PLAN Pinellas_COASTAL MANAGEMENT Supplemental

COASTAL MANAGEMENT SUPPLEMENTAL [CM] INTRODUCTION

All of Pinellas County is situated within a few miles of the Gulf of Mexico. The shoreline provides natural, economic, and recreational resources that contribute to quality of life and attracts residents and visitors to the area. The Coastal Planning Area of encompasses the entire County, because of its unique geography and the importance of its coastal resources. Sound coastal management practices that protect, restore, and enhance the overall quality of coastal resources are a priority. The goals, objectives, policies and strategies of the Coastal Management Element seek to balance the use and preservation of coastal resources by establishing a framework for more sustainable redevelopment and public expenditures while reducing risk to life and property. This policy framework is supplemented in detail by plans, policies and programs discussed herein, including, but not limited, to Pinellas County's:

- Local Mitigation Strategy (LMS)
- Post-Disaster Redevelopment Plan (PDRP)
- Comprehensive Emergency Management Plan (CEMP)
- Coastal Management Program (CMP)
- Capital Improvements Program (CIP)

Because coastal resources are intrinsic to Pinellas County, many of the statutory requirements of the Coastal Management Element are covered by many other Comprehensive Plan Elements, including:

| Торіс | Element |
|-----------------------------------|--|
| Coastal Area Natural Resources | Natural Resource Management and Conservation |
| Coastal Area Natural Resources | Recreation, Open Space, and Culture |
| Estuaries | Surface Water Management |
| Beach and Shoreline Public Access | Recreation, Open Space, and Culture |

Pinellas County is extremely susceptible to the effects of tropical storms and hurricanes, sustained rainfall events, rising sea levels, and the effects of climate change. As one of the most densely populated and heavily developed counties in Florida, the potential for the loss of human life, property, and natural resources is significant. The Coastal Management Element must balance the vulnerability of the County with the reality of existing human and physical influences. The protection of life is of primary importance; followed by the need to reduce risk to property and infrastructure investments while maintaining economic vitality.

The maps provided as part of this supplemental chapter are valid as of the date identified on the respective map. Please visit the County's Geographic Information System (GIS) tool for the latest information as linked here: <u>https://egis.pinellas.</u> <u>gov/apps/egis/</u>

CHAPTER 1 BEACHES AND DUNES¹

Beaches and dunes are valuable natural resources, providing protection for coastal development, habitat for many different coastal species, public open space for recreation, and the foundation of the County's tourism industry. Beaches and dunes are also the frontline defense when it comes to protection from storms such as hurricanes, tropical storms, and Nor'easters. They absorb the brunt of the energy from storms to provide a unique and natural protection to upland development and infrastructure.

^{1.} For more information on Pinellas County's barrier islands see: http://www.pinellascounty.org/environmental/coastal/

The barrier islands located along the Gulf Coast of Pinellas County form a string of long, narrow strips of sand separated from the mainland by the Intracoastal Waterway varying from less than 100 feet to more than 2,000000 feet in width. These islands are called "barriers" because they experience direct wave action and attenuate some of the wave energy before reaching the mainland.

GEOLOGIC ORIGIN AND SETTING OF PINELLAS BARRIER ISLANDS

Barrier islands are one of the most dynamic landscapes on earth and may have multiple origins. Until approximately 4,000 to 5,000 years ago the shoreline of Pinellas County was tens to hundreds of miles to the west. As the sea level has gradually risen due to the continued retreat of the glaciers, the shoreline has retreated to its current location. There are a few theories on the origin of barrier islands from a geologic perspective; one of these theories is through accretion of sand and other deposits on submarine sand bars. A modern-day example of this is the formation and accretion of Shell Key, Three Rooker Island, and several sand bars at the north end of Fort Desoto County Park. Once formed, these Islands may elongate through spit formation as is seen in Anclote Key and Honeymoon Island.

In northern Pinellas County most of the barrier islands are made of unconsolidated sediment 16 to 26 feet thick, which rest on the Tampa Formation, a limestone bedrock of Miocene age that dips to the south. Consequently, in southern Pinellas County barrier islands, the Hawthorn formation lies below the barrier islands and above the Tampa Formation. Unconsolidated barrier island sediments atop the Hawthorne Formation in southern Pinellas County are much thicker in relation to northern parts of the County. The upper most layer of unconsolidated sediment that comprise almost all of Pinellas Counties barrier islands are thought to have been deposited during the late Holocene and are much newer in age.

The barrier island chain along Pinellas County's Gulf coast consists of islands separated by inlets, referred to as passes. Inlets serve as an essential part of the coastal system by allowing for the flushing and mixing of back bay waters with water from the Gulf of Mexico during every change in tide. This flushing also acts as an outlet for storm waters coming in and out of the inlet, and aids in the overall quality of the water within the back bays. Inlet are used by people to access the Gulf for commercial and recreational purposes.

The beach zone includes the area from the dunes to offshore within the area of active sand movement. On an undisturbed barrier island, dunes are located immediately inland from the beach zone. Dunes in Pinellas County are usually less than 4 to 5 feet in height above the dry beach. Primary dunes, those closest to the beach, are the most important and should be protected for the wave attenuation they provide. Behind the primary dunes are the secondary dunes, which are usually not as high as primary dunes and are more extensively colonized by vegetation, whose root systems help to stabilize this environment. Dunes act as a reservoir of sand that naturally replenishes the beach as the dunes erode.

The beach zone and dunes function as an interactive system under natural conditions with sand passing between the parts of the system based on the prevailing meteorological conditions. In Pinellas County this flow of sand is crucial since the supply of sand for the barrier islands is primarily derived from the barrier islands themselves. The sand contained in the County's barrier islands is mostly a closed system because there is little contribution of sand from outside the system; however, an unknown amount of sand does move onshore periodically at some locations. Contribution from rivers to the open coast is negligible because most rivers drain into lagoons or estuaries where the sand is deposited. With no new sand entering the system other than through beach nourishment, the County's barrier islands are dependent upon the existing sand supply along its coast.

Most of the sand in Pinellas County is held in the beaches and dunes as well as in the ebb shoals and flood shoals of the major inlets in the county. The ebb shoal is the large sand feature that is normally found offshore of an inlet and is created by a combination of waves and tides. A flood shoal is the large body of sand found on the interior of the inlet and is generally deposited in the back bay by incoming tides (flood tides). Since the main source for Pinellas County beach renourishment projects are inlet-based sources, not much offshore exploration of sand sources has occurred.

