Beach Preservation Ad Hoc Committee
10:00 a.m., Thursday, October 10, 2025
City Hall Council Chambers
1207 Palm Boulevard, Isle of Palms, SC 29451

Agenda

1. Call to order and acknowledgement that the press and the public have been duly notified of this meeting in accordance with the Freedom of Information Act
2. Discussion with Foth Olson regarding 2nd opinion report- Chris Creed
3. Review progress on Beach Preservation Ad Hoc Committee's recommendations
4. Next steps
5. Adjournment

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September 29, 2025

Douglas Kerr, Deputy City Administrator
City of Isle of Palms
P.O. Drawer 508
Isle of Palms, SC 29451

RE: Island of Palms, SC Beach Management Program – Review and Second Opinion

Foth Infrastructure & Environment, LLC (Foth | Olsen) is pleased to provide this summary of our review of the City of Isle of Palms (IOP) beach management program. For our review, we deferred exclusively to existing information made available to Foth | Olsen by the City. The work did not seek to conduct independent research or engineering analyses but rather relied upon existing information and reports by others to assess past, current, and expected future shoreline conditions. Furthermore, it aims to develop opinions about expected future conditions and possible beach management initiatives that may be considered to improve future conditions and potentially reduce the long-term cost of beach management for the City and community.

We focused our efforts on information and technical reports that have been prepared by the City of IOP and the city's coastal engineering consultant, Coastal Science and Engineering (CSE), including the summary report prepared by the Ad Hoc Beach Committee and CSE. Since initial planning of the 2008 restoration project, CSE has prepared dozens of reports that document shoreline conditions, shoreline change, project development details, project implementation, project performance, and other related beach management activities and results. From the work of CSE, the City and community have pursued a range of beach management initiatives ranging from large-scale comprehensive beach restoration to smaller, localized emergency sand scraping and redistribution projects, dune restoration, emergency sandbag projects, and experimental structural shore-stabilization projects.

For our review, we have specifically reviewed the following…

1. Beach Ad Hoc Committee Report and recommendations,
2. Prior beach management project planning reports and presentations,
3. Prior project scope summaries and presentations,
4. Prior post-construction summary reports,
5. Prior planning, engineering and design reports,

6. Permit applications for currently planned future projects,
7. Select beach monitoring reports,
8. Available aerial imagery with focus on inlet shoal bypass events, and
9. City regulations that prohibit erosion control structures within 250 feet of the MHWL.

The purpose of our efforts is to provide the City with a second opinion regarding the scope and appropriateness of past and planned future beach management activities. We also offer suggestions and recommendations about other beach management initiatives that the City may want to consider for future beach management. From this, we address the following,

a. The impact of each item listed above on IOP beach management,

b. Possible solutions and alternatives to reduce erosion and enhance the effectiveness of future renourishment projects,

c. Causes of recent shoreline erosion acceleration along the southern end of the island, and

d. A potential relationship between beach management activities on IOP and observed changes that occur to Breach Inlet.

Our comments and recommendations are presented to address general island-wide conditions and the City's beach management approach along the north and south ends of the island where conditions require active beach management. For this summary, we describe the north end of the island (Reaches 5 and 6) as being adjacent to Dewees Inlet and the south end of the island (Reaches 1 and 2) being adjacent to Breach Inlet. We focus our review and comments on these areas separately. **Figure 1** presents the location and limits of the IOP Atlantic Ocean shoreline, and the noted beach management reaches. The defined reaches are used through our comments for reference.

Given the long-term and expected future stability of the central area of the island (Reaches 3 and 4), we did not focus our review on that area of the island. The central island area has historically been stable due to the benefits derived from the management practices implemented along the areas to the north and south. This condition is expected to continue for the foreseeable future assuming that proactive sand management will continue along the adjacent areas. Moreover, development along the central area of the island is more set back from the active beach and primary dune than development along the northern and southern areas of the island. This also benefits beach and dune conditions along the central area of the island and limits the need for proactive beach and dune management activities along that area.

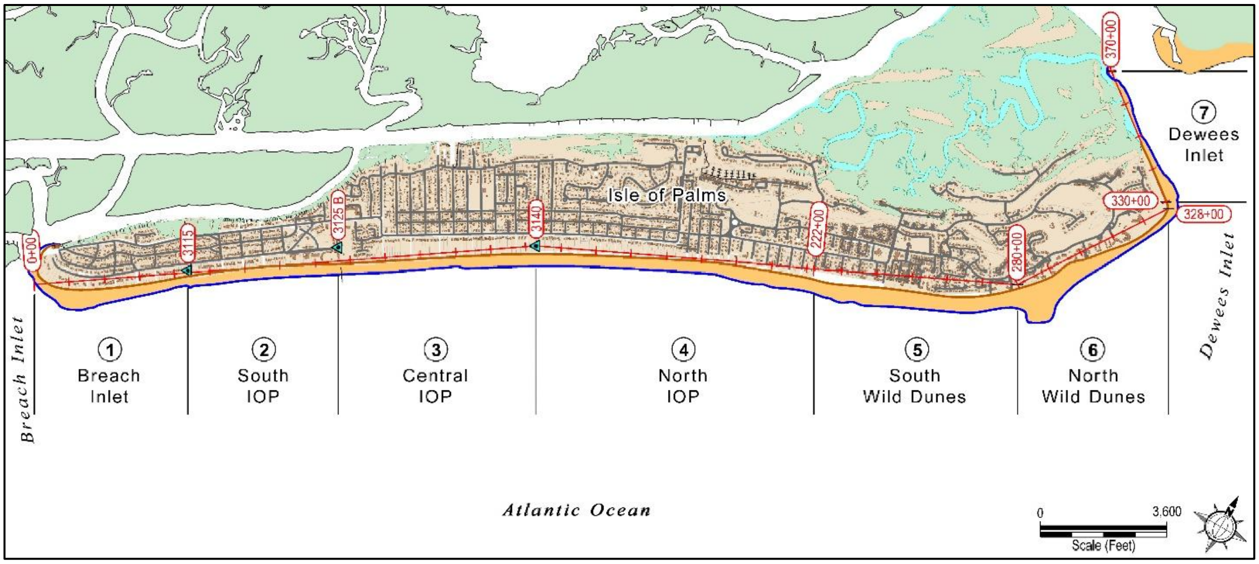

Figure 1: Location of beach management reaches along Isle of Palms, SC (CSE, 2024a).

Summary of Beach Conditions and Past Management Efforts

Overall, there appears to be a good understanding by CSE and the City of the sediment transport regime and past shoreline change conditions along the IOP Atlantic Ocean, Dewees Inlet, and Breach Inlet shorelines as it relates to the City's beach management program. The available surveys, analyses, and reports clearly capture shoreline conditions, shoreline change, and the performance of past beach management efforts.

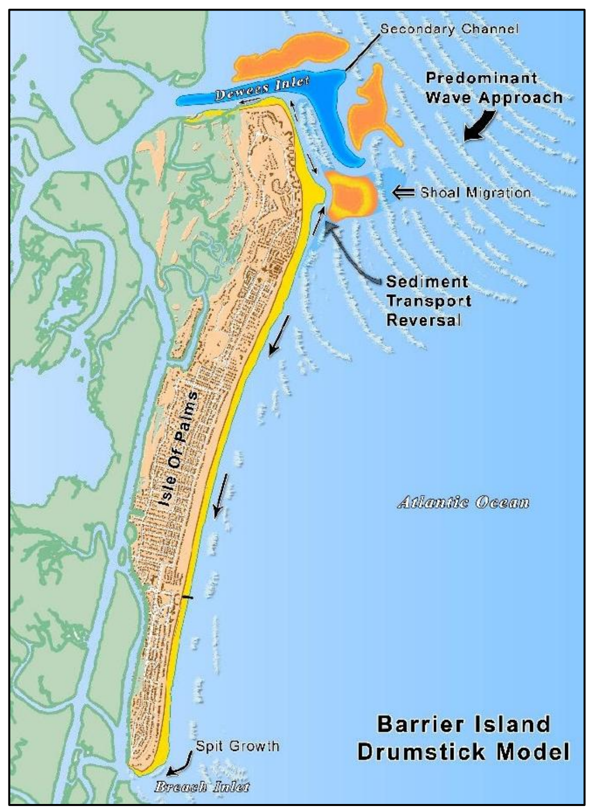

Figure 2: Concept of sediment transport regimen along the drumstick shaped IOP barrier island (Hayes, 1979 and CSE, 2024a).

As presented by CSE, the island's morphology and large-scale sediment transport conditions along IOP are well explained by the barrier island drumstick model of Hayes, 1979 and CSE, 2008. (**Figure 2**). That is, the island is wider on the north end and narrower on the south end. From north to south, the island's shape and shoreline behavior is strongly related to the Dewees Inlet ebb shoal, the periodic north to south sand bypass events that occur across the ebb shoal, and the periodic attachment of large bypass shoals to the IOP shoreline (**Figure 3**).

When the bypass shoals attach to the island, shoal sand is spread both north and south by the incident wave climate (**Figure 3**). This sand is available to accumulate along the Dewees Inlet shoreline and the central and southern area of the island. This contributes to the stability of the shoreline enjoyed along the central area of the island and the presence of a large historically accretional spit shaped feature at the southern terminus of the island (**Figure 4**). The southern end of the island's shoreline terminates at Breach Inlet where sand movement transitions to the inlet's ebb tidal shoal.

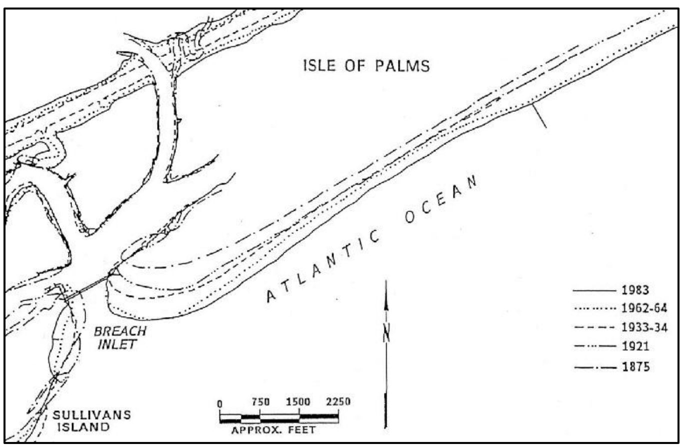

Figure 4: Historical growth of "spit" at southern terminus of Isle of Palm at Breach Inlet (IOP, 2007).

