

## **Final Order Adopting Pass-a-Grille Inlet Management Plan**

WHEREAS in 2008, the Florida Legislature amended Section 161.142, Florida Statutes, finding, “The Legislature recognizes the need for maintaining navigation inlets to promote commercial and recreational uses of our coastal waters and their resources. The Legislature further recognizes that inlets interrupt or alter the natural drift of beach-quality sand resources, which often results in these sand resources being deposited in nearshore areas or in the inlet channel, or in the inland waterway adjacent to the inlet, instead of providing natural nourishment to the adjacent eroding beaches. Accordingly, the Legislature finds it is in the public interest to replicate the natural drift of sand which is interrupted or altered by inlets to be replaced, and for each level of government to undertake all reasonable efforts to maximize inlet sand bypassing to ensure that beach-quality sand is placed on adjacent eroding beaches. Such activities cannot make up for the historical sand deficits caused by inlets, but shall be designed to balance the sediment budget of the inlet and adjacent beaches and extend the life of proximate beach restoration projects so that periodic nourishment is needed less frequently;” and

WHEREAS in 2017-18, the Department of Environmental Protection (Department or DEP) and Pinellas County sponsored an inlet management study of Pass-a-Grille performed by the University of South Florida Coastal Research Laboratory (USF-CRL), which compiled new and historical data and information regarding its coastal processes and inlet and shoreline dynamics, updated its sediment budget, and evaluated alternatives for the mechanical transfer of sand from the inlet channel and ebb shoals to adjacent critically eroded beaches; and

WHEREAS, in December 2018, the Department developed an inlet management plan that contains corrective measures to mitigate the identified erosion impacts to adjacent critically eroded beaches; and

WHEREAS, Pinellas County and the U.S. Army Corps of Engineers are the entities responsible for dredging at Pass-a-Grille, and therefore, responsible for implementation of the inlet management plan; and

WHEREAS, this inlet management plan (attached) is consistent with the Department’s program objectives under Chapter 161, Florida Statutes,

**THEREFORE:**

The Department does hereby adopt the following implementation strategies, as set forth in the attached **Pass-a-Grille Inlet Management Plan**. Future inlet management activities conducted by Pinellas County or the U.S. Army Corps of Engineers shall be consistent with the following five strategies:

- 1) **A comprehensive beach and inlet hydrographic monitoring program** shall be conducted to evaluate the performance and impact of existing sand bypassing and nourishment projects and to periodically update the inlet sediment budget.
- 2) **Sand bypassing shall be performed from the Pass-a-Grille navigation channel and ebb shoal to the adjacent gulf-fronting beaches to the north of the inlet, Pass-a-Grille Beach, between FDEP Reference Monuments R160 and R166.** The quantity of fill to be placed shall be based on observed beach erosion patterns and ebb shoal and navigation channel deposition quantities documented through the monitoring protocol of Strategy #1 above.
- 3) **On an average annual basis, the initial target inlet sand bypassing quantity to Pass-a-Grille Beach shall be 14,000 cubic yards per year.** This target quantity may be modified or updated based on a minimum of four years or more of monitoring data indicating a change in the sediment budget.
- 4) **The source of sediment for meeting the target sand bypassing quantities in Strategy #3 shall be the Pass-a-Grille navigation channel, channel margin linear shoal and north lobe of the ebb shoal.**
- 5) **Additional sediment up to an annualized quantity of 50,000 cubic yards per year may be obtained from the Pass-a-Grille ebb shoals for beach nourishment projects on Sand Key, Treasure Island and Long Key.**

Inlet management actions conducted by Pinellas County or the U.S. Army Corps of Engineers that implement the strategies contained in this plan are subject to further evaluation, and subsequent authorization or denial, as part of the Department's permitting process. Activities that implement these adopted strategies shall be eligible for state financial participation pursuant to Section 161.143, Florida Statutes, subject to Department approval of funding and an appropriation from the Florida Legislature. The level of State funding shall be determined based on the activity being conducted and the

Department's rules. The Department may choose not to participate financially if the proposed method of implementation is not cost effective or fails to meet the intent of Section 161.142, Florida Statutes, and this final order. Nothing in this plan precludes the evaluation of other strategies for the effective management of Pass-a-Grille and the adjacent beaches.

## Approval of Adoption

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Alex Reed  
Director of Division of Water Resource Management  
Florida Department of Environmental Protection

## Filing and Acknowledgement

FILED, on this date with the designated Department Clerk, pursuant to

Section 120.52, F.S., receipt of which is hereby acknowledged.

 \_\_\_\_\_  
Deputy Clerk

01/11/2019  
\_\_\_\_\_  
Date

## Notice of Rights

This action is final and effective on the date filed with the Clerk of the Department unless a petition for an administrative hearing is timely filed under Sections 120.569 and 120.57, Florida Statutes, before the deadline for filing a petition. On the filing of a timely and sufficient petition, this action will not be final and effective until further order of the Department. Because the administrative hearing process is designed to formulate final agency action, the hearing process may result in a modification of the agency action or even denial of the request for a variance or waiver.

### Petition for Administrative Hearing

A person whose substantial interests are affected by the Department's action may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, F.S. Pursuant to Rule 28-106.201, F.A.C., a petition for an administrative hearing must contain the following information:

- (a) The name and address of each agency affected and each agency's file or identification number, if known;
- (b) The name, address, telephone number, and any e-mail address of the petitioner; the name, address, telephone number, and any e-mail address of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests are or will be affected by the agency determination;
- (c) A statement of when and how the petitioner received notice of the agency decision;
- (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
- (e) A concise statement of the ultimate facts alleged, including the specific facts that the petitioner contends warrant reversal or modification of the agency's proposed action;
- (f) A statement of the specific rules or statutes that the petitioner contends require reversal or modification of the agency's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
- (g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wishes the agency to take with respect to the agency's proposed action.

The petition must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000. Also, a copy of the petition shall be mailed to the applicant at the address indicated above at the time of filing.

#### Time Period for Filing a Petition

In accordance with Rule 62-110.106(3), F.A.C., petitions for an administrative hearing must be filed within 21 days of receipt of this written notice. The failure to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under [Sections 120.569](#) and 120.57, F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, F.A.C.