This is partially due to having more easily accessible sand sources since the many inlet ebb shoals store sand that can be dredged up and used for beach renourishment. Other sources of sand that may be used to supplement the beach renourishment conducted by the county could include looking at offshore borrow areas or upland sand mines that have beach compatible material.

COASTAL PROCESSES

The West Central Coast of Florida is considered a low-energy coast. Hurricanes are infrequent and the winter frontal systems are rarely intense; however, most of the wave energy generated here is associated with winter frontal systems. Spring tidal ranges in Pinellas County are between 2.3 to 2.6 feet. Tides become significant during the few hurricanes that make landfall in or near the Pinellas coast. For example, the September 1848 hurricane produced a storm surge that was twelve feet (12') above normal, forming John's Pass by breaching a barrier island. In October 1921, a Category 4 hurricane produced a storm surge nearly nine feet (9') above normal and created Hurricane Pass by breaching Hog Island thereby forming Caladesi and Honeymoon Islands. Even though major hurricanes only hit periodically, the damage they cause can be catastrophic and can even change the entire coastline. It is also important to note the increasing frequency of smaller storms and the erosion and flooding impacts associated with them due to rising sea levels.

The low-energy waves drive littoral drift and longshore transport of sand. This steadily moves sand parallel to the barrier islands. The sand in Pinellas County tends to move from North to South coinciding with the dominate direction in which waves approach the coast from offshore. However, this tendency changes in some areas along the county where the trend can be temporarily reversed. Examples of this include in and around the major inlets where the tides can influence the alongshore transport. This is called a divergent zone and can result in a much more erosive coastline compared to adjacent beach erosion rates. Estimates of the amount of sand transported along the Pinellas County coast range from 15,000 to 100,000 cubic yards per year. If this sand supply is interrupted for any reason (e.g., inlet, groin, jetty) then the downdrift beach may be starved of sand. There is also sand movement offshore and onshore, perpendicular to the coast. Gentle waves tend to push sand up on the beach. Stronger waves, more typical in the winter and when tropical systems pass, carry sand offshore from the beach.

The beach condition is dependent on the net balance between erosion and accretion. The beach responds to energy changes to produce a three-dimensional profile that is in equilibrium with that specific energy regime. Storms remove beach sand that is normally replaced from berms or dunes under natural conditions. For example, during the high-energy winter months, the increased wave heights require a broad offshore sand apron and an offshore bar system to break the wave energy prior to reaching the swash zone. In order to adjust to this change in energy regime, the profile of the sandy beach changes. In summer, when there is less energy and wave heights are lower, the opposite occurs, and berms and dunes are replenished from the nearshore areas. Loss of dunes or berms, as has so often been the case in Pinellas County, reduces the reserve sand held in storage. Consequently, the system is no longer as capable of replacing sand losses from severe storms. Smaller beach widths mean less sand can be held in the profile to aid in beach recovery under normal conditions and during natural post storm recovery. Major storms, such as hurricanes, flush out the inlet and the sand is transported laterally where it is used to absorb the storm energy in the beach zone.

Trends in erosion and accretion are measured in terms of mean high water shoreline changes and volumetric accretion and erosion. According to the Florida Department of Environmental Protection (FDEP) 2020 Strategic Beach Management Plan, there are 39.3 miles of beach of which 23 miles have been designated critically eroded. Since 1950, the shoreline has responded less uniformly, with some stretches continuing to recede and others exhibiting accretion, or an advance in the shoreline. In many instances, accretion since 1950 has been primarily attributed to corrective action (e.g., construction of shoreline protection structures and beach renourishment projects). During the time period from 1873 to the latter 1970's, erosion has been severe on Honeymoon Island, the beaches on the central and southern portions of Clearwater Beach Island, and on the beaches on Sand Key, Treasure Island, Long Key and Mullet Key.

EARLY DEVELOPMENT

Intensive development of the Pinellas County barrier islands began at the beginning of the twentieth century.

Shoreline development, such as multi-story luxury resort hotels, occurred from the 1890s through the 1930s. In the 1950s and the 1960s, national-chain hotels and small motels were built. From the 1960s through the 1980s, multi-story apartments and condominiums were the primary development activity along the shoreline, as were large commercial strip centers that are almost entirely dependent upon tourism.

In 1958, the Pinellas County Water and Navigation Control Authority established bulkhead lines to protect and preserve waterways from dredging, pumping, or other alterations of the shoreline. Upon the urging of the Pinellas County Board of County Commissioners, the Florida Legislature established an aquatic preserve for Boca Ciega Bay. All remaining sovereign submerged lands in Pinellas County were subsequently added to the aquatic preserve system. These actions limited horizontal dredge and fill development on the bayside of the barrier islands.

During the 1960s and 1970s, vertical construction on the barrier islands expanded, characterized by large multi-story, multi-family, and commercial buildings. In the late 1970s and the 1980s, local governments made further attempts to control coastal development and redevelopment through height restrictions, greater setbacks, realistic parking requirements, environmental regulations, and land use and environmental planning.

As shoreline development continued to encroach on the natural beach and dune system, the landward migration of the shoreline in certain areas and the occurrence of major storms posed a threat to these structures. An effort was made to stabilize the eroding beaches through shoreline engineering. The strategies normally used to stabilize the shoreline include: beach renourishment, groins, jetties, and seawalls.

Other more recent engineering projects have included the construction of structures on John's Pass, Clearwater Pass, Pass-a-Grille Channel, and Blind Pass, as well as dredging of those passes for navigation or beach fill. Much of the erosion and loss of beach in Pinellas County was the result of building upon the dunes and in the active beach zone. This interferes with the natural coastal processes causing the beach in many areas to recede. As the coastline transgresses, seawalls have been constructed in the active beach zone to protect threatened structures. Exposed seawalls accelerate beach erosion and often result in a steepened offshore beach profile. This is because seawalls do not allow for the absorption of wave energy causing the beaches to scour out. The steep profile increases storm-wave energy striking the shoreline, thus exacerbating erosion, and often resulting in the need to reinforce the structure.