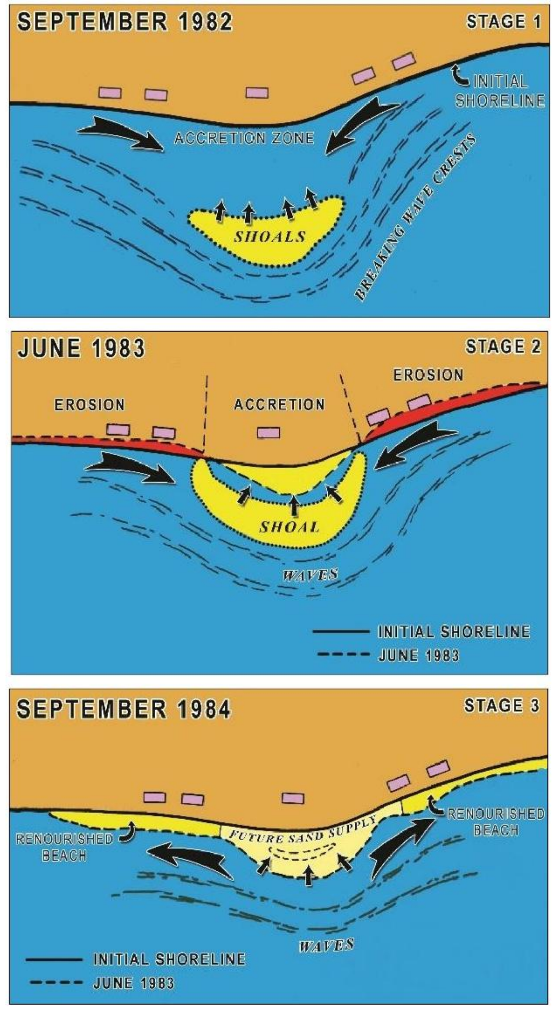

Figure 3: Phases of shoal attachments along northern end of the island and concept of shoal spreading following full shoal attachment (CSE, 2024a).

The delivery of large volumes of sand to the island from Dewees Inlet bypass events would be expected to provide a net benefit to at least a portion of the island's shoreline and total sand volume. Unfortunately, history has shown that shoal migration toward the island and the influence of a shoal's shape as it approaches the island alters the incident wave climate in such a manner that causes highly localized erosional stress and sand loss immediately north and south of the shoal that has proved difficult to manage. An example of the eroded shoreline condition that occurs with shoal migration is shown in **Figure 5** (CSE, 2022). The shoal induced localized erosion can be so extreme that past interventions such as large-scale renourishment and sand scraping have not been able to effectively offset this effect and protect upland infrastructure throughout the entire cycle of shoal approach and attachment. The impact of these localized erosion events is exacerbated by the erosional stress associated with inlet dynamics, sea level rise, and the presence of upland development within the range of natural beach movements.

The areas of the managed beach referred to as Reaches 5 and 6 are affected most by these extreme erosion events. The wide range of available sand volume in the beach profile through time for Reaches 5 and 6 compared to other areas of the island is represented in **Figure 6**. It is also along these areas where the measured beach volume more commonly decreases below the identified "healthy" conditions.

As identified by CSE, in addition to the localized effects, the sand shoals have not been able to completely offset the long-term background loss rates for Reaches 5 and 6. As a result, the entire northern end of the island suffers from long-term net sand volume loss in the absence of large-scale periodic renourishment projects. The net sand loss and the localized impacts from shoal migration will continue to be a beach management challenge for the northern end of the island.

Figure 5: Example of shoal attachment event along northern end of Isle of Palms and the associated severe erosion along the shoreline leeward of the shoal edges (CSE, 2024b).

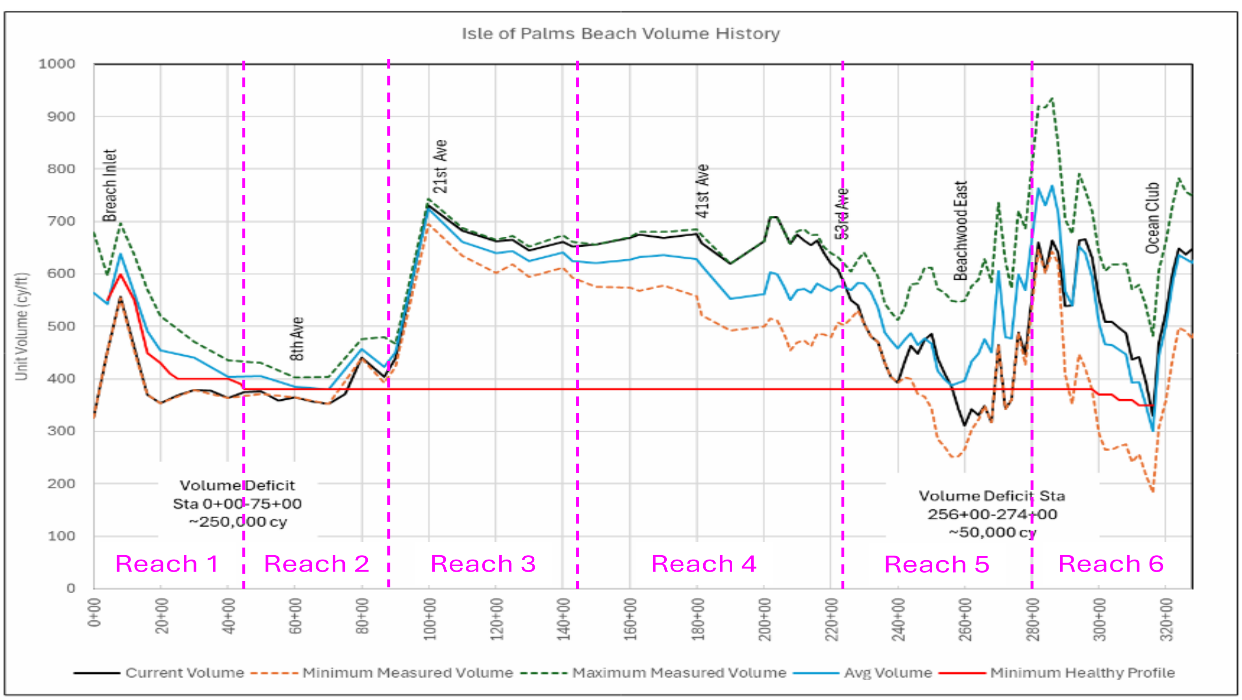

Figure 6: The range of documented shoreline locations and extent of beach management reaches along Isle of Palms, SC (CSE, 2024c).

North End (Reaches 5 and 6) Management

To date, the northern end of the island (Reaches 5 and 6) has required the most active management compared to all other areas of the island. Efforts have been required to address the significant localized erosion events associated with shoal attachments and an overall persistent net loss of sand volume from the beach. The management initiatives have included two large-scale beach restoration projects, several smaller emergency sand-scraping projects, and temporary shore-hardening applications (i.e., sandbags) when shoal attachment events induced severe localized erosion during the pre-attachment phase of the shoal event.

The past management efforts for the northern end of the island have been reasonable given what was known about general shoreline behavior and the effects of shoal migration and attachments. These projects, based upon well-established beach management techniques, however, have not been sufficient to completely offset and/or control (1) the impacts associated with the localized erosional effects caused by the sand shoal attachment events and (2) the overall net sand loss rate from the northern end of the island.

Erosion associated with shoal attachment events continues to severely impact the Reaches 5 and 6 shorelines and beach management projects. Localized volume loss rates associated with these events far exceed the average rates along each reach, reducing the extent of protection provided by management events, such as beach fill or sand scraping projects. For example, the average sand loss rate along Reach 5 since completion of the 2018 project has been about -25 cy/ft/yr, which unto itself is extremely high compared to typical barrier islands. During this same period, however, a localized area of Reach 5 experienced sand loss rates over a one-year period that approached -150 cy/ft/yr, or 6 times the average rate. Even if a renourishment project design is based upon an expected sand loss rate of -25 cy/ft/yr, on average, a localized erosion rate of more than 6 times the average along any section of the project will have a significant impact on the overall project's performance and significantly reduce the effectiveness of that project.

The recent overall net loss of sand from Reaches 5 and 6 is also problematic for beach nourishment performance and feasibility. **Figures 7** and **8** present a timeline of volume change for Reaches 5 and 6 for the period late 2007 to late 2024. Notable conditions from these figures show that Reach 5 experienced more erosion over the period than Reach 6. As of September 2024, Reach 5 contains less than 5% of the 2018 project volume.

Volume loss rates along both reaches have increased significantly since completion of the 2018 project. Along Reach 5, the average volume loss rate is about 1.7 times higher than that which occurred following the 2008 project. For Reach 6, the sand loss rate after the 2018 project is more than 15 times higher than following the 2008 project. These changes are likely related to shoal attachment events, continued sea level rise, and storm activity. It is noted, however, that

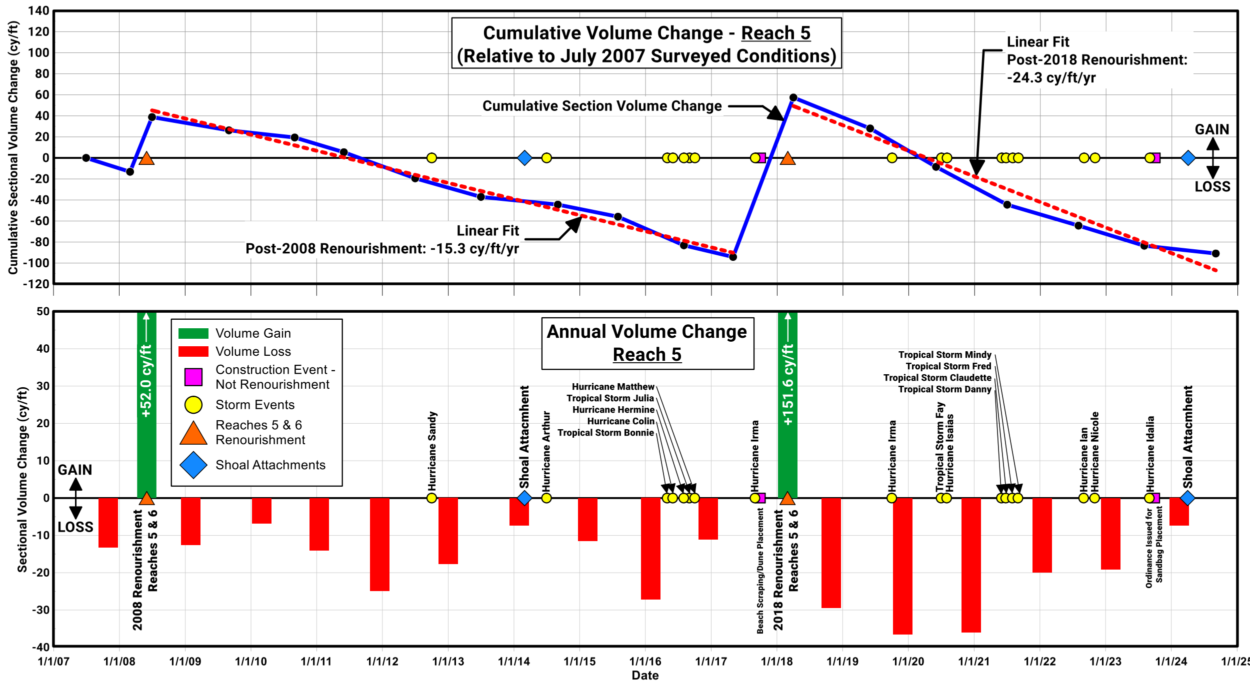

Figure 7: Timeline of IOP Reach 5 beach volume change between 2007 and late 2024. (Data Source: CSE, 2024a)

