SECTION 111 APPENDIX G
FOLLY BEACH, SOUTH CAROLINA

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Prepared by:

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Study References:

a. USACE, Coastal Engineering Research Center, 1985, *Evaluation of the Impact of Charleston Harbor Jetties on Folly Island, South Carolina*

b. USACE, Charleston District, August 1987, *Detailed Project Report, Charleston Harbor, South Carolina, Folly Beach Section 111 Study*

c. USACE, Charleston District, May 1991, *General Design Memorandum, Folly Beach, South Carolina Shore Protection Project*

Section 111 Authority

Congress provided USACE discretionary authority to mitigate federal navigation works' adverse shoreline impacts. Section 111 of the River and Harbor Act of 1968, as amended, (Section 111) authorizes the Secretary of the Army to "investigate, study, plan, and implement structural and nonstructural measures for the prevention or mitigation of shore damages attributable to Federal navigation works." 33 U.S.C. § 426i. Implemented prevention or mitigation measures are cost-shared "in the same proportion as the cost-sharing provisions applicable to construction of the project causing the shore damage." § 426i(d). If USACE determines mitigation is appropriate, Section 111 mitigation measures are to be integrated with specifically-authorized federal Coastal Storm Risk Management (CSRM) studies or projects in the same geographic area for a complete solution to shore damages. § 426i(d); *see* EP 11-5-2-58, CONTINUING AUTHORITIES PROGRAM, at 37 (01 Mar. 2019) (stating, "[t]o the extent practicable, any Section 111 projects and shore protection pursued under other authorities in the same area will be combined into a comprehensive regional project"). Additionally, Congress has expressly prioritized CSRM projects that include Section 111 mitigation measures above CSRM projects that lack such measures: "preference shall be given to . . . areas with respect to which the need for prevention or mitigation of damage to shores and beaches is attributable to Federal navigation projects or other Federal activities." § 426e (Federal Aid in Protection of Shores).

Although it is proper to combine Section 111 mitigation measures with specifically-authorized CSRM measures in the same area, Section 111 mitigation measures are not evaluated in the same manner as the CSRM project pieces. For the CSRM project, the PDT is bound to select "the alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment, the NED plan," unless the ASA (CW) grants an exception. ER 1105-2-100, PLANNING GUIDANCE NOTEBOOK, at 2-7 (22 Apr. 2000). A determination on whether to mitigate identified federally caused erosion damages, however, is guided by distinctive Section 111 planning policies. USACE Section 111 policies reflect the unique equitable purpose underlying the statute by affirming that although economics is a piece of the Section 111 evaluation, a determination to mitigate federal impacts is not limited to standard NED analysis. Instead, the standard for determining the propriety of Section 111 measures is stated in EP

