IN THE OFFICE OF STATE ADMINISTRATIVE HEARINGS
STATE OF GEORGIA

ONE HUNDRED MILES, Petitioner, vs. SHORE PROTECTION COMMITTEE, Respondent, and SEA ISLAND ACQUISITION, LLC, Respondent-Intervenor.	)	Docket No: OSAH-BNR-SP-1630908-60-Miller
ALTAMAHA RIVERKEEPER, INC. and SURFRIDER FOUNDATION, Petitioners, vs. SHORE PROTECTION COMMITTEE, Respondent, and SEA ISLAND ACQUISITION, LLC, Respondent-Intervenor.	)	Docket No: OSAH-BNR-SP-1630912-60-Miller

<u>PETITIONERS' PROPOSED FINDINGS OF FACT</u>
<u>AND CONCLUSIONS OF LAW</u>

TABLE OF CONTENTS

I. FINDINGS OF FACT

A. Introduction

i. Procedural Background

1. Intervenor Sea Island Acquisition, LLC (Sea Island) is a private resort and real estate development company that owns and operates Sea Island Resorts.

2. On October 9, 2015, Sea Island filed an application for a Shore Protection Act (SPA) permit authorizing the construction of a rock groin on the southern portion of the island in an area known as the Spit. *See* Joint Ex. 1. The application also sought authorization to construct dunes and renourish the beach between an existing groin and the proposed groin. *See* Joint Ex. 1.

3. According to Sea Island, "[t]he purpose of the project is to stabilize the eroding beach south of the existing south groin and to provide storm protection to the adjacent upland." Joint Ex. 1 at 1.

4. The proposed groin would be located approximately 1,200 feet south of the existing south groin and would be approximately 350 feet in crest length with a "T" head section, parallel to the shoreline, of 120 feet in crest length. Joint Ex. 1 at 2-3. The proposed nourishment project would involve the removal and placement of approximately 120,000 cubic yards of sediment from the northern side of the existing south groin to the project area. Joint Ex. 1 at 2-3.

5. Currently, there are no homes located in the proposed project area. Thus, no existing structures are threatened by the beach erosion the proposed project seeks to avoid. Instead, the intent of the project is to protect "valuable real estate" – specifically, eight

undeveloped lots that make up a proposed 7.3-acre development called the Reserve at Sea Island. *See* Joint Ex. 1 at 18-19.

6. During the public comment period, the Georgia Department of Natural Resources' (DNR) Coastal Resources Division (CRD) received 102 comments. Burgess, SPC WD-1, p. 9, ¶ 18. Ninety-nine of those comments opposed the issuance of the permit. Burgess, SPC WD-1, p. 9, ¶ 18.

7. In addition to public comments from individuals, the DNR Wildlife Resources Division's (WRD) Nongame Conservation Section submitted written comments explaining that "[t]he construction of the T-head groin will result in the loss of sea turtle nesting habitat and will interfere with the conservation of sea turtle populations in Georgia." P. Ex. 6 at 1. The United States Fish and Wildlife Service (USFWS) also submitted written comments opposing the construction of the groin, advising, "We recommend denial of the permit. Construction of another groin will have negative impacts to sea turtles and have possible adverse impacts to the Sea Island spit which is utilized habitat for federally listed shorebirds and sea turtles." P. Ex. 7 at 2.

8. The permit application was presented to Respondent Shore Protection Committee (the Committee) at a public hearing on December 11, 2015. Many individuals and organizations spoke in opposition to the permit. *See* SPC Ex. 29. A representative of the United States Fish and Wildlife Service also spoke in opposition to the permit. SPC Ex. 29 at 102-105.

9. Four out of five committee members were present at the public hearing. Two members voted in favor of issuing the permit, and one member voted against issuing the permit. The DNR commissioner did not vote. Thus, despite significant public opposition, the permit was granted with only two votes in favor of its issuance. *See* SPC Ex. 29; Joint Ex. 4.

ii. Background on Groins and the Sand-Sharing System

10. Sea Island is a barrier island along the Georgia coast that is approximately four and a half miles long. The southern portion of the island contains a fragile, undeveloped area called the Spit that provides significant habitat for state and federally protected sea turtles, shorebirds, and other species. The Spit is approximately one mile long and is largely protected by a conservation easement. *See* SI Ex. 1.

11. As part of the proposed project, Sea Island intends to build a groin immediately north of the conservation easement boundary.

12. A groin is a structure built perpendicular to a beach. Its very purpose and design is to trap or block sand so that sand cannot naturally move with the prevailing currents along the shoreline. More specifically, a groin artificially traps or blocks sand on the groin's updrift side so that the sand cannot naturally flow with the current to the downdrift side. As this occurs, the beach downdrift of the groin retreats or erodes. In a very real sense, the groin starves the downdrift beach of sand by eliminating the updrift sand supply. Webb, P. WD-2, p. 4, ¶ 16; Young, P. WD-1, p. 9, ¶¶ 31-32.

13. On Sea Island, as on the rest of the East Coast, sand generally moves along the shoreline from north to south, with some infrequent seasonal reversals of lesser magnitude. Webb, P. WD-2, p. 5, ¶ 21. This was substantiated by a twenty-year Army Corps of Engineers wave information study that looked at wave characteristics immediately offshore of Sea Island. Webb, P. WD-2, p. 5, ¶ 21. The study showed that 39% of wave events had an average spectrally significant wave height of 3.6 feet, a peak period of 9.5 s, and approached the beach from a compass heading of 112.5 degrees (+/- 11.25 deg). Webb, P. WD-2, p. 5, ¶ 21. In other words, the most frequent waves approach Sea Island with an orientation that drives the longshore

sand transport to the south. Webb, P. WD-2, p. 5, ¶ 21. This is also the heading that corresponds to the "dominant" wave direction (*i.e.*, the direction associated with the highest wave energy and, therefore, the most longshore transport potential) along this part of the Georgia coast. Webb, P. WD-2, p. 5, ¶ 21.

14. Thus, Sea Island's proposed groin would block sand moving south down the beach on the updrift, or north, side of the groin in front of the Reserve development, creating a wide beach in front of the Reserve at the expense of the downdrift land south of the groin that is protected by the conservation easement. As set forth in the below findings of fact, the proposed groin would increase downdrift erosion and adversely impact protected sea turtles and shorebirds and their habitat.

B. Impact of the Proposed Project on the Conservation of Wildlife

i. The proposed project would negatively impact endangered and threatened sea turtles.

a. Background on sea turtle recovery efforts and threats in Georgia

15. Petitioners elicited testimony from two individuals, Mark Dodd and Dr. Kirt Rusenko, who were qualified as experts regarding sea turtle habitat, sea turtle behavior, and the potential impacts of Sea Island's proposed beach nourishment, dune, and groin project on conservation and recovery of sea turtles and sea turtle habitat.

16. Mark Dodd has been employed by DNR for 17 years as a Senior Wildlife Biologist and the State of Georgia's Sea Turtle Program Coordinator. His duties include establishing protocols for sea turtle conservation in Georgia and reviewing and commenting on permit applications for projects that might impact sea turtles. Dodd, Vol. II, p. 224, l. 25; p. 225, l. 1-12; p. 226, l. 3-12; p. 227, l. 20-24; p. 229, l. 5-13.

17. Dr. Kirt Rusenko has been employed for 20 years as the Marine Conservationist for the City of Boca Raton, Florida's Gumbo Limbo Center where he manages the Boca Raton Sea Turtle Conservation and Research Program. Gumbo Limbo has 20 acres of protected barrier island, and the City of Boca Raton has five miles of barrier island beach shoreline. He supervises nine sea turtle specialists and reviews and reports on all beachfront construction permits and monitors all beach renourishment projects for the city. Rusenko, P. WD-3, p. 1, ¶ 1; p. 2, ¶ 5; p. 3, ¶¶ 6-7.

18. Neither the Committee nor Sea Island presented any sea turtle expert testimony.[1]

19. Both Dr. Rusenko and Mr. Dodd are very familiar with shoreline engineering activities, including beach nourishment, groins, rock revetments, and other shoreline stabilization devices, and their potential impacts on sea turtles and sea turtle habitat. They could not properly do their conservation jobs if they were not fully aware of the many negative impacts that groins can and do have on sea turtles. Rusenko, P. WD-3, p. 4, ¶ 10 and p. 8, ¶ 28; Dodd, Vol. II, p. 229, l. 24-25; p. 230, l. 1-25; p. 231, l. 1-5. Mr. Dodd has personally observed the downdrift erosion caused by groins several times and has never observed one that did not have such an effect. Dodd, Vol. II, p. 275, l. 23-25; p. 276, l. 1-18. Dr. Rusenko has also personally observed the downdrift erosion caused by groins on numerous occasions. Rusenko, P. WD-3, pp. 8-9, ¶ 31.

20. All sea turtle species are listed as threatened or endangered under the Endangered Species Act. They are also protected by Georgia law. Rusenko, P. WD-3, p. 5, ¶ 18; *see also* Dodd, Vol. II, p. 231, l. 20-25; p. 232, l. 1.

[1] Only two witnesses for the Shore Protection Committee and Sea Island offered any testimony related to sea turtles, Dan Bucey and Raleigh Nyenhuis. Sea Island's counsel confirmed that neither witness was being offered as a sea turtle expert. Bucey, Vol. III, p. 479, l. 4-5; Nyenhuis, Vol. II, p. 431, l. 22-23.

21. Several species of protected sea turtles nest on the Georgia coast including Sea Island. The most common species found on Sea Island is *Caretta caretta*, more commonly known as the Loggerhead Sea Turtle. Two other species are found occasionally, *Chelonia mydas* and *Demochelys coriacea,* more commonly known as the Green Sea Turtle and Leatherback Sea Turtle respectively. Rusenko, P. WD-3, pp. 5-6, ¶19; *see also* Dodd, Vol. II, p. 231, l. 20-23.

22. The Endangered Species Act requires that there be a plan to recover a threatened or endangered species such as the Loggerhead Sea Turtle. The recovery plan must list all of the actions, including priority actions, that are considered necessary for recovery of the species. Dodd, Vol. II, p. 232, l. 15-21.

23. Mr. Dodd helped author the recovery plan that applies to Georgia, the "*Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle*," developed by the National Marine Fisheries Service and the USFWS. Dodd, Vol. II, p. 232, l. 2-11; *see also* Rusenko, P. WD-3, p. 6, ¶ 20. The Recovery Plan contains hundreds of action items with approximately 35 listed as number one priority actions. Dodd, Vol. II, p. 306, l. 6-20; *see also* P. Ex. 28. Priority one actions are the higher priorities and include actions that must be taken to prevent extinction or to prevent irreversible decline in the species for the foreseeable future. Dodd, Vol. II, p. 233, l. 8-11.

24. One of the priority one actions listed in the Recovery Plan is Action Item Number 231 which mandates maintaining the current length and quality of sea turtle nesting beach. In fact, the goal of the Recovery Plan is to increase, not decrease, the percentage of available sea turtle nesting habitat. Dodd, Vol. II, p. 233, l. 20-25; Rusenko, P. WD-3, p. 6, ¶ 20; P. Ex. 28 at III-13. This includes insuring that the amount of beach with impediments, including shoreline

stabilization devices such as groins, does not increase. Dodd, Vol. II, p. 245, l. 18-22; p. 257, l. 7-13.

25. Both Dr. Rusenko and Mr. Dodd have personally observed on numerous occasions the adverse effects, including downdrift erosion, caused by groins which eliminates dry sandy areas of the beach that are necessary for sea turtles to lay their nests. Rusenko, P. WD-3, pp. 8-9, ¶ 31; Dodd, Vol. II, p. 230, l. 14-17; p. 250, l. 2-11. This result is contrary to the priority number one goal in the Recovery Plan to maintain the current length and quality of habitat.

26. Mr. Dodd testified that approximately 38% of the Sea Island shoreline is not currently useable sea turtle habitat as a result of revetments, groins, and breakwaters. Dodd, Vol. II, p. 245, l. 13-18; p. 248, l. 5-17. Such structures pose a significant threat to the recovery of sea turtles. Dodd, Vol. II, p. 230, l. 14-25; p. 231, l. 1-5.

b. The proposed T-head groin would harm endangered and threatened sea turtles.

27. Dr. Rusenko and Mr. Dodd's expert testimony stands unrebutted to the effect that T-head groins have the following direct and indirect adverse effects on sea turtles:

a. inhibit females from reaching the beach;

b. function as barriers to hatchling migration to the ocean;

c. entrap hatchlings within the structure;

d. concentrate predators in the vicinity of the groin resulting in increased hatchling mortality;

e. result in the loss of at least 100 meters (328 feet) of nesting habitat on either side of the groin;

f. result, in this particular instance, in an additional loss of 40 meters (131 feet) of habitat as a result of the T-head that would run parallel to the shore.