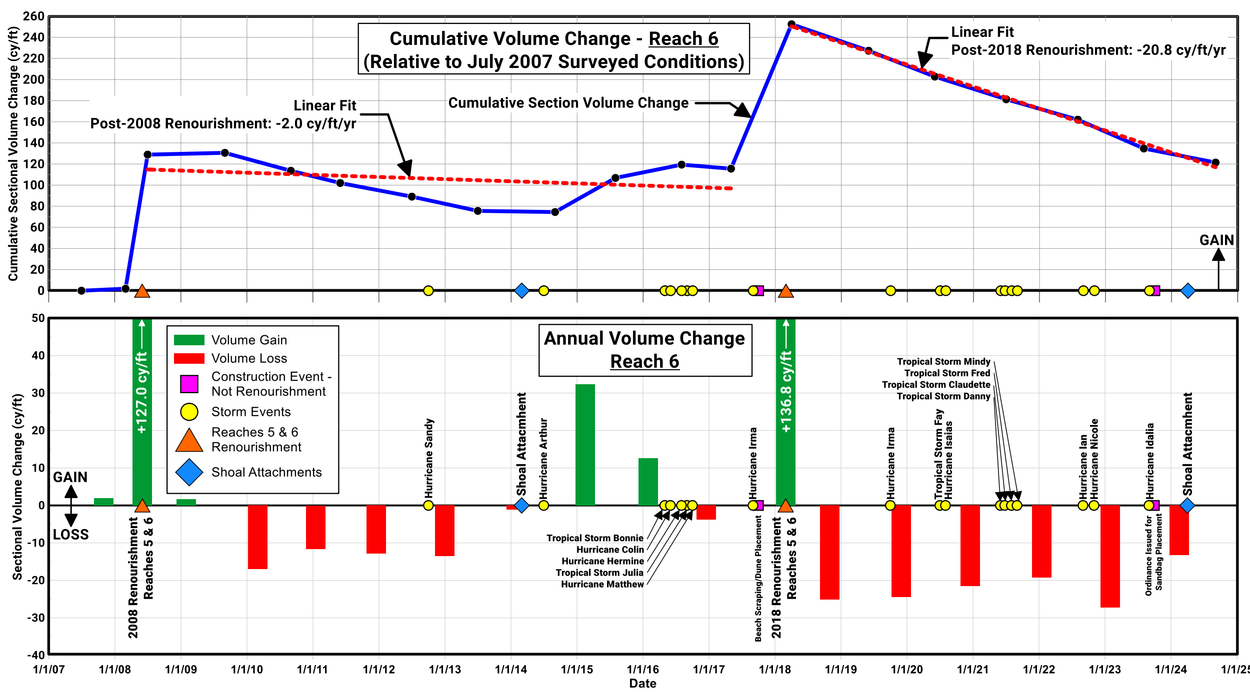

Figure 8: Timeline of IOP Reach 6 beach volume change between 2007 and late 2024. (Data Source: CSE, 2024a)

the rates through time following the 2018 project are consistent, suggesting that they may not be strongly related to episodic events but rather reflective of a possible change in background conditions. The reasons for this change are not clear. We note that we have not reviewed borrow source geotechnical information for the 2018 project in detail. As such, we cannot determine to what extent borrow area sediment compatibility with the native beach sediments may have contributed to the increase in sand loss rates, but differences in sediment conditions can lead to changes in beach behavior. Sediment quality for future nourishment activities should remain an important consideration for future project planning.

CSE (2007) reports average long-term historical net sand loss rates along this area of the island to be between 5 and 10 cy/ft/yr. Average net loss rates of this magnitude may be manageable with beach nourishment, but the recent trend of volume loss rates along both the northern and southern ends of the island suggest that future conditions may not be represented by those experienced historically.

Given the apparent increase in the background net sand loss rate and the magnitude of localized erosion caused by shoal migration, it is our opinion that beach nourishment alone will not be a feasible nor sustainable long-term solution to address beach and dune erosion conditions along Reaches 5 and 6 and provide reliable shore protection. Accordingly, we believe that future planning and management at IOP should consider the following,

1) The localized erosion rates that occur during shoal attachments cycles are too large to address with sand placement alone. The timing and occurrence of these large erosion events cannot be managed with an offshore dredge project because of the time required to identify and permit an offshore source and the cost to mobilize a large offshore dredge,

2) Localized erosion cannot be effectively managed with emergency sand scraping events. The magnitude of erosional stress far exceeds the amount of sand that can be effectively moved to address the rate of sand loss,

Ideally, the City should seek to implement beach management measures to reduce the rate of localized erosion caused by sand shoal attachment events and protect the most vulnerable areas of Reaches 5 and 6 from the impacts of the extreme erosion that occurs during a shoal attachment event. The goal will be to provide more consistent beach conditions and shore protection between large-scale nourishment events and increase the time between required large-scale renourishment. The latter will potentially reduce the long-term demand on available offshore sand resources as well as reduce the impacts of dredge mobilization costs to long-term beach management.

Based upon documented performance of past beach management activities as well as expected future increases in sand loss rates from the island's beach, it is recommended that the City and community explore more proactive beach management measures beyond nourishment alone.

These will likely be needed to manage the impacts from future shoal migration events and an increase in the overall background sand loss rate from the island. The goal will be to identify an approach or approaches that control and/or prevent future excessive sand loss from the island and decrease the long-term cost of beach management for the City and community. To accomplish this, the City and community may consider the following,

- more proactive management of the sand shoal migrations (**Figure 9**).

- the strategic use of shore-stabilizing structures along those areas of Reaches 5 and 6 that are most susceptible to large sand loss rates between shoal attachment events (**Figure 10**).

Proactive shoal management may consist of the use of dredge equipment, rather than mechanical scrapers, to excavate and reshape large areas of the approaching shoals to reduce the wave focusing effect that causes the highly localized erosion. The excavated material would be placed along the leeward shoreline (i.e., the eventual natural destination of the shoals) along areas most susceptible to the wave-focusing effects of the remaining shoal. This approach offers the opportunity to manipulate the shape of the approaching shoal to reduce the wave focusing effects that cause the localized erosional stress along Reaches 5 and 6. This would also accelerate and better control the delivery of shoal sand to the IOP beach.

The shoal management approach could also include the creation of an offshore sand trap that is the designated sand collection area as shoal events form and migration toward the island. The trap would be strategically sited far enough away from the island's shoreline to reduce the adverse effects caused by a shoal event.

The specifics of how a more proactive shoal management strategy will be implemented will require significant investigation. Geotechnical studies to determine if the shoal can be dredged in a manner that will only produce beach compatible sand during excavation will be necessary. A detailed numerical wave, hydrodynamic, and sediment transport study will also be useful to better understand how shoal shape affects the wave climate and shoreline erosion. This model can also be used to evaluate feasible dredging approaches and shoal reshaping shape that will reduce the most problematic wave refraction/diffraction and wave focusing.

Shore-stabilizing structures would limit the landward extent that the beach could migrate during the most severe eroded condition and maintain more consistent conditions until a shoal migration event can fully attach to the shoreline, and/or a large-scale beach nourishment project can be constructed.

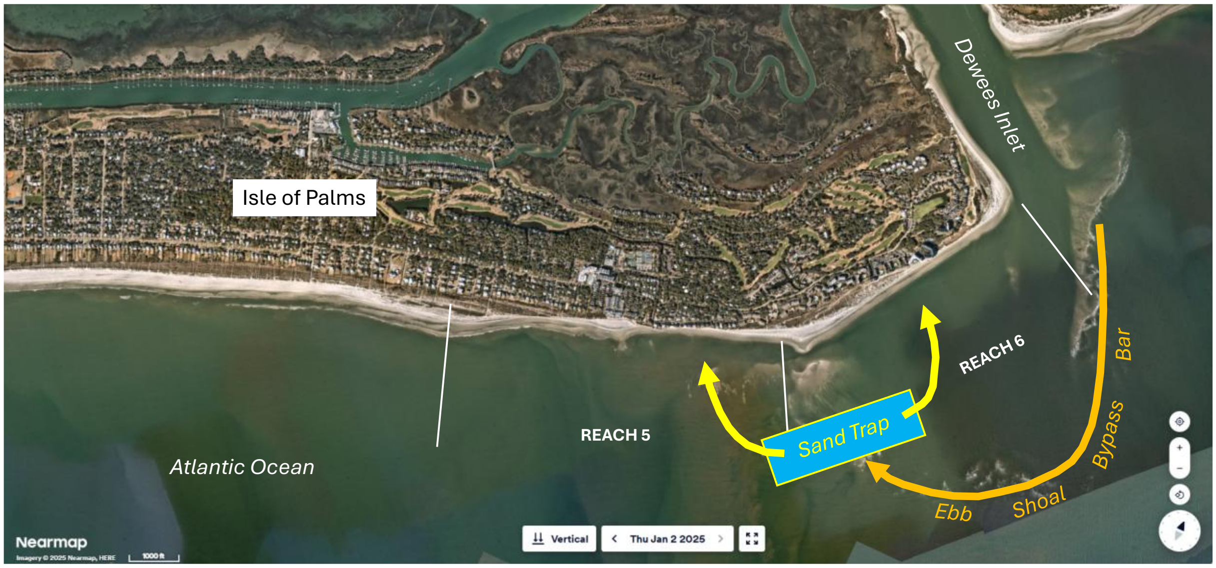

Figure 9: CONCEPT of shoal borrow area/sand trap. This would be intended to control the shoal shape and the unpredictable onshore migration of sand shoals along the northern end of IOP. Sand from the trap would be periodically dredged and placed along the northern IOP shoreline. The trap would then capture additional sand bypassing Dewees Inlet ebb shoal to be used for future dredging.

Figure 10: CONCEPT of a series of detached breakwaters along areas most impacted by variable shoal shoreline attachment. The purpose of the breakwaters will be to maintain a minimum beach condition along the most vulnerable areas of Reaches 5 and 6 during all phases of sand shoal migration and attachment.

The two proposed proactive approaches for future management of Reaches 5 and 6 are very different in concept. The application of shore-stabilizing structures will simply stabilize the areas of shoreline that are most vulnerable to localized erosional stress during shoal migration events. This would not address the periodic occurrence and magnitude of shoal induced erosion along areas of Reaches 5 and 6. Proactive shoal management will seek to reduce the magnitude of localized erosional stress that occurs during shoal advancement. It may be prudent to consider both approaches to address future management of Reaches 5 and 6.

Proactive shoal management will require project permits that allow the City and/or community the opportunity to work in advance of a specific erosion problem. There should be sufficient historical data to demonstrate the cause and effect of shoal migration to shoreline impacts. Ideally, project permits would allow multiple shoal management events to reduce the administrative effort and time to acquire permits. This will be very important given the uncertainty about the future timing and occurrence of shoal attachment events. Maintenance style permits that allow multiple actions under one regulatory authorization are unusual in South Carolina both at the State and Federal level. So, some advance work with the agencies may be required to ultimately be successful in acquiring such permits.

Under existing conditions and typical permits, timing and executing a response to shoal induced erosion is difficult due to the variability of the timing of the occurrence and the magnitude of the erosion that occurs during the shoal event. The uncertainty about the timing of occurrence for shoal response makes timing a response when other areas of the island need sand more difficult. Again, the goal of more proactive management of the northern end of the island's shoreline will be to control the effects of shoal migration events and reduce the extent of localized erosion between large-scale restoration events along all managed areas of the island. This may likely contribute to extending the time between large-scale renourishment events which can reduce program costs over time.