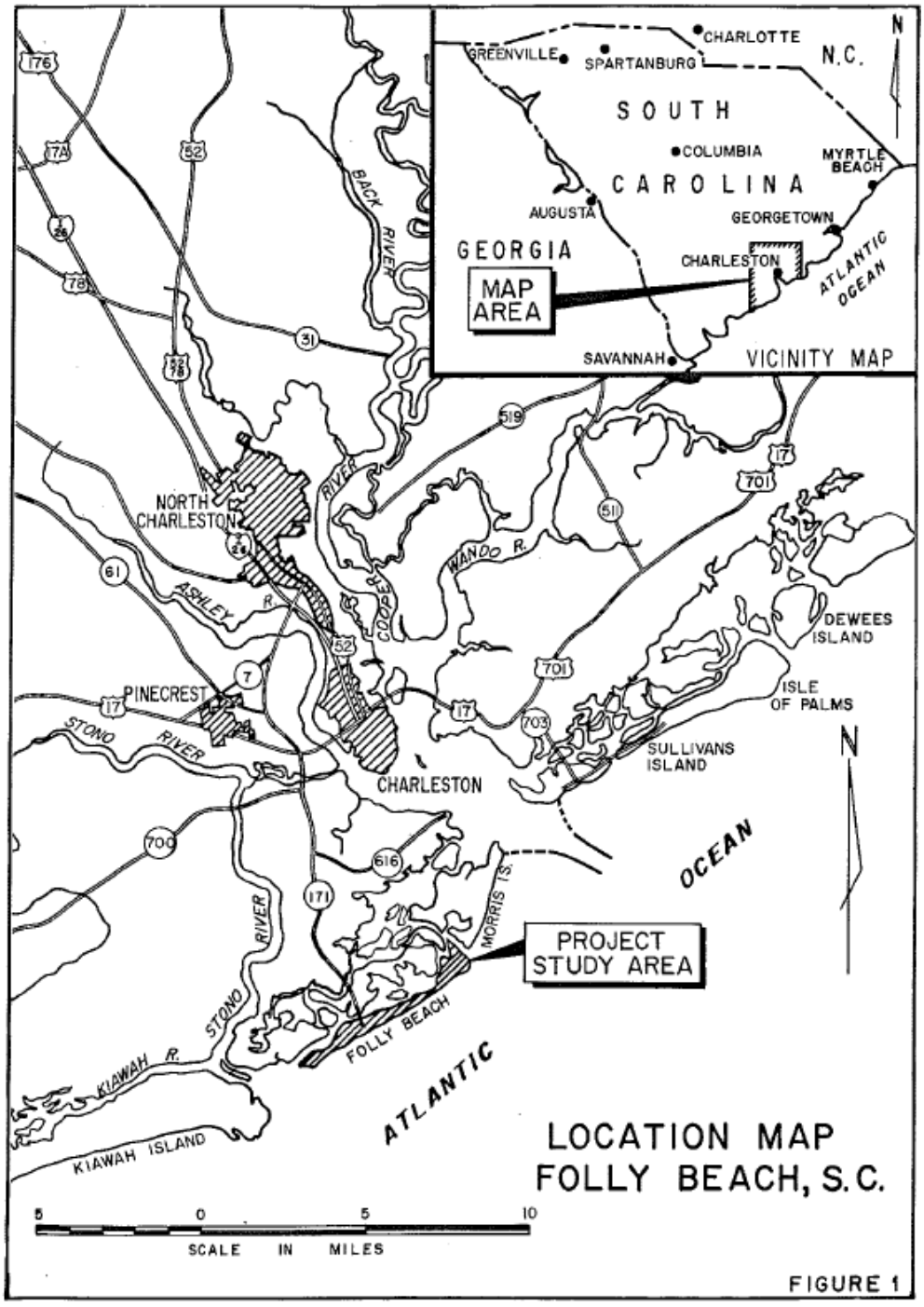
1105-2-58, which provides that Section 111 "authorizes the planning of a justified level of work for prevention or mitigation of damages to both non-Federal public and privately owned shores to the extent that such damages can be directly identified and attributed to Federal navigation works located along the coastal . . . shorelines of the United States." EP 1105-2-58, CONTINUING AUTHORITIES PROGRAM, at 37.

History of Folly Beach Section 111 Mitigation Measures

USACE recognition of the relationship between the Charleston Harbor federal navigation jetties and Folly Beach shoreline damages has a long history. In 1878, USACE began implementing a federal project to protect the Charleston Harbor entrance channel that included the construction of two jetties. Subsequent federal projects increased the jetties' length and height. USACE has also deepened the entrance channel over the years. In conjunction with the ongoing deepening of Charleston Harbor (including the entrance channel), USACE continues to perform maintenance on the federal jetties. The federal navigation jetties have been constructed and maintained at 100 percent federal expense.

As early as 1935, a USACE cooperative study with the State of South Carolina pursuant to Section 2 of the River and Harbor Act of 1930 reported to Congress regarding beach erosion at Folly Beach, SC. H.R. Doc. No. 156, 74th Cong., 1st Sess. (1935). At the time, the shoreline at Folly Beach was observed to be a comparatively flat beach of fine sand, with a line of sand dunes immediately shoreward ranging in height from 12 to 18 feet above mean low water. Among other things, the report concluded that "[l]ittle if any of the littoral drift from the coast north of Charleston Harbor reaches Folly Island because of the large volume of flow in and out of that entrance [channel]." H.R. Doc. No. 156, Beach Erosion at Folly Beach, SC Report, at 12.