#### Extension of Time

Under Rule 62-110.106(4), F.A.C., a person whose substantial interests are affected by the Department's action may also request an extension of time to file a petition for an administrative hearing. The Department may, for good cause shown, grant the request for an extension of time. Requests for extension of time must be filed with the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000, before the applicable deadline for filing a petition for an administrative hearing. A timely request for extension of time shall toll the running of the time period for filing a petition until the request is acted upon.

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## ***Introduction***

Pursuant to subsection 161.101(2), Florida Statutes, the Florida Department of Environmental Protection (Department or DEP) is the beach and shore preservation authority for the State of Florida. As part of the Department's statewide comprehensive, long-term beach management plan implemented pursuant to section 161.161, Florida Statutes, the Department is adopting this inlet management plan for Pass-a-Grille in Pinellas County, Florida.

*Pass-a-Grille Inlet Management Plan* updates strategies for Pass-a-Grille that were adopted in the *Strategic Beach Management Plan* (DEP, 2018) to be consistent with current statutes and observed erosion<sup>1</sup> conditions. The Department and Pinellas County sponsored an inlet management study in 2017-18, that was performed by the University of South Florida Coastal Research Laboratory (USF-CRL). This was a two-inlet study of Pass-a-Grille and Bunces Pass. Pursuant to section 161.161, Florida Statutes, the Department only develops inlet management plans for inlets that have been altered, modified, or improved for navigation. Since Bunces Pass is a natural inlet that has not been dredged or structured, it is not considered an altered inlet, and therefore, does not require an inlet management plan.

## ***Program Objectives and Statutory Responsibilities for Inlet Management***

In 2008, the Florida Legislature amended section 161.142, Florida Statutes, finding,

“The Legislature recognizes the need for maintaining navigation inlets to promote commercial and recreational uses of our coastal waters and their resources. The Legislature further recognizes that inlets interrupt or alter the natural drift of beach-quality sand resources, which often results in these sand resources being deposited in nearshore areas or in the inlet channel, or in the inland waterway adjacent to the inlet, instead of providing natural nourishment to the adjacent eroding beaches. Accordingly, the Legislature finds it is in the public interest to replicate the natural drift of sand which is interrupted or altered by inlets to be replaced and for each level of government to undertake all reasonable efforts to maximize inlet sand bypassing to ensure that beach-quality sand is placed on adjacent eroding beaches. Such activities cannot make up for the historical sand deficits caused by inlets but shall be designed to balance the sediment budget of the inlet and adjacent beaches and

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<sup>1</sup> As used in this document, the term “erosion” means wearing away of land or the removal of consolidated or unconsolidated material from the coastal system by wind or wave action, storm surge, tidal or littoral currents or surface water runoff. As used in this document, the term “accretion” means the buildup of land or accumulation of unconsolidated material within the coastal system caused by wind and wave action, storm surge, or tidal or littoral currents. The descriptions of coastal processes in this document are not intended to affect title to real property or real property boundaries.



extend the life of proximate beach restoration projects so that periodic nourishment is needed less frequently.”

Pursuant to section 161.143, Florida Statutes,

“Studies, projects and activities for the purpose of mitigating the erosive effects of inlets and balancing the sediment budget of the inlet and adjacent beaches must be supported by separately approved inlet management plans or inlet components of the statewide comprehensive beach management plan.”

The U.S. Army Corps of Engineers (USACE) and Pinellas County have been the entities responsible for dredging Pass-a-Grille’s channel and ebb shoal and consequently, mitigating the extent of beach erosion caused by the inlet, as specified in subsection 161.142 (6), Florida Statutes.

## History of Pass-a-Grille

Pass-a-Grille was originally a natural inlet in Pinellas County on the southwest coast of Florida connecting the Gulf of Mexico with Boca Ciega Bay (*Figure 1*). Pass-a-Grille is bounded on the north by Pass-a-Grille Beach on Long Key, on the south by Shell Key, and on the east by the developed Tierra Verde. Understanding the history of Pass-a-Grille, its evolution and prior inlet management activities, and beach erosion control activities along the adjacent beaches, is necessary to gain a perspective on the inlet's dynamics and the need to change inlet management strategies over time.