Even with more proactive management actions, it should be expected that future beach nourishment projects will continue to be required to address the continued net sand loss from the northern end of the island. A future beach management goal should be to reduce the frequency and magnitude of these projects as their cost is higher than shoal management.

South End (Reaches 1 and 2) Management

The southern area of the island has historically been naturally accretional over the past 150+ years (**Figure 4**) due to the north to south transport of sand along the central and southern areas of the island. This accretion has created the morphological, spit-shaped feature that forms the southern end of the island.

However, beginning as early as 2011 the southern end of the island has experienced a general trend of retreat. Based upon available data, it appears that the change in the trend of accretion to erosion occurred around the 2010-2012 timeframe. CSE has suggested that the onset of this change may have been exacerbated by the effects of Hurricane Sandy in 2012. However, the occurrence of that one event could not be entirely responsible for the ongoing erosional stress and sand loss that continues to occur along the southern end of the island.

Figures 11 and **12** present a timeline of volume change for beach management areas Reach 1 and 2, respectively. Recent elevated erosion along Reaches 1 and 2 has reduced overall beach volume and eliminated the primary dune along the combined large reach of shoreline, about 8,600 feet in length. It is estimated that the total sand loss since 2011 is about -558,800 cy with about -456,600 cy occurring along Reach 1 and -102,200 cy occurring along Reach 2. This sand loss has exposed shorefront development to the effects of the active beach dynamics and frequent impacts associated with elevated wind and wave conditions. The most severe volume losses have occurred over the past 18 to 24 months, but a review of historical conditions dating back to at least 2011 suggests that the south end of the island has experienced net volumetric sand loss since that time. Although this area may have historically been accretional, as identified by CSE, available data suggests that the beach along Reaches 1 and 2 is now net erosional. Erosion appears to gradually increase from north to south starting at the northern limit of Reach 2 with the high sand loss rates occurring in Reach 1. Although there are periods of both accretion and erosion along Reaches 1 and 2 during this period, there has been a net loss of sand from each reach over the past 14 years.

The net erosion rate along Reach 1 is higher than along Reach 2 suggesting that the sand loss rate is highest near Breach Inlet and increases from north to south from the central area of the island to the inlet. This pattern of erosion along the terminal end of a drumstick barrier island is not uncommon.

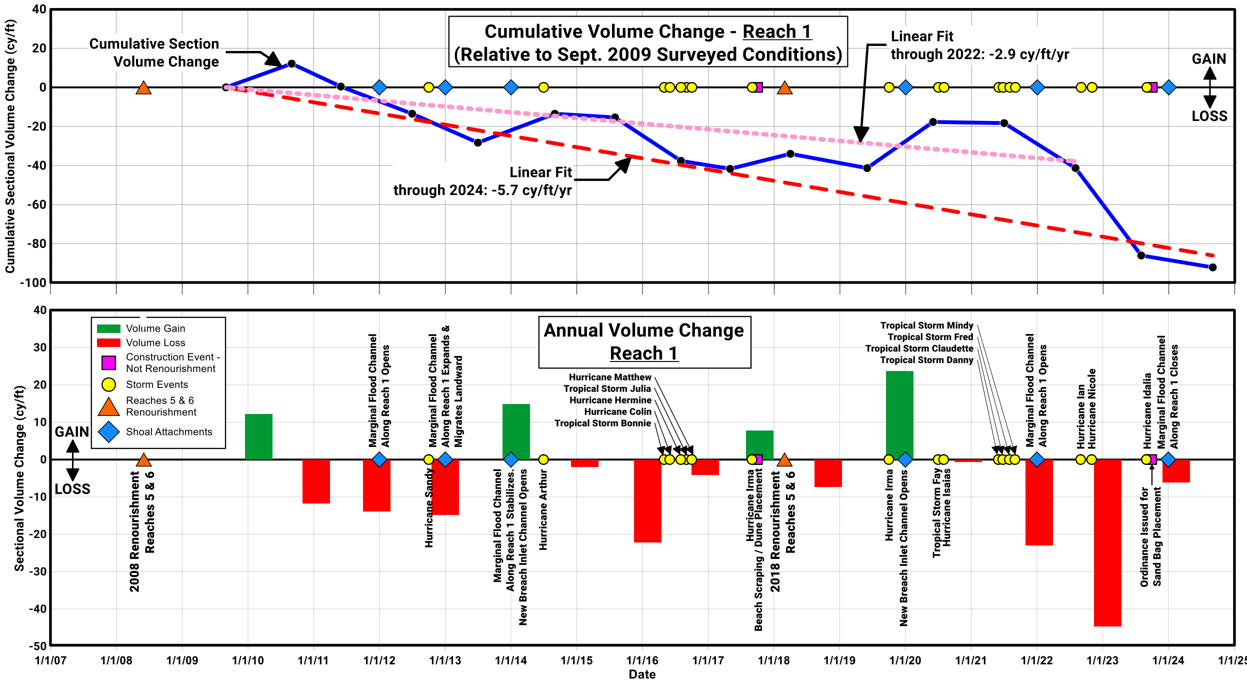

Figure 11: Timeline of IOP Reach 1 beach volume change between 2009 and late 2024. (Data Source: CSE, 2024a)

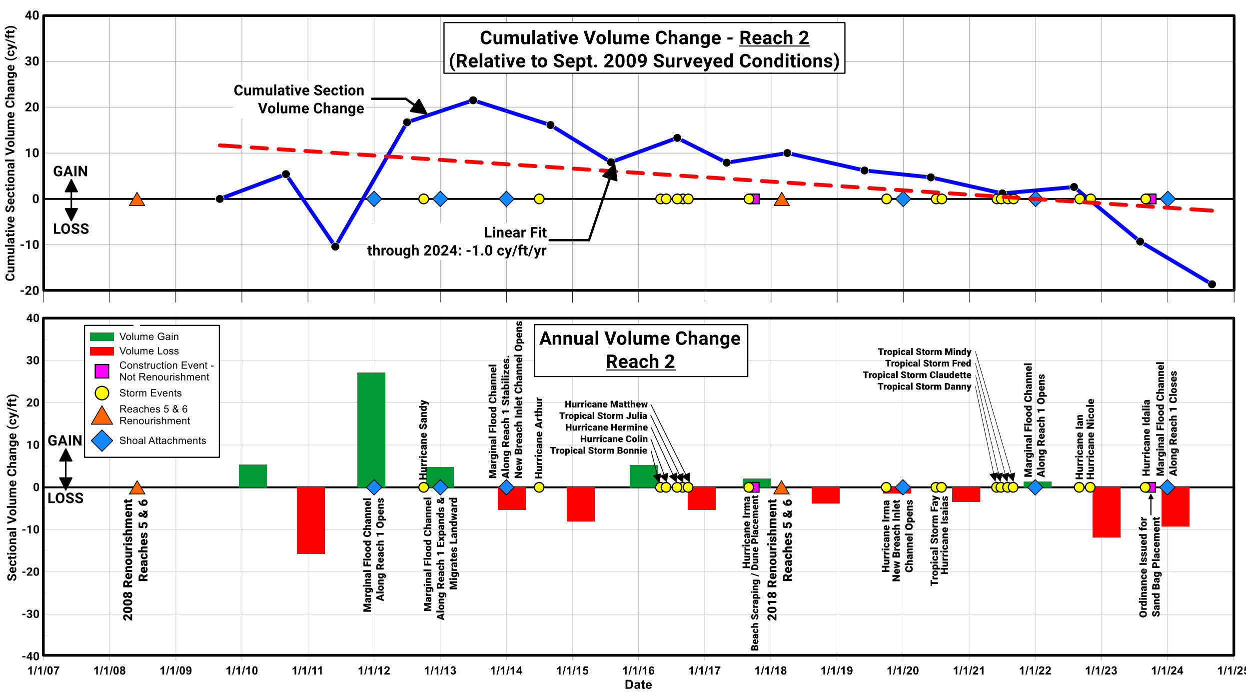

Figure 12: Timeline of IOP Reach 2 beach volume change between 2009 and late 2024. (Data Source: CSE, 2024a)

Although the exact reason(s) for the significant shift in shoreline change trends are not clearly understood, we explore some possible reasons in the following section. Regardless of the reason, it appears that some form of proactive intervention will be required to address the recent beach volume loss and expected continued future trend of sand loss from the southern end of the island. We believe that the options to address the problem are limited to several commonly used shore restoration and stabilization approaches. These are,

1) Large scale sand restoration with periodic renourishment. This approach would consist of replacing the recently lost sand volume and providing a sufficient volume of additional material (i.e., advance nourishment) to offset anticipated future sand losses over a planned project performance period (i.e. renourishment interval). Consideration will also need to be given to compatibility between the native beach sediments and borrow area sediments available for the project. Emphasis should be placed on incorporating overfill ratios in future beach fill designs to improve the success and longevity of projects.

   It is possible that restoration and periodic renourishment alone may not be an effective or cost-effective beach management approach along Reach 1 where sand loss rates are highest, especially near Breach Inlet. Moreover, implantation of a renourishment-only approach under existing sand loss rates may limit the long-term success of this approach due to the need for high frequency renourishment and demands on limited offshore sand sources. Thus, a more proactive approach may be necessary to successfully manage and maintain future conditions.

2) Renourishment with Shoreline Stabilization. This approach would consist of replacing the recently lost sand volume and constructing a strategically designed shore-stabilizing structure, or structures, to reduce future sand loss rates and provide more consistent beach conditions between required renourishment events. The improved shoreline stability would also serve to maintain a minimum beach condition between renourishment events. This would be particularly beneficial should the timing of the required renourishment be delayed and/or dependent upon the required timing of renourishment along other areas of the island.

   In our opinion a terminal groin-type structure would be the most effective at meeting the intended shoreline stability requirements at the southern end of the island. This structure could be implemented as a single terminal groin or a terminal with a complementary breakwater or breakwaters to its immediate north. The combined approach can be beneficial to address shorelines with significant curvature. In such instances, a standalone terminal groin may need to be very long to provide the required shoreline stability and protection along a long, curved shoreline. Such a structure may have undesired effects on an adjacent inlet or other areas.

Figure 13 presents an example concept of a standalone terminal groin. This example is depicted as a single, relatively long structure that would reposition the southern end of the island such that the most erosional areas of the southern shoreline will benefit from the effect of the structure. This would reconfigure the southern end's plan form shape to a more linear alignment. The beach would be wider at the southernmost area of the island, near the structure and gradually narrow in the northward direction.

Figure 14 presents an example concept of a shorter terminal groin with a complementary breakwater to the immediate north. This approach is intended to stabilize all of the southern end of the island requiring stabilization while maintaining a more curved planform shoreline shape than that associated with the single terminal groin approach. The length of the terminal groin and the position and size of the breakwater would need to be determined to maximize shoreline stability while minimizing the size and scope of the structures. Structure design would need to consider potential impacts and impact minimization to interior sand shoreline downdrift of the structure.

The terminal groin approach can also incorporate multiple complementary structures, such as breakwaters and groins. Ultimately, the structure application will depend upon the specific situation and identified best solution for the specific problem. Selection of an appropriate plan and structure configuration will require a significant amount of detailed investigation.

Figure 13: CONCEPT of a long terminal groin and the intended residual beach position response at the southern end of IOP adjacent to Breach Inlet.