Dodd, Vol. II, p. 244, l. 14-25; p. 245, l. 1-25; p. 246, l. 1-25; p. 247, l. 1-17; P. Exs. 5 and 6 at unnumbered pp. 2-5; Rusenko, P. WD-3, pp. 7-8, ¶¶ 23-27; p. 11, ¶¶ 36-37.

28. Thus, the total amount of sea turtle habitat that would be lost as a result of the proposed groin would be approximately 240 meters or 787 feet of shoreline. P. Exs. 5 and 6 at unnumbered p. 4; Rusenko, P. WD-3, pp. 7-8, ¶ 25.

29. On November 20, 2015, the Nongame Conservation Section of Georgia DNR's Wildlife Resources Division filed formal comments with DNR's Coastal Resources Division staff for consideration by the Shore Protection Committee in response to Sea Island's permit application. P. Ex. 5; Dodd, Vol. II, p. 254, l. 2-25; p. 255, l. 1-5; Rusenko P. WD-3, pp. 7-8, ¶ 25.

30. As the person in charge of the state's sea turtle conservation and recovery program, Mr. Dodd prepared those comments. Dodd, Vol. II, p. 254, l. 2-10. The comments were edited and approved by his supervisor and his section chief for the Nongame Conservation Section before the section chief filed them. Dodd, Vol. II, p. 255, l. 13-15, p. 256, l. 2-12.

31. Subsequently, only four days later, the director of WRD, Dan Forster, stepped in and instructed the DNR staff to cancel the originally filed comments and substitute a new set of comments. Dodd, Vol. II, p. 260, l. 25; p. 261, l. 1-15; p. 263, l. 2-11; p. 289, l. 4-18; P. Ex. 6. Mr. Forster has no background in sea turtle conservation. Mr. Dodd has far more experience in sea turtle conservation than Mr. Forster. Dodd, Vol. II, p. 346, l. 3-18.

32. Both the original and revised set of comments included Mr. Dodd's and the WRD's conclusion that the proposed T-head groin would result in the loss of sea turtle nesting habitat and would interfere with the conservation of sea turtle populations in Georgia. P. Exs. 5 and 6 at unnumbered pages 1 and 8.

33. This conclusion once again was based upon the undisputed evidence that T-head groins inhibit females from reaching the beach; function as barriers to hatchling migration to the ocean; entrap hatchlings within the structure; concentrate predators in the vicinity of the groin resulting in increased hatchling mortality; and result in the loss of at least 100 meters of nesting habitat on either side of the groin plus, in this instance, an additional loss of 40 meters of habitat as a result of the T-head that runs parallel to the shore. P. Exs. 5 and 6 at unnumbered pages 2-6.

34. WRD's conclusion also was based upon specific evidence that the current groins on Sea Island "have also had negative impacts on sea turtle nesting habitat" and that the south groin in particular "has resulted in increased erosion rates on the south side of the groin." P. Exs. 5 and 6 at unnumbered pages 2-3.

35. Notably, in reaching its conclusion that the existing south groin has increased erosion on the south side, WRD relied upon a detailed analysis by Dr. Chester Jackson, an expert coastal geologist, who had closely examined shoreline change on Sea Island. WRD specifically rejected the shoreline change analysis submitted by Drs. Oertel and Basco on behalf of Sea Island because "[t]he analysis provided by the applicant uses data from the early 1980's (sic) and does not use the best available technology and analysis for assessing coastal erosion rates." P. Exs. 5 and 6 at unnumbered page 3.

36. WRD further found that Dr. Jackson's use of his advanced AMBUR computer program "has resulted in more accurate assessments of shoreline change that can be used to

assess the effects of shoreline engineering projects on erosion rates." P. Exs. 5 and 6 at unnumbered page 3.[2] Mr. Dodd and WRD also gave more weight to Dr. Jackson's technique because, unlike Dr. Oertel's survey methodology, Dr. Jackson's methodology could be used to assess shoreline change over long periods of time for specific sections of the beach, and it contained confidence limits to assess the quality of the estimates. P. Ex. 104, p. 2, ¶ 4.[3]

37. The original comments filed by WRD included Mr. Dodd's opinion that the proposed T-head groin "will unreasonably interfere with the conservation of sea turtle populations in Georgia." P. Ex. 5 at unnumbered pages 1 and 8. Although the revised comments prepared by Mr. Forster deleted the term "unreasonably" from the above statement, Mr. Dodd testified that he had no involvement in making that change and that he continues to believe that the proposed groin will unreasonably interfere with sea turtle conservation in Georgia. Dodd, Vol. II, p. 263, l. 2-25; p. 264, l. 1-4; p. 265, l. 14-25; p. 266, l. 1-2; P. Exs. 5 and 6 at unnumbered pages 1 and 8.

38. The original comments also included Mr. Dodd's recommendation that Sea Island's permit application be denied. Dodd, Vol. II, p. 258, l. 6-7; P. Ex. 5 at unnumbered page 6. Although Mr. Forster deleted this statement, Mr. Dodd had no involvement in making that change, and he continues to believe that Sea Island's permit application should be denied. Dodd, Vol. II, p. 264, l. 23-25; p. 265, l. 1-10; p. 266, l. 3-8.

---

[2] Although Mr. Dodd is not an expert in the field of coastal geology, he and the Wildlife Resources Division routinely solicit and rely upon the opinions of other persons who are experts in that field – an acceptable practice which he and the Division followed in this case with respect to erosion caused by the current groins. Dodd, Vol. II, p. 277, l. 12-25; p. 278, l. 1-12.

[3] Petitioners' Exhibit 104 is Mr. Dodd's and the Division's reply to the comments that Sea Island filed with DNR's staff in response to the Wildlife Resources Division's comments (P. Exs. 5 and 6) to Sea Island's permit application. Dodd, Vol. II, p. 268, l. 3-24. Although the comments likely were not shared with DNR staff, Mr. Dodd prepared them, and had them edited by his boss, to address several inaccuracies in Sea Island's response. Dodd, Vol. II, p. 268, l. 22-25; p. 269, l. 1-21.

39. As the person who has been in charge of the State of Georgia's sea turtle conservation and recovery program for 17 years, the Court finds that Mr. Dodd's opinion carries great weight and should be accorded great deference.

40. The United States Fish and Wildlife Service (USFWS), one of the federal agencies that administer the Endangered Species Act, also filed comments with CRD regarding Sea Island's permit application. P. Ex. 7.

41. In reviewing Sea Island's application, the USFWS criticized Dr. Oertel and Dr. Basco's conclusions from their shoreline dynamics and history report providing that the proposed groin would not cause any downdrift erosion thusly: "[t]here is little data or analysis to support this. The analysis is referenced 'Oertel-2012' on page 10 of the report (pdf page 12 of 22); however, it is not listed in the references indicating it is not published for peer review, nor are the data included with the report." P. Ex. 7 at 2.[4] As a result, USFWS concluded that Dr. Oertel's "data and analysis is not substantial and somewhat controversial." *Id.*

42. Most significantly, the USFWS cited the same sea turtle conservation concerns noted by Dr. Rusenko and Mr. Dodd including the groin causing the "permanent loss of habitat used by . . . sea turtles"; acting as "a physical obstacle to nesting sea turtles"; serving "as [an] impediment[] to offshore migration by hatchlings," and having "the potential to entrap hatchlings, and concentrate predatory fishes, resulting in higher probabilities of hatchling mortality and predation." *Id.*

43. The USFWS therefore concluded: "We recommend denial of the permit. Construction of another groin will have negative impacts to sea turtles and have possible adverse

[4] The Oertel/Basco report is attached to Sea Island's permit application as Attachment D. Joint Ex. 1, Attachment D.

impacts to the Sea Island spit which is utilized habitat for federally listed shorebirds and sea turtles." *Id.*

44. After the USFWS and WRD filed their comments opposing Sea Island's proposed project, DNR staff filed a report with the Shore Protection Committee in which the staff found that "the proposed project will interfere with the conservation of marine life and wildlife." Joint Ex. 2 at 10.

45. Finally, after carefully reviewing Sea Island's proposed project and volumes of Georgia DNR sea turtle data going back to 1989, the first year that records were maintained, Dr. Rusenko stated his expert opinion that "[t]o a reasonable degree of scientific certainty, SIA's [Sea Island] proposed project would unreasonably interfere with the conservation of threatened and endangered Loggerhead Sea Turtles, Green Turtles, and Leatherback Turtles." Rusenko, P. WD-3, p. 28, ¶ 68.

c. The proposed project would not increase sea turtle habitat because the project area is already functioning sea turtle habitat; therefore, the groin's negative effects would cause a net loss of habitat.

46. Sea Island attempts to rebut this unanimous expert opinion regarding the adverse effects of groins on sea turtles by arguing that its proposed project will actually increase the amount of sea turtle habitat on Sea Island. Sea Island's argument is premised on its assumption that the proposed 1200-foot project area currently is unsuitable sea turtle habitat which will be converted to suitable habitat by the project.

47. Both Mr. Dodd and Dr. Rusenko repeatedly testified, however, that the proposed project area historically and presently is suitable and functioning sea turtle habitat. Sea Island has not offered any rebuttal expert testimony on this point.

48. Specifically, Mr. Dodd testified that sea turtles regularly use the proposed project area for nesting and that the area "absolutely" provides suitable sea turtle nesting habitat. Dodd, Vol. II, p. 244, l. 4-13; p. 250, l. 22-25; p. 251, l. 1-9; p. 285, l. 20-23; p. 299, l. 6-25; p. 300, l. 1-25; p. 301, l. 1-15. In fact, using a sea turtle nesting density quartile analysis with the fourth quartile being the highest for sea turtle density, Mr. Dodd testified that the proposed project area falls within the third quartile which means that the project area is "a relatively high density nesting area for Sea Island relative to other nesting on Sea Island." Dodd, Vol. II, p. 243, l. 2-17.

49. Utilizing all available data compiled by the Georgia DNR from 1989 to 2015, including sea turtle reports submitted by Sea Island to DNR, Dr. Rusenko has performed a detailed density analysis of sea turtle nesting on Sea Island, the Spit, and the proposed project area. Rusenko, P. WD-3, pp. 12-16, ¶¶ 41-50; P. Exs. 48, 51, and 81. His undisputed findings are that nesting densities at the proposed project area are comparable to nesting densities on the rest of the Spit and the rest of the island. *Id.*

50. Based in part on this data, Dr. Rusenko concluded that the proposed project area historically and currently provides suitable and functioning sea turtle nesting habitat outside the "shadow" of the existing south groin.[5] Therefore, Sea Island's proposed project would not add any sea turtle habitat to the island. Rusenko, P. WD-3, p. 16, ¶ 50.

51. Utilizing DNR's survey data available only from 1999 to 2015, Dr. Rusenko also reviewed the degree of nesting success for the proposed project area. Nesting success is measured by dividing the total number of nests by the combined total of nests and false crawls. False crawls are incidents where a sea turtle comes ashore to make a nest, but rather than make a nest, returns to the sea to look for a better nesting spot. Nesting is generally considered

[5] The "shadow" of a groin is the 100 meter area downdrift of the groin that is unsuitable sea turtle habitat due to the accelerated erosion that typically occurs downdrift of a groin. Dodd, Vol. II, p. 252, l. 11-17.

successful when this calculation results in a 50% nesting rate. Rusenko, P. WD-3, pp. 25-26, ¶ 64.

52. Dr. Rusenko's review found that in the 17 years from 1999 to 2015, eight of those years showed a nesting success rate of at least 50%. Although the overall success rate for the entire 17-year period (44%) was slightly below 50%, the 44% success rate was due primarily to two outlier years in 2000 and 2012 when there were only two nests and 18 false crawls. Based on this data, Dr. Rusenko concluded that the proposed project area outside the shadow of the groin provides stable nesting habitat. Rusenko, P. WD-3, pp. 26-27, ¶ 66; P. Ex. 79a.

