by a small bridge. Most of the area has an elevation of just 6 feet above sea level, with some areas as low as 2 feet.

### **3.1. Infrastructure**

The bridge was damaged, the pedestrian walkways were destroyed, and erosion along all sides of the structures was severe. Streets were not damaged except in way of deteriorated outfall locations and failed drains. Key Allegro was annexed into the City of Rockport in 1985 and the City assumed responsibility for the bridge, most of the streets, outfalls, lighting, water, and gas service.

Breakwaters protecting the entrance channel on the east end of the development were damaged and some sections were destroyed. The breakwaters and channels are owned and maintained by the Aransas County Navigation District which also owns the submerged land in the channels.

The bulkheads along the canals generally are owned by the individual lot owners. The submerged land in the canals is owned by the Key Allegro Canal and Property Owners Association (KACPOA) and those canals have required only minor maintenance dredging.

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### **3.2. Residential Development**

Construction began in the mid-1960s with Unit 1 consisting of single family homes on Bayshore Drive along the Aransas Bay shoreline. At the time of construction, the development was outside the Rockport city limits and many of the original homes were constructed at or only slightly above grade. That is the lowest area of Key Allegro. Complicating current concerns is the fact that subsidence of 12" to 18" has occurred in that area and some properties are being undermined by sea action. Newer homes were built to more stringent standards including higher elevations, especially those built since 1985

The development now consists of 667 single family home sites along with approximately 200 condominiums in one large complex and several smaller ones, in five units. Ages of the homes range 50 years old to new construction. Many are large beach houses. Approximately 85% of the residences are occupied only part time and many are rental units.

All of the single-family residences either front directly on the bay or are on canals open to the bay on the south side of the development. There is a small harbor area with community resources, including a yacht club and restaurant, but no other commercial businesses.

Damage from Hurricane Harvey was severe. Numerous homes were totally destroyed; many others were damaged beyond repair. Several collapsed in the waterways. At the time of this report, more than 10% of the single-family homes had received demolition permits with that number expected to climb beyond 15% and possibly to 20%.

### **3.3. Residential Damage**

The most damage occurred to single-family homes. As would be expected, the worst damaged was inflicted on the older homes in Unit 1 along the north side of the development facing northward into Aransas Bay, and in Unit 5 facing eastward into the Bay. Many of those were built in the 1960s and 1970s, and both construction standards and material condition varied widely. Those homes received the full impact of the counterclockwise rotating winds off the bay as well the full effect of the storm-driven water. Surge levels were only about 2 feet, but wind-driven waves on top of the storm surge and tide reached 5 feet high. Damage to lower levels of homes was extensive, and a number of the homes collapsed.

Wind impacts were responsible for most of the damage to homes that didn't front the bay. Major damage occurred to virtually all elements of the regional infrastructure. Marine impacts included large a drill rig breaking free of its moorings near Port Aransas and two large tugs in that area being sunk. Shipping channels sustained shoaling from sedimentation and a wide variety of debris accumulated. Waterfront businesses were heavily damaged or destroyed throughout the region. However

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Uplifting of docks and decks and wave damage also occurred. As would be expected, the newer the homes were the better they fared; however, roof damage was still extensive throughout the development. Wind forces were severe enough to damage all types of roofs including those with metal and tile coverings and older homes with stone-covered roofs. Wind-blown roofing materials were widely scattered and contributed to the overall damage.

Canal impacts included extensive debris accumulations and numerous boats displaced and in some cases sunk by wind, surge, and wave action. A major impact was a 60 ft houseboat that broke free from moorings near Rockport Harbor and was driven several miles to end up in Key Allegro. Sunken boats were responsible for minor oil spills in the canals.

#### **3.4. Debris Management**

The KACPOA contracted with Crowder-Gulf for removal of floating debris and visible sunken debris. Crowder-Gulf currently holds the primary disaster debris management contracts for Aransas County (including incorporated cities) as well as for Corpus Christi. Debris was collected using barges. Collected materials were staged on site within the development then moved to a roadside pickup location outside the development for pickup by large-capacity trucks. Boats were gathered and left for owners to secure. Sunken boats and the large houseboat were removed under a Texas General Land Office program.