With a natural beach and dune system, the profile adjusts to the storm beach profile and usually recovers completely under normal post-storm conditions; whereas the bulkhead isolates the beach from dune material and interferes with its transfer to the beach. Additional municipal shoreline protection and beach renourishment projects have occurred post-1950. Currently, restoration efforts focus on engineering natural solutions, such as breakwaters and beach renourishment. The use of hard engineering structures is only permitted if beach renourishment or other soft engineering measures are insufficient to maintain the beach and dune system. Since structures can cause unintended harm to downdrift beaches, they are normally reserved as a last resort, are heavily monitored, and modeled before permanent implementation.

COASTAL MANAGEMENT PROGRAM²

In addition to their environmental value, Pinellas County's beaches and barrier islands are an important component of the local tourist industry and the local tax base. Due to this importance, the County supports and implements its Coastal Management Program. Beach renourishment projects include dune restoration and monitoring for erosion. Projects are also assessed for their suitability for sea turtles to nest (including such things as an analysis of the physical characteristics of the sand, slope of the beach face, timing of the project, etc.).

2. For the latest information on the County's Coastal Management Program see: <u>http://www.pinellascounty.org/environment/coastalMngmt/</u> <u>default.htm</u>

Pinellas County has constructed over 70 dune walkovers in the communities of Madeira Beach, Indian Shores, Indian Rocks Beach, Treasure Island, and St. Pete Beach. The Coastal Management Program is updated annually through the County's Capital Improvement Program.

As a result of past development activities and building practices on the municipal barrier islands, there will be a continual need for beach renourishment.

Beach renourishment is expensive and the economic investment needed to maintain the beaches will continue into perpetuity. However, the beaches are one of the County's most valuable natural assets and the foundation for a significant sector of the economy. The beaches provide extensive recreational benefits, protection for coastal development, as well as a valuable environmental habitat. Therefore, resource protection and restoration, and beach renourishment activities continue to be the best available option to protect this valuable natural, social, and economic asset.

CHAPTER 2 COASTAL LAND USES

The first inhabitants of Pinellas County settled primarily on sheltered coastal areas convenient to the waterways connecting the peninsula to other areas. As the population of the United States acquired more leisure time and greater mobility, the beaches and barrier islands of Pinellas County became more viable for development. The waterfront property was consumed and additional acreage was created by extensive dredge-and fill operations on the bayside until the 1970s. From the 1970 s to the current period, development on the barrier islands and waterfront areas intensified, with smaller scale tourist accommodations being replaced with larger hotels and condominiums. Meanwhile, the interior of Pinellas County experienced sprawling suburban growth to support hundreds of thousands of new residents, many of them attracted by the favorable climate and coastal amenities. This resulted in Pinellas County becoming the most densely-populated county in Florida.

The County has over 35 miles of sandy barrier island beaches, located in municipal jurisdictions. The barrier islands under the jurisdiction of the Pinellas County Board of County Commissioners are largely undeveloped and designated as Preservation or Recreation and Open Space. This includes the southern portion of Anclote Key, Three Rooker Bar, Shell Key, and Mullet Key.

The non-beach shoreline of Pinellas County is also under the control of multiple jurisdictions. These lands are less intensely developed than the barrier islands, mainly consisting of residential areas, parkland, and open space. The primary unincorporated non-beach shoreline areas include Palm Harbor and Tierra Verde.

Coastal areas in Pinellas County contain a diverse array of land uses, ranging from natural open spaces to intensely developed barrier islands. Much of the tourist-oriented retail, service development, and water-dependent uses are located in barrier island municipalities. Coastal Pinellas County contains a mix of uses including large natural areas, resource-based recreational lands, and residential uses. There are few water-dependent commercial and industrial uses.

For a depiction of existing and future land uses, please see the Existing Land Use Map in the Future Land Use Element.

Although single-family residential development prevails along the coastline of unincorporated Pinellas County, there are two major areas where multi-family development is a significant component of the existing land use. Portions of Feather Sound and Tierra Verde are designated for residential development at up to 12.5 units per acre. Other major land uses located along the unincorporated coastline are the St. Petersburg/Clearwater International Airport and a power plant in the Gateway Area.

For the purposes of this Comprehensive Plan, water-dependent and water-related uses are defined as follows:

<u>Water-Dependent Uses</u> are activities that can be carried out only on, in or adjacent to water areas because the use requires access to water. Water-dependent uses in unincorporated Pinellas County include boat ramps, marinas, electrical generating facilities, fisheries and marine products, large boat repair and maintenance facilities, fishing piers, public beaches and public access to the beach or shoreline through public lands, private property open to the general public, or other legal means and upland support for water-dependent uses, such as parking (except for beach or shoreline access), storage and warehousing, restrooms and bathhouses, food services, etc.

<u>Water-Related Uses</u> are activities not directly dependent upon access to water, but which provide goods and services that are directly associated with water-dependent or waterway uses.

Since land use along much of the County's coastline is already established, land use patterns have largely been set. Preservation land, residences, residential related business, and parkland comprise most land along the coast of unincorporated Pinellas County.

As the population of the Tampa Bay area continues to grow there will be increasing demands placed on Pinellas County's coastal waters. Since some of these demands will require direct water access, an understanding of the future need for water-dependent and water-related uses can serve as a guide in determining appropriate land use designations in the coastal area. Projected future water-dependent and water-related uses are described below.

Boat Ramps – There are currently 109 boat ramp lanes available to the public in Pinellas County, including 55 in the unincorporated County. More than half of the overall total boat ramp lanes are managed by the Pinellas County Board of County Commissioners. The number and distribution of boat ramps has remained relatively static, with more in the southern portion of the County. Like other types of public water access, acquiring already scarce land for additional ramps is expensive and may present compatibility issues. Please see the Recreation, Open Space and Culture Element for a comprehensive listing of countywide boat ramps and their available amenities.

Fisheries and Marine Products and Processing Plants – These facilities are primarily concentrated in coastal municipalities and have faced increasing pressure from the encroachment of residential and tourist-related facilities.