53. Under cross-examination at the hearing in this case and at the request of Sea Island's counsel, Mr. Dodd referred to a panoramic photograph of the proposed project area (SI Ex. 20) and illustrated numerous areas that are suitable for sea turtle nesting, despite the photograph being taken in the month of April when the coast has the most storm activity which tends to reduce temporarily the amount of habitat. In doing so, Mr. Dodd explained that scarped dunes in the project area were not continuous, that even dune scarped areas can provide suitable habitat, and that once the storm season has passed, additional areas of suitable habitat typically return over the summer months during the nesting season. Dodd, Vol. II, p. 298, l. 22-25; p. 299, l. 1-25; p. 300, l. 1-25; p. 301, l. 1-15. Moreover, the Georgia coast is constantly variable, so a section of beach may be suitable one year for nesting and not be suitable the next year or vice versa. Dodd, Vol. II, p. 284, l. 22-25; p. 285, l. 1-3.

54. While reviewing Sea Island's photograph of the entire project area, Mr. Dodd once again concluded that the proposed project area provides functioning sea turtle habitat and that "the area will remain adequate sea turtle habitat unless the shoreline is intentionally manipulated to freeze this important dynamic process [functioning sand-sharing system] (such as

the groin north of this area)." Dodd, Vol. II, p. 300, l. 5-6; p. 301, l. 25; p. 302, l. 1-7; P. Ex. 104 at 1, ¶ 1.[6]

55. Mr. Dodd's testimony was compelling particularly given that he is very familiar with the entire island, has been there many times, frequently visits the proposed project area, last visited the site within the past couple of months, and has personally performed sea turtle surveys on the island. Dodd, Vol. II, p. 234, l. 11-25; p. 295, l. 6-18.

56. As noted by Mr. Dodd, Sea Island's proposed project will not result in additional sea turtle nesting habitat because the project site is *already* providing functioning sea turtle habitat. However, because the proposed T-head groin will have adverse downdrift impacts and reduce the length of suitable shoreline habitat by 787 feet, the proposed project will result in a net loss of habitat. Dodd, Vol. II, p. 344, l. 16-21.

57. Moreover, as correctly noted by Mr. Dodd, even if Sea Island could show that the proposed T-head groin would have no downdrift impact, the groin by itself would cause a net adverse impact based upon his previously described direct impacts (preventing adults from reaching the shore to lay their nests) and indirect impacts (preventing hatchlings from safely reaching the ocean). Dodd, Vol. II, p. 342, l. 11-25; p. 343, l. 1-8.

58. Sea Island's remaining point in support of its argument that the proposed project area is unsuitable sea turtle habitat is based on the number of sea turtle nests that the Sea Island naturalist has relocated from the project area since 2012.

59. The fundamental flaw in this argument is that the only sea turtle experts who testified in this matter, Dr. Rusenko and Mr. Dodd, unequivocally stated that relocations of sea turtle nests are not an accepted standard in the sea turtle scientific community for measuring the

[6] Additionally, Mr. Dodd made clear that sea turtles can nest in an eroding habitat where the shoreline is retreating. If that were not the case, no shoreline in Georgia would be suitable for sea turtle nesting. Dodd, Vol. II, p. 347, l. 20-23.

suitability of sea turtle habitat. Rusenko, P. WD-3, p. 21, ¶ 58(d); Dodd, Vol. II, p. 271, l. 7-25; p. 272, l. 1-11 and 22-25; p. 273, l. 1-11; p. 348, l. 13-20. As Mr. Dodd stated with regard to the impropriety of using relocations as a standard to judge the suitability of habitat for sea turtles:

> That would be a really poor standard. So again, we looked (sic) to the turtles to tell us what's good nesting habitat. They've been around a long time, they've been on the planet for millions of years, so they know what they're doing. And so where they nest is considered good habitat. . . . So as a standard to determine whether or not a particular stretch of beach is quality nesting habitat or even suitable nesting habitat, based on the number of relocations is really not appropriate.

Dodd, Vol. II, p. 271, l. 13-18; p. 272, l. 7-11.

60. Mr. Dodd recently published a paper based on a study confirming that relocations of sea turtle nests make no difference in terms of hatching and emergence success versus simply leaving the nests in situ. Consequently, high relocation rates are cause for real concern. Dodd, Vol. II, p. 284, l. 13-20.

61. From 2012 to 2015, the Sea Island naturalist relocated 10 of 11 sea turtle nests that were laid in the proposed project area. However, she relocated four of the 10 nests to another spot within the project area itself. In each of the four years, she either relocated certain nests within the project area or left a nest there without moving it, thereby demonstrating that she consistently considered the area to be suitable sea turtle habitat. In fact, she so testified, unequivocally saying "absolutely." Nyenhuis, Vol. II, p. 435, l. 1-25; p. 436, l. 1-25; p. 437, l. 1-10; SI Ex. 70.

62. Ms. Nyenhuis did not dispute Mr. Dodd's or Dr. Rusenko's testimony that turtle relocations have no bearing on the suitability of sea turtle habitat, and she candidly acknowledged that she very much respects Mr. Dodd's opinions as he has far more expertise and knowledge than she does. Nyenhuis, Vol. II, p. 433, l. 5-16. Mr. Dodd specifically testified that

despite Ms. Nyenhuis' turtle relocations, the proposed project area provides functioning sea turtle habitat. Dodd, Vol. II, p. 285, l. 20-23.

63. To the extent there may be any remaining doubt on this issue, it is worth noting that from 2000 to 2015, some nests were relocated from outside to inside the proposed project area, and some nests were relocated from inside to outside the project area due solely to proximity to the current south groin, a problem created, of course, by Sea Island's own actions. Rusenko, P. WD-3, pp. 20-21, ¶ 58.

64. Based on this undisputed expert testimony, the Court finds that sea turtle relocations have no bearing on whether a particular area is suitable sea turtle habitat and that the proposed project area historically and currently provides suitable and functioning sea turtle habitat.

65. Finally, Sea Island argues that because its existing groin/beach nourishment project has increased the amount of habitat and sea turtle nests, its proposed project can be expected to do the same. The obvious first answer to this contention is that it has been demonstrated that the proposed project area already provides suitable sea turtle habitat, so the proposed project cannot possibly create any additional habitat. As such, it is irrelevant whether the existing groin/beach nourishment project has created additional sea turtle habitat within the confines of that project. In any event, the premise that the existing project has increased sea turtle habitat is fundamentally wrong. Additionally, the record does not support the allegation that the existing project has led to an increase in the number of nests.

66. As pointed out by Mr. Dodd, the existing project did not increase the amount of habitat but merely restored habitat that Sea Island had destroyed with the installation of rock

revetments along the entire developed portion of the island. Dodd, Vol. II, p. 312, l. 22-25; p. 313, l. 1-25; p. 347, l. 5-19.

67. Additionally, as correctly noted by Mr. Dodd, the scope of Sea Island's analysis in this regard is artificially limited to the area between the two existing groins. The analysis fails to consider the negative impacts that the existing groins have had on the north and south ends of the island resulting in habitat loss. Moreover, a significant portion of the new habitat is less desirable habitat because it is located in very developed areas, including in front of the beach club. Mr. Dodd found that 4.56 kilometers of beach was useable by sea turtles prior to construction of the current groin/beach nourishment project compared to 4.58 kilometers that was useable after construction of the project. As Mr. Dodd correctly notes, "the net result is no substantial gain in sea turtle nesting habitat from the period prior to construction." Dodd, Vol. II, p. 280, l. 8-25; p. 281, l. 1-25; p. 282, l. 1-9; P. Ex. 104 at 1, ¶ 2.

68. With respect to increasing numbers of actual nests, Sea Island relies solely on one pre-project sea turtle survey from 1989 that documented only 19 nests in the year prior to construction of the existing project. Sea Island then compares this survey to two succeeding years where numbers of nests were higher. This is a straw man argument that does not support Sea Island's position. First, as noted by Mr. Dodd, the 1989 survey was done by a "kid" who surveyed very infrequently (perhaps twice a week) compared to surveys in subsequent years that were done every day. Dodd, Vol. II, p. 337, l. 3-25; p. 338, l. 1-6. Second, 1989 is the only year for which pre-groin construction data is available, which is not adequate to make a sweeping conclusion that sea turtle nests were routinely as low as 19 nests prior to construction. Dodd, Vol. II, p. 337, l. 16-18; p. 338, l. 7-11. Third, as shown in Dr. Rusenko's summary of annual sea turtle nests on Sea Island obtained from DNR's data set, sea turtle nesting can vary greatly from

one year to the next. P. Exs. 56-58; Rusenko, P. WD-3, p. 21-23, ¶ 59; *see also* Dodd, Vol. II, p. 350, l. 11-19. This includes very low numbers of nests in post-groin construction years that Sea Island conveniently does not cite, including only 23 nests in 2004, 38 in 1993, and 41 in 2014. P. Ex. 56.

69. Mr. Dodd correctly concludes that the 1989 survey does not provide a reliable number, cannot be used to conclude there was lower nesting in 1989, and does not give us any idea what sea turtle nesting numbers were like pre-groin construction. Dodd, Vol. II, p. 337, l. 8-9; p. 338, l. 4-6. It therefore does not lend any support to the argument that the existing groin/beach nourishment system has led to greater sea turtle nesting on Sea Island.

70. In fact, as noted by both Mr. Dodd and Dr. Rusenko, sea turtle nesting on Sea Island has essentially been flat since the current groins were installed contrary to the state-wide trend where numbers of sea turtle nests have significantly been increasing on a statistical basis at every beach in Georgia since 1989 (when data collection began), except for Sea Island and Little Cumberland Island. Dodd, Vol. II, p. 323, l. 12-24; Rusenko P. WD-3, pp. 21-23, ¶¶ 59-61; P. Exs. 57 and 58.

71. Based on the overwhelming probative evidence of record, including the many expert opinions expressed in this matter by Mr. Dodd, Dr. Rusenko, and the U.S. Fish and Wildlife Service, the Court finds that Sea Island's proposed project would unreasonably interfere with the conservation of endangered and threatened sea turtles.

ii. The proposed project would adversely impact protected shorebird habitat.

72. The evidence in the record also suggests that the proposed project would negatively impact shorebirds.

73. In comments recommending denial of the permit application, the United States Fish and Wildlife Service explained:

> The island beaches are utilized by wintering and migrating federally listed shorebirds; the piping plover (*Charadius melodus*) and red knot (*Calidris canutus*). The construction area and the Sea Island spit are designated piping plover critical habitat by the Service. The spit is used by large numbers and a large variety of shorebirds. The shorebird survey attachment to the permit request documented over 7,000 shorebird observations and 22 species observed. Shorebird usage of the spit is year-round. . . .

P. Ex. 7 at 1-2.

74. The USFWS comments cautioned that, should erosion occur downdrift of the proposed groin, "it would impact piping plover critical habitat and impact an area used by federally listed piping plovers and red knots on their migratory breeding route and as a wintering area by some of the birds." P. Ex. 7 at 2. According to the USFWS, "[t]he area is used year-round by other shorebirds as well, some of which are Georgia state species of concern." P. Ex. 7 at 2.

75. The DNR Wildlife Resources Division expressed similar concerns. In comments to the Shore Protection Committee, WRD explained:

> Regarding waterbirds, we are specifically concerned with erosional impacts to habitat south of the proposed groin. This area is designated critical wintering habitat for federally threatened piping plover (*Charadrius melodus*) and is heavily used by a wide range of other shorebirds and seabirds, including the federally threatened red knot (*Calidris canutus*). Gould's Inlet, at the southern tip of this area, also provides nesting habitat for American Oystercatcher (*Haematopus palliatus*) and Least Term (*Sternula antiallarum*), both state species of concern.

P. Ex. 6 at 8.

76. According to WRD, "All of these species require the natural sand-sharing system to build up appropriate nesting, roosting, and foraging habitat. Shoreline engineering projects (including groins), particularly near inlets are listed as one of the major threats to shorebird

conservation in shorebird conservation plans (Atlanta Flyway Shorebird Business Plan 2015) because they disrupt the natural sand sharing system." P. Ex. 6 at 8.

77. As a result, WRD concluded:

> Based on erosion rates listed above, it is reasonable to expect that the proposed groin will increase erosion rates to the south as an unintended consequence. As an example of unintended consequences, the 1990 groin and beach renourishment project on Sea Island was likely responsible for the loss of a site protected by the Bird Island Rule called Pelican Spit, which at the time was one of the most important seabird nesting sites in Georgia.

P. Ex. 6 at 8.

78. Based on this evidence, the Court finds that Sea Island's proposed project would unreasonably interfere with the conservation of threatened shorebirds.

C. Impact of the Proposed Project on the Sand-Sharing System

i. Groins indisputably have negative effects which is why, absent special circumstances, beach nourishment without groins is universally the preferred alternative.

79. Groins cause serious disruption of the sand-sharing system, erosion, and loss of wildlife habitat. Young, P. WD-1, p. 9, ¶ 30.