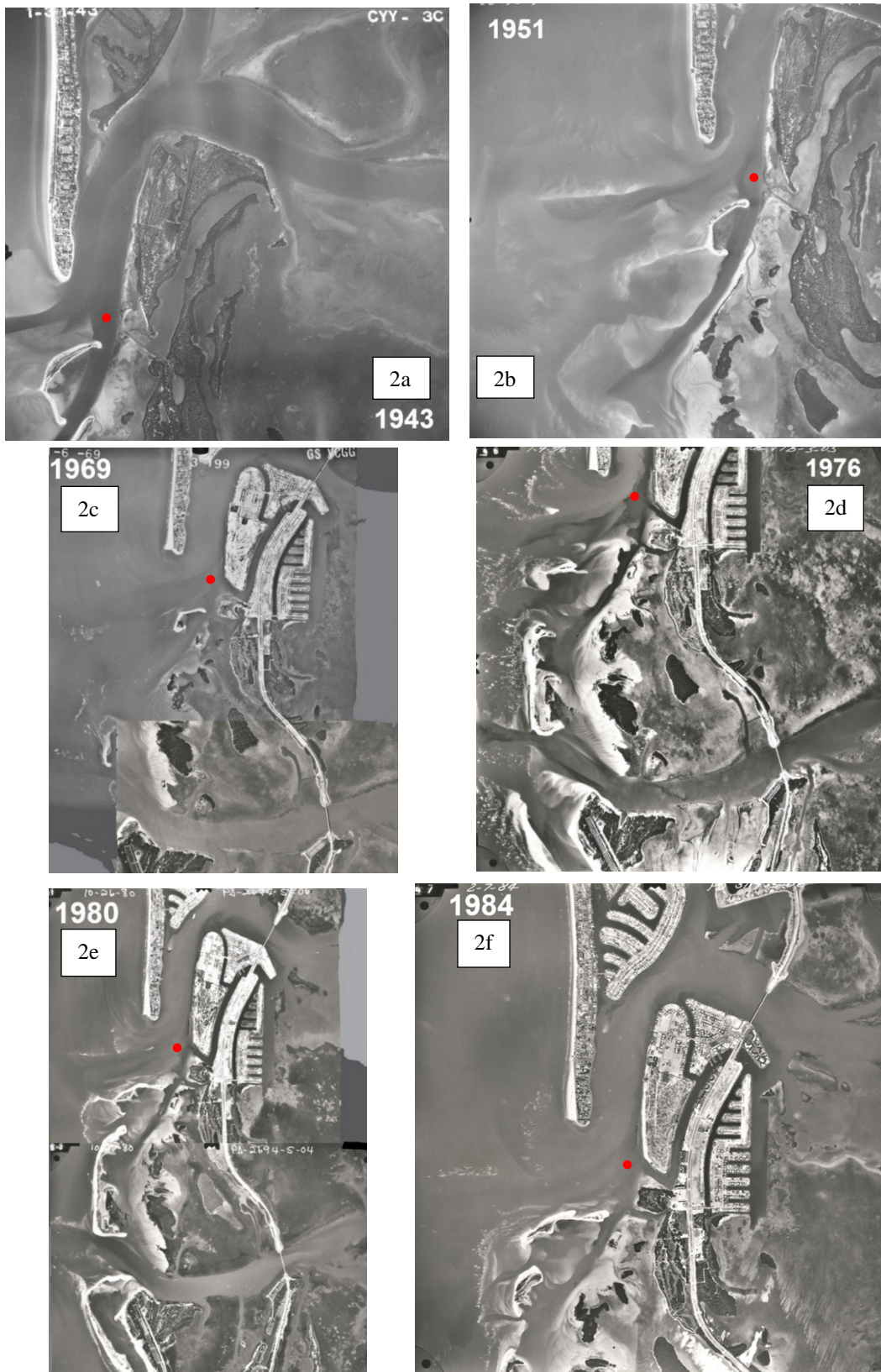


**Figure 1.** Pass-a-Grille in Pinellas County, FL (ESRI Image 2014).

Historical records since 1873 indicate that Pass-a-Grille has undergone substantial change in morphology, including the closure of one of its two main channels and the evolution of Shell Key to the south. Historically, Pass-a-Grille has had two main channels, including a north channel that aligned east-west immediately south of Long Key, and a south channel that aligned northeast-southwest and was located substantially south of the north channel. Aerial photography from 1943 reveals an emergent shoal between the two channels (*Figure 2a*), which by 1951 had become smaller and had filled in part of the south channel suggesting a significant flow reduction (*Figure 2b*). Reduced flow in the south channel was likely due to its location between the north channel and the stable Bunces Pass to the immediate south, as both the north channel and Bunces Pass were more hydraulically efficient and carried the dominant flow between Boca Ciega Bay and the Gulf of Mexico.

The Pass-a-Grille north channel has an authorized federal navigation project. The first navigation improvements were completed in 1966, including a jetty at the south end of Long Key to the north of the channel. The channel was dredged and material was placed offshore. By 1969, as shown in aerial photography, substantial development had taken place east of Pass-a-Grille (*Figure 2c*). A road, causeway and bridges had been constructed to connect Mullet Key, located south of Bunces Pass, with the mainland. A large mangrove island east of Pass-a-Grille had become the Tierra Verde development, which was completely armored with bulkheads. The 1969 aerial photography also shows the emergence of a shoal at the southwest terminus of the Pass-a-Grille south channel marking the initial evolution of Shell Key. Subsequently, the north channel remained relatively stable, while the south channel was subject to the morphological growth of Shell Key.

Shell Key grew throughout the 1970s, extending northward while blocking flow at the southwest terminus of the Pass-a-Grille south channel. Along the south side of the northern channel, extensive shoal development emerged and evolved to become the northern portion of Shell Key. By 1976, flow at the end of the southern channel had been nearly completely blocked (*Figure 2d*). Between 1976 and 1980, Shell Key experienced significant growth including the enclosure of a bay behind the island, now known as Shell Key Preserve. As of 1980, Shell Key Preserve was connected to the Gulf of Mexico through connections to Pass-a-Grille to the north, Bunces Pass to the south, and directly through a breach in the Shell Key barrier beach (*Figure 2e*). A new breach at the location of the old Pass-a-Grille southern channel formed most likely during the subtropical storm of June 1982, which caused significant impact along the southwest coast of Florida. Aerial photography from 1984 shows two small breaches across Shell Key (*Figure 2f*).



**Figure 2a - 2f.** Pass-a-Grille and vicinity from 1943 through 1984. The red dot is for a consistent reference point in each image.

In 1984, the Pass-a-Grille jetty was reconstructed and a fishing platform was constructed along its crest. In 1986, the USACE dredged 650,000 cubic yards of sand from the Pass-a-Grille ebb shoal and placed the material on the north and south ends of Long Key (Upham Beach and Pass-a-Grille Beach), and on the south end of Treasure Island (Sunset Beach). Pass-a-Grille Beach received 73,000 cubic yards of this material between FDEP reference monuments R160 and R165. In 1991, the USACE dredged 230,000 cubic yards of sand from the Pass-a-Grille ebb shoal and placed the material on Upham Beach at the north end of Long Key.

By 1991, the Pass-a-Grille south channel had become the dominant flow path of the two small connections between the Shell Key Preserve and the Gulf of Mexico along the west shore of Shell Key (*Figure 3a*). Also, the preserve was still connected by water to Pass-a-Grille to the north and Bunces Pass to the south; however, the northern spit of Shell Key extending eastward had substantially filled in the old south channel of Pass-a-Grille. By 1998, the small breach across the west shore of Shell Key had closed and the small connection between the Shell Key Preserve and Pass-a-Grille at the north shore of Shell Key was nearly closed (*Figure 3b*).