Figure 14: CONCEPT of a short terminal groin and updrift detached breakwater to address the natural curvature of the island's southern shoreline. The CONCEPT of residual beach position response to both the short terminal groin and updrift breakwater at the southern end of IOP adjacent to Breach Inlet is also depicted in the figure.

Figures 15 and **16** depict two examples where "leaky" terminal groins have been implemented with complementary updrift structures. Foth | Olsen was the Engineer of Record for both terminal groin projects. These structures are configured to maintain minimum beach conditions on their updrift side while allowing some sand transport to occur over and through the structure(s) to minimize impacts to the adjacent downdrift shoreline and inlet.

The first example, shown in **Figure 15**, is located at the southern end of Amelia Island, Florida adjacent to Nassau Sound, a large natural tidal inlet. There the southern end of the island was experiencing significant erosion and shoreline recession that could not be managed with beach nourishment alone. Following the onset of elevated erosion and shoreline loss, a large-scale beach restoration project with no structural stabilization was constructed. Although that project restored a significant portion of previously lost sand volume, the post-project shoreline, particularly closest to the inlet, continued to experience ever increasing and unmanageable sand loss rates. Through project monitoring and consideration of available limited offshore sand resources as well as the need to increase protection to a maritime forest, the decision was made to add a low-crested leaky terminal groin along with an updrift detached breakwater to reduce sand loss rates along the southern end of the island. The structures were constructed in 2004 and have successfully reduced the long-term sand loss rates from the island, allowing for more consistent minimum beach position conditions and time between required renourishment events. Shoreline conditions updrift of the terminal groin also benefit from the placement of sand dredged from a nearby shoal in the Atlantic Intracoastal waterway (AICWW) every 2 to 3 years. This

Figure 15: Example at the southern end of Amelia Island, Florida of a low-crested terminal groin and updrift detached breakwater to address chronic shoreline erosion that could not be addressed with beach nourishment alone due to excessively high erosion rates. This project has reduced sand loss rates along the southernmost end of Amelia Island to a level that allows typical beach restoration along the southern end of the island to be a successful beach management application.

material is much finer than the native beach material along the southern end of the island and erodes away much quicker than sand place from offshore borrow areas. Accordingly, it has been found that the AICWW sand cannot be a replacement for the periodic placement of higher quality sand from offshore borrow areas.

The other example, shown in **Figure 16**, is located at Bald Head Island, NC along the western end of South Beach adjacent to the Cape Fear River entrance, a coastal inlet with a federal navigation channel. Like the structure implemented at Amelia Island, the Bald Head Island terminal groin is a low-crested, leaky structure that allows sand transport to occur through the structure while maintaining intended minimum beach conditions on its updrift side. Two lengths of the terminal groin were considered. Ultimately, the shorter option was selected, and emphasis was placed on continued maintenance of an existing updrift radial sand tube groin field that had been constructed a decade earlier. The combined effects of this structure configuration, regular sand renourishment from channel maintenance dredging, and occasional beach renourishment using offshore sand resources has been successful in maintaining required beach conditions. Future uncertainties about the continued availability and accessibility of offshore sand resources may warrant consideration of additional structural applications. Both structure projects described herein are relevant examples of the type of structure application that should be considered for the southern end of IOP.

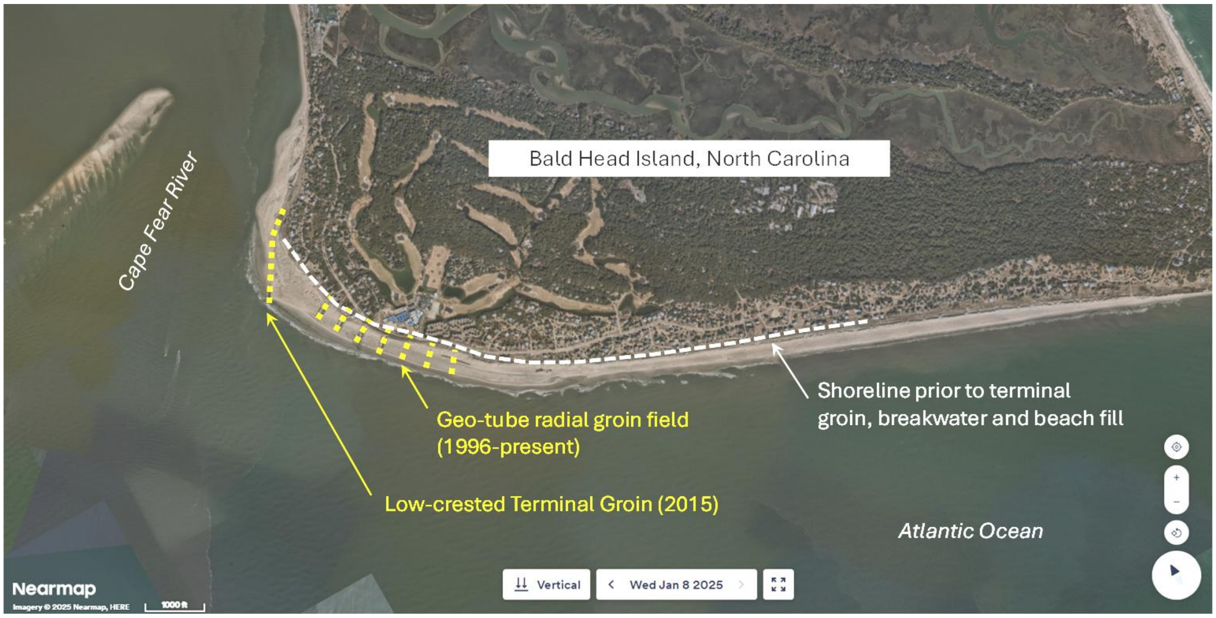

Figure 16: Example at the western end of Bald Head Island, North Carolina of a low-crested terminal groin and series of geo-tube groins to address chronic shoreline erosion that cannot be addressed with beach nourishment alone due to excessively high erosion rates.

For any beach management strategy that incorporates shore-stabilizing structures, a detailed engineering investigation is recommended. Moreover, such an investigation may be required to justify the project and support statements regarding expected performance to regulatory agencies. A shore-stabilizing structure investigation may include, but not be limited to, a comprehensive numerical model investigation that considers inlet hydrodynamics, the near-shore wave climate, and the effect of both upon the local sediment transport and shoreline and inlet shoal change. The model would be used to study existing conditions as well as the various project alternatives and their respective performance and effects. Although a numerical model would not be expected to provide a definitive answer to the question regarding need and scope of a structural stabilization approach, it would provide insight into the expected benefit of the use of structures as well as the expected relative performance of various structural alternatives to one another and to the no-action and nourishment only alternatives.

The cost of a shore-stabilizing structure project can be offset over a long-term planning period by the reduction in the amount and frequency of future sand renourishment events. There is also the benefit of more consistent beach conditions and relatively stable minimum beach conditions if the structures are configured in such a manner to provide that condition. Efforts to reduce future sand loss will benefit managed beaches as the availability of beach compatible sand resources suitable for beach project use become more limited and as sea levels increase. Further, the distance between managed beach and suitable sand resources will also increase in the future, increasing the cost to transport the materials to the beach. Exacerbating the situation are the ever-escalating costs from the U.S. dredge industry.

Causes of Recent Changes to South End Shoreline

The recent changes to the southern end of the island consist of a net loss of beach and dune sand volume and a persistent trend of sand volume loss. Historically, over the past 150+ years, this area of the island was generally stable to accretional. The specific reason or reasons for the change is unclear. There are, however, several recent and notable morphological changes around the southern end of the island and Breach Inlet that may have contributed in part to the recent observed changes. Given the lack of specific investigations of the probable causes, at this time, we can only hypothesize about the possible causes.

As correctly identified by CSE, there appears to be a strong relationship between the condition and behavior of the southern IOP shoreline (Reaches 1 and 2) and Breach Inlet and its associated shoals and channels. So, it may be reasonable to assume large changes to Breach Inlet and the shoals and channels, such as realignment, shift or other large change, can impact the IOP southern shoreline. Based upon our very cursory review of available inlet history information and knowledge of recent regional changes due to storms and global water level change, we believe that observed shoreline changes may be due, in part, to the following or a combination of the following,

- Changes to Breach Inlet tidal prism and inlet shoals,
- Recent hurricanes and other coastal storms, and
- Sea Level Rise (SLR).

Changes to the Breach Inlet Tidal Prism. CSE (2022) notes significant changes to the Breach Inlet ebb shoal and the potential relationship between these changes and the recent sand loss experienced along the southern end of the island. We agree that the historical stability of the southern end of the island is related to the location and condition of the northern lobe of the Breach Inlet ebb shoal and recent changes to this shoal are likely responsible, at least in part, to the recent sand losses along the southern end of the island. Of interest to future planning are the reasons for the large changes to the Breach Inlet ebb shoal.

Review of historical aerial photography of the Breach Inlet area shows that the interior area of the Breach Inlet channel at the Atlantic ICWW has experienced significant changes over the past several decades. Specifically, it appears that the interior area of the inlet channel is expanding. **Figure 17** depicts aerial photographs from 1994 and 2024. The respective apparent interior marsh edges near Breach Inlet are also shown. The specific area of interest is located within the purple circle included in the figure. Comparison of the photographs and delineated marsh edges show that the planform size of the direct opening between the Atlantic ICWW and the Breach Inlet channel has increased over this noted period. This change has also caused the channel between the ICWW and the ocean to become straighter.

An expanded and straighter inlet channel can increase the hydraulic efficiency of the channel which can increase the amount of water that is transported into and out of the inlet over a tidal cycle, a fixed amount of time. The total flow of water into and out of an inlet over a tidal cycle is termed the “tidal prism.” An increase in the tidal prism will increase water velocities and the amount of sediment transport that occurs over the same period. Such permanent change to the tidal prism can have significant impacts on the overall inlet structure as well as the size, shape, location and function of the inlet’s ebb and flood shoals as well as shorelines adjacent to the inlet. With an increase of the tidal prism at Breach Inlet, there could be significant changes to the adjacent shorelines including increase sand volume loss like that observed along the IOP southern shoreline.

The effects of a gradual increase in the inlet tidal prism would likely have a similar gradual influence on the condition and behavior of the adjacent shorelines. However, the occurrence of a large coastal storm while the inlet is experiencing changes to the general morphology and tidal prism can exacerbate and accelerate change to the entire inlet system. Further, it could be that such storm impacts are so significant that there can be permanent change to the inlet structure that the structure will not return to pre-storm conditions. As noted below, the IOP shoreline has experienced significant impacts from numerous hurricanes over the past 15 years, which is within the time frame of the noted inlet planform changes. So, it may be reasonable to conclude that the observed changes are related to the combined effects of overall inlet morphology change due to an increase in the tidal prism and large coastal storms that have a direct impact on the inlet and beach system.

It is noted that these observations are based upon limited aerial photography and there are no direct measurements of the inlet’s width and cross-section. However, anecdotal observations from locals who use the inlet have indicated that conditions within the inlet, including the magnitude of water velocities, have increased over the years.