80. Due to these negative effects, groins are now largely disfavored and are regulated in all states, including Georgia. Young, P. WD-1, pp. 9-10, ¶¶ 30, 32.

81. As Dr. Robert Young, a Licensed Professional Geologist, Elected Fellow of the Geological Society of America, Professor of Geology at Western Carolina University, and Director of the Program for the Study of Developed Shorelines at Western Carolina/Duke University, testified, the negative effects of groins have been documented extensively in the scientific literature and are widely recognized in the scientific community. Young, P. WD-1, p. 10, ¶ 33.

82. For example, the United States Army Corps of Engineers' (the Corps) Coastal Engineering Manual recognizes that groins are ". . . probably the most misused and improperly designed of all coastal structures. . . . Over the course of some time interval, accretion causes a positive increase in beach width updrift of the groin. Conservation of sand mass therefore produces erosion and a decrease in beach width on the downdrift side of the groin." P. Ex. 33 (USACE Manual) at Part V, Chapter 3, p. V-3-59.

83. In the Manual, the Corps also acknowledges that "[c]oastal zone management policy in many countries and the United States presently discourages the use of groins for shore protection." *Id*. at V-3-61. Although the Manual goes on to state that properly designed groins can function effectively under "certain conditions" for increasing the longevity of renourished beaches, the Manual proceeds to say that groins cause downdrift erosion and harm. *Id*. at V-3-61, 67-68. Thus, though groins may be "effective" at increasing the longevity of a beach within their protection, they do so at the expense of the downdrift shoreline. *Id.* This is one of the reasons why the Corps has not considered groins in recent New Jersey beach nourishment projects and, where possible, has been altering existing groins to allow sand passage down the shore. Young, P. WD-1, p. 10, ¶ 34.

84. Paul Komar, professor emeritus in the College of Oceanographic and Atmospheric Sciences at Oregon State University, states in his textbook used by most coastal engineering programs that "[g]roins and jetties have the same effect in damming the longshore sediment transport, the shoreline builds out on the updrift side and erodes in the downdrift direction." Young, P. WD-1, pp. 10-11, ¶ 35.

85. In commenting on proposed groin legislation in North Carolina, no less than 43 of the world's leading coastal scientists signed a statement providing that:

> The negative impact of groins and jetties on downdrift shorelines is well understood. When they work as intended, sand moving along the beach in the so-called downdrift direction is trapped on the updrift side, causing a sand deficit and increasing erosion rates on the downdrift side. This well-documented and unquestioned impact is widely cited in the engineering and geologic literature.

P. Ex. 36 (Coastal Scientist Statement on Groin Impacts) at 2.

86. The Coastal Scientist Statement further provides that:

> [t]he localized and temporary updrift benefits afforded by groins and jetties rarely, if ever, justify the downdrift damage caused by increased erosion . . . and "**[u]sing groins in conjunction with beach nourishment projects is of dubious value as well**.

Id. at 1-2 (emphasis added).

87. The bottom line is that beach nourishment without a groin is now the preferred method in the United States for restoring shorelines. Dr. David Basco, Sea Island's coastal engineering expert in this matter, agrees: "Beach nourishment with periodic renourishment (maintenance) has become the preferred alternative for many coastal sites in the US that experience long-term erosion." Basco, SI WD-5, p. 26, ¶ 46.

88. The preference for beach nourishment is consistent with the mandate in Georgia's Shore Protection Act which provides that (a) shoreline stabilization activities, including groins, should be permitted only when the applicant has demonstrated that no reasonable or viable alternative exists, and (b) beach restoration and renourishment techniques are preferable to the construction of shoreline stabilization devices such as groins. Young, P. WD-1, p. 9, ¶ 29; O.C.G.A. § 12-5-239(c)(3)(C).

ii. The negative impact of Sea Island's proposed groin is predictable based not only on the overwhelming scientific consensus on the adverse effects of groins, but by the documented negative impacts of Sea Island's current groins.

89. The parties have presented expert testimony regarding historical shoreline change on Sea Island both before and after the current groins were installed on the island. That testimony included an analysis of the two existing groins on Sea Island and the Sea Island shoreline to determine what impact, if any, the groins have had, particularly with respect to retreat or accretion of the shoreline downdrift of the southern-most groin. Because these two groins have been in place for nearly twenty-five years, they are a useful tool in assessing the likely impacts of the proposed groin. *See, e.g.*, Webb, P. WD-2, p. 11, ¶ 37. The parties' testimony will be discussed further below.

a. Methodologies for measuring rates of shoreline change.

90. As noted by Dr. Chester Jackson, an Associate Professor of Geology at Georgia Southern University, there are a number of ways to measure shoreline change. Jackson, Vol. IV, p. 842, l. 15-p. 844, l. 6. In general, those methods use a feature-based proxy (also called a shoreline proxy) or a numerical proxy. Jackson, Vol. IV, p. 844, l. 7-14.

91. A feature or shoreline-based proxy is tied to an actual physical feature within the shoreline system at the very location where the change, if any, is being measured. Jackson, Vol. IV, p. 844, l. 7-10; P. Ex. 32 at 3. Physical features include such things as a stable vegetation line, high water line, wrack line, or water/land interface. Jackson, Vol. IV, p. 845, l. 8-12; P. Ex. 32 at 3. With a feature-based proxy, one simply takes a measurement from a fixed point on the shoreline that can be physically observed and compares measurements to that feature over time. Jackson, Vol. IV, p. 843, l. 4-12.

92. A numerical proxy, such as a tidally based datum, is tied to an elevation level such as mean high water or mean low water. Jackson, Vol. IV, p. 845, l. 13-17; P. Ex. 32 at 3. It is not tied to a physical feature that one can easily see on the shoreline.

93. If one attempts to measure shoreline change based on the numerical proxy of mean high water levels over time, one must ultimately tie those measurements to the tides. Therefore, if a shoreline change analysis begins by taking measurements based on a land-based datum, such as NAVD88 (North American Vertical Datum adopted in 1988), one must convert those measurements to a tidal gauge that provides mean high water levels. Jackson, Vol. IV, p. 845, l. 17-18; p. 846, l. 5-7; p. 848, l. 15-18. This is so because a land-based datum is tied to a fixed point on the land and not to the tides. Jackson, Vol. IV, p. 845, l. 20-21; p. 853, l. 19-25.

94. Another datum is NGVD29 (National Geodetic Vertical Datum adopted in 1929). Although that datum is called a geodetic or land-based datum, it actually relied upon tidal data, unlike NAVD88. Jackson, Vol. IV, p. 852, l. 20-25; p. 853, l. 1. In fact, NGVD29 was originally known as the Sea Level Datum of 1929 because it was based upon several tide gauges in the United States and Canada which were then tied to a fixed point on land. Jackson, Vol. IV, p. 853, l. 1-9. NGVD29 assumed that sea level was stagnant or constant at each tidal gauge in order to give a constant fixed measurement. However, due to plate tectonics, including subsidence and uplift of the earth's crust, scientists later determined that sea levels were not stagnant so measurements taken based upon NGVD29 were not really being taken from a fixed point and could not result in a constant fixed measurement. Jackson, Vol. IV, p. 853, l. 10-15.

95. As a result of accuracy issues with NGVD29, NAVD88 eventually replaced it. Unlike NGVD29, NAVD88 was, in fact, tied solely to a fixed point on land without any reference to tide gauges. A fixed point was chosen in Quebec, Canada where there are very little

tectonic variations. Jackson, Vol. IV, p. 853, l. 19-25. A complex array of benchmarks was then related to that fixed point. Jackson, Vol. IV, p. 854, l. 2-3. Due primarily to the lack of tectonic variations, NAVD88 is more accurate than NGVD29. Jackson, Vol. IV, p. 853, l. 1-25; p. 855, l. 2-19. Until the U.S. Coast and Geodetic Survey or the National Geodetic Survey re-surveys points established by NGVD29 and converts them to NAVD88, the older points under NGVD29 are not valid for measuring shoreline change. Jackson, Vol. IV, p. 855, l. 12-19.

96. Pure and semi-based land datums such as NAVD88 and NGVD29 must be correlated to the tides in order to make the necessary mean high water calculation. As a result, elevation measurements obtained from NAVD88 and NGVD29 must be converted to a tide datum. Jackson, Vol. IV, p. 845, l. 17-18; p. 848, l. 15-19.

97. There are no tide gauges at Sea Island. Jackson, Vol. IV, p. 847, l. 12-14. The closest tide gauge is at St. Simons Island, and that tide gauge is out-of-date and not as accurate as the two other nearest and most accurate first order tide gauges at Fort Pulaski and Fernandina Beach. Jackson, Vol. IV, p. 851, l. 13-22; p. 850, l. 19-24.

98. Sea Island lies between Fort Pulaski and Fernandina Beach. Consequently, to convert NGVD29 or NAVD88 to a tide datum in order to obtain a mean high water level for Sea Island, one must interpolate a measurement from the Fort Pulaski and Fernandina Beach tide gauges which are approximately 100 miles apart and which have mean tides ranging from 6.92 feet at Fort Pulaski to 6.02 feet at Fernandina Beach. Jackson, Vol. IV, p. 846, l. 9-17; p. 847, l. 8-10; p. 851, l. 7-25; p. 852, l. 1.

99. In order to convert from a land-based datum such as NAVD88 to a tide datum, one cannot simply assume that the tidal range is linear from Fort Pulaski to Fernandina Beach nor can one simply draw a linear line due to the curvature of the earth. In order to compensate for

these issues, the National Oceanic and Atmospheric Administration (NOAA) provides a tool known as V-datum. Jackson, Vol. IV, p. 846, l. 5-25; p. 847, l. 1-7. NOAA's V-datum formula uses a geoid model that must be regularly updated. Jackson, Vol. IV, p. 847, l. 15-25; p. 848, l. 1-13. If appropriate updating is not done, the resulting measurements can be off by as much as an entire meter. Jackson, Vol. IV, p. 848, l. 10-13.

100. There are potential rates of error at every step in using a numerical proxy including the conversion from the land-based datum to a tidal datum and the interpolation of the tidal gauges at Fort Pulaski and Fernandina Beach. Jackson, Vol. IV, p. 849, l. 5-8; p. 851, l.13-25; p. 852, l. 1-19.

101. This discussion shows that use of a numerical proxy is difficult and is prone to potential rates of error at multiple points. This is especially true when the older, less accurate NGVD29 datum is used and when the outdated and less accurate St. Simons tide gauge is used (which is what Dr. Oertel did as discussed further below).

102. A feature or shoreline-based proxy is better and easier to use because it is tied to a more easily identifiable physical feature on the shoreline. In contrast, a numerical proxy is not tied to anything that one can actually stand on the beach and see. As a result, shoreline change historically has generally been measured by a feature or shoreline-based proxy. Jackson, Vol. IV, p. 858, l. 4-20; P. Ex. 32 at 2-3.

b. Dr. Chester Jackson's use of a physical feature-based methodology to measure shoreline change demonstrates the negative impacts that Sea Island's proposed groin would have on the downdrift shoreline.

103. Dr. Jackson used a visible feature-based methodology, the high water line, to measure shoreline change on Sea Island from 1869 to 2013. Jackson, Vol. IV, p. 859, l. 1-3; P. Ex. 32 at 1, 4.

104. More specifically, Dr. Jackson obtained geo-referenced aerial photography in digital format referenced to a coordinate system, put it into his geographic information system, and made measurements from it. The aerial photography was obtained from the U.S. Department of Agriculture, the U.S. Geological Survey, and other agencies. Jackson, Vol. IV, p. 859, l. 11-17. He also obtained aerial photography that was not geo-referenced, but followed established protocols that were designated by the appropriate agency in order to geo-reference it and make it compatible for mapping change.

105. Dr. Jackson assessed all of the photography for accuracy and applied a conservative potential rate of error to each photo. Jackson, Vol. IV, p. 859, l. 18-25; p. 860, l. 1-7. Dr. Jackson used the original aerial photographs rather than Google Earth images (made from the original photographs) because higher end, higher accuracy analyses can be performed with the original photographs. Jackson, Vol. IV, p. 860, l. 9-25; p. 861, l. 1-3. The federal agencies producing the photographs also provide data on their level of accuracy so that Dr. Jackson could use that information in doing his shoreline change analysis. Jackson, Vol. IV, p. 861, l. 14-18.

106. Dr. Jackson scanned the various aerial photographs into his computer and digitally traced the high water line on them. Jackson, Vol. IV, p. 861, l. 19-24.