In 1987, USACE completed a Section 111 study (Folly Beach Section 111 Study) to "define any damages to adjacent shores that may be attributable to the Federal navigation project for Charleston Harbor, and to determine the most efficient methods of alleviating identified damages." The study reach included the entire Atlantic frontage of Folly Island, extending from Lighthouse Inlet on the northeast to Stono Inlet on the southwest, and from the front beach to the -30 feet MLW ocean depth. Below (Figure 1) is the location map of the Section 111 study area. Figure 1 also depicts the location of the entrance channel jetties in relation to Folly Beach (the north jetty is 15,443 feet long and the south jetty is 19,104 feet long).



Contained in the Folly Beach Section 111 Study were (1) findings on how much erosion on the front beach of Folly Island was attributable to the Charleston Harbor Navigation Project and (2) a selected plan for mitigating the navigation project's impact. The Folly Beach Section 111 Study concluded that the jetties that stabilize the Charleston Harbor entrance channel also block the southward littoral transport of sediment to Folly Beach, starving the beach of its usual supply of

sand. This decrease in sediment supply also resulted in steepened offshore contours, increasing wave energy potential along the Atlantic frontage of Folly Island. The Folly Beach Section 111 Study then determined that the best solution at that time to prevent shore damage and mitigate this direct impact on the Folly Island front beach shoreline was the construction and periodic nourishment of a project previously authorized in the 1986 Water Resources Development Act (WRDA)—the restoration of 3.19 miles of Folly Island beachfront.

USACE later modified the Folly Beach project to provide a higher degree of storm damage protection via the 1991 General Design Memorandum (GDM). The 1991 GDM recommended initial restoration of 5.34 miles of shoreline, extending from just below the U.S. Coast Guard base through the Charleston County Park on the west end of Folly Island. In addition to extending project length, the GDM recommended plan adjusted the protective berm from 25 feet wide at elevation 4 feet NGVD 29 to 15 feet wide at elevation 8.0 ft NAVD88. The berm consisted of a foreshore slope of 1V:10H to the mean high water (MHW) line then offshore at 1V:30H out to the existing bottom. Initial placement demanded 2.5 million cubic yards of material. USACE projected periodic beach nourishment every eight years—in contrast to the previously recommended 5 years—for the first four efforts, with one final nourishment during the remaining 10-year period. The plan anticipated a requirement of 1.7 million cubic yards of material for the eight-year nourishment efforts and 2.1 million cubic yards of material for the final 10-year effort. The initial and following beach fills included advanced nourishment of varying volume. The rehabilitation of nine steel sheet pile groins was also included.

The 1991 GDM recommended plan consisted of both CSRM and Section 111 measures. Full federal costs therefore amounted to a combination of the federal government's Section 111 costs, derived from the Section 111 statute, and CSRM project costs, derived from WRDA 1986. The 1987 Folly Beach Section 111 Study had determined that the federal navigation works at Charleston Harbor were responsible for about fifty-seven percent of the erosion that had occurred along the front beach at Folly Island. Utilizing this percentile, and the fact that the Charleston Harbor jetties were constructed at full federal expense, the 1991 GDM held that 57 percent of the total project cost would be 100 percent federal. The remaining 43 percent of the project cost was to address flood risk management benefits, which at that time were cost-shared at 65 percent federal and 35 percent non-federal, and recreation benefits, which were cost-shared on a 50-50 basis. All in all, the total cost for the federal government was 73.8 percent of the total project cost. This federal cost share would increase to 85 percent in later years as the USACE's policies on government funding for sole recreation benefits shifted, resulting in the federal government paying 65 percent for the whole non-mitigation piece of the project.

Proposed Section 111 Mitigation Measures

In the current reassessment of the authorized Folly Beach project under the Bipartisan Budget Act of 2018 (P.L. 115-123), USACE has determined that Section 111 measures are justified across the entire Atlantic frontage of Folly Island as part of a comprehensive shoreline

protection solution. The Folly Beach Section 111 Study concluded that the Charleston Harbor jetties were causing erosion damages across the entire Atlantic frontage of Folly Island(see also the CESAD-PDP Additional Guidance of 6 April 2021, likewise recognizing the jetties' erosion effects on the entirety of Folly Island). Because the detrimental impact of the Federal jetties is a continuing impact, it is appropriate to apply Section 111 measures to both initial construction and periodic renourishment.