It is possible that maintenance of the ICWW at Breach Inlet has contributed to the observed changes in the interior channel and marsh edge conditions. Dredge records suggest that the area of the ICWW at Breach Inlet regularly requires dredging to maintain ICWW navigable conditions. The presence of the large dredge material disposal areas immediately adjacent to this area support the ICWW channel maintenance need. Long-term and frequent dredging of the ICWW immediately inside Breach Inlet may have contributed to the observed interior marsh edge change and channel expansion. Should this be the case, one could likewise conclude that ICWW maintenance dredging could be responsible, in part, to the long-term effects to shoreline conditions along the southern end of IOP. Given the noted change to the inlet marsh edges and channel, a more detailed investigation of a possible increase to the Breach Inlet tidal prism and possible associated effects to the inlet and adjacent shoreline may be a beneficial endeavor to support long-term beach management at IOP.

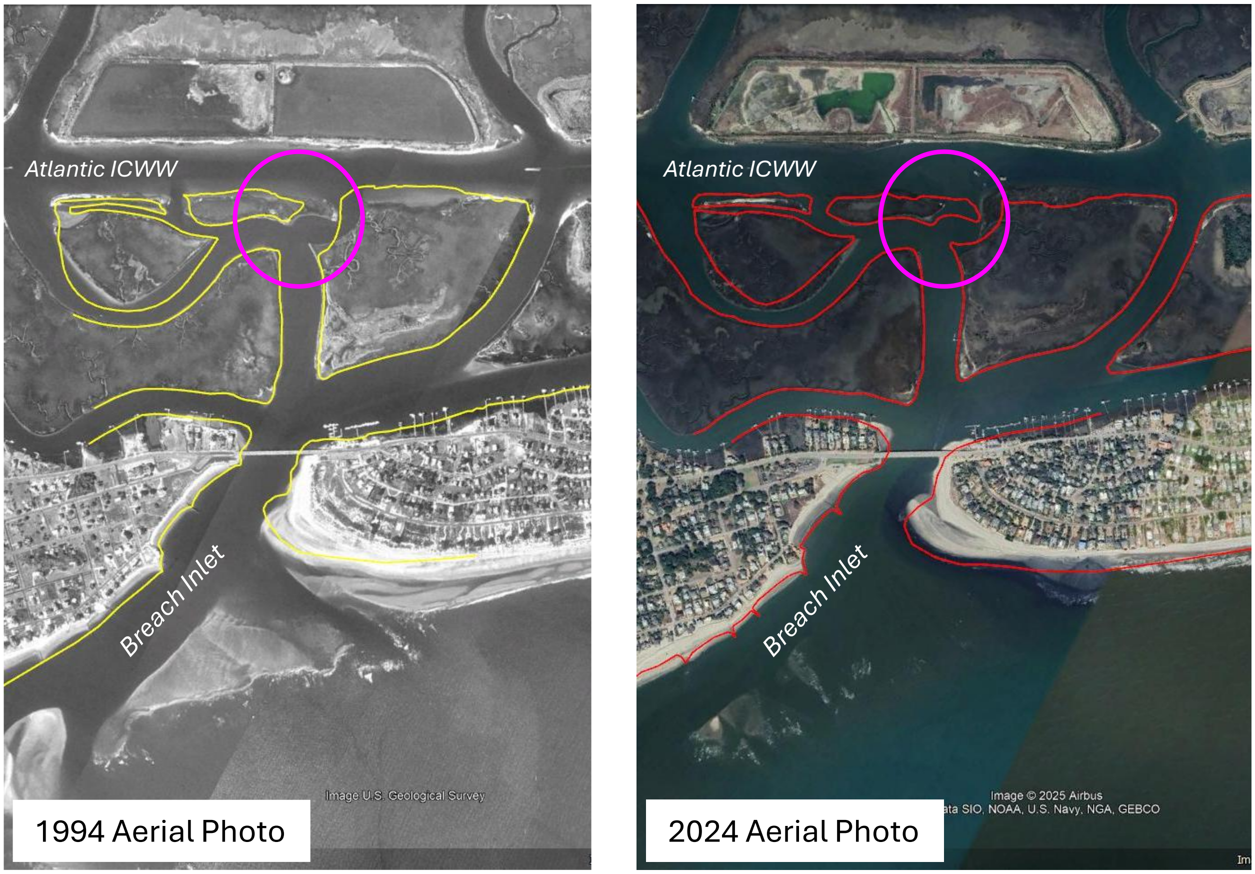

Figure 17: Aerial photographs of Breach Inlet from 1994 (left panel) and 2024 (right panel) with the respective apparent interior marsh edges near Breach Inlet also shown. The purple circle indicates the specific area of interest.

<u>Storms.</u> Recent net beach volume loss along the southern end of the island and changes to the Breach Inlet ebb shoal, also may be related to recent hurricane activity. Large sand volume losses occurred along Reaches 1 and 2 during Hurricanes Sandy (2012), Hurricane Matthew (2016), and Hurricane Irma (2017), among others. Although there was some volumetric recovery in the beach system following these events, there has been a trend of net sand loss from both Reach 1 and 2 since about 2011. Large storms can cause significant sand loss from across the entire beach profile from the upper dune to beyond the typical depth of closure. When this occurs, the sand is lost to the adjacent inlets as well as to the offshore, beyond the typical depth of closure. Once sand is transported beyond the local littoral system, it is not available to support post-storm recovery. From review of the recent sand loss trends at IOP, it appears that storm activity has contributed to the net loss of sand from the island's beach system.

<u>Sea Level Rise (SLR).</u> CSE (2022) summarizes the general trend of increasing average water levels in the vicinity of IOP and Charleston (**Figure 18**). Inspection of this figure reveals the gradual

increase in measured water levels between 2000 and 2023. The most obvious change in this record appears to occur between about 2010 and 2023.

An increase in average water levels contributes to numerous changes in beach and inlet behavior. For sand beaches, higher water levels allow larger waves to reach the shoreline, allowing waves to increase sand transport, and allowing waves to remove sand from higher aeras of the beach and dune profiles. Higher water levels can also increase the amount of water that is transported through tidal inlets, increasing the tidal prism, water velocities through the inlet, and sediment transport rates. Large water volumes and velocities through an inlet will alter the shape and behavior of the inlet's channel, shoals, and adjacent shoreline. In instances where shoreline stability is maintained through inlet ebb shoal configuration and stability, changes to an inlet and inlet stability can adversely impact adjacent beaches.

Sea level rise is expected to continue at an ever-increasing rate. Additional increases in average water levels will further exacerbate the erosional effects to the island's sand beach and increase the amount of sand that will be required to maintain desired beach and dune conditions. The higher water levels will likewise increase potential instabilities around the adjacent inlets and associated shorelines.

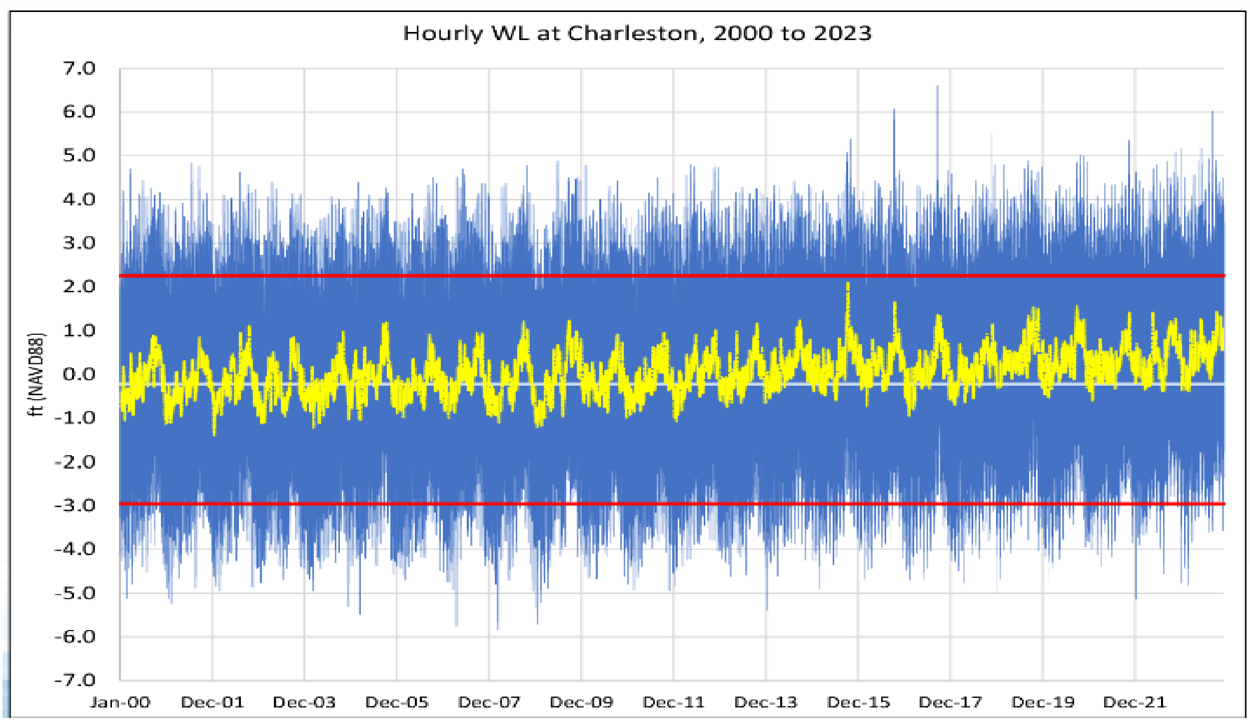

Figure 18: Sea level measures in the vicinity of Charleston, SC between 2000 and 2023 (CSE, 2022). Note the position and range of the yellow line relative to the white horizontal line.

Future beach management planning at IOP should consider the known effects that higher water levels can have upon beach and dune behavior. Specifically, plans should consider structural changes to beach fill design including changes to berm crest elevations and increases in sand volumes to offset future increases in sand loss rates due to higher water levels.

Comments on the USACE Beneficial Use Project. The USACE beneficial sand use project is a unique opportunity for the city to replace a portion of the recent sand loss along the southern end of the island. We are concerned, however, about the quality of the material compared to the sand that occurs naturally on the island's beach and dune and its ability to provide meaningful benefit. The material in the disposal area originated from maintenance dredging of the ICWW channel. It is common for sand excavated from interior waterways such as the ICWW to have a smaller average grain size and higher fines (silts and clays) content than that which typically found along Atlantic Ocean sand shorelines.

When materials with a smaller grain size than those which occur naturally are placed on the beach, they are susceptible to rapid transport away from the placement area contributing to higher-than-normal sand loss rates. The fines fraction of the material will be lost almost immediately, reducing the net volume of material that remains on the beach immediately after placement. Should the material be placed in the intertidal or nearshore region, the sediments will tend to sort by grain size from large to small with larger grain sized material tending to migrate shoreward and finer grain sediments migrating offshore (Dean (1973), Kraus et. al. (1991), and Dalrymple (1992)). Preliminary observations of the material placed by the USACE in 2025 indicate that the material is not being retained along the southern end of the island as hoped (Douglas Kerr, personal communication). This is likely due in part to the fine grain characteristics of the material and high silt content. Much of the placed material has likely migrated offshore and/or to the Breach Inlet shoals.