107. For earlier times where no photographs were available, Dr. Jackson was able to obtain U.S. Coast and Geodetic topographic sheets (T-sheets) that are some of the highest accuracy maps ever made of the shoreline. Jackson, Vol. IV, p. 862, l. 15-25; p. 863, l. 1-13.

108. The T-sheets now contain benchmarks that allowed Dr. Jackson to scan them into his computer, geo-reference them thereby enabling him to measure their accuracy, and digitally trace the high water line. In doing so, he followed established NOAA protocols. Jackson, Vol. IV, p. 864, l. 3-12; p. 865, l. 20-25; p. 866, l. 1-4.

109. Once everything was scanned into his computer, Dr. Jackson created transects or perpendicular lines that cross the beach or shoreline for where he wanted to take his measurements. He then applied a software program that he developed known as AMBUR (Analyzing Moving Boundaries Using R) to measure the distances and rates of change along the transect lines over time. Jackson, Vol. IV, p. 862, l. 2-14.

110. AMBUR is a computer software program that utilizes geographic information system (GIS) data and a suite of algorithms to calculate change in the position of a boundary, such as a shoreline, over time. P. Ex. 32, at 2; Vol. IV, p. 840, l. 1-19; p. 869, l. 2-4. It was a scientific breakthrough at the time that Dr. Jackson developed it because it was the first such program that was capable of analyzing and mapping curved shorelines. Jackson, Vol. IV, p. 839, l. 10-20. AMBUR is now used worldwide. Jackson, Vol. IV, p. 839, l. 20-25.

111. In performing his shoreline change analysis, Dr. Jackson calculated a margin of error for the aerial photographs and T-sheets using federal agency established protocols and even went so far as to calculate a margin of error based on the thickness of the pen or pencil used to make the maps in accordance with published scientific protocols. All of these potential margins of error are taken into account in his shoreline change analysis. Jackson, Vol. IV, p. 866, l. 10-25; p. 867, l. 1-8.

112. Dr. Jackson's methodology utilized in this case is widely accepted in the coastal scientific community and is used in the U.S. Geological Survey's National Shoreline Assessment. Jackson, Vol. IV, p. 867, l. 9-25. Use of the high water line has been shown to be a viable and robust shoreline proxy for measuring shoreline change. P. Ex. 32 at 4 (citing Dolan, *et al.*, 1978; Dolan, *et al.* 1980; Dolan, *et al.* 1991; Pajak and Leatherman, 2002; *see also* Shalowitz, 1964 and Moore, 2000).

113. Dr. Jackson initially applied his methodology to make measurements at 11 locations (transects) south of the currently existing south groin and at 11 locations (transects) north of the existing south groin on Sea Island. The locations were spaced 50 meters apart consistent with the practice of the U.S. Geological Survey, and covered the time period from 1869 to 2013. Jackson, Vol. IV, p. 870, l. 1-23; p. 871, l. 1-13; P. Ex. 32 at. 4, 7-8. Thus, the transects where the measurements were made included the entire length of the proposed project area which is 1,200 feet long. The measurements were made based upon aerial photographs or T-sheets from 1869, 1933, 1988, 1993, 1999, 2003, and 2013. P. Ex. 32 at 7, Figure 1.

114. By comparing the change in the location of the high water line over time, Dr. Jackson calculated a rate of shoreline change at each one of the 22 transect lines and summarized his findings in Table 1 of his Report as follows:

Table 1. Summary of shoreline changes rates (m/yr) for the Sea Island, GA southern groin area.

Transect	1869 to 1988 (119 yrs)	1933 to 1988 (55 yrs)	1988 to 2013 (25 yrs)	2003 to 2013 (10 yrs)
	pre-groin installation		post-groin installation	
	south (downdrift) side of groin			
1	-0.04	0.92	-3.23	-3.56
2	-0.05	0.92	-3.31	-3.57
3	-0.06	0.93	-3.28	-3.55
4	-0.08	0.86	-3.24	-3.58
5	-0.11	0.77	-3.15	-3.56
6	-0.10	0.78	-3.20	-3.20
7	-0.11	0.77	-3.18	-2.85
8	-0.14	0.70	-3.14	-2.71
9	-0.11	0.73	-3.15	-2.65
10	-0.06	0.82	-2.83	-2.19
11	-0.01	0.89	-1.47	-0.16
mean:	-0.08	0.83	-3.02	-2.87
± error estimate:	0.07	0.13	0.31	0.86
Transect				
	north (updrift) side of groin			
12	0.01	0.89	3.02	-0.05
13	0.05	0.87	2.99	-0.71
14	0.09	0.77	2.19	-1.90
15	0.12	0.71	1.82	-1.95
16	0.16	0.67	1.49	-1.90
17	0.17	0.57	1.38	-1.67
18	0.19	0.46	1.38	-1.64
19	0.22	0.52	1.31	-1.40
20	0.24	0.54	1.30	-1.26
21	0.24	0.49	1.29	-1.34
22	0.24	0.42	1.36	-1.43
mean:	0.16	0.63	1.78	-1.39
± error estimate:	0.07	0.13	0.31	0.86

Note: Positive numbers indicate accretion and negative numbers are erosion.

P. Ex. 32 at 8, Table 1.

115. As shown in Table 1, Dr. Jackson calculated shoreline change for longer and shorter time periods in order to set forth both long- and short-term trends and because he only had a short term to work with, approximately 25 years, for the period of time after the south groin was installed. Jackson, Vol. IV, p. 872, l. 19-25; p. 873, l. 1-7 and 17-21.

116. Dr. Jackson's analysis shows that the mean rate of shoreline change for the 11 transects south of the current location of the south groin from 1869 to 1988 prior to installation

of the south groin in 1991 was -0.08 meters/year or barely retreating. P. Ex. 32 at 8, Table 1; Jackson, Vol. IV, p. 874, l. 14-18.

117. On the other hand, after the south groin was installed, the rate of shoreline change dramatically increased to -3.02 meters/year from 1988 to 2013 (the last year for which aerial photography was available at the time the analysis was performed). This change represents more than a 37-fold increase in the rate of shoreline retreat south of the groin after the south groin was installed. P. Ex. 32 at 8, Table 1; Jackson, Vol. IV, p. 876, l. 11-21.[7]

118. Dr. Jackson's analysis also shows that the dramatic increase in shoreline retreat has not changed in any significant way for the more recent 10-year period from 2003 to 2013. For that time period, the shoreline south of the south groin has retreated at a rate of -2.87 meters/year or almost 36 times greater than the rate of retreat prior to installation of the south groin. P. Ex. 32 at 8, Table 1; Jackson, Vol. IV, p. 878, l. 1-5.

119. Based on a statistical analysis of over 70,000 transect locations, Dr. Jackson and a team of scientists have determined that it is statistically significant to have an area with a rate of shoreline change equal to or greater than -1.0 meters/year (which is approximately 3.28 feet/year). To put this figure in perspective, for the entire last century, the total amount of sea level rise for that 100 years in this area was only about one foot. Jackson, Vol. IV, p. 914, l. 7-12. Thus, Dr. Jackson calls a location with shoreline change rate equal to or greater than 3.28

[7] Dr. Jackson acknowledged that 1988 was a few years prior to installation of the south groin in 1991, but he used the 1988 aerial photo because that is the one that Sea Island used in its permit application to represent the shoreline prior to installation of the groin, and he wanted to be able to compare apples to apples by using the same aerial imagery that Sea Island used for its shoreline analysis. Jackson, Vol. IV, p. 877, l. 14-24; P. Ex. 32 at 5. However, Dr. Jackson still believes that the rates are reliable. Jackson, Vol. IV, p. 877, l. 1-13.

feet/year (or the equivalent of 328 feet over a period of 100 years) a "hotspot." Jackson, Vol. IV, p. 880, l. 1-20; P. Ex. 32 at 1-2.

120. Based on Dr. Jackson's analysis, the area south of the south groin is not only a hotspot, it is an extraordinary hotspot given that the rate of erosion is three times higher (-3.02 meters/year) than the threshold (-1.0 meters/year) for a hotspot. Jackson, Vol. IV, p. 880, l. 21-25; P. Ex. 32 at 1-2.

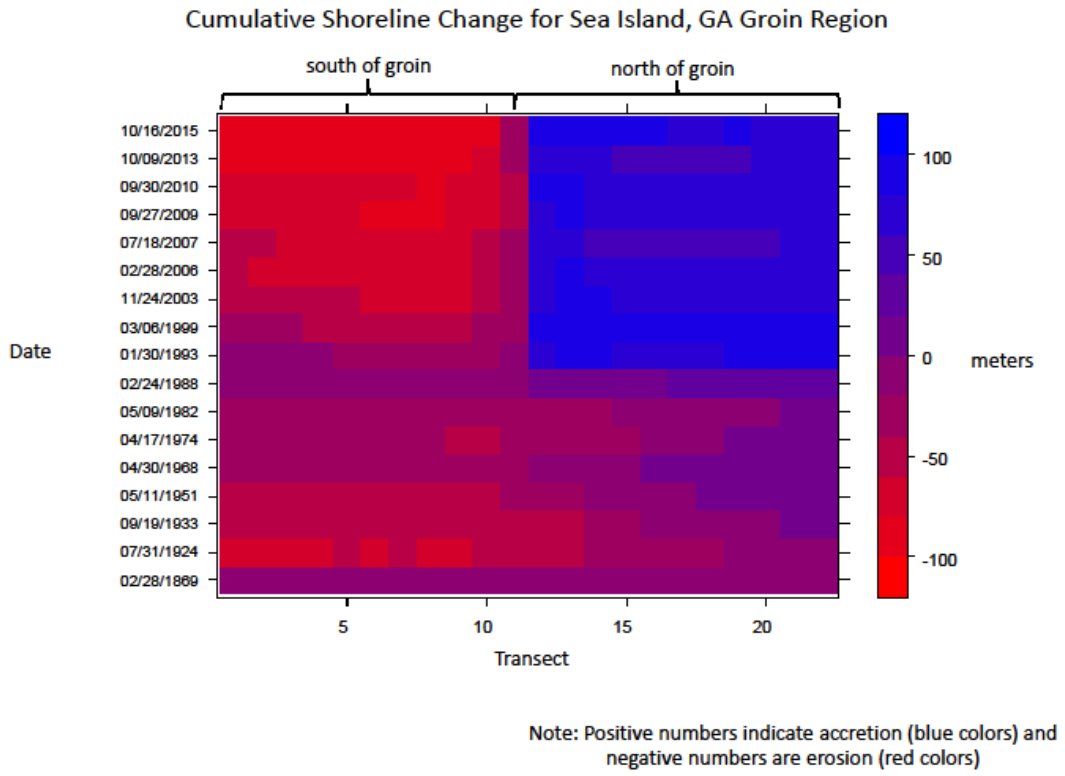
121. The shoreline change rates south of the groin since its installation are particularly significant given that prior to the groin's installation, rates of shoreline change north and south of the south groin location were comparable, but since that time, the rates of change are substantially different to the detriment of the area south of the south groin.

122. For example, over a 119 year time period, from 1869 to 1988, the area south of the south groin barely eroded at a rate of -0.08 meters/year, and the area north of the groin barely accreted at the rate of +0.16 meters/year. P. Ex. 32 at 8, Table 1. Similarly, the rate of shoreline change from 1933 to 1988 north and south of the area where the south groin eventually was installed was comparable: the south area accreted at the rate of +0.83 meters/year, and the north area accreted at the rate of +0.63 meters/year. Jackson, Vol. IV, p. 879, l. 5-9; P. Ex. 32 at 8, Table 1.

123. However, since the south groin was installed, the downdrift side has retreated at a rate of -3.02 meters/year while the updrift side accreted at a rate of +1.78 meters/year. P. Ex. 32 at 8, Table 1; Jackson, Vol. IV, p. 879, l. 10-17. And even if the analysis is confined to the more recent 10-year time period of 2003-2013, the rate of negative shoreline change on the downdrift side is more than double the rate on the updrift side (-2.87 meters/year versus -1.39 meters/year). P. Ex. 32 at 8, Table 1; Jackson, Vol. IV, p. 879, l. 22-25.

124. Notably, consistent with widely-accepted scientific principles, Dr. Jackson included conservative potential margins of error for all of his calculations. All of his shoreline change rates greatly exceed the applicable potential margins of error. P. Ex. 32 at 8, Table 1.