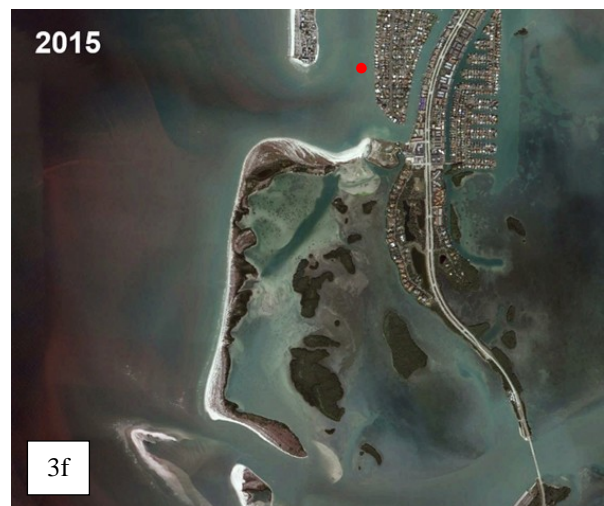
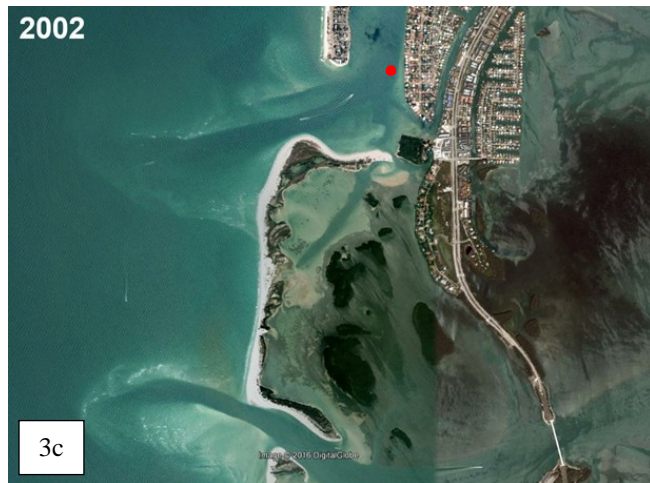
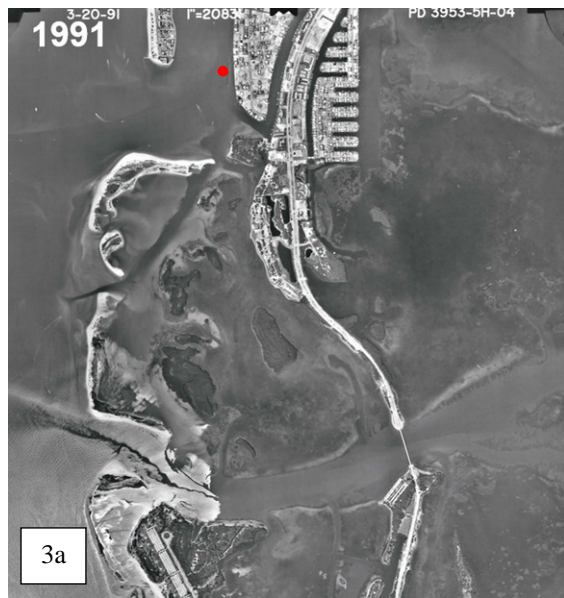
The 2002 aerial more clearly shows the Pass-a-Grille channel and ebb shoal with its bypassing bar attachment area on northern Shell Key (*Figure 3c*).

In 2004, the USACE dredged 780,000 cubic yards of sand from the Pass-a-Grille channel and ebb shoal and placed the material on the north and south ends of Long Key (Upham Beach and Pass-a-Grille Beach) and on the south end of Treasure Island (Sunset Beach). Pass-a-Grille Beach received 147,000 cubic yards of this material between DEP reference monuments R160 and R165.

By 2010, northerly longshore transport of sand along the west shore of Shell Key resulted in erosion of the gulf beach as indicated by the substantially narrower beach width and the accretion around the island's northwest corner. This has contributed to a substantially wider beach along the island's north shoreline fronting Pass-a-Grille (*Figure 3d*). By 2013, continued eastward growth of the northern shore of Shell Key towards "Collany Key," an adjacent residential development, had resulted in closure of the connection between Shell Key Preserve and Pass-a-Grille; however, a local effort to dredge a new channel across this attachment area created a temporary opening (*Figure 3e*).

In 2014, USACE dredged 140,000 cubic yards of sand from Egmont Channel at the entrance to Tampa Bay to the south, with placement on Pass-a-Grille Beach between DEP reference monuments R160 and

R166. By 2015, some of this material had been transported southward around the jetty and accreted to the south end of Long Key (**Figure 3f**). Also, longshore transport that continued eastward along northern Shell Key resulted in the permanent closure of the remnant connection between Pass-a-Grille and Shell Key Preserve.



**Figure 3a - 3f.** Pass-a-Grille and vicinity from 1991 through 2015. The red dot is for a consistent reference point in each image.

## ***Inlet Management Study (Wang et al., 2018)***

In 2018, the University of South Florida, Coastal Research Laboratory (USF-CRL), completed an inlet management study of Pass-a-Grille and Bunces Pass (Wang et al, 2018), sponsored by Pinellas County and the Department. Both inlets were jointly investigated because the tidal prism of each inlet overlaps within Boca Ciega Bay to create a multi-inlet hydrodynamic system between the gulf and the bay. The goals of this study were to quantify the sediment pathways and provide a sediment budget for Pass-a-Grille and Bunces Pass, as necessary for the development of an inlet management plan for Pass-a-Grille, pursuant to section 161.142, Florida Statutes. The study also provided an evaluation of alternative inlet management implementation strategies. A Technical Advisory Committee (TAC) was created to provide technical guidance to USF-CRL during the course of the study. The TAC was composed of representatives of the Department, the USACE, APTIM, and Pinellas County.