Given the nature of the material from the ICWW, it should not be considered a reliable future sand source for the island. Although placement along areas of the beach can have some benefit, any meaningful improvement will likely be short in duration and will not be expected to maintain desired beach volume and width conditions for an entire nourishment cycle. Should the recent sand loss rates along the southern end of the island continue, additional sand placement from offshore or other sources will be required.

Potential relationship between IOP beach management activities IOP and Breach Inlet

In short, we have found no evidence that would suggest that beach management activities on IOP have influenced the recent changes that have occurred at Breach Inlet. Further, there is no evidence that past beach management practices along the northern end of the island are related to the recent changes along the southern end of the island. As discussed above, we believe that the recent changes along the southern end of the island are related to morphological changes at Breach Inlet, recent storms, sea level rise, and/or a combination of these.

It may be possible that the release of the large volume of sand from the southern end of IOP (i.e., the recent net loss of sand) may have contributed, in part, to growth of the inlet's ebb and flood shoals, as well as increasing sand transport toward Sullivan's Island. An increase in the amount of sand transported to the Breach Inlet ebb shoal, especially the northern ebb shoal lobe just off IOP, may increase the potential for the Breach Inlet channel to migrate southward toward Sullivan's Island. Such channel migration could increase erosional stress along areas of the Sullivan's Island shoreline, especially that area of shoreline immediately adjacent to Breach Inlet. Again, we do not believe that the large loss of sand along the southern end of IOP and changes to the Breach Inlet ebb shoal and channel, and the Sullivan's Island shoreline are related to past beach management activities at IOP.

Future Sand Sources and Sand Source Sustainability

Current and expected future sand loss rates along the IOP shoreline, with or without shore-stabilizing structures will require regular sand replacement events to maintain desired beach and dune conditions. This need places significant demand on beach compatible sand resources that may be available to the island.

Regionally, sand resources suitable for placement on the beach are limited. The City should prioritize the identification of the future sand volume need and the sand resources that are available for currently planned and future projects. Planning should extend beyond just the next project and consider the sand resource needs over the coming decades. It is noted that USACE project planning typically involves identification of sand resources that will meet at least a 50-year project need.

Knowledge of the location and extent of available sand sources also allows for meaningful evaluation of the long-term probable sand replacement costs. The distance between the sand source and placement site has a significant impact on sand cost. As sand near the island is depleted, the City will be required to use more distant sand resources for future projects. This will have a direct impact on the cost of future projects. Between the ongoing cost increases in the US dredge market and expectation that future sand resources will be farther away from the island, the City should expect that the cost of future sand placement projects will continue to increase at an ever-increasing rate. The impacts of such cost increases to the overall beach management program should be considered in continued program planning.

Beyond identification of the available suitable sand resources, the City should prioritize sand resource preservation. This will include strategic borrow area design and controls over how dredge contractors are allowed to use borrow areas. We often develop dredge plans as part of borrow area design that are intended to control how a dredge contractor will work within a borrow area and this information is provided to bidding contractors prior to bidding. The purpose of this is to control where and how the contractor removes material from a borrow area so as not to unnecessarily disturb large areas of a sand resource. We often subdivide the sand borrow areas into zones and prescribe a specific order of dredging and the amount of sand that must be removed from each zone before the contractor can move to a subsequent zone. This information is provided in the project design, bid and contract documents. Without such constraints, a dredging contractor will operate in a borrow area in a manner that is most advantageous to their production and profitability. This may or may not be beneficial to sand source preservation and sustainability. It is possible for dredging equipment to dredge borrow areas in such a way that all usable sand is not removed and other areas are disturbed in such a way that future access to that material with a dredge is not possible. Beach compatible sand resources are a valuable and limited resource. Their prudent use and preservation are important for all beach management practices.

Summary and Recommendation

In summary, we believe that the beach management practices and projects implemented to date have been reasonable and prudent. But localized erosion rates caused by sand shoal migration along the northern end of the island and a persistent increase in the sand loss rate from the island's beach has limited the benefit of the sand placement only approach. There is no evidence that the occurrence of localized erosion due to shoal migration and attachments on the northern end of the island and recent increased sand loss rates along the southern end of the island will change. In fact, it should be expected that sand loss rates along the island may only continue to increase into the future. Accordingly, it is clear to us that sand placement alone as a beach management strategy will not be the most effective approach moving forward. More proactive approaches, such as intervention in shoal migration events and the use of strategic shore-stabilizing structures, along with sand placement, should be considered.

Below is a summary of future management practices that can be considered by the City,

- Future Restoration and Renourishment Schedules. The City should anticipate that the foundation of continued beach management at IOP will be beach restoration and periodic renourishment. A future challenge will be addressing this need in the most cost-effective way possible. To accomplish this, the City should explore measures to,

1) reduce the amount of sand needed to maintain suitable beach conditions,
2) address the cause of localized problematic erosion that triggers the need for emergency dredge mobilization and/or sand scraping events (i.e., proactive shoal management),
3) implement improvements to address areas with above average erosion rates and seek to create conditions that allow regular renourishments to occur for all areas of the island on the same schedule (i.e., use of strategic shore-stabilizing structures),
4) identify sand source(s) to address immediate need and long-term numerous future needs, and
5) implement measures to preserve available sand sources.

- <u>Proactive Management of Shoal Attachments (Reaches 5 and 6).</u> The City should consider implementing a shoal management plan that will reduce or eliminate the impacts that accompany shoal migration toward the island (i.e., localized hot-spot erosion on the shoulders of the shoal) and provide more consistent beach conditions between shoal attachment events. In concept, this would involve programmatic manipulation of approaching shoals with dredging equipment to alter the shape of the approaching shoal and transfer sand to the leeward beach. This work should be accomplished before the shoal shape and location becomes problematic to the leeward shoreline. It is possible that this could be a highly efficient and cost-effective long-term approach to managing the consistent beach conditions along the northern end of the island.

  The City should coordinate with representatives from the dredging industry regarding the feasibility of using dredge equipment (small or large) to excavate areas of the shoal to meet the goal of reducing shoal impact. Likewise, the City should also consult with state and federal regulatory and resource agencies about if such an activity is permittable. Additionally, the City should explore with the agencies the concept of a maintenance style authorization that would allow the city to respond in a timely manner to shoal events as they occur. This will eliminate permit processing time and allow for immediate responses before a shoal can adversely impact the shoreline.

  The specifics of how a more proactive shoal management strategy may be implemented will require significant investigation including geotechnical and numerical wave, hydrodynamic and sediment transport studies. These studies would help evaluate the feasibility and scope of a project approach.

- <u>Strategic Shore-Stabilization Structures in Reaches 5 and 6.</u> With or without the implementation of a proactive shoal management project, there are areas along Reach 5 and 6 where the use of shore-stabilization structures should be considered. Past beach restoration projects have not successfully provided consistent protection to all areas of the Reaches 5 and 6 shorelines. The structures would provide a last line of defense and establish a minimum shoreline position between the edge of upland development and the waterline. This would be particularly beneficial along those areas of Reaches 5 and 6 that have been most susceptible to highly localized erosion and infrastructure impacts during shoal migration events. The City should consider both a more aggressive shoal management program and the implementation of the shoreline stabilizing structures. The cost of the structures should be compared to the potential benefit of reduced sand placement needs in the future.

- Terminal Groin at Beach Inlet (Reach 1). Review of beach condition and shoreline change data available along the southern end of IOP as well as recent changes to the Breach Inlet morphology suggest that the current pattern of erosion will continue into the foreseeable future. Should existing sand loss rates along the southern end of the island continue, sand replacement alone is not expected to provide reasonable protection, likely requiring frequent maintenance to maintain conditions. Frequent dredge mobilization for beach maintenance is typically not the most cost-effective long-term beach management strategy.

  To reduce sand loss rates along the southern end of the island and provide more consistent beach and dune conditions, the City should consider the implementation of a terminal groin at the southern end is the island at Breach Inlet. The terminal groin should be scoped to maintain the desired shoreline position along the southern end of Isle of Palms while minimizing impacts to Breach Inlet and Sullivan's Island. Similar terminal groins have been constructed at the ends of Amelia Island, FL and Bald Head Island, NC. Both example groins have been constructed adjacent to tidal inlets and have been very successful in stabilizing the island shoreline while minimizing effects to the adjacent inlet and inlet shorelines.

- Sand Source Identification and Preservation. IOP beach management will continue to require compatible sand resources to maintain beach and dune conditions along the island. To support long-term planning and program sustainability, the City should seek to identify all potentially available sources that may be available for immediate needs as well as the need over the coming decades. Knowledge of the location and availability of future sand sources benefits and better understanding of the potential cost of future sand sources and projects. It is expected that future sand sources will be farther from this island than those that have been used historically and those that may be identified for the next renourishment. The cost of sand is directly related to the distance between the sand source and the beach placement site. The price of sand increases with distance between borrow source and beach.

> Beach compatible offshore sand sources are not unlimited. Therefore, prudent beach and beach program management will require careful planning for sand source design and use to maximize the available sand source opportunities. The City should prioritize sand source identification and preservation as part of continued beach management program planning and implementation.

To round out our review of the IOP beach management program, we have identified select topics identified by the city's Ad Hoc Beach Management Committee for which we will provide some thoughts and comments for committee consideration. The selected topics and our comments are provided below.

<u>Establish a minimum healthy beach volume profile.</u> We agree with this goal. Note, more proactive management of Reaches 1, 2, 5, and 6 will be necessary to achieve this goal. The minimum beach volumes currently used by the city seem reasonable and measures should be implemented to address areas where current beach management practices have not been successful at maintaining consistent minimum conditions. We do not recommend increasing regional minimum beach volume requirements, island-wide, as an approach to address localized problem areas. The proactive measures explored throughout this report, including better shoal management and strategic shore-stabilizing structures, are recommended as priorities in future beach management on IOP.

<u>Establish triggers for when Council should consider authorizing construction of mid-scale and large-scale project.</u> Project triggers should be part of a proactive beach management strategy. Efforts should be made to establish triggers that represent large regions of the island's managed beach rather than highly localized areas. It is not cost-effective in the long term to have beach management decision making for the entire island based upon highly localized problems. Efforts to reduce the occurrence and extent of localized erosion problems should be pursued as part of the island's overall beach management strategy.

<u>Consider becoming a USACE managed beach.</u> There are pros and cons associated with a USACE managed beach. The most obvious benefit of a USACE managed beach is the cost-sharing that can be available from the USACE to restore and maintain the beach and dune. Also, the USACE managed beach can be eligible for 100% federal cost for repairs following impacts due to an eligible coastal storm event. The journey to successfully becoming a USACE managed beach, however, can be long and difficult and there is no guarantee about the ultimate financial benefit that can be secured.

Eligibility for a USACE beach is based upon but not limited to (1) the amount of storm damage protection that a project will provide, (2) the amount of public access that is available along a project area, and (3) the availability of perpetual easements from private owners along the area that allow USACE and public access to their beach front.

Below are some discussion points for the City to consider regarding a potential study by the USACE aimed at creating a federal beach project at Isle of Palms. In considering the desirability of a federal project, we believe the following questions or topics should be considered by the City and subsequently addressed by the USACE. It is noted that answers to many of these points would likely require some level of research by the USACE.

Necessary studies. It is assumed that the city would be seeking a project that encompassed most, if not all of, the entire shoreline of the IOP shoreline.