#### **3.5. Lack of Pre-Event Planning**

The information above was obtained during conversations with the KACPOA Island Manager and visits to the development. The Island Manager noted that the fact that 85% of the residences are occupied only part of the time contributed to the lack of preparations and the subsequent extent of damage. Another significant problem was that no one knew who would deal with post-storm debris and boats immediately following the storm. The contract with Crowder-Gulf was executed with a not-to-exceed fee without benefit of any pre-planning.

### **4. Conclusion**

Although only Key Allegro in Rockport was selected for comparison, available information indicates that the impacts at other waterfront communities in Aransas County near the path of the storm's eye were similar in scope. Reports on the damage at Port Aransas also indicate similar magnitudes of damage.

It is reasonable to conclude that had Hurricane Harvey made landfall at or just south of the Padre Isles area, the scope of damage would have been similar to that at Key Allegro.









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## **Action Plans**

### **1. Risk Assessment Action Plan**

An initial risk assessment was completed in September 2017 by Rodino, Inc. to identify the nature and scope of risks and threats that a major coastal storm presents for the for the Padre Isles development area. The risk assessment considered historical storm information as well as the impacts of Hurricane Harvey, a Category 4 hurricane that struck the region on August 25, 2017.

#### **1.1. General Risk Summary**

This table lists the resources within the Padre Isles development and the nature of the coastal storm risks that could affect them as described in the above-referenced report.

Resource	Risk Element			
	Wind	Rain / Freshwater Flood	Storm Surge / Coastal Flood	Backwash
<b>PIPOA (PIMD) RESPONSIBILITY</b>				
Canal Bulkheads	n	L	H	H
Canal Waters	n	n	H	H
Canal Bottoms	n	n	M	H
Boat Ramps	n	n	H	M
Canal-end Properties	n	L	M	M
Aerators	n	n	H	H
PIPOA Office Building & Equipment	M	L	H	H
Monuments	n	n	L	L
<b>Not PIPOA Responsibility</b>				
Residences	H	L	H	H
Businesses, etc.	H	L	H	H
Streets	n	L	H	H
Parks	n	n	M	M
Seawall at Beach Area	n	n	M	M

n = No or very little impact anticipated  
L = Low levels of damage anticipated  
M = Moderate impact and damage possible  
H = High impact and damage possible

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### **1.2. Periodic Risk Assessments**

Any substantial change in conditions in and around the Padre Isles development should be cause for review and reevaluation of the risks that property owners, the PIPOA and PIMD included, might face. Changes can result from additional development, from the actual impact of a major coastal storm as occurred with Hurricane Harvey, or just from the passage of time.

At a minimum, an annual review of risk conditions is recommended. The objective is to identify the nature and extent of changes in population, development, or other factors that might bear on the risk the area faces. If any of the risk factors have changed appreciably, then the disaster preparedness and recovery plans must be reviewed to ensure that they reflect the prevailing conditions and that all actions necessary to address the changed risks are incorporated into the plans.

### **1.3. Mitigation Measures**

The review should look for positive as well as negative changes, i.e. have actions occurred that reduce the risks associated with a major coastal storm. That would include any measures taken following Hurricane Harvey to reduce the potential impacts of future tropical storms.

### **1.4. Condition assessments**

The results of any condition assessments conducted for PIPOA or PIMD property such as the canal bulkheads should be integrated into the risk assessment.

## **2. Evacuation and Reentry Action Plan**

### **2.1. Evacuation Plan**

A comprehensive evacuation plan should be developed to identify the actions that are necessary for the PIPOA staff to protect valuable materials, records, and information. The plan should include a detailed list of all necessary actions and a timeframe for completing each item.

Developing the plan should be a joint effort by the entire staff to ensure that all critical concerns and needs are identified and addressed.

All actions necessary to safeguard vital materials should be documented in checklist form.