In this study, the USF-CRL developed, calibrated and verified a Coastal Modeling System (CMS) model of Pass-a-Grille and Bunces Pass and the surrounding aquatic systems. The CMS model, developed by the USACE, is a widely used numerical model for evaluating inlets. As recommended by the TAC for the study, eleven alternative inlet management strategies were evaluated using the CMS model, as reported by Wang et al. (2018). Of the eleven alternatives, five alternatives evaluated inlet management strategies for Pass-a-Grille, which were Alternatives 1, 2, 3, 6, and 7. Alternatives 4 and 5 evaluated alterations to Bunces Pass, while Alternatives 8 through 11 evaluated dredging navigation channels within Shell Key Preserve.

The five alternatives evaluated in this study that apply to Pass-a-Grille are discussed below. The following factors were considered in the evaluation of these inlet management alternatives for Pass-a-Grille: (1) potential influence on the wave field in the vicinity of the inlet; (2) potential influence on tidal flow patterns; (3) potential influence on erosion or accretion trends along the adjacent beaches; (4) potential influences on erosion and deposition patterns in the channel; (5) potential influences on erosion and deposition patterns over the ebb shoal, and therefore, sand bypassing; and (6) for alternatives, including dredging, the in-filling rate, and resulting dredging interval.

### **Alternative 1: Baseline Simulation**

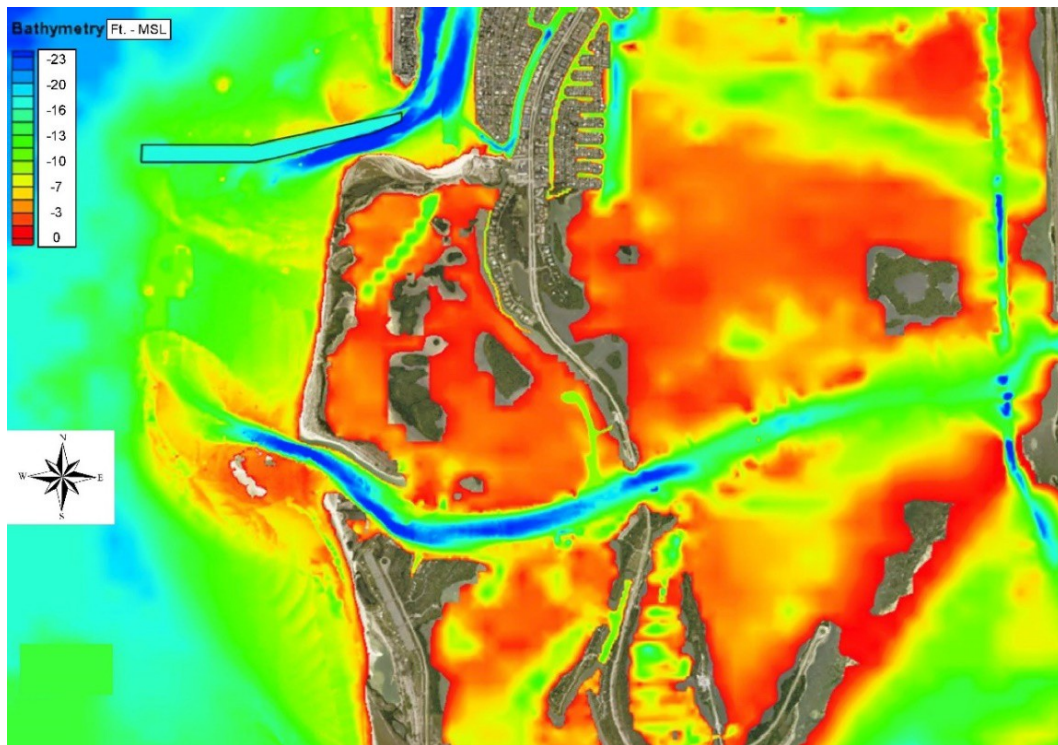
Alternative 1 provides baseline conditions for comparison with the various management alternatives and is based on the detailed bathymetry surveyed in 2016. At Pass-a-Grille, the spring tidal prism representing the volume of water flowing through the inlet between a spring low tide and spring high



tide was determined to be  $89.7 \times 10^6$  cubic yards. Pass-a-Grille has a cross-section at its mouth of approximately  $3.23 \times 10^4$  square feet, and an ebb shoal volume of approximately  $7.2 \times 10^6$  cubic yards.

**Alternative 2: Dredging the Pass-a-Grille Channel and Channel Margin Linear Shoal**

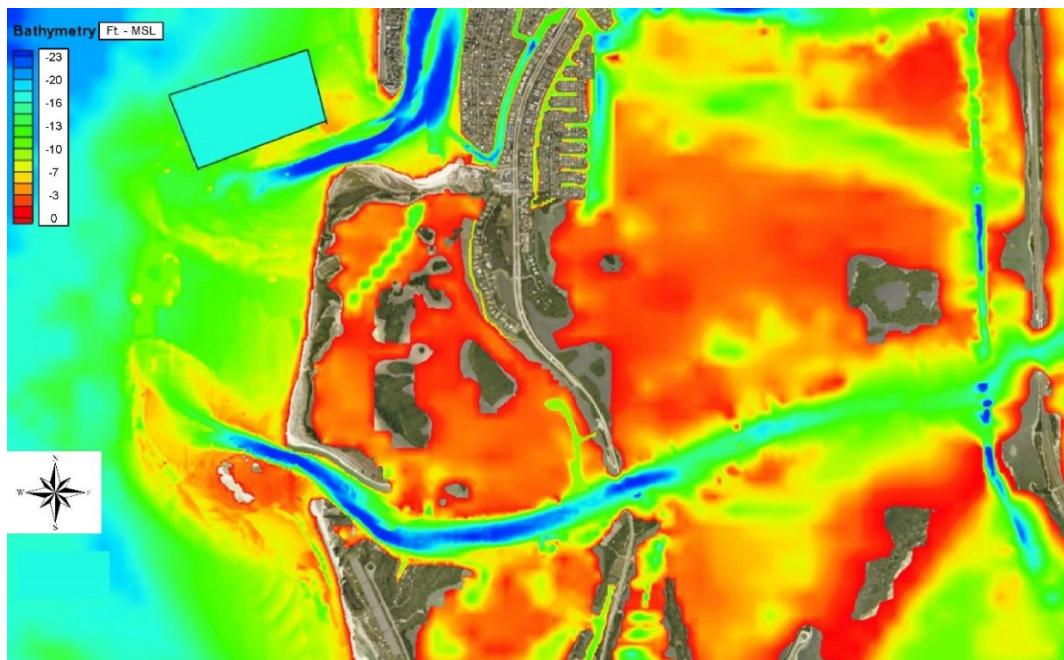
The channel margin linear shoal that parallels the north side of the Pass-a-Grille channel was used in the last dredging event in 2004. Alternative 2 evaluates widening the channel northward across this linear shoal by 109 yards to a depth of -16.7 feet below sea level. The dredge area extends seaward across the terminal lobe of the shoal and provides a volume of approximately 785,000 cubic yards of sand for beach nourishment projects (*Figure 4*). The overall influence of dredging the channel margin linear shoal on ebb and flood tidal flow is not significant. The model reveals an increase in wave heights across the entrance channel and along the northern shoreline of Shell Key in an area that has been accretional. The increased wave heights may result in greater sediment transport on northern Shell Key. Morphology modeling calculated approximately 213,000 cubic yards per year of dredge area infilling with recovery between three and four years. Alternative 2 appears to be a reasonable dredge area for inlet sand bypassing. Given higher wave activity may affect north Shell Key, shoreline change effects should be monitored along the island.