Large Boat Repair and Maintenance Facilities; Commissioning Yards – Improved technology involved in large boat repair has made the business more efficient, and improved products have decreased the frequency of repairs. These two factors have decreased demand in the marine boat yard business. As a result, the existing large boat repair facilities and commissioning yards are expected to be adequate for meeting demand in the planning horizon. However, as with marinas and waterfront tourist accommodations, the supply of boat yard businesses in Pinellas County could be affected by land values, and there is the potential threat of conversion to other uses. Therefore, the County should monitor boat yard conditions.

Marinas – Pinellas County purchased its first marina property in 2006 and maintains the goal of providing equitable public water access. The Recreation, Open Space and Culture Element of this Comprehensive Plan provides a countywide marina inventory and graphical depiction of their locations.

Dry storage requires less acreage for storage and services per boat than wet storage and has less potential to disturb adjacent water resources than wet storage. Increased future usage of dry storage may be a better alternative for the future of Pinellas County.

Marine Terminal (Port of St. Petersburg) – This facility is located within the City of St. Petersburg and is, therefore, not discussed within the County's Comprehensive Plan.

Non-Boat Saltwater Fishing (piers, catwalks, boardwalks, and jetties) – Note that any new non-boat saltwater fishing facility will likely require permits from numerous government agencies. Should a County Permit be required, such a

facility must – at a minimum – satisfy strict criteria outlined in Pinellas County Code. Please see the Public Access to the Water section of the Recreation, Open Space and Culture Element of this Comprehensive Plan for more information.

Public Beach Access – All beachfront property in Pinellas County is privately owned or is being used for public beach access or other public purpose. The Board of County Commissioners provides several beach access parks throughout the County to accommodate public access needs. Even so, the acquisition of additional access remains a primary goal. For additional discussion, please see the Recreation, Open Space and Culture Element of this Comprehensive Plan.

Tourist Lodging and Services Associated with Water-Dependent Recreation – These land uses are concentrated in the barrier island municipalities where there is immediate access to the Gulf beaches. The barrier islands are intensively developed and have little vacant land remaining for expansion of tourist lodging, except for redevelopment. The remaining vacant land is generally protected by public ownership.

U.S. Coast Guard and Other Public Agency or Educational Docking Facilities – The U.S. Coast Guard station in unincorporated Pinellas County is located adjacent to the St. Petersburg-Clearwater International Airport and is strictly an air station with no water-dependent or water-related uses. There are additional Coast Guard facilities in the municipalities of Clearwater and St. Petersburg.

There are few suitable vacant parcels remaining for public acquisition for beach access. The main siting criteria is availability of land. Beyond that, the following criteria would apply to both beach and shoreline access sites:

- Adequate transportation facilities to accommodate the projected number of visitors.
- The intended use would be compatible with the surrounding land uses.
- The site should have adequate provisions for providing sewer and potable water.
- Sites that would support multiple objectives are preferred. Complementary objectives include natural resource conservation, hazard mitigation, and water management.

COASTAL ECONOMIC BASE

A large portion of the Pinellas County economy is based upon visitors and the goods and services they purchase. Pinellas County's coastal parks draw many visitors and generate tax dollars through parking fees and supporting tourism-related industries (lodging, restaurants and specialty retail). The economic conditions of specific regions of the United States, coupled with the Canadian, European and other foreign economies, impact the economic outlook for visitor-related industries. Significant world events play a crucial role in tourism. Gross sales and tax collections have shown a steady growth trend since recovery from the Great Recession. Pinellas County brought in a record high of \$63 million in bed tax revenues in Fiscal Year 2019. However, 2020 revenues have been severely impacted by the COVID-19 pandemic. Fiscal Year 2019 is likely to represent a peak until the global economy enters a recovery from the effects of the COVID-19 pandemic.

Finfish, shrimp and invertebrate landings for the State of Florida and Crystal River-Tarpon Springs can be found at <u>https://public.myfwc.com/FWRI/PFDM/ReportCreator.aspx</u>. While State landings have fluctuated, Crystal River-Tarpon Springs landings have slightly decreased between 2005 and 2019 as a percentage of statewide totals. The potential conversion of the County's fishery infrastructure into other uses due to high demand for waterfront property is a concern; however, the industry appears relatively stable.

Other marine industries in Pinellas County, such as motorboats, commercial fishermen, and seafood dealers, also contribute to the County's economy. These sectors were steady but will likely be at least temporarily affected by the pandemic. The red tide cleanup industry also contributes to the County's economy. Red tides, or harmful algal blooms, are naturally occurring phenomena that can be exacerbated by man-made nutrient sources. In Pinellas County, red tides

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are predominantly caused by *Karenia brevis*, which produces toxins that cause marine vertebrates to die. During red tide events, state, county and municipal agencies work together with contractors to collect and dispose of dead marine life to minimize negative impacts.

SHORELINE LAND USE CONFLICTS AND REDEVELOPMENT NEEDS

The shoreline of Pinellas County has a diversity of land uses which can create conflict between different uses. Land use conflicts can take various forms that may include one or more of the following:

- Degradation of the natural environment
- Adverse impact on the economic base of the coastal area
- Disruption of established land use patterns
- Adverse impact on existing infrastructure

Unincorporated coastal Pinellas County is largely precluded from development either because of State or local environmental regulations or because the property has been acquired for protection and public use Such areas include the Gateway tract of the Weedon Island Preserve on the western end of the Howard Frankland Bridge, portions of southeast Oldsmar along the Pinellas/Hillsborough County line, and wetlands along the Anclote River in the Tarpon Springs area.

Over the last several decades, the County has determined that the highest and best use for most remaining undeveloped, unincorporated land is to maintain it in its natural condition, particularly along the shoreline. As development attempts to expand onto more marginal coastal properties, the further destruction of natural coastal resources is a possibility. The natural resources of the coastal area are beneficial in numerous ways. They provide protection from the effects of hurricanes and other coastal storm events, contribute to water quality, provide natural habitat, offer recreational opportunities, help define community character, provide respite from the surrounding urban environment and contribute immeasurably to the County's economic well-being. An understanding of the role and importance of the natural system, and how and where redevelopment can occur without harming these resources is necessary to ensure that future growth and preservation of our natural resources occur harmoniously.