125. Subsequent to his initial analysis, Dr. Jackson performed a more comprehensive analysis of shoreline change at the same 22 transects on Sea Island by making measurements for every time step in which he could find an aerial photo that was not initially available. Jackson, Vol. IV, p. 869, l. 23-24; p. 876, l. 9-10. This analysis covered 17 data points (as opposed to the original 7 data points) for almost every decade in the 20th and 21st centuries including the years 1869, 1924, 1933, 1951, 1968, 1974, 1982, 1988, 1993, 1999, 2003, 2006, 2007, 2009, 2010, 2013, and 2015. P. Exs. 90 and 91.



P. Ex. 90: Cumulative Shoreline Change for Sea Island, GA Groin Region

126. Dr. Jackson followed the same protocols and applied the same rigorous process, including calculating potential rates of error at each step of the process, for this additional analysis as he utilized with his initial analysis. Jackson, Vol. IV, p. 885, l. 25; p. 886, l. 1-7.

127. Dr. Jackson's additional analysis was consistent with his initial analysis: the shoreline north and south of the south groin was fairly uniform until the south groin was installed. However, once the groin was installed, the area downdrift of the groin suddenly began eroding at a significant rate, whereas the area north of the groin changed from erosion to accretion. Jackson, Vol. IV, p. 884, l. 21-25; p. 885, l. 1; p. 929, l. 6-25; p. 930, l. 1-10; P. Ex. 90.

128. This phenomenom is easily seen in the color-coded Petitioners' Exhibit 90 which shows a virtually solid blue square for all of the transects north of the south groin from 1993 to 2015 (after the south groin was installed) and a virtually solid red square for all transects south of the south groin for that same time period (red = erosion and blue = accretion).

129. Dr. Jackson concluded that "it is clear from the shoreline's shape and movements that the groin has had a noticeable impact following its installation" on the Sea Island shoreline. P. Ex. 32 at 1; *see also* Jackson Vol. IV, p. 885, l. 21-24 ("And yet it shows very clearly the cumulative change going from shorelines are acting consistent here and then we get to the 1980s, lo and behold, something happens. The groin's installed.").

130. Dr. Jackson calculated that the "noticeable impact" is approximately100 meters or over 300 feet. Jackson, Vol. IV, p. 894, l. 16-23; P. Ex. 90 (as denoted by the bright red color at the top of the chart on the left-hand side showing cumulative change from 1988 to 2015 for the area south of the groin). This amount of shoreline retreat is well within Dr. Jackson's

conservative potential margin of error of 0.31 meters/year (approximately 1.0 feet/year or a total of 25 feet for the time period measured). *Id.*; P. Ex. 32 at 8, Table 1.[8]

131. Dr. Jackson did not direct or have any involvement in determining the timing for taking or developing the photographs and T-sheets that he used for his analysis. That data constitutes random samples which is significant in science when the samples show a pattern as is the case here. Jackson, Vol. IV, p. 885, l. 6-19.

132. The credibility of Dr. Jackson's analysis is further strengthened by being repeatable and verifiable – a critically important scientific principle. Any capable coastal geologist can use the same historical photographs and T-sheets that Dr. Jackson used, geo-reference them, digitally trace the high water line on them, and apply AMBUR, Dr. Jackson's software that he has made available to the public free of charge. Jackson, Vol. IV, p. 887, l. 2-25; p. 888, l. 1-5; p. 900, l. 17-23; p. 927, l. 14-17. Despite the ability to do this, neither the Committee nor Sea Island has come forward with any evidence showing that they were not able to repeat and verify Dr. Jackson's conclusions. In fact, Sea Island's counsel acknowledged at the hearing that Sea Island was not challenging Dr. Jackson's methodology. Jackson, Vol. IV, p. 890, l. 5-7.

133. The Court finds that Dr. Jackson's methodology is credible and reliable and resulted in credible and reliable rates of shoreline change.

134. In his written testimony, Dr. George Oertel, a coastal geologist who testified on behalf of Sea Island, contended that Dr. Jackson's use of AMBUR results in a potential rate of

[8] Dr. Jackson's initial analysis covered two less years of potential change and used less photographic evidence than his subsequent analysis. As a result, his initial analysis found approximately 250 feet of shoreline retreat from 1988 to 2013 (-3.02 meters/year = 9.9 feet/year x 25 years = 247 feet). Of course, 250 feet is also a substantial figure.

error up to 150 feet based on a constant slope of 1.5 degrees and a difference of four feet between neap and spring tides.[9] Oertel, SI WD-4, pp. 31-32, ¶ 65.

135. As Dr. Jackson testified, however, his methodology took into account the location of the tide on the days the aerial photos were taken because he had the exact times and dates that each photograph was taken. Jackson, Vol. IV, p. 912, l. 11-24. The Court therefore finds that Dr. Oertel's contention has no merit.[10]

c. Dr. Bret Webb's use of a physical, feature-based methodology also demonstrates negative impacts that Sea Island's proposed groin would have on the downdrift shoreline.

136. Dr. Bret Webb, a Licensed Professional Engineer and Associate Professor of Civil Engineering at the University of South Alabama, also presented testimony demonstrating that the current groins on Sea Island have caused downdrift shoreline retreat.

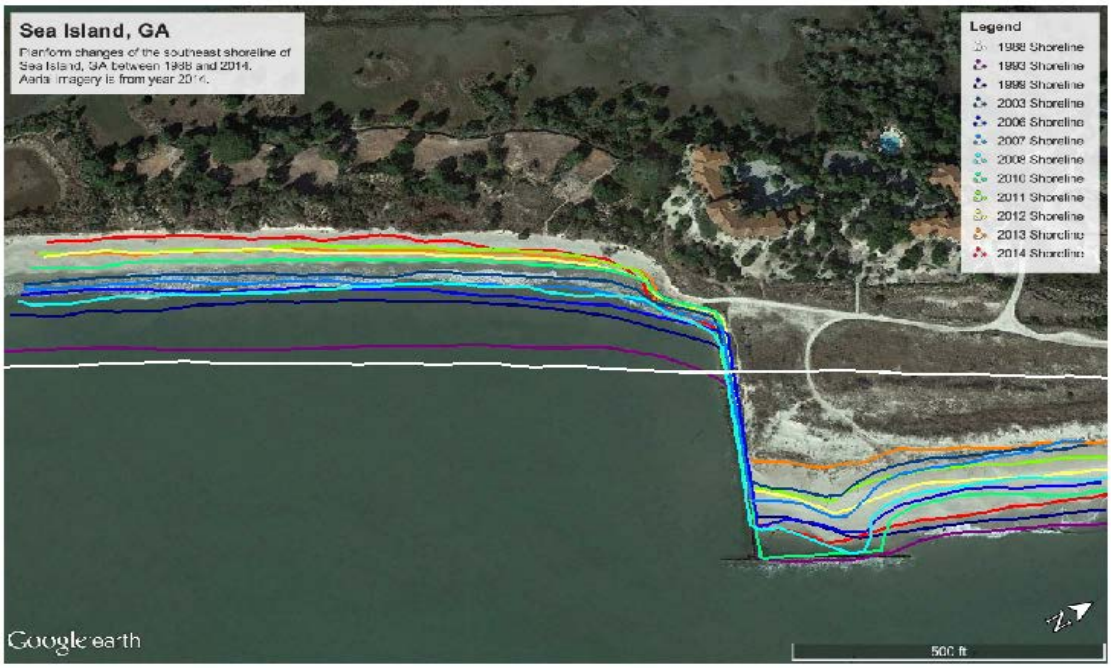
137. Dr. Webb reviewed a series of 12 Google Earth images for Sea Island from 1988 to 2014 near the current south groin, traced the wet-dry line on the beach for each image, and

---

[9] A neap tide is the lowest of the low tides that occurs only twice a month based on the lunar cycle. A spring tide is the highest of the high tides that occurs only twice a month based on the lunar cycle.

[10] Dr. Oertel's criticism is also entitled to little weight because: (a) he provides no actual evidence to support his conclusory statement regarding a constant 1.5 degree slope of the beach upon which he bases his error analysis nor precisely where, how, and when he took any slope measurements (*see, e.g.*, Oertel, SI WD-4, p. 33, Figure 18, which is merely a generic diagram; Jackson,Vol. IV, p. 892, l. 22-25); (b) as Dr. Jackson testified, and as was confirmed by the Court's site visit with counsel and the parties to the project area on May 11, 2016, the slope of the beach, in fact, is not a constant 1.5 degrees, but is typically much larger and can be as much as 45 degrees due to scarping of the dunes (Vol. IV, p. 893, l. 5-7 and l. 15-25; p. 894, l. 1-4); (c) as confirmed by the Court's site visit at low tide on May 11, 2016, there is not close to 150 feet of dry sand as required by Dr. Oertel's contention; and (d) Dr. Oertel's contention necessarily assumes that every random aerial photo used by Dr. Jackson was taken precisely at the lowest low tide over a period of 146 years from 1869 to 2015 in order to have a four-foot difference in the tides based upon a neap tide. Given that neap tides occur only twice each month and a lunar month is 28 days, there is only a one in fourteen probability that any given photo was taken at a neap tide. The odds that every photo over a period of many decades was taken at a neap tide is exponentially less likely than one in fourteen. Jackson, Vol. IV, p. 896, l. 3-12.

superimposed them on the 2014 base image for comparative purposes. Webb, P. WD-2, p. 19, ¶ 55. The result is the following image:



Locations of previous dry beach (mean high water, MHW) shorelines near the south groin on Sea Island between the years 1988 and 2014

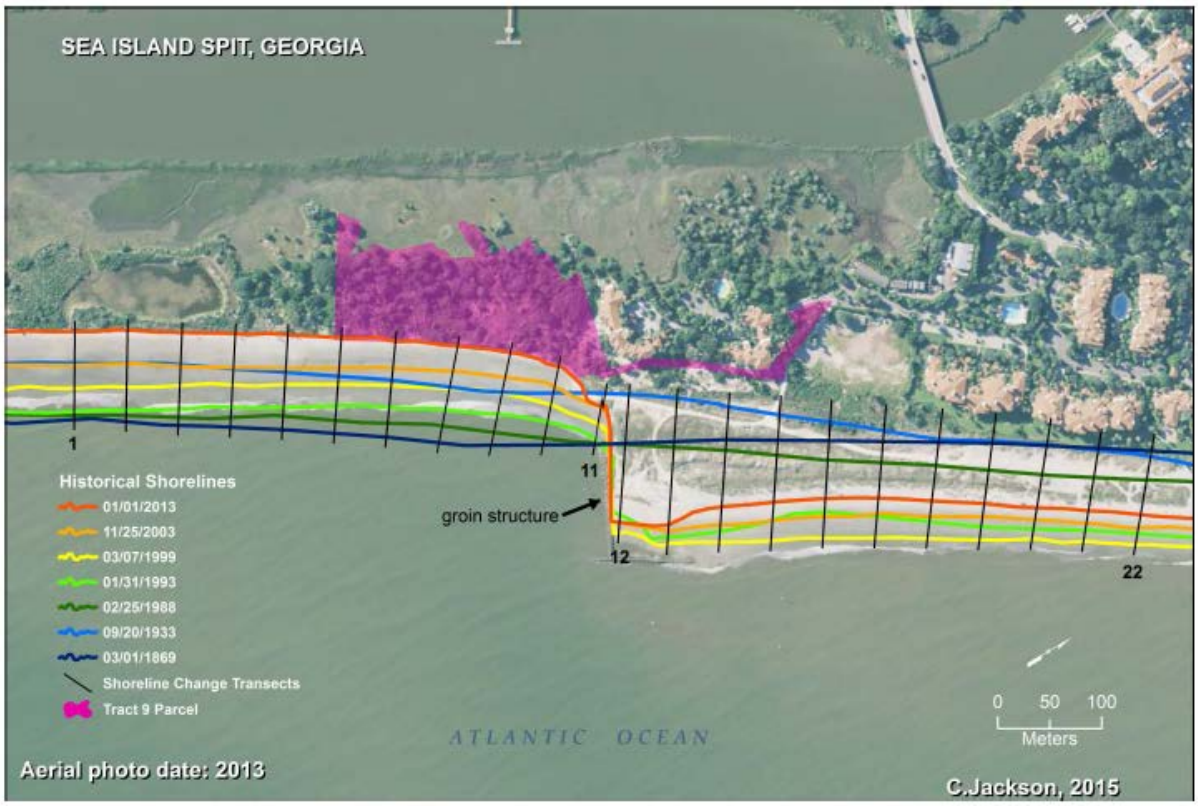
P. Ex. 46: Locations of previous dry beach shorelines near the south groin on Sea Island between the years 1988 and 2014.