The plan should specifically assign responsibilities for each of the actions to the appropriate staff members by title/position, rather than by name. Both primary and backup responsibilities should be included.

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The plan should address safeguarding all records, files, electronic equipment, personal property, and valuable items. For materials that will be removed from the PIPOA Office, the plan should clearly note the locations to which those materials will be taken for safekeeping.

The plan should identify communication protocols for advising residents of the situation and encouraging them to heed all warnings, recommendations, and evacuation orders.

The plan should be reviewed and updated annually and each person to whom responsibilities are assigned should be required to acknowledge them in writing.

#### **2.2. Contact Lists**

The evacuation plan should include current contact information for all persons to whom responsibilities are assigned.

For materials that will be removed for safekeeping, the plan should also include contact information for the locations to which the material will be transported and the individuals to whom it will be entrusted.

The staff should ensure that contact lists and methodology for disseminating information to residents are maintained current to the extent practicable. At a minimum, an annual review prior to the start of hurricane season is recommended.

#### **2.3. Reentry Plan**

The PIPOA and the PIMD should identify a person or persons who will be responsible for coordinating the damage assessment process. The “Nueces County Hurricane Reentry Tier Definitions” in the *Nueces County Hurricane Reentry Plan* identify the persons included in each tier for reentry:

*Tier 1: Search and rescue (SAR) and security force operations.* This generally means first responders and select government personnel, and no others.

*Tier 2: Immediate mass care and damage assessment.* The damage assessment personnel in this category are those engaged in official duties for public entities.

*Tier 3- Restoration of essential services, point of distribution (POD) and other support operations.* Insurance adjusters conducting damage assessments for private property (including PIPOA property) are included in this category. Business owners providing critical services also are included.

*Tier 4- Business operators not allowed reentry under Tier 3 and residents.* Residents and business owners fall within this tier; the general population does not.

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### **2.4. PIMD Reentry**

The PIMD can assign a Board member to be the public official in charge of PIMD damage assessment and recovery planning. If done, the PIMD should advise the CoCC EMC in writing of the name and contact information for that person for Tier 2 authorization.

An engineer or other qualified professional under contract to the PIMD to conduct an assessment of PIMD-owned property could qualify for entry in Tier 2. To take advantage of that option, the PIMD should advise the CoCC EMC in writing of the name and contact information for that firm and request authorization for that firm to be listed as eligible for Tier 2 entry.

### **2.5. PIPOA Reentry**

PIPOA staff and residents fall under Tier 4.

Due to the large population in the development area, one or more representatives of the PIPOA could possibly be included in Tier 3 if the PIPOA implements a recovery plan that includes providing services for residents. If the PIPOA chooses to take such actions, the PIPOA should so advise the CoCC EMC in writing and request authorization for the PIPOA staff providing those services to be listed as eligible for Tier 3 entry.

### **2.6. Annual Review and Update**

The Evacuation Plan and the Reentry Plan must be reviewed and updated annually to ensure that all contact information is correct.

Requests for Tier 2 or Tier 3 reentry authorization must be resubmitted annually, well in advance of the start of hurricane season which begins June 1 of each year.

These actions should be completed no later than May 1 of each year.

## **3. Damage Assessment Action Plan**

The Preliminary Damage Assessment (PDA) is undertaken by local government forces who may be assisted by contractors. The PDA is focused on identifying the magnitude and extent of damage to allow an initial estimate of the amount of damage. The PDA is followed by detailed damage assessments by government entities for public infrastructure and by insurers and certain other parties for private property.

### **3.1. Damage Assessment at Padre Isles**

TXDOT is responsible for damage assessment for state roads and bridges.

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The CoCC will conduct damage assessment for streets in Padre Isles and for city-owned property such as parks. The CoCC will not conduct damage assessment on behalf of the PIMD or the PIPOA, but could assist in cases where severe creates a public safety hazard or a risk or subsequent damage that would qualify as Emergency Work under FEMA guidelines.

Evaluating damage to PIMD-owned infrastructure and property is the PIMD's responsibility. Since the PIMD is a political subdivision of Texas, any damage to owned property would be considered in the total used for Public Assistance Program eligibility and the estimated value of that damage would have to be provided to the state.