*Figure 4. Bathymetry for the Alternative 2 model run. A dredge pit is excavated at the channel margin linear shoal adjacent to and north of the Pass-a-Grille navigation channel.*

**Alternative 3: Dredging the Northern Flank of the Pass-a-Grille Ebb Shoal**

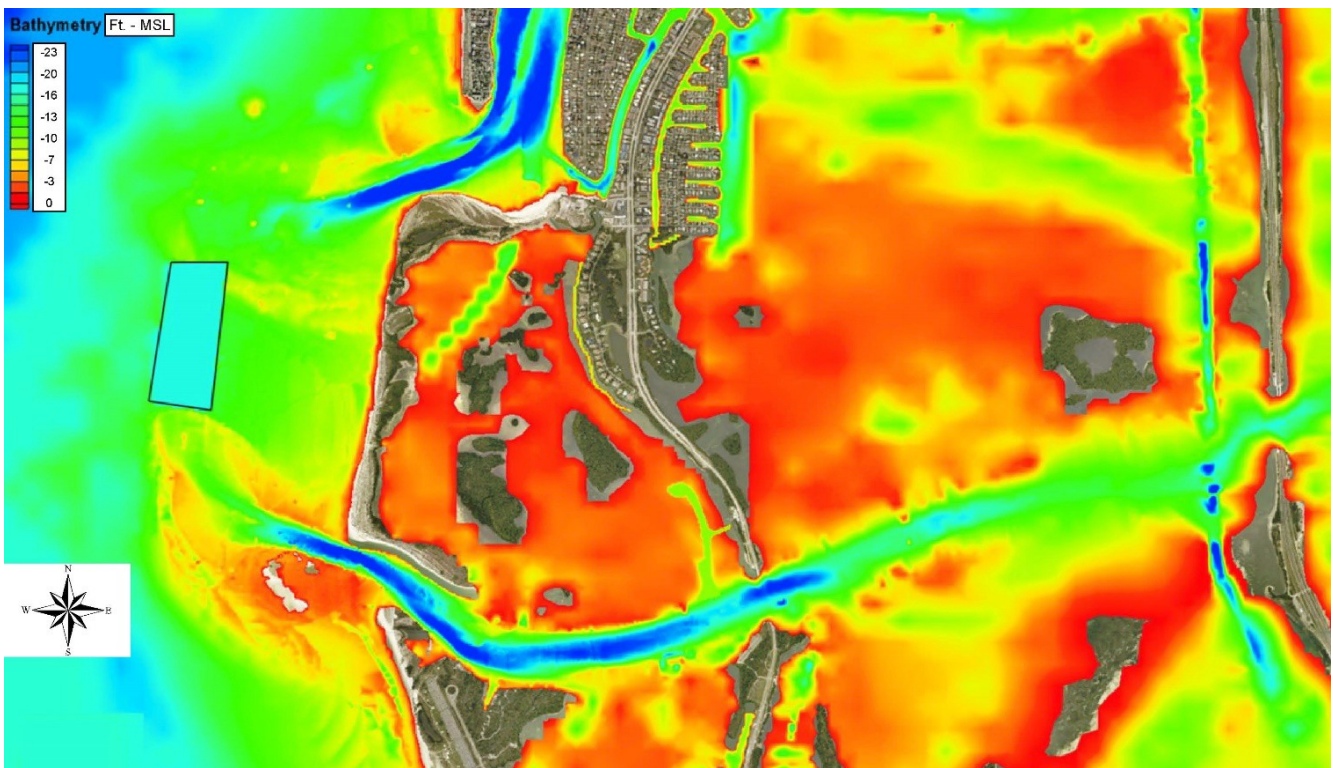
The northern flank of the ebb shoal off Pass-a-Grille has been used for previous dredging events. Alternative 3 evaluates a dredge area of 1,640 feet by 3,280 feet and provides a volume of 2,090,000 cubic yards for beach nourishment projects (**Figure 5**). Dredging this large ebb shoal borrow area is expected to cause a reduction in ebb flow velocities over the dredge area, which would likely increase shoaling within the dredge area; however, insignificant changes are expected during flood flow with a minor flow reduction at the south end of Long Key. The model predicts a wave height reduction over the dredge area and a wave height increase along the shallow area to the south with minor nearshore effects adjacent to Shell Key. Effects on Shell Key are less than Alternative 2 as the channel margin linear bar remains to provide wave sheltering to the south. The morphology model calculated a sedimentation rate of approximately 32,700 cubic yards per year in the ebb shoal borrow area, with the shallow southwest area adjacent to the channel margin linear bar recovering in three to six years, while the deeper area infilled much slower. The entire dredge area was projected to recover in 64 years; however, a more modest dredge area could be designed with a reasonable recovery period. In the past 32 years, only 1,660,000 cubic yards have been dredged in three separate projects, which is substantially less than what was modeled. Alternative 3 appears to be a viable area for dredging inlet shoal material with minimal hydrographic effects on the adjacent aquatic systems or beaches if the geotechnical characteristics of the material are compatible with the existing beach sediments in the placement area.