138. The white line represents the position of the shoreline in 1988. The red line represents the position of the shoreline in 2014. Webb, P. WD-2, p. 19, ¶ 56. Based on his analysis, Dr. Webb concluded that the shoreline in that location has retreated approximately 270 feet from its 1988 position. Webb, P. WD-2, p. 19, ¶ 56. Nearly 70 feet of that retreat has occurred in the past five years, and double that amount, or 140 feet, has occurred since 2008. *Id.*

139. At the hearing, Sea Island argued that Dr. Webb's use of aerial photographs potentially can be imprecise because the lunar cycle can affect the tides and thus the wet-dry line. While this may be true, Petitioners' Exhibit 46 plainly shows that there has been a considerable trend of retreat of the shoreline south of the south groin after the groin was

installed. That amount of retreat is far greater than any potential error associated with determining the location of the wet-dry line on a series of photographs. Webb, P. WD-2, pp. 19-20, ¶ 57.

140. The validity of Dr. Webb's findings was essentially confirmed by Dr. Jackson's similar map which was derived from Dr. Jackson's more refined analysis with very small margins of error described above:



P. Ex. 32 at 7.

141. The accuracy of Dr. Webb's conclusions is also supported by his analysis of vegetation line changes between 1988 and 2015. Dr. Webb examined two aerial images created by Dr. Jackson (P. Ex. 67). The first image showed the vegetation line in 1988. The second image showed the 2015 vegetation line, and had the 1988 vegetation line superimposed on the image as well. Webb, P. WD-2, pp. 20-21, ¶¶ 58-59. Dr. Webb's analysis of the vegetation line

change yielded results very similar to those reached by examining the wet-dry line. Both analyses showed that the area downdrift of the existing south groin has experienced significant retreat between 1988 and 2015 after the south groin was installed. *Id.*

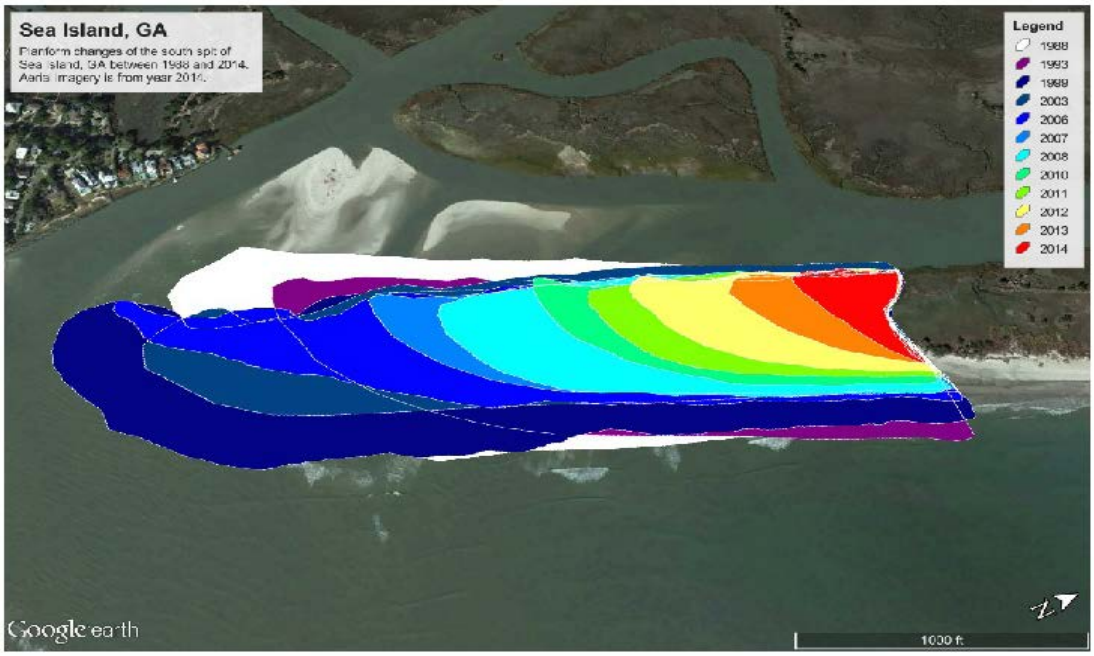
142. As discussed previously, Dr. Jackson reached a similar conclusion to Dr. Webb using different photographs and a different, more refined methodology, as described above. Webb, P. WD-2, p. 22, ¶ 63.

143. Thus, Dr. Webb's conclusions are supported by two additional analyses performed using different methodologies which the Court finds to be reliable.

144. According to Dr. Webb, the 270 feet of shoreline retreat since 1988 is the direct result of a reduction in historical longshore transport rates and volumes to this portion of the Sea Island Shoreline caused by the groins. Webb, P. WD-2, p. 22, ¶ 65.

145. Dr. Webb also analyzed whether the southern end of the Spit has retreated since the existing groins were constructed in 1991. To do so, Dr. Webb once again examined aerial photographs that covered the time period from 1988 to 2014. Webb, P. WD-2, p. 11, ¶ 38. On each photograph, Dr. Webb identified the wet-dry line – or the line on the beach that marked where the tide had advanced to during the last tide cycle. Webb, P. WD-2, p. 11, ¶ 39; p. 18, ¶ 54. He traced that line and saved it as a polygon shape corresponding to that year's shoreline position. He then transferred all the polygons to the 2014 base photograph. Webb, P. WD-2, p. 11, ¶ 39.

146. Petitioners' Exhibit 45 shows the results of Dr. Webb's analysis. According to his analysis, the Spit has deflated significantly – nearly 3,000 feet in length and by a factor of one half (788 feet to 436 feet) in width – since the north and south groins were built. Webb, P. WD-2, p. 17, ¶ 53.



Planform change of the south spit of Sea Island at Gould's Inlet between the years 1988 and 2014

P. Ex. 45: Planform change on the south spit of Sea Island at Gould's Inlet between the years 1988 and 2014

147. The white area on Petitioners' Exhibit 45 represents the size of the southern end of the Spit in 1988. The red area represents the size of the Spit in 2014. While it is true that during the mid-1990's the end of the Spit accreted, Dr. Webb attributed that growth to the southerly movement of sand that was already in the sand-sharing system south of the existing groins. Webb, P. WD-2, p. 12, ¶ 41.

148. This retreat would be significant by any measure. It is more so, however, in light of the fact that, according to Dr. Webb, the Spit had been *growing* in length for nearly 130 years before the groins were constructed. Webb, P. WD-2, p. 17, ¶ 52; P. Ex. 43.

149. Tellingly, during the time that the Spit has retreated and eroded significantly, a significant majority of other barrier islands in the state have either remained stable or grown in

the direction of longshore sand transport (to the south) since either 1988 or 1993. Webb, P. WD-2, pp. 24-30, ¶¶ 68-73; P. Ex. 84a-j.

d. Dr. George Oertel's use of a numerical mean high water proxy fails to demonstrate that Sea Island's proposed groin would not have negative impacts on the downdrift shoreline.

150. Dr. George Oertel, a geologist who is not currently a licensed professional geologist in any state, testified on behalf of Sea Island. Oertel, Vol. III, p. 543, l. 23-25; p. 524, l. 1-4.

151. In contrast to Dr. Jackson's feature-based methodology, Dr. Oertel performed shoreline change analysis based on a numerical proxy of mean high water. He established that proxy by beach surveys and concluded that for the 18-year period from 1990 to 2008 (after the south groin was installed), the rate of shoreline change for the south end of Sea Island was -9.6 feet/year. Joint Ex. 1, Attachment D (Oertel/Basco Report: *Shoreline Dynamics and History of Erosion Control Projects*) at 10. This rate of shoreline change is comparable to Dr. Jackson's shoreline change calculation for the 25-year period from 1988-2013 of -3.02 meters/year (or -9.9 feet/year)[11] for the area south of the south groin. P. Ex. 32 at 8, Table 1; Jackson, Vol. IV, p. 929, l. 6-25; p. 930, l. 1-10; P. Ex. 90.

152. Notably, Dr. Oertel made clear in his testimony that although he used his shoreline change data to compare rates of shoreline change for the 1979-1988 period to the post-groin period, he was not using his shoreline analysis to make any conclusions regarding the *cause* of the shoreline change. Rather, he was just presenting his data. Oertel, Vol. III, p. 547, l. 8-25; p. 548, l. 1-6.

[11]One meter is equivalent to approximately 3.28 feet.

153. On the other hand, as noted previously, both Dr. Jackson, a coastal geologist, and Dr. Webb, a coastal engineer, affirmatively determined in their expert opinion that the south groin *is* the cause of the accelerated rate of erosion south of the south groin. P. Ex. 32 at 1; *see also* Jackson, Vol. IV, p. 885, l. 21-24; Webb, P. WD-2, p. 22, ¶ 65. As Dr. Webb testified, "[t]his is a well-documented effect of groin construction. . . ." Webb, P. WD-2, p. 22, ¶ 65.

154. In contrast to Dr. Jackson's use of a visible physical feature on the shoreline to measure shoreline change, Dr. Oertel relied heavily on a numerical proxy or mean high water elevation data compiled by licensed surveyors utilizing NGVD29 or NAVD88. Dr. Oertel is not a licensed surveyor and acknowledged that his analysis was based entirely on the reliability of those surveys. Oertel, Vol. III, p. 593, l. 16-19. He further acknowledged that interpolations would need to be done to convert NGVD29 or NAVD88 to a tidal datum, but he did not do them, he does not know how to do them, he does not know for certain if the surveyors did them, and, if they did so, he does not know if the surveyors did them properly. Oertel, Vol. III, p. 588, l. 5- 25; p. 589, l. 1-13.

155. Bobby Shupe, a surveyor for Sea Island, indicated that NGVD29, the less accurate sea level datum he used for Sea Island until 2008, was never converted to the more accurate NAVD88 datum. Shupe, Vol. IV, p. 681, l. 5-8. Dr. Oertel confirmed that all of his surveys were done using NGVD29 until 2008 and that none of them were converted to NAVD88. Oertel, Vol. III, p. 580, l. 18-23. As noted previously, Dr. Jackson testified that NGVD29 should not be used to measure shoreline change unless it has been converted to NAVD88 (which replaced NGVD29 due to accuracy issues with that datum).

156. Although Dr. Oertel relied on survey information from several different surveyors from 1979 to 2015, only Bobby Shupe testified at the hearing. Mr. Shupe did not begin

performing surveys for Sea Island until 2003, and he made no effort to review the earlier surveys or ground-truth them, so there is no evidence in the record to gauge the reliability of the earlier surveys, determine whether required interpolations were done and done correctly, and determine potential rates of error. Shupe, Vol. IV, p. 681, l. 12-23; p. 685, l. 1-7.

157. Despite using a numerical proxy based on a land-based datum that had to be converted to a tidal datum, Mr. Shupe did not link the land-based datum to any tidal gauge. Instead, he relied on other surveyors who did not testify at the hearing. Shupe, Vol. IV, p. 682, l. 17-21. Mr. Shupe further agreed that Sea Island lies between the two accurate tide gauges at Fort Pulaski and Fernandina Beach, that the tides are a lot different over the distance between them, that an interpolation calculation would therefore need to be done to determine the mean high water level at Sea Island, and that there is a margin of error when doing interpolations between tide gauges. Shupe, Vol. IV, p. 683, l. 16-25; p. 684, l. 1-17.

158. Unlike Dr. Jackson's and Dr. Webb's shoreline change analyses, however, none of Dr. Oertel's shoreline change calculations contain any potential margins of error. Oertel, Vol. III, p. 591, l. 20-24. Therefore, there is no way to evaluate their accuracy or the confidence level that should be attributed to them.

159. Additionally, as noted by Mark Dodd, and as will be discussed further below, Dr. Oertel's calculations are not precisely tied to the area north or south of the groin unlike Dr. Jackson's and Dr. Webb's findings.

160. As also noted by Mark Dodd, and as will be further discussed below, unlike Dr. Jackson, Dr. Oertel did not perform any independent shoreline change analysis prior to 1979 despite his admission that more weight should be given to data that is compiled over longer time periods of time because a longer time period gives you a more accurate picture. Oertel, Vol. III,

p. 572, l. 8-15; *see also* Joint Ex. 1, Attachment D (Oertel/Basco) at 11 ("If we plan to project these rates into the future, it would be advisable to use long-term rates, not short-term intervals.").[12] Although Dr. Oertel further stated that the preference for relying on data compiled over a longer time period is dependent on the older data being quality data, he admitted that he has no basis to question the quality of the older Griffin and Henry data used by all of the parties in this case. Oertel, Vol. III, p. 572, l. 8-25; p. 573, l. 1-6.