Damage to PIPOA-owned property and infrastructure will not be included in any consideration for the PA Program. The damage assessment for PIPOA property and other private property will be the responsibility of the PIPOA and its insurers.

### **3.2. Recommended Action for Damage Assessment**

The PIPOA and the PIMD should maintain a permanent record of the property for which those entities are responsible and which could be impacted by a major storm. The records should include the status of the property with respect to condition assessments, known problem areas, work in progress or planned, and any other pertinent information that could help in establishing pre-event and post-event conditions. Condition reports should be included.

Damage to PIMD-owned property could be eligible for federal cost recovery and documentation of impacts is crucial.

PIPOA-owned property is not eligible for federal recovery assistance; however, the same level of documentation will be necessary to establish pre-event conditions for insurance purposes and to plan for repair or restoration.

Damage assessment should be initiated as soon as post-storm conditions allow for safe operations.

### **3.3. Resources to be Assessed**

#### **3.3.1. Canal Bulkheads**

Canal bulkheads should be examined from both the land side and the water side to the extent practicable using maps of the subdivisions to document the areas covered and the findings.

The ongoing bulkhead inspection program will establish a baseline for assessing storm-related impacts. For the areas that have been inspected, the engineers performing the work have established a rating system to characterize varying levels of existing damage. Representative examples of each rating level should be used in the damage assessment. For areas that have

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yet to be fully examined, a preliminary assessment should be carried out as soon as practicable to gauge the overall general condition of the bulkheads in each area.

At a minimum, a general examination of the bulkheads should be conducted annually, prior to the beginning of the hurricane season, to aid in establishing pre-storm conditions.

### **3.3.2. Boat Ramps**

Since the boat ramps are contiguous to the bulkheads, they should be evaluated as part of the bulkhead inspection process.

### **3.3.3. Canals – Surface**

Impacts could include loose floating debris and damaged structures such as docks. A visual inspection of the canals should be conducted as soon as it is safe to do so to identify the nature and amounts of debris or pollutants and determine if immediate containment and removal action is necessary to eliminate health and safety threats.

Oil and hazardous materials pollution should be reported to federal and state agencies by calling the National Response Center (NRC) at 1-800-424-8802. If that is not possible, notify U.S. Coast Guard Sector Corpus Christi (USCG) at 361-939-6349/6393 and/or Texas General Land Office Region 3 (GLO) at 361-825-3300.

Removal of floating debris and pollutants could be eligible for emergency work classification to mitigate risks to public safety and the environment.

### **3.3.4. Canals – Bottoms**

Canal bottom impacts could include debris accumulations or siltation.

Side scan sonar surveys employed following Hurricane Harvey proved effective in locating and characterizing sunken debris.

The maintenance dredging records provide a reference for assessing the extent of siltation. Soundings should be taken on a regular basis. At a minimum, annual spot checks should be conducted. For areas with a history of siltation or storm impacts, soundings should be taken prior to the start of hurricane season.

Post-storm depth soundings should be taken in all areas where siltation is evident or suspected and in areas where past impacts have occurred, and compared to the most recent maintenance reports.

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#### **3.3.5. Aerators**

Documenting damage to aerator systems should be done at the same time as the canal impact assessments.

#### **3.3.6. PIPOA Building, Office Equipment, and General Property**

Evaluating damage to the building, office equipment, personal property, and miscellaneous general property will be solely the responsibility of the PIPOA and its insurers and would not be part of the PDA process.

#### **3.3.7. Shoreside Debris Estimates**

To the extent practicable, debris types and volumes on PIPOA / PIMD owned property should be estimated during the initial damage assessment. Debris on privately owned property is the responsibility of the property owner. Debris moved to the ROW will be removed by CoCC contractors, but (with very few exceptions in cases of public safety threats) neither contractors nor CoCC personnel will enter private property to remove debris.