Marinas and large boat repair facilities constitute another category of non-residential shoreline uses in Pinellas County. Marinas are of several types. Some are associated with a condominium project and are, therefore, located in a residential area. Other marinas, however, are open to the general public and are under private or public ownership. Such facilities may not be compatible with some residential developments due to traffic and noise concerns. Some marinas are located in commercial nodes where there is little or no conflict with nearby residential uses. Such areas, however, are often considered ideal locations for condominium development. Because of the greater return on investment, the conversion of marinas to condominiums has been occurring throughout Florida and is a proven source of marina loss in Pinellas County. Marina slip losses in Pinellas County are difficult to recoup because there are few available sites for additional marina development that are not precluded by environmental constraints and/or potential neighborhood opposition.

Large boat repair and maintenance facilities are sometimes associated with a marina or may be a separate boat yard. This type of land use is more intensive than a marina land use and is more appropriately considered an industrial or heavy commercial use, which can be incompatible with residential development.

The shoreline uses servicing the commercial fishing business are also generally concentrated in the marine commercial/ industrial nodes. These operations, which include docking facilities and seafood processing plants, are also dependent upon shoreline access and may not be compatible with residential development.

COASTAL HIGH HAZARD AREA

The coastal high-hazard area (CHHA) in the County is extremely vulnerable to natural hazards. The coastal high-hazard

area is defined by the Florida statutes as "the area below the elevation of the Category 1 storm surge line as established by a Sea, Lake, and Overland Surges from Hurricanes (SLOSH) computerized storm surge model."³ The CHHA is the area with the highest risk from a combination of high-velocity wind and coastal storm surge flooding.

The SLOSH model is a computer model that predicts tidal surge heights and flooding that result from hypothetical hurricanes that vary in pressure, size, forward speed, direction, and winds. The SLOSH model was last updated in 2020. Since the previous SLOSH update in 2016, the CHHA has grown by nearly 7,700 acres in Pinellas County. The CHHA now covers about 30 percent (%) of the land area in the County.

The CHHA increased because the modeling technology improved. The 2016 model had more refined and accurate input data and ran nearly eight (8) times for as many scenarios as the 2008 model. As modeling technology continues to improve, even more areas may be included in the CHHA; particularly because the SLOSH model is based on current conditions and does not attempt to factor in the future effects of climate change.

Development in the CHHA is limited by both Florida Statutes, Forward Pinellas's Countywide Plan, and the Pinellas County Comprehensive Plan. These areas are not only found along major coastlines, but also further inland near lakes, rivers, and creeks where storm surge can be pushed during a hurricane. To account for future conditions, the Pinellas County Comprehensive Plan expands land development restrictions beyond the CHHA to the Coastal Storm Area (CSA) (See Figure 1), which includes the CHHA and:

- All land connected to the mainland of Pinellas County by bridges or causeways;
- Isolated areas projected to be inundated by storm surge from a Category Two hurricane or above by the SLOSH, the most recent surge models that are surrounded by the CHHA, or by CHHA and a body of water; and
- All land located in "V" "VE" or "V1-30" velocity zones designated by the federal emergency management agency (FEMA) flood insurance rate maps.

The location of new or expanded hospitals, nursing homes, and assisted living facilities, or site improvements that would increase the bed capacity of these facilities are prohibited within the CSA. The Future Land Use Element and Land Development Code restrict all (re)development in the CSA and directs residential population concentration out of the CSA.

County funded public infrastructure expenditures that could subsidize (re)development in the CSA are restricted to:

- Maintenance, repair, or replacement of existing facilities (including bridges and causeways to barrier islands);
- Hardening existing infrastructure to avoid, mitigate, or reduce the potential for future damages from hazards, such as storm surge and sea level rise;
- Restoration or enhancement of natural resources or public access;
- Address an existing deficiency identified in this plan;
- New or retrofit of existing stormwater management facilities for water quality enhancement of stormwater runoff; or
- Fund a public facility of overriding public interest to ensure public health, safety, and welfare.

Most of the CHHA in Pinellas County is already developed with resort, housing, and commercial facilities. Many structures built prior to current federal, state, and local regulations designed to reduce risk from hurricane hazards still exist. These structures are more susceptible to damage or destruction by major storms and other tropical weather as well as king tides, which have increased in frequency and inundation area in recent years as of 2021.

3. FS 163.3178(2)6.(h)

Within unincorporated Pinellas County, the existing and future land uses in the CHHA have had little change, despite development and economic pressures to build more intensely at the coastline. The health, safety, and welfare of our residents is paramount: therefore, PLANPinellas establishes policies to reduce risk of life and property.

INFRASTRUCTURE IN COASTAL HIGH HAZARD AREA

The County's public infrastructure within the CHHA generally are transportation facilities, parks and recreational facilities, public utilities, and shore-hardening structures that protect other public facilities.

There are many of bridges throughout the CHHA that connect to the barriers, with a few examples of major transportation facilities located in the CHHA, including:

- Dunedin Causeway
- Portions of Belleair Causeway
- Gandy Bridge
- Howard Frankland Bridge and Causeway
- Courtney Campbell Causeway
- Bayshore Boulevard
- Fred Howard Parkway
- Pinellas Bayway
- State Route 580 Bridge at Safety Harbor
- Bayside Bridge
- Lake Seminole Bridge
- Gulf Boulevard

Forward Pinellas, in collaboration with the Hillsborough and Pasco Metropolitan Planning Organizations, Tampa Bay Regional Planning Council, and Florida Department of Transportation District 7, was awarded a Federal Highway Administration Resilience and Durability to Extreme Weather grant to study this problem and integrate solutions into each MPO's 2045 Transportation Plan (LRTP). The study's findings include:

"...about 11 percent of the region's roadways are highly vulnerable to storms, sea level rise, and heavy precipitation, an additional eight percent of the roadways are of moderate vulnerability. Among these high or moderate vulnerable roadways, over one third are facilities that are highly critical to the region's safety, mobility, and economy."⁴

Many County parks are located within the CHHA. Infrastructure within these parks includes administration buildings, maintenance buildings, park supervisors' residences, parking lots, restrooms, changing facilities, fishing piers, boat ramps and dock facilities, playgrounds, trails, and picnic facilities. Additionally, portions of the Pinellas Trail, as well as beach access parks as listed in the Recreation and Open Space Element, are also found in the CHHA. These facilities could be subject to storm surge damage and/or flooding due to tropical weather.