**Figure 5.** Bathymetry for the Alternative 3 model run. An ebb shoal borrow area is excavated north of the Pass-a-Grille navigation channel.

**Alternative 6: Dredging the Relic Ebb Shoal of the closed Pass-a-Grille South Channel**

Much of the relic shoal for the Pass-a-Grille south channel contributed to the growth and evolution of Shell Key, resulting in closure of the south channel. The remaining relic shoal connects the terminal lobes of the current ebb shoal for Pass-a-Grille to the north and Bunces Pass to the south. Alternative 6 evaluates a relic ebb shoal borrow area 1,640 feet wide by 2,950 feet alongshore off Shell Key and provides a volume of approximately 1,308,000 cubic yards for beach nourishment projects (**Figure 6**). Dredging this relic shoal is expected to only have minor hydrodynamic effects during ebb and flood tide conditions. Modeling also shows the dredge pit would have only minor effects on nearshore wave heights along Shell Key or within the inlet channel. A sedimentation rate of approximately 99,400 cubic yards per year was predicted for the dredge area resulting in a recovery period of 13 years, as sediment will be received from the active ebb shoals to the north and south. Alternative 6 appears to be a viable dredge area for obtaining sediment for beach nourishment projects without causing significant adverse hydrographic effects on the adjacent aquatic systems or beaches.

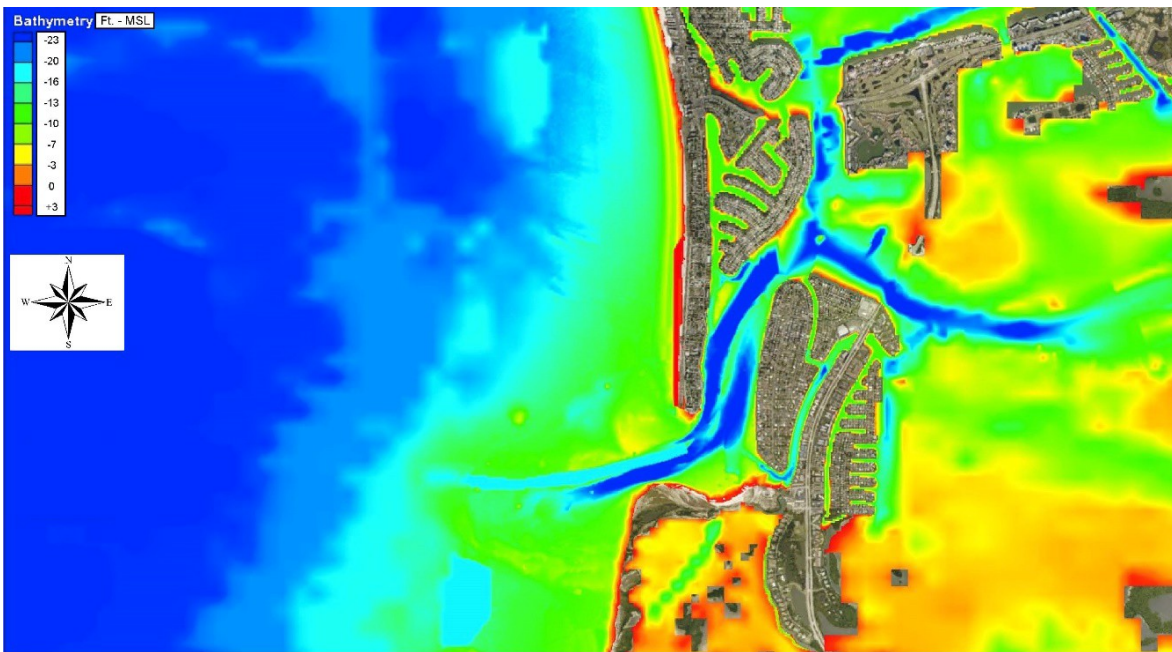


**Figure 6.** Bathymetry for the Alternative 6 model run. A relic ebb shoal borrow area is excavated between the Pass-a-Grille ebb shoal and the Bunces Pass ebb shoal.

### **Alternative 7: Nourishing Pass-a-Grille Beach with Sand from Alternative 2**

The inlet management study investigated nourishments of Pass-a-Grille Beach on the southern end of Long Key and the gulf beach of Fort Desoto Park on the north end of Mullet Key using sand excavated from the Pass-a-Grille channel and channel margin linear shoal (Alternative 2) as well as from the relic ebb shoal offshore from Shell Key (Alternative 6). Mullet Key is not designated critically eroded by the Department, and, given that this currently eroding beach is in the cyclical process of being nourished naturally by the emergence and shoreward migration of an inlet shoal, this inlet plan will only address the Pass-a-Grille Beach nourishment using the channel dredge area.

The beach nourishment area along Pass-a-Grille Beach extends for approximately 5,250 feet north along Long Key north of Pass-a-Grille to roughly DEP reference monument R160 (*Figure 7*). The CMS model employed in the study does not have the spatial resolution to capture the evolution of the beach nourishment project, and therefore, predict beach fill performance. The Alternative 7 effects on the currents and wave conditions, and therefore, the morphology of the inlet system, is nearly the same as Alternative 2. Pass-a-Grille Beach is a designated critically eroding beach by the Department and is an existing beach restoration project immediately adjacent to Pass-a-Grille, and is therefore, a priority area for beach quality dredge material from the Pass-a-Grille channel or shoals.