The need to integrate Section 111 mitigation measures within the proposed project's NED-justified CSRM reaches is largely unremarkable (with the exception of the methodology by which the extent of Section 111 mitigation is calculated, as discussed in the subsequent section). All of these reaches are part of the current comprehensive shore protection project, all were and are economically justified based upon NED benefits, and all continue to be subject to erosional impacts due to the Federal jetties' blockage of the littoral flow of sand. These reaches consist of the shoreline in front of the most highly developed portions of Folly Island, which are subject to the most physical economic damage during storms. The proposed Section 111 mitigation measures would contribute sand towards the construction of an enlarged berm and a dune, which are both part of the proposed comprehensive shoreline protection solution addressing both jetty harm and other erosional impacts. The addition of the dune (the current project has no constructed dune component) will provide greater stability to the shoreline, protect against elevated water levels resulting from storm surge, and serve as a "reservoir" of sand to feed the beach during erosive events.[1] Construction of the proposed project, which integrates Section 111 measures into an enlarged berm and added dune, will result in a more resilient shoreline, benefiting both Federal and local economic interests.

Two areas of the proposed project are defensible solely based upon a need for mitigation pursuant to Section 111: Folly Beach County Park and the Lighthouse Inlet Heritage Preserve. While these areas are not justified for CSRM measures due to insufficient NED benefits, in each case the Wilmington District found that the prevention and mitigation of jetty-induced damages in these locations is justified under Section 111 authority. See the Section 111 Authority analysis, above. These stand-alone Section 111 mitigation measures are appropriately included as part of the proposed comprehensive shoreline protection solution at Folly Beach.

Including Folly Beach County Park within the scope of the proposed project's Section 111 measures is justified for a variety of reasons. First, as discussed in this Appendix's history section, USACE determined that the entirety of the Atlantic frontage of Folly Island (including the County Park) has been impacted by the Federal jetties and calculated discrete damages attributable to the Federal jetties. Due to these acknowledged and identified damages, the

[1] As noted in EP 1165-2-1, 14-1.d.(1), "the Corps will recommend authorization for continued Federal participation in periodic nourishment of the protective dune. The rationale for this policy is that the protective dune, along with the protective beach, is part of the sacrificial storm damage reduction system where loss of material from the system is anticipated."

Folly Beach County Park area was included in the 1991 GDM recommended plan and in the existing project (ongoing for decades). In reliance upon USACE's existing commitment, the County has invested over 2.5 million dollars to replace facilities in the County Park previously damaged by storms (this includes the Dunes House shown below).

The County Park area also serves as a key amenity to and provides important infrastructure for the recreating public at Folly Beach. This area includes Folly Beach's largest amount of public parking, as well as concessions, restrooms, showers, changing stations, two boardwalk access paths, and a pelican watch pavilion. Additionally, this area provides critical environmental benefits important to the national interest by providing suitable habitat used by nesting sea turtles, endangered shorebirds, and migrating monarch butterflies, among other species. For local community members, national visitors, and the general public alike, it is justifiable to protect these conduits to public use and habitat benefits from jetty-induced erosion.

In determining that Section 111 mitigation measures were justified in the Folly Beach County Park, Wilmington District considered the County's terminal groin installation. The County has been actively contributing to addressing the severe erosion in this area, which is due in large part to the federal navigation works. The County has taken various steps to address erosion here by installing a terminal groin, providing interim nourishment, and undergoing a major dune restoration in 2013 at a cost of nearly $3 million. Any additional federal sand placement in this area will be to an area already containing important protection measures. The County Park reach was included in the Beachfx modeling and the terminal groin has reduced the erosion rate in this reach since its installation. The USACE continues to include this area in the proposed mitigation plan because the long-term effectiveness of the groin is not readily established. Future beach surveys may therefore illustrate a need to renourish this area of Folly Island to return the area to the erosional state that would have existed without the influence of navigation works at the time such navigation works were accepted as a Federal responsibility. It is expected that the sand placed will only be that amount necessary to ensure a berm

approximately 35 feet wide, a berm width determined by USACE to best address the jetty-induced shoreline erosion in this reach.