Other important County-operated public facilities located within the CHHA are the South Cross Bayou Wastewater Treatment Plant, the W.R.E. Dunn (North Pinellas) Wastewater Treatment Plant, and portions of the St. Petersburg-Clearwater International Airport. Operation of these critical wastewater treatment facilities are particularly vulnerable to the impacts of storm surge and debris.

Pinellas County Utilities (PCU) distributes water to both retail and wholesale customers. PCU provides potable and wastewater service to most of the unincorporated areas and several municipalities. A very small percentage of the County remains on private wells or septic systems. Clean drinking (potable) water and wastewater infrastructure in the CHHA is susceptible to storm damage. There are also many stormwater conveyance structures in the coastal area that could be damaged by storm surge.

4. "Technical Memorandum Resilient Tampa Bay: Transportation Pilot Program Project FHWA Resiliency & Durability to Extreme Weather" <u>https://</u> forwardpinellas.org/wp-content/uploads/2020/01/8a-DraftFinalReport_Resilient-Tampa-Bay.pdf



Figure 1: Coastal Storm Area and Coastal High Hazard Area

PLANNING FOR SEA LEVEL RISE

Global sea levels are rising, partly because ocean waters are expanding as they warm, and partly because ice sheets and glaciers at the poles are melting and adding more water volume. A NOAA measuring station in St. Petersburg, which was established in 1946, shows Tampa Bay rising more than 10 inches in the last century, mirroring a worldwide trend. Forecasts of future sea level rise (SLR) vary, but the fact-based consensus is that this trend will continue and accelerate (Table 1). In coastal communities, rising waters could shrink beaches and inundate public infrastructure leading to a far less resilient coastline to also protect from storm events, which are predicted to get stronger and more frequent.⁵

| TABLE 1: NATIONAL OCEAN AND ATMOSPHERIC ADMINISTRATION (NOAA) FORECAST SEA LEVEL CHANGE RELATIVE TO THE YEAR 2000 FOR ST. PETERSBURG, FL ⁶ | | | | | | |
|--|---------------------------------|-----------------------------|---------------------|--|--|--|
| Year | NOAA Intermediate-Low (feet) | NOAA Intermediate (feet) | NOAA High (feet) | | | |
| 2030 | 0.56 | 0.79 | 1.25 | | | |
| 2040 | 0.72 | 1.08 | 1.77 | | | |
| 2050 | 0.95 | 1.44 | 2.56 | | | |
| 2060 | 1.15 | 1.87 | 3.48 | | | |
| 2070 | 1.35 | 2.33 | 4.56 | | | |
| 2080 | 1.54 | 2.82 | 5.71 | | | |
| 2090 | 1.71 | 3.38 | 7.05 | | | |
| 2100 | 1.90 | 3.90 | 8.50 | | | |

In recognition of the long-term and increasing threat of sea level rise to our community and assets, Pinellas County has implemented *Guidance for Incorporating Sea Level Rise into Capital Planning*. The Guidance provides a framework for evaluating SLR within the capital improvement program process.

Pinellas County is also preparing a comprehensive, countywide vulnerability assessment, which will conclude in 2021. Long-term capital investments, policies, and strategies to mitigate or adapt to the environmental shifts associated with climate change will be identified. Project assumptions are based on the NOAA's sea-level rise scenarios.

Predicted future tidal flood mapping for the years 2040, 2070, and 2100 are being developed to plan for short-term and long-term analysis of the County's exposure to sea level rise. The maps will project the extent of flooding at both average high water and higher flooding thresholds. Probabilistic future storm-surge maps are also being developed using modeling that considers sea level rise, the projected effects of climate change on the frequency, intensities and tracks of tropical systems, and accounts for wave action.

As of 2021, the County is developing a county-wide asset database, capturing the location and attribute information for potable water supply, wastewater management, stormwater management, transportation, natural gas, and electrical infrastructure. Using the tidal flooding and storm surge inundation maps, the risk of flooding at these thousands of assets can be evaluated for multiple horizons and scenarios.

County analyses intend to determine damage costs for each general asset class that include damage repair to each type of facility and socioeconomic costs to the surrounding communities. These costs will then be used to score the vulnerability of the asset providing a risk-based, system-wide vulnerability assessment so the County can identify where best to initiate adaptation efforts.

^{5.} Bender, Morris A., et al. "Modeled impact of anthropogenic warming on the frequency of intense Atlantic hurricanes." Science 327.5964 (2010): 454-458.

^{6.} Recommended Projections of Sea Level Rise Tampa Bay Climate Science Advisory Panel In The Tampa Bay Region, April 2019 <u>http://www.tbrpc.</u> org/wp-content/uploads/2019/08/CSAP_SLR_Recommendation_2019_Final-1.pdf

The vulnerability analysis facility-level adaptation assessments. The scenario-based approach will include a detailed benefit-cost analysis of each alternative under each climate scenario to develop recommendations for adaptation options.

The findings of the Pinellas County Vulnerability Assessment will be incorporated by reference into the Comprehensive Plan once adopted.

CHAPTER 3 NATURAL DISASTER PLANNING

The inventory and analysis of evacuation and shelter populations is based upon the Tampa Bay Region Evacuation Study 2017, prepared by the Tampa Bay Regional Planning Council (TBRPC). This study used the SLOSH numerical storm surge prediction model to analyze the expected hazards from potential hurricanes affecting the Tampa Bay region. The SLOSH model considered hypothetical hurricanes covering the entire range of the Saffir/Simpson Damage Potential Scale, from Category 1 (least intense) to Category 5 (most intense). Using the results of the SLOSH model, five levels of vulnerability to storm surge were identified for different intensities and types of approaching hurricanes. The results of this storm surge hazard analysis allow for the storm tide limits to be graphically identified based on the maximum storm surge for Categories hurricanes rated categories one through five (1-5). These five vulnerability levels are used to identify Pinellas County's five evacuation levels (A through E) in which each evacuation level includes a successively larger land area that must be totally evacuated from overland storm surge as well as all mobile home residents throughout the County (Table 2 and Figure 2). For hurricanes, these evacuation levels correspond to a hurricane's intensity on the Saffir/Simpson Scale.

| TABLE 2: VULNERABLE POPULATION IN PINELLAS COUNTY ⁷ | | | | | | | |
|--|-----------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------------|
| | Mobile Homes | Evacuation Zone A | Evacuation Zone B | Evacuation Zone C | Evacuation Zone D | Evacuation Zone E | Total County Population |
| Total | 76,383 | 195,659 | 79,948 | 90,269 | 123,635 | 56,018 | 959,103 |

Number of Persons Requiring Evacuation:

The number of persons requiring evacuation within Pinellas County (Table 3) is based upon scenarios and assumptions provided by the Tampa Bay Regional Council (TBRPC) and population figures, and includes the population-at-risk, estimated seasonal population and an additional shadow evacuation; i.e., the number of persons not-at-risk that would still evacuate.