### **3.4. PIMD Action Necessary**

The PIMD should:

1. Ensure that baseline conditions have been documented for all PIMD-owned property to allow comparison of post-storm conditions. That documentation should include the most recent condition surveys and records to show that the property has been properly maintained. To the extent practicable when faced with an impending coastal storm, existing conditions should be documented photographically, especially in areas known to be susceptible to damage or suspected to be at very high risk.
2. Identify an official representative of the PIMD to take the lead in managing damage assessment activities for PIMD-owned property. That individual will be responsible for coordination with Nueces County to ensure that the appropriate damage assessment documentation and reporting requirements are satisfied.
3. Contract with an engineer or other qualified professional capable of performing damage assessment for PIMD-property. The party chosen must be capable of providing the services without support from local entities, including being self-sufficient in terms of transportation to and within the site, and providing logistical support for its personnel. Since a major hurricane could render local resources incapable of performing the work, the party selected should either be from outside the local area or have resources that are not likely to be impacted by a major storm in the Corpus Christi region.
4. Inform the CoCC in writing of its selection of persons or firms to perform the duties described in 1 and 2 above, and request that they be granted Tier 2 reentry authorization.

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5. Complete the above actions annually prior to the start of hurricane season.

#### **3.5. PIPOA Action Necessary**

The PIPOA should:

1. Ensure that baseline conditions have been documented for all PIPOA-owned property to allow comparison of post-storm conditions. That documentation should include the most recent condition surveys and records to show that the property has been properly maintained. To the extent practicable when faced with an impending coastal storm, existing conditions should be documented photographically, especially in areas known to be susceptible to damage or suspected to be at very high risk.
2. Identify an official representative of the PIPOA to take the lead in managing damage assessment activities for PIPOA-owned property.
3. Ensure that its insurance carriers are capable of performing damage assessment for all PIPOA-property. The insurance company must be capable of providing the services without support from local entities, including being self-sufficient in terms of transportation to and within the site, and providing logistical support for its personnel. Since a major hurricane could render local resources incapable of performing the work, the party selected should either be from outside the local area or have resources that are not likely to be impacted by a major storm in the Corpus Christi region.
4. Inform the CoCC in writing of its selection of the person and insurance company chosen to perform the duties described in 1 and 2 above, and request that they be granted Tier 3 reentry authorization.
5. Complete the above actions annually prior to the start of hurricane season.

#### **3.6. Damage Assessment Contractor**

The PIPOA should:

1. In selecting a firm to conduct damage assessment work, consider firms that have resources available from outside the local area to overcome likely shortages of local resources.
2. Damage assessment forces should be licensed engineers, surveyors, or other professionals who can demonstrate familiarization with FEMA standards, capabilities and experience in damage assessment, and comprehensive documentation capabilities. The ability to develop detailed cost estimates for damage restoration is crucial. The ability to develop repair plans is beneficial.
3. The parties must be able to operate independently with little or no supervision, and be self-sufficient.



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4. Some damage assessment will have to be conducted on the water, and the selected firm must be able to provide that support.
5. Firms that are already engaged in work in the Padre Isles development should be considered where they fit these criteria. (Ex: Hanson/Naismith has performed condition surveys of the canal bulkheads for the PIPOA.

#### **4. DEBRIS REMOVAL ACTION PLAN**

##### **4.1. Debris Management Contract**

Since the PIPOA/PIMD does not have the capacity to undertake debris removal and disposal independently, it will be necessary to contract with a qualified firm to handle those operations. The CoCC has a pre-positioned contract program in place to provide debris management services and the scope of work for that contract can form a sound basis for a PIPOA / PIMD program.

If sometime in the future the PIMD takes responsibility for the canals, it may be possible for the PIMD to use the CoCC contract terms and provisions for the Padre Isles operations. In such case, certain state and federal contracting rules would apply.

If the PIPOA retains responsibility for cleanup in the canals, it could negotiate with any qualified contractor to provide the necessary services. It is reasonable to expect that Crowder-Gulf would be able to offer competitive terms for the work since the company is already contracted for work in Corpus Christi. Crowder-Gulf also handled the majority of the debris removal in Aransas County following Hurricane Harvey.