*Figure 7. Bathymetry for the Alternative 7 model run. A dredge pit is excavated at the channel margin linear shoal adjacent to and north of the Pass-a-Grille navigation channel and sand is placed along Pass-a-Grille Beach.*

### ***Pass-a-Grille Sediment Budget (Wang et al., 2018)***

Pursuant to section 161.142, Florida Statutes, dredging within an inlet system, including its shoals, should result in the placement of all beach quality sand on adjacent eroding beaches to balance the sediment budget between the inlet and adjacent beaches. A sediment budget is a balance of the volumes (or volume rate of change) for sediments entering and leaving a tidal inlet system and its adjacent beaches. A sediment budget quantifies the natural longshore sediment transport by waves and tides to and from the inlet, the entrapment of longshore sediment by the inlet channel and the ebb and flood shoals, and the mechanical “bypassing” of sediment, typically by a hydraulic dredge, from the inlet to the adjacent beaches or nearshore. Sediment transport volumes and pathways are unique to each inlet as influenced by regional geology, morphological characteristics, wave and tide conditions, and sediment characteristics and supply. A sediment budget is determined by comparing two or more topographic/bathymetric surveys of an inlet system, including its channel, ebb and flood shoals, and the adjacent beaches.

The inlet management study for Pass-a-Grille developed a sediment budget for the period from 1998 to 2016. For this sediment budget, the coast directly affected by Pass-a-Grille has been divided into the beach and inlet littoral cells as shown in **Figure 8**. This sediment budget is influenced by the excavation of 780,000 cubic yards of sand from the Pass-a-Grille channel and ebb shoal in 2004 with placement of 147,000 cubic yards on Pass-a-Grille Beach and placement of the remaining 633,000 cubic yards outside of the Pass-a-Grille system to Upham Beach on northern Long Key. Also included in the sediment budget is the placement of 140,000 cubic yards of sand on Pass-a-Grille Beach in 2014 with material coming from Egmont Channel, which is outside the Pass-a-Grille system.

The sediment budget shows that 102,000 cubic yards per year is accreting within the Pass-a-Grille ebb shoal. This ebb shoal growth greatly exceeds the -37,000 cubic yards per year of erosion to the adjacent beaches of Shell Key and Pass-a-Grille Beach. The erosion area of Shell Key is contributing over 95 percent of its sediment loss to adjoining beaches of Shell Key, while Pass-a-Grille Beach to the north is losing nearly twice its volumetric loss to the Pass-a-Grille ebb shoal. Longshore transport to the south along Long Key is offsetting nearly half of the sediment transport from Pass-a-Grille Beach, resulting in net erosion of -14,000 cubic yards per year. The growth of the northern lobe of the ebb shoal (64,000 cubic yards per year) is sufficient to mitigate the net erosion rate of Pass-a-Grille Beach (-14,000 cubic

yards per year) and still have an excess growth of 50,000 cubic yards per year of sand available for other nourishment projects.



**Figure 8.** Annualized Pass-a-Grille sediment budget based upon beach and inlet volume change data between 1998 and 2016. Units are cubic yards per year. Green represents net sediment transport into and out of littoral cells. White or red represent net accretion or erosion, respectively, within a littoral cell. (Wang et al., 2018)

## ***Recommended Inlet Management Plan Strategies***

The Department staff recommends the following inlet management strategies be adopted to meet the requirements of Chapter 161, Florida Statutes. Future inlet management activities shall be consistent with the following five strategies.

- 1) A comprehensive beach and inlet hydrographic monitoring program shall be conducted to evaluate the performance and impact of existing sand bypassing and nourishment projects, and to periodically update the inlet sediment budget.**

**Discussion** – A comprehensive beach and inlet hydrographic monitoring program is required to manage the sediment at Pass-a-Grille. Topographic and bathymetric surveys provide reliable data to estimate the volumetric impact of the inlet on adjacent beaches and to establish a sand placement protocol that complies with section 161.142, Florida Statutes.

- 2) Sand bypassing shall be performed from the Pass-a-Grille navigation channel and ebb shoal to the adjacent gulf-fronting beaches to the north of the inlet, Pass-a-Grille Beach, between FDEP Reference Monuments R160 and R166.** The quantity of fill to be placed shall be based on observed beach erosion patterns and ebb shoal and navigation channel deposition quantities documented through the monitoring protocol of Strategy #1 above.

**Discussion** – Pass-a-Grille Beach north of Pass-a-Grille is the beach erosion area directly impacted by Pass-a-Grille. The Long Key beaches to the north of Pass-a-Grille (R160-R166) are currently designated critically eroded by the Department (DEP, 2018).

- 3) On an average annual basis, the initial target inlet sand bypassing quantity to Pass-a-Grille Beach shall be 14,000 cubic yards per year.** This target quantity may be modified or updated based on a minimum of four years or more of monitoring data indicating a change in the sediment budget.

**Discussion** – The sediment budget indicates a need to place a total of 14,000 cubic yards of sand per year on the eroded beaches north of the inlet.

- 4) The source of sediment for meeting the target sand bypassing quantities in Strategy #3 shall be the Pass-a-Grille navigation channel, channel margin linear shoal and northern lobe of the ebb shoal.**

*Discussion* – The area dredged for sand bypassing is the Pass-a-Grille navigation channel, channel margin linear shoal, and the northern lobe of the Pass-a-Grille ebb shoal. This does not exclude acceptable quality sand obtained from inland sand mines or offshore sources when determined necessary to supplement or facilitate the target sand bypassing quantities.

- 5) Additional sediment may be obtained from the Pass-a-Grille ebb shoals by an annualized quantity of up to 50,000 cubic yards per year for beach nourishment projects on Sand Key, Treasure Island, and Long Key.**

*Discussion* – The sediment budget indicates Pass-a-Grille ebb shoal growth sufficient to provide sand for nearby beach restoration projects without significant hydrographic impacts to the Pass-a-Grille aquatic system or the adjacent beaches of Shell Key and Long Key.



## ***References***

- Florida Department of Environmental Protection, 2018. *Critically Eroded Beaches in Florida*, Division of Water Resource Management, 89 p.
- Florida Department of Environmental Protection, 2018. *Strategic Beach Management Plan*, Division of Water Resource Management, 365 p.
- Wang, P., Cheng, J., Westfall, Z., and Vallee, M., 2018. *Inlet Management Study for Pass-a-Grille and Bunces Pass, Pinellas County, Florida*, University of South Florida, Coastal Research Laboratory, 313 p.