7. Florida Statewide Regional Evacuation Program, Florida Division of Emergency Management, Tampa Bay Regional Planning Council – Tampa Bay Region 2020



Pinellas County Evacuation Zones and Shelters

Figure 2: Evacuation Zones and Shelter Locations

| TABLE 3: EVACUATING POPULATION ESTIMATE ⁸ | | | | | | | |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|--|
| Type of Home | Evacuation Level A | Evacuation Level B | Evacuation Level C | Evacuation Level D | Evacuation Level E | | |
| Site Built Homes | 195,659 | 275,607 | 365,876 | 489,511 | 545,529 | | |
| Mobile/ Manufactured Homes | 76,383 | 76,383 | 76,383 | 76,383 | 76,383 | | |
| Tourists | 18,033 | 20,728 | 21,616 | 22,116 | 22,607 | | |
| Total | 290,075 | 372,718 | 463,875 | 588,010 | 644,519 | | |

From a transportation management standpoint, the number of vehicles evacuating is more important than the population evacuating (Table 4).

| TABLE 4: VEHICLES EVACUATING ⁹ | | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|--|
| Type of Home | Evacuation Level A | Evacuation Level B | Evacuation Level C | Evacuation Level D | Evacuation Level E | | |
| Site Built Homes | 103,923 | 128,784 | 186,287 | 236,923 | 292,977 | | |
| Mobile/ Manufactured Homes | 33,641 | 35,511 | 39,975 | 43,314 | 44,796 | | |
| Tourists | 6,840 | 8,100 | 8,831 | 9,090 | 9,344 | | |
| Total | 144,404 | 172,395 | 235,093 | 289,327 | 347,117 | | |

PUBLIC SHELTERING

The estimate of Pinellas County public shelter demand is based on surveys and behavioral assumptions. Public shelter demand estimates range from 15,314 people in a Category 1 evacuation to 58,433 people in a Category 5 evacuation.¹⁰

When an evacuation order is given, most people in the affected Hurricane Evacuation Zone will begin to seek alternative shelter from the storm. The decision to evacuate to a less vulnerable location within the County or to leave the region entirely is based upon many factors. Evacuees not using public shelters (Figure 2) will seek shelter in a variety of ways, e.g., leaving the region, checking into a hotel or motel, or staying with friends or relatives in less vulnerable areas of the County.

Pinellas County promotes the "Host Home" concept as the preferred kind of evacuation. The Host Home program solicits churches, businesses, and organizations to predetermine the evacuation status of all members, encourage members living in non-evacuation areas to host those living in evacuation areas or mobile homes, and in cases where the entire membership lives in evacuation areas or mobile homes, encourages a church/facility in a non-evacuation area to serve as the "Host" to the other organization's membership. Additionally, public education and information are used to discourage people who do not need to evacuate from using public shelters. Other alternatives to a traditional public sheltering include retrofitting existing structures, utilizing refuges of last resort as appropriate, and the evacuating of guests from transient accommodations to inland "sister" transient accommodations.

^{8.} Florida Statewide Regional Evacuation Program, Florida Division of Emergency Management, Tampa Bay Regional Planning Council – Tampa Bay Region 2020

Public shelters should be considered a shelter of last resort, because space and comforts are limited. The Pinellas County School Board has significant responsibilities in transporting and sheltering during emergency situations, and is supported by the County and other partners.

A significant number of vehicles move across Pinellas County roads and the regional road network in an evacuation. The County must be prepared to evacuate the vulnerable populations on critical routes, which may be concurrently evacuating populations from adjacent counties. Movement of traffic along the evacuation routes is directly affected by the planned destinations of evacuees and the availability of acceptable destinations within the County or outside the County.

Figure 2 identifies emergency shelters within Pinellas County and the primary regional evacuation routes for people leaving Pinellas County.

EVACUATION CLEARANCE TIMES

Evacuation clearance time refers to the estimated time it would take to clear the roadway of all vehicles evacuating in response to a hurricane situation. Calculated clearance times are used by emergency managers as one input to determine when to recommend an evacuation order. This calculation can include the population-at-risk, shadow evacuees, as well as evacuees from other counties anticipated to pass through the county. Clearance time includes the time required for evacuees to secure their homes and prepare to leave, the time spent by all vehicles traveling along the evacuation route network, and the additional time spent on the road caused by traffic congestion. Clearance time does not relate to the time any one vehicle spends traveling along the evacuation route network, nor does it guarantee vehicles will safely reach their destination once outside the County. Four clearance times were calculated as part of the TBRPC evacuation transportation analysis (Table 5):

Clearance Time to Shelter - The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the county based on specific assumptions. Calculated from when the evacuation order is given to when the last vehicle reaches a point of safety within the county.

In-County Clearance Time - The time required from evacuation until the last evacuee can either leave the evacuation zone or arrive at safe shelter within the county (which is not in an A - E evacuation zone).

Out of County Clearance Time - The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the county and all out of county evacuees have left the county but may still be evacuating. Calculated from evacuation order to when the last vehicle assigned an external destination exits the county.