The second area where Wilmington District found stand-alone Section 111 mitigation measures to be justified is the Lighthouse Inlet Heritage Preserve. This area possesses significant historical, cultural, and recreational value. Archeological work has confirmed that this area contains historic sites from the Civil War and was the scene of several significant battles, resulting in its listing on the National Register of Historic Places (NRHP). This area is open to the public for recreational purposes and is an access point to view the historic Morris Island lighthouse, likewise on the NRHP. While this reach was not included in the existing shore protection project, the rationale for its exclusion was based in part upon the existence of a U.S. Coast Guard facility in the area and the fact that the shoreline was therefore Federally-owned. The Charleston County Parks & Recreation Commission now owns this area and anticipates investing further in this property with additional public amenities to enhance visitation and historic site interpretation. There is no question that the Atlantic frontage of this reach has been impacted by the Federal jetties, to which it is in close proximity. Absent appropriate mitigation, this area is likely to suffer the fate of Morris Island to the north, which has largely disappeared since Charleston Harbor jetty construction.

USACE intends to mitigate the Federal jetty-induced impacts to the Lighthouse Inlet Heritage Preserve via a 50 ft wide berm. A 50 ft wide berm will match the overall shoreline project's plan and be cost effective. An alternative protection measure such as armoring would not take advantage of fixed dredge deployment costs or properly align with the overall shoreline protection engineering and could exacerbate erosion in adjacent reaches. Additionally, protecting this historically and culturally significant area for educational and recreational visitation purposes will result in significant regional and local economic benefits.

Section 111 Mitigation as a Volumetric Calculation

Current USACE policy determines the appropriate extent of Section 111 mitigation on a volumetric basis. Previously (including for the current Folly Beach shore protection project), the Section 111 mitigation amount was based on the percentage of overall erosion to the shoreline attributable to the federal navigation project. USACE policy now requires Section 111 analysis to define a federal navigation project's adverse shoreline impacts as a fixed annual cubic yard volume of sand lost. The goal is to ensure Section 111 mitigation measures accurately reflect sand loss due only to federal navigation projects, not other manmade and ecological factors.

Because a new Section 111 analysis is not required and the existing Folly Beach Section 111 analysis was formulated to establish the percent of overall Folly Beach erosion caused by the Charleston Harbor jetties rather than a set annual volume of jetty-created sand loss, the Wilmington District was tasked with utilizing existing information to determine the fixed annual cubic yardage figure. The engineering assessment underlying the Folly Beach Section 111 Study determinations was the USACE Coastal Engineering Research Center's report entitled

Evaluation of the Impact of Charleston Harbor Jetties on Folly Island, South Carolina. This report did not wholly explain the assumptions underlying the engineering analysis for purposes of determining the fixed annual volume lost. As a result, Wilmington District engineers were unable to pinpoint the precise annual volume of sand lost due to the jetties based solely on that report.

To determine a reasonable estimate of jetty-induced sand volume lost across the entirety of Folly Beach, Wilmington District turned to the 1991 GDM.[2] As discussed above, 57 percent of the sand utilized in the 1991 GDM recommended project was deemed necessary to counteract the impacts of the Charleston Harbor jetties. Taking 57 percent of the 1991 recommended project's total sand volume reveals the sand volume within that project that was necessary to mitigate for jetty-caused erosion. Although the 1991 GDM recommended project did not extend across the entire beachfront, Wilmington District used the project's Section 111 mitigation sand volume to extrapolate the appropriate beach wide mitigation volume.

This methodology leads to a total jetty-induced sand loss of 132,700 cy/year across the entire length of Folly Beach—30,890 ft from the island's southwest terminal groin to the northwest terminal groin. To explain, the 1991 GDM recommended the placement of 1,700,000 cubic yards along the 28,200 feet of project length on a projected eight-year renourishment cycle. That total recommended sand volume can be converted into the average volume placed per linear foot each year by taking 1,700,000 cy ÷ 28,200 ft ÷ 8 years, a calculation amounting to an average of 7.536 cy/ft/yr along the Folly Beach shoreline. Multiplying the total 1991 GDM project volume of 7.54 cy/ft/yr by 57 percent, the percent of harm from the jetties, amounts to a total of 4.295 cy/ft/yr of sand mitigating for jetty impacts. To determine the total sand mitigation across the entire island on an annual basis, 4.295 cy/ft was then multiplied by the total Folly Beach length of 30,890 ft, amounting to a total volumetric loss of 132,700 cy/year. In sum, for the currently proposed project, which mitigates for the jetties' harm across the entire Atlantic frontage of Folly Island, an annual fixed mitigation volume of 132,700 cy/yr was established, equating to 1,590,000 cy of mitigation for the projected 12-year renourishment cycle. Should project conditions merit renourishment earlier than the projected 12-year cycle, the total Section 111 mitigation volume would decrease by 132,000 cy per year.