- What series of studies and/or steps would be required to ultimately achieve an authorized project, assuming the initial studies return favorable findings?
    - How much time would be required to reach authorized project status?
        - Recent examples of USACE projects that we have been involved with have required 10 to 15 years from initiation of study to project authorization, followed by additional years to fund and initiate construction.
    - Would the studies include investigations of other possible federal project authorizations, such as limited renourishment from adjacent navigation projects? What are the steps, costs, and requirements associated with these potential projects?
    - Could a federal project include proactive shoal management and shore-stabilizing structures as project features?

Up-front study costs.

- Except for a limited initial reconnaissance-level review, the City would be expected to share in the costs of all upfront feasibility studies, engineering analyses, design, and permitting. What will the cost-sharing percentage be between the city and the USACE? We expect that it will be an even 50%-50% cost-share. Currently, a feasibility study by the USACE typically costs on the order of $3M or more.
- Can the USACE estimate for the City what the total costs of all the studies and preparation will be to get to the point of an authorized project, assuming the studies result in a favorable finding?
- Is it correct that the City would be required to provide their portion of the funding for each step in the process up front, prior to any work being performed?
- What happens to the City's contributed funds if the project is determined to be ineligible for Federal funding? At what point (and cost) might this be known?

Potential Benefits and Eligibility.

- It is our understanding that a new USACE feasibility study will base the comparative "pre-project" conditions on the current beach conditions. The City has already made a very significant investment in its beaches. Accordingly, that investment has substantially improved the level of storm protection offered by the beach.

- To compute the benefits of a federal beach project, this existing level of storm protection would be compared to various project scenarios to determine the added levels of storm protection from each option (the "benefit"). Unlike a calculation based on a non-restored and severely eroded beach, the difference between the existing condition and any new project condition (i.e., the BENEFIT) will be significantly less than conditions that existed prior to the City's past beach management projects. Hence, the benefit-to-cost ratio could be much less. Many projects are facing a similar circumstance since many beaches have been substantially restored and are now essentially in maintenance mode. This is a significant issue for consideration here.
- As mentioned above, it is also our understanding that the current federal guidelines for Public Use Determination limit the potential level of federal participation. Can the USACE estimate how this might impact IOP prior to the city agreeing to participate in and fund a study?

Easements.

What are the public-use easement requirements from each property owner for the USACE to construct and maintain a federal project?

Project Control.

- What control will the City as local sponsor have over engineering, permitting, costs, and timing decisions for a federal project on IOP?
- Can the USACE contribute funds to a project constructed by the City, or must the USACE wholly control and manage the project? It is our experience that the USACE must control and manage a project to which it provides funds. Hence, costs typically increase due to USACE supervision and conformance with federal contract regulations.
- Can the City provide in-kind participation to provide survey, engineering, and environmental services for such a study (and perhaps a project, if authorized)? The City should consider that option as one way to exert increased control in the process should a decision be made to pursue a federal project. Such participation would have to be clearly described in the agreement documents between the City and the USACE.
- Assuming a federal project is initiated, could the City amend the USACE's construction drawings and contract to add beach nourishment at locations outside of a federally authorized project (at local cost)?

Foth | Olsen is the coastal engineering consultant for the non-Federal (local) sponsor of numerous federal shore protection and navigation projects throughout the southeast U.S., many of which we have worked with for over 30 years. As such we are very familiar and experienced with the complex requirements, costs, advantages, and disadvantages of federal projects, particularly from the perspective of the local sponsor. There are significant differences between older comprehensive shore protection projects and new projects with limited federal interest. Toward providing the City with a clear explanation of the complex realities of the federal program, these issues and questions should be addressed by the USACE.

Repeal/modify ordinance prohibiting hard erosion construction structure 250' of mean high-water line. Consideration should be given to modifying the prohibition of hard structures along the shoreline to allow for the use of temporary structures should beach management practices not provide adequate protection to all shorefront infrastructure. Ideally, problematic areas will be addressed through programmatic change to the beach management approach that would render the need for hard structures useless. Once those goals are achieved, the temporary structures can be removed.

Determine City Responsibility for Emergency Work. The most effective community beach management programs approach management on a comprehensive manner with a single entity, such as the City, being responsible for all activities. Otherwise, it is difficult to implement projects that are most effective and cost-effective in addressing the beach system needs and consistent with the City's beach management program. This does not mean that the City would need to fund all the activities. Rather, the City could establish funding responsibilities with all stakeholders, public and private, and use the available funds in areas if needed and in the most effective manner that benefits the overall managed beach and dune.

Establish property owner responsibility for dune maintenance on private property. Following the comprehensive model with a single entity heading responsibility described above, it may be best for the City to assume this responsibility.

Prohibit construction of new pools seaward of the maximum building line. Although likely politically unpopular, it is our opinion that new pools should not be constructed seaward of a maximum building line. The price to construct and continued value of pools to a property make them an indispensable asset to the owner. Should beach and dune conditions degrade to a point where a pool is exposed to the active beach, private owners will want to protect a pool in the same manner that they would want to protect the habitable structure. Such need will place additional strain on the beach system and beach management resources. The City's focus should be on maintaining a reasonable development line for ALL infrastructure and implementing a reasonable and feasible beach management program to protect that infrastructure.

Accelerate and increase frequency of large-scale dredging projects from 10 years to 8 years. We recommend seeking a management strategy that will decrease, rather than increase the frequency of large-scale projects. The long-term cost of beach management using beach nourishment is directly related to the fixed cost of dredge equipment mobilization. The more frequently dredging equipment is mobilized, the more expensive the program cost is over time. The City should seek to implement management strategies that increase the time between required dredge mobilizations. More frequent large-scale projects will increase the overall program cost through time.

Initiate permitting for large-scale projects two years after completion of a large-scale project. Given typical permit acquisition timelines in the State of South Carolina, this may not be unreasonable. Consider seeking project permits that allow for multiple events under one authorization.

Coordinate the construction of large-scale nourishment project on both un-stabilized inlet zones to occur at the same time. We agree with and encourage this approach. There are significant long-term cost savings to the beach management program through minimization of dredge mobilization events and maximization of sand placement volume when a dredge is mobilized to the island. This effort, however, will not just simply occur through planning but rather through proactive management of areas of the island's beach that experience above average erosion rates compared to the island-wide average. The goal should be to manage sand loss rates to be more uniform along large areas of the island's shorefront. Trigger areas should not be localized hot spots but rather larger areas of the managed beach that require nourishment at the same time.

Hire full-time employee tasked with overseeing resilience efforts, including beach management. Many communities throughout the southeastern US with established and active beach management program typical have at least one dedicated staff member responsible for the community beach program. With the increase in awareness and activity related to community resiliency in addition to beach management, more communities are finding a dedicated staff person is essential to management all aspects of the program. The responsibilities of such a dedicated staff person may also include overseeing grant and resiliency programs related to the beach. A City led program for all beach management activities should justify such a position.

Increase the frequency of beach monitoring surveys from annual to semi-annual. We agree with this proposed change to annual monitoring. Semi-annual surveys are useful for several reasons. One reason is the ability to capture seasonal behavior of the beach, dune and inlets along the island's shoreline. The other is focused on the effects of potential annual storm impact on the island's shoreline and potential eligibility for FEMA Public Assistance funding should the island be impacted by an eligible storm. In many instances, we encourage the communities with which we work to conduct one survey in late spring, prior to hurricane season, and the other in late-fall after hurricane season. We also use the second annual survey as the immediate post-storm event should a damage assessment survey be required in the summer or fall. We recommend an annual comprehensive summary report that details the conditions represented by both surveys.

We thank you for the opportunity to review the City's beach management program and provide our thoughts and comments about potential future strategies that the City can consider for continued program sustainability. We look forward to your review and discussing any questions and comments that you may have.

Sincerely yours,

Christopher G. Creed, P.E.
Senior Coastal Engineer & Client Team Leader

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Beach Preservation Ad Hoc Committee Recommendations - Next Steps- Updated 10/9/25

1) Beach Restoration Policies

Recommendation	Next Step
Establish a minimum healthy beach volume profile per Figure 5 (approx. 600 cy per foot within the unstabilized inlet zones and 380 cy per foot elsewhere on the beach)	included with second opinion
Establish triggers, as stated in the January 2025 Beach Ad Hoc Report, for when Council should consider authorizing construction of mid-scale and large-scale projects	included with second opinion
Consider becoming a US Army Corps of Engineers (USACE) managed beach	no action necessary now - letter of intent submitted for feasibility study
Repeal ordinance prohibiting hard erosion control structures 250' of mean high water	included with second opinion
Modify ordinance prohibiting hard erosion control structures 250' of mean high water	included with second opinion
City performs emergency work (sand scraping, trucking in sand and/or placement of sandbags)	need Council direction
Establish property owner's responsibilities for maintaining dune system within private property (Folly Beach model)	need Council direction- should be done after decisions made about hard erosion control structures
Prohibit construction of new pools seaward of the maximum building line	done
Consider seeking second opinion on emergency protective actions, future beach nourishment program and other beach protection options (groins, sandbag installation and review of emergency protective actions taken during the last 2 years)	underway now with Foth Olson

2) Proactive Response to Beach Erosion

Recommendation	Next Step
Accelerate and increase frequency of large-scale dredging beach nourishment projects from every 10 years to every 8 years	included with second opinion
Initiate permitting for large scale nourishment projects two years after completion of a large-scale nourishment project	no action necessary now - permit applications expected to be submitted Aug. 2025

Coordinate construction of large scale nourishment projects on both unstabilized inlet zones to occur at the same time	no action necessary now - permit applications for both ends expected to be submitted Aug. 2025
Hire full time employee tasked with overseeing resilience efforts, including beach management	included in draft FY26 budget- next step is job description to be considered by Council and begin hiring process
Establish an ongoing Beach Preservation Committee made up of 5 Residents and 2 Council members	no action necessary now - it was agreed to keep the existing ad hoc committee engaged until the completion of the 2nd opinion and then establish membership of the new permanent committee, which is advertised now
Increase the frequency of beach monitoring surveying from annual to semi annual	done

3) New and Consistent Funding Mechanisms for Future Needs and Projects

Recommendation	Next Step
Establish separate accounts for 1) emergency beach restoration work, and 2) large-scale beach nourishment projects and 3) other beach related projects	done
Consider raising revenue to cover the proposed proactive beach nourishment schedule (See funding sheet)	need Council direction
Engage state and federal lobbyists/legislators to secure funding for beach nourishment	no action necessary State lobbyists have given direction and Federal lobbyist have been authorized to begin work
Engage state lobbyists/legislators to amend state law to allow beach nourishment to be added to Municipal Improvements Act (MID) to allow City to establish special purpose tax district	need Council direction
Engage state lobbyists/legislators to amend state law to provide coastal communities ability/flexibility to raise revenue for beach nourishment (i.e. real estate transfer fees or additional ATAX)	need Council direction
Establish a cost-sharing plan with Wild Dunes for projects along areas that do not meet public access requirements based on WD contributions to the Beach Preservation Fund	plans can be made but current Council and WDCA board will not be able to bind future Councils and WDCA boards. Both City staff and Wild Dunes staff has indicated an ability to continue to participate, but expressed concerns about their abilities to continue in outyear major renourishment projects