Regional Clearance Time - The time necessary to safely evacuate vulnerable residents and visitors to a "point of safety" within the TBRPC region. Calculated from evacuation order to last vehicle assigned an external destination exits the region.

| TABLE 5: PINELLAS COUNTY CLEARANCE TIMES (IN HOURS) ¹¹ | | | | | | | |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|--|
| Clearance Time | Evacuation Level A | Evacuation Level B | Evacuation Level C | Evacuation Level D | Evacuation Level E | | |
| In-County - to Shelter Clearance Time | 14 | 17 | 23 | 32.5 | 41.5 | | |
| Out-of-County Clearance Time | 14 | 17 | 23 | 32.5 | 41.5 | | |
| Regional Clearance Time | 17 | 20 | 26 | 45 | 50 | | |

Measures taken to maintain or reduce evacuation clearance times include:

- Capital improvements on regional evacuation routes have been completed on Tampa Road, West Bay Drive, Central Avenue and Park Boulevard
- Ordinance 90-87 requires recreational vehicle parks and transient accommodations to develop hurricane evacuation plans
- Through the Forward Pinellas Transportation Improvement Program, the State is encouraged to consider prioritizing road improvements on regional evacuation routes
- Use of the Countywide Advanced Transportation Management System/Intelligent Transportation System (ATMS/ ITS) to expedite evacuation
- Development and publication of the annual, multilingual hurricane guide that is distributed countywide at the beginning of hurricane season
- The County's Emergency Management staff and the State Division of Emergency Management work together on evacuation and disaster preparedness plans, and Pinellas County participates in the State's annual drill
- Pinellas County conducts an annual hurricane drill to assess its ability to mobilize and respond during a hurricane. The drill is evaluated by the County, and Pinellas County Emergency Management makes changes to its Comprehensive Emergency Management Plan based upon the observations made during the drill
- Pinellas County promotes the Host Home Program and supports the Pinellas County School Board in emergency sheltering operations
- Land use policy directs residential population out of the CSA, and increases to existing densities in the CSA are prohibited

HAZARD MITIGATION

Pinellas County is statistically subject to recurring natural hazards such as hurricanes and coastal storms which have potentially-devastating effects on human lives and property. Hurricane Irma made landfall on the mainland of Florida on September 10, 2017 as a Category 3 hurricane. Irma passed by Pinellas as a Category 1 storm, and caused upwards of \$400 million in residential property damage, with additional damages to commercial properties, along with economic damages.¹² Although the effects of Hurricane Irma in Pinellas were minor compared to other areas, much of the County was without power for over seven days. Debris removal from this relatively minor storm lasted months.

Hazards associated with these storms include, but are not limited to, the following:

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^{11.} Florida Statewide Regional Evacuation Program, Florida Division of Emergency Management, Tampa Bay Regional Planning Council – Tampa Bay Region 2020. Supplemented with updated information from Pinellas County Emergency Management.

^{12.} Tampa Bay Regional Planning Council. http://www.tbrpc.org/wp-content/uploads/2018/11/2018-Pinellas-County-Hurricane-Irma-Impact-Analysis.pdf

- Wind damage;
- Tornadoes and water spouts;
- Water and erosion damage caused by flooding, storm surge, and wave action;
- Inlet impacts;
- Hazardous material accidents caused by wind impacts, flooding, storm surge, and wave action; and
- Loss of life-sustaining utilities, such as electricity and potable water.

In unincorporated County, most of the exposed barrier islands are contained within County or State parks and will remain undeveloped, except for supporting park facilities. Tierra Verde, however, is a vulnerable barrier island which has been developed with a mixture of primarily residential development. However, since development on Tierra Verde is mostly of recent origin, many of the homes are elevated on piers or have breakaway walls in compliance with federal and local floodplain regulations. However, these building requirements are only to the 100-year event, which is generally comparable to about a category 1 hurricane storm surge. Most of the Palm Harbor/Crystal Beach coastline is already developed with a mix of older, somewhat vulnerable single-family housing, parks, and small scale commercial, as well as newer, more hurricane resistant condominiums and residences. The Seminole area contains a mix of single-family housing, recreational facilities and commerce with a few multi-family developments. The Gateway area consists of either protected wetlands along the coastline, residential uses, campus-type office and industrial development, and some vacant land located on the adjacent uplands.

In 1993, the County (for unincorporated areas) began its participation in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) program. One requirement for participation in the CRS program is to identify areas with structures that have filed two or more NFIP claims of \$1,000 or more. In the County's CRS Repetitive Loss Area Plan, an appendix to the Local Mitigation Strategy (LMS), areas of repetitive loss are identified. While it is not necessarily known if the history of these losses were due to coastal storm surge or to rainfall events, most of the repetitive loss areas and several of the isolated repetitive loss properties lie within the CHHA.

Hazard mitigation is a sound financial investment. The National Institute of Building Sciences found that society enjoys benefit-cost ratios (BCR) between 4:1 and 11:1 for a variety of hazard mitigation strategies, and a BCR of \$6 for every \$1 spent through mitigation grants funded through select federal agencies.¹³

LOCAL MITIGATION STRATEGY

13. Multi-Hazard Mitigation Council (2019.). Natural Hazard Mitigation Saves: 2019 Report. Principal Investigator Porter, K.; Co-Principal Investigators Dash, N., Huyck, C., Santos, J., Scawthorn, C.; Investigators: Eguchi, M., Eguchi, R., Ghosh., S., Isteita, M., Mickey, K., Rashed, T., Reeder, A.; Schneider, P.; and Yuan, J., Directors, MMC. Investigator Intern: Cohen-Porter, A. National Institute of Building Sciences. Washington, DC. https://www.nibs.org/projects/natural-hazard-mitigation-saves-2019-report







CM SUPPLEMENTAL- 19

Pinellas County and its municipalities developed a unified, community-wide mitigation strategy. Most of the burdens of recovering from a disaster are borne by local governments. Such disasters can bring extraordinary hardship to citizens, devastate the economic base, and diminish its quality of life for years to come.

The Pinellas County Local Mitigation Strategy (LMS) provides a countywide blueprint for a unified and consistent course of action needed to eliminate or minimize the impact of disasters that threaten Pinellas County and its municipalities in coordination with the CEMP and PDRP. The County coordinates the LMS Working Group, which includes County and municipal government representation as well as a broad range of private and public sector interests, such as the regional planning council, public utilities, health care, schools, and the insurance industry. Mitigation initiatives addressed in the LMS may be accomplished on an individual community basis or coordinated among jurisdictions. The initiatives are categorized by specific objectives which include critical facilities, public shelters, flood and storm water control, vegetative and beach management, new construction, infrastructure protection, property acquisition, community outreach, and elevation of flood-prone structures. Pinellas County coordinates FEMA disaster funding distribution across local governments. The Pinellas County LMS, as amended, is a coordinated incorporated component of the Coastal Management Element of the Pinellas County Comprehensive Plan.