<u>Recommended Project's Cost Share</u>

[2] The 1991 GDM recommended project, as opposed to the 1987 Folly Beach Section 111 Study's recommended project, was selected because the PDT felt it best represented the appropriate degree of storm damage protection needed at that time to counteract erosional impacts, both from the jetties and other factors. The 1991 GDM adjusted the 1987 project's berm width, length, and nourishment cycle. Relying upon the 1987 recommended project would reflect neither the most recent engineering analysis nor current conditions based upon the existing USACE project.

As with the current Folly Beach shoreline protection project, incorporating Section 111 mitigation into the overall project will modify the usual CSRM construction cost-sharing for this report's recommended project. Section 111 provides that the cost of mitigating the shore damage caused by the Charleston Harbor jetties is to be shared in the same proportion as the cost sharing provisions applicable to the Charleston Harbor jetties' construction. Since the Charleston Harbor jetties' construction was 100 percent federally funded, the cost of the Section 111 mitigation measures for Folly Beach would likewise be a 100 percent Federal responsibility. Measures addressing damages not caused by the Federal navigation project will continue to be apportioned in accordance with Section 103 of WRDA 1986, as amended (33 U.S.C. § 2213). Based upon WRDA 1986, as amended, the non-federal share of project costs assigned to hurricane and storm damage reduction purposes is 35 percent, rendering the federal government responsible for 65 percent of the costs of initial construction for the CSRM project. The federal government is also responsible for 50 percent of the periodic renourishment costs associated with the CSRM project.

As discussed above, the Section 111 cost share calculation will be based upon the volumetric approach to Section 111 mitigation. The proposed 50-year project anticipates 12-year renourishment cycles, amounting to placements at initial construction and three additional renourishments every subsequent 12 years thereafter. Although the fixed Section 111 mitigation volume would remain the same for each 12-year cycle, the total sand volume placed per nourishment will vary based on borrow area overfill ratios and pre-project beach profile surveys. Under a Section 111 volumetric approach, the federal and non-federal project cost sharing will vary based upon the total nourishment amount and the number of years since the last construction iteration. For cost-shared renourishment occurring on a lesser or greater cycle of years than the projected 12 years, the Section 111 cost share would be adjusted based upon the fixed annual cubic yard volume of sand lost.

To estimate the average federal cost share over the recommended project's life, Wilmington District averaged the total sand volume needed per construction interval. The average of the four sand placements is 2,232,000 cy for the 30,890 ft long island including the two County parks. Based on this average, for each anticipated 12-year renourishment cycle, 1,593,924 cy of material will constitute Section 111 mitigation volume at 100% Federal funding. Therefore, for an average sand placement on a 12-year cycle, the percent of the Folly Beach project that will be 100% federally funded Section 111 mitigation is 1,593,924 cy ÷ 2,232,000 cy or 71 percent of the average total sand volume. From there, the remaining 29 percent of non-Section 111 sand costs will be cost-shared in line with Section 103(c)(5) of WRDA 1986. The net cost share for an average sand placement on a 12-year cycle would be 90 percent federal for initial construction and 86 percent federal for the periodic renourishments.[3]

[3] This federal cost share percentage is not fixed. It will vary based upon both the renourishment volume and the number of years since the last construction iteration.

Conclusion

USACE's proposed mitigation for the Charleston Harbor jetties' documented and continuing impacts to the entire Atlantic frontage of Folly Island is justified based upon the variety of reasons discussed throughout this Appendix. Moreover, integrating Section 111 measures within the NED-justified CSRM project serves to effectuate Congressional intent for a comprehensive shoreline solution and prioritization of such projects. In the proposed project, Section 111 measures include proportional contribution of sand to the enlarged berm and added dune throughout the most heavily-developed reaches and berm development in the southern- and northern-most reaches. Consistent with guidance, the fixed annual cubic yard volume per linear foot of shoreline determining the level of Section 111 mitigation is 132,700 cy/year.