##### **4.1.1. Contract Content**

The contract should provide for a contractor to perform all of the work associated with debris removal from PIPOA / PIMD property, including debris in the canals.

The contractor should be made responsible for all aspects of the operations including compliance with all applicable safety, health, and environmental rules. The contractor should also be responsible for preparing debris collection and management sites, volumetric reduction and recycling to reduce disposal costs, transportation for disposal, disposal management, post-operation restoration of management sites and work-related damage or impacts, documentation at all stages, and all other actions associated with the debris management activities.

The contractor should also be charged with coordination with the CoCC operations at debris management and disposal sites.

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### **4.2. Canals**

Removal of debris from the canals and the proper handling, staging, management, transportation, and disposal of the materials should be handled under a carefully crafted scope of work specific to the Padre Isles project.

The contracts developed following Hurricane Harvey provide a basis for developing comprehensive contracts for future events. Contracting in advance is recommended.

#### **4.2.1. Accessibility**

It is expected that much of the debris removal will be conducted from the water. In most areas, accessibility from the shore is limited by structures that extend to and in some cases beyond the bulkheads. In general, only the canal-end lots and boat ramps offer direct access to the canals.

The contractor should be made aware of the acceptable access points.

#### **4.2.2. Floating Debris**

Some debris will be accessible from the shore and can be hauled out by hand or by equipment. Debris in the water can also be picked up using mechanical equipment such as knuckleboom cranes and winches mounted on boats or small barges.

The contractor should be tasked to aggregate debris in areas where it can be hauled out such as the canal ends and boat ramps.

#### **4.2.3. Sunken Debris**

Sunken debris will generally be collected from boats or barges. In most cases, it is expected that the work would be done after the majority of the floating debris has been collected.

#### **4.2.4. Boats and Vehicles**

Boats and vehicles remain the responsibility of their owners, including the responsibility for removing them from the water when necessary.

Boats adrift but not sunken should be moved to the nearest location where they could be moored securely without hampering the cleanup.

Boats sunk at a dock would not be removed by the contractor. Boats sunk in the canal that impede the debris removal operations would be lifted out of the water and placed on shore, preferably at a site identified by the PIPOA/PIMD and prepared by the contractor so as to minimize potential pollution.

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Vehicles, including golf carts and similar conveyances, will generally be handled the same as boats.

The contractor should be tasked to mark all sunken items that could not be removed.

### **4.3. Monitoring Debris Management Operations**

The PIPOA / PIMD must plan for monitoring and oversight of the debris management contractor's activities throughout the recovery period. The contractor's responsibilities do not relieve the PIPOA / PIMD of responsibility for safe and lawful management of the debris. The PIPOA / PIMD will have to verify that the work is performed in accordance with the contract requirements and the applicable regulatory requirements. Monitoring also will be necessary to determine the amount of work performed, amounts of debris removed, and the compensation due to the contractor.

### **4.4. Coordinate with the CoCC Waste Stream Management**

The CoCC will be responsible for managing citywide operations including the collection of household garbage as is done routinely. The CoCC will provide waste separation and staging guidelines for residents in order to help the contractor's waste stream management operations. The PIPOA should aid in disseminating that waste management information to residents through its normal networking procedures.

The PIPOA / PIMD contractor should be familiar with the CoCC program and be prepared to coordinate operations with those of the city and its contractors.

### **4.5. Oil Pollution and Hazardous Materials**

Removal, handling, storage, transportation, and disposal of polluting and hazardous materials must be undertaken in compliance with local, state, and federal guidelines. Persons conducting the work must be properly trained, certified, and equipped to perform the work safely. All stages of the operations must be fully documented.

With respect to pollutants and hazardous debris in the Padre Isles canals, it is expected that the GLO and TCEQ will have response oversight and the contractor must coordinate operations with them.

Those issues must be fully addressed in the debris management contract.

### **4.6. Siltation**

Unless it poses an immediate safety or navigation hazard, removal of accumulated soil should be integrated with the maintenance dredging program for the canals.