161. Dr. Jackson specifically analyzed the quality of the older shoreline data compiled by Griffin and Henry and determined that it was more accurate than reported. Additionally, for purposes of his own analysis, he updated the data to enhance its accuracy. Jackson, Vol. IV, p. 866, l. 4-9.

162. Furthermore, although Dr. Oertel stated he could not tell whether the Griffin and Henry data that he presented in his testimony was actually tied directly to tidal data because the report used the numerical proxy terminology of mean high water, Oertel, Vol. III, p. 572, l. 23-25; p. 573, l. 1-2, Dr. Jackson cites to numerous authoritative papers and books on coastal geology to show that Griffin and Henry were actually mapping based upon a feature-based high water line, not a numerical proxy such as mean high water. Jackson, Vol. IV, p. 867, l. 17-25; p. 868, l. 1-11.

163. Based on this evidence and testimony, Dr. Oertel has no legitimate basis to discount the Griffin and Henry data compiled between 1860 and 1924. This is significant, because as will be discussed further below, when the entirety of Griffin and Henry's shoreline change rate calculations are considered, they weigh in favor of finding that the existing south groin has adversely impacted the downdrift shoreline.

[12] In his discussion of error rates, Dr. Jackson agrees that use of long-term rates that extend over 100 years is preferable because they tend to factor out short-term influences such as storms and other isolated events. Jackson, Vol. IV, p. 896, l. 13-25; p. 897, l.1-2.

164. Dr. Oertel presents data which he argues shows that shoreline changes were essentially the same at the proposed groin site, *i.e.*, south of the current groin, before and after the current groin was constructed. Oertel, SI WD-4, pp. 34-38, ¶¶ 72-77, Figures 19-21. From this premise, Sea Island argues that the current groin could not have contributed to the substantial rate of erosion that now characterizes the area south of the current groin.

165. To support his conclusion that shoreline change rates were the same pre- and post-groin construction south of the current groin, Dr. Oertel first posits that the rate of shoreline change before the groin was installed was between -5.0 and -10.0 feet/year. Oertel, SI WD-4, p. 37, ¶ 76. That range in itself is quite large representing a potential 100% range of values. On that basis alone, its utility is highly questionable.

166. Next, Dr. Oertel concludes that the rate of shoreline change south of the south groin after the groin was installed was -7.4 feet/year which is right in the middle of his range of shoreline change before the groin was installed. Oertel, SI WD-4, p. 17, ¶ 77.

167. As will be discussed below, Dr. Oertel's analysis does not withstand close scrutiny.

168. Dr. Oertel summarized in the following chart the data he relied upon to arrive at his -5.0 to -10.0 range of shoreline change prior to construction of the current south groin:

Summary of shoreline shift rates at the groin location prior to groin construction.		
Source	**Period**	**ft/yr**
Dean and Oertel (1989)	1983-1984	-13.2
	1979-1988	-7.3
Griffin and Henry (1984)	1924-1955	-8.1
	1955-1974	-5.1
	1974-1980	-13.1
Olsen Associates (1988)	1979-1988	-10.2
Jackson (p.85, 2010) *	1933	-3.6
	1951	-9.2
*Average rate for the whole island		

1. Dr. Oertel's reliance on the first data set from Dean/Oertel is misplaced.

169. The first pre-groin construction data set from Dean and Oertel (1989) upon which Dr. Oertel relies contains only one year of unverifiable survey data from 1983-1984 that Dr. Oertel himself compiled. This one-year piece of data was cherry-picked from the larger 1979-1988 survey data that Dr. Oertel analyzed for an area north and south of the current groin that he calls Shore Reach 5 of Sea Island.

170. Moreover, Dr. Oertel conspicuously fails to mention in his summary table that the -13.2 change rate was the *maximum* recession rate for Shore Reach 5 during only one year of the 1979-1988 time period. *See* SI Ex. 60 at 8, Table I. The mean change rate for Shore Reach 5 from 1979-1988 was actually much lower at -7.3 feet/year without considering a small beach nourishment project that was installed in this area in 1987. *Id.*; Oertel, Vol. III, p. 603, l. 18-25.

171. Not only is the maximum -13.2 rate unrepresentative of the short-term trend for the 1979-1988 time period, it is not representative of the area south of the current groin – the

area that Dr. Oertel is claiming to analyze. On cross-examination, Dr. Oertel admitted that 50% of the area included in Shore Reach 5 is not even located south of the current groin. Instead, it is located north of the groin, an area that Dr. Oertel acknowledges was eroding much faster than the area to the south. Oertel, Vol. III, p. 603, l. 5-8; p. 604, l. 1-4; Oertel, SI WD-4, p. 37, ¶ 76. Thus, not only is this figure only a one-time maximum recession rate for one year, it has little bearing on shoreline change in the relevant area south of the current groin.

2. Dr. Oertel's reliance on the second data set from Dean/Oertel is misplaced.

172. The second pre-groin construction data set upon which Dr. Oertel relies is his more complete analysis of his unverifiable survey data for the entire 1979-1988 time period. Dr. Oertel performed a shoreline change analysis of that survey data based upon an arbitrary division of the island into six sections that he described as Shore Reaches 1 - 6. Each Shore Reach has a number of beach profiles where measurements were taken. There were a total of 28 profiles. Oertel, SI WD-4, pp. 13-14, ¶¶ 25-31; Oertel, Vol. III, p. 602, l. 8-25; p. 603, l. 1-4. The section he relies upon is Shore Reach 5 where he calculated an average shoreline change rate of -7.3 feet/year from 1979-1988. Oertel, SI WD-4, p. 20, ¶ 48, Figure 10; SI Ex. 34.

173. The first fundamental problem with using this data to compare shoreline change rates pre- and post-groin construction is that the data covers only a nine-year period. As noted previously, Dr. Oertel admits that long-term data is more reliable and relevant to making any conclusions based upon shoreline change. Oertel, Vol. III, p. 572, l. 8-25; Joint Ex. 1, Attachment D (Oertel/Basco Report) at 11.

174. The second fundamental problem is that Dr. Oertel contends that, on an historical basis, unusually high rates of shoreline retreat were occurring during the 1970s and 1980s. Joint Ex. 1, Attachment D (Oertel/Basco Report) at 12-13. However, rather than use his recommended

long-term approach, Dr. Oertel once again cherry picks what he believes to be an historically high short-term pre-groin rate of retreat between 1979 and 1988. He then uses that artificially high pre-groin rate (on a long-term historical basis) to compare to the high post-groin rate thereby enabling him to conclude that the rates of change pre- and post-groin are similar. Using short-term data in this manner clearly skews the analysis.

175. The third fundamental problem is that Dr. Oertel acknowledged, as noted above, that Shore Reach 5 is not confined to the area south of the current groin. Rather, 50% of the area is located to the north of the current groin. Dr. Oertel does not break out the data in order to derive a rate of shoreline change confined to the area south of the current groin. This error is compounded by Dr. Oertel's admission that the 50% area north of the current groin was eroding more rapidly than it was to the south. Given that Dr. Oertel's figure of -7.3 was the average of several profiles that extended both north and south of the current groin, it is inexplicable why he could not present his data in a more precise fashion south of the current groin by using the individual profiles located only in the southern portion of Shore Reach 5. *See, e.g.*, Oertel, SI WD-4, p. 13, ¶ 25, Figure 6; SI Ex. 29. In any event, this average -7.3 figure is clearly skewed and unrepresentative of shoreline change south of the current groin.

176. Fourth, Dr. Oertel could not say with any assurance what the actual rate of shoreline change was in the upper or lower half of Shore Reach 5. Oertel, Vol. III, p. 605, l. 19-18. Given that the rest of the Spit in Shore Reach 6 (south of Shore Reach 5) was actually accreting at a rate of +4.0 feet/year (Oertel, Vol. III, p. 605, l. 22-25; p. 606, l. 1-4; SI Ex. 34), it is entirely possible that the lower half of Shore Reach 5 was also accreting. Dr. Oertel acknowledged at the hearing that the true picture of shoreline change south of the current groin would require revising his -7.3 number to, at the very least, a less negative number for the lower

half of Shore Reach 5 and making a significant adjustment by accounting for the +4.0 accretion number that was occurring on the rest of the Spit. Oertel, Vol. III, p. 609, l. 3-25; p. 610, l. 1-25; p. 611, l. 1-13.

177. Of course, given that Dr. Oertel chose not to provide the exact data for the lower half of Shore Reach 5 south of the current groin, his data does not support a conclusion that any of the area south of the groin was retreating prior to the groin's installation. Obviously, a small rate of retreat – or an overall rate of accretion - south of the groin in the relevant lower half of Shore Reach 5 *before* the groin's construction compared to the undisputed substantial level of retreat south of the groin *after* its construction could have a significant bearing on the Petitioners' contention that the groin is the cause of the substantial retreat that has taken place since the groin was installed.

178. Notably, Dr. Jackson's analysis does not suffer from these deficiencies. Unlike Dr. Oertel's analysis, Dr. Jackson's comparative analysis uses data tied precisely to the area north of the existing groin and the area south of the groin – there is no overlap and consequential fudging of numbers.

3. Dr. Oertel's reliance on selective portions of the third data set from Griffin and Henry is misplaced.

179. The third data set relied upon by Dr. Oertel is shoreline data compiled by Griffin and Henry. Although Griffin and Henry compiled their data for four time periods, 1860-1924, 1924-1955, 1955-1974, and 1974-1980, Dr. Oertel notably omits the earlier time period, 1860-1924, in his summary chart above. Oertel, SI WD-4, p. 29, ¶¶ 60-61, Figure 16; SI Ex. 32. This is a significant omission given that for the first 64 years of the 120-year time period analyzed by Griffin and Henry, the South Central section, one of the sections that includes a portion of the relevant area, was accreting at a rate of +3.9 feet/year. *See* SI Ex. 32. Rather than include this

significant time period of accretion, Dr. Oertel once again cherry picks the data by selectively considering only the negative shoreline change rates from 1924 to 1980, and does so despite his acknowledgement that shoreline change rates over longer periods of time give a better picture of shoreline dynamics.

180. Second, Griffin and Henry provided their data based upon six sections of the island. Two sections include the area that is now south of the current groin. As with Dr. Oertel's 1979-1988 data, the Griffin and Henry data includes an area, the "South Central" area, that appears to be fairly evenly split between the north and south areas of the current groin. *See* Oertel, SI WD-4, p. 30, Figure 4-1. As a result, the shoreline change rates are not confined to the area south of the groin and therefore suffer from the same defect as Dr. Oertel's Shore Reach 5 discussed above. This discrepancy is especially significant given that the weighted average (based on the differing time periods for the shoreline change data) for the South Central section is barely erosional at -1.5 feet/year. Thus, if only the southern part of this section were considered, the overall change rate for the portion of this section south of the groin may be accretional.

181. Finally, even taking the Griffin and Henry data as it exists for the entire "South Central" area results in a weighted average for the 120-year period of only -1.5 feet/year. Thus, even assuming solely for the sake of argument that Dr. Oertel's posited *post-groin* -7.4 feet/year rate of retreat south of the groin is accurate, a *pre-groin* rate of -1.5 feet/year results in almost a five-fold increase in shoreline retreat after the groin was installed.

4. Dr. Oertel's reliance on the fourth data set from Olsen is misplaced.

182. The fourth data set relied upon by Dr. Oertel is Olsen's mean *low* water shoreline change data from 1979 to 1988. Using this data set compares apples to oranges because the post-

groin data to which it is being compared is based upon mean *high* water data. Significant differences exist between mean high water and mean low water making reliance on mean low water data inappropriate. *See* Oertel, Vol. III, p. 613, l. 7-16 (Oertel acknowledging low water shift rates are not comparable to high water shift rates).

5. Dr. Oertel's reliance on the fifth data set from Jackson is misplaced.

183. As noted in the chart itself, the fifth data set is shoreline change data compiled by Dr. Jackson in 2010 showing average shoreline rates for the *entire island.* SI Ex. 48. Given the wide range of shoreline change rates discussed previously for various parts of the island and the inability to show whether this particular data from Dr. Jackson is comparable for the area south of the current groin, it simply has no relevance to the issue at hand. Additionally, the data is presented only for the years 1933 and 1951. *Id.* Finally, Dr. Jackson testified extensively in this matter and presented far more relevant and comprehensive data comparing shoreline change rates north and south of the current groin and pre-groin and post-groin construction from 1869 to 2015 – data that is directly relevant and more probative to showing the current groin's negative effect on the shoreline to the south of the groin than selected data from two isolated data points.

6. Dr. Oertel's downdrift post-groin shoreline change rate is not supported and is entitled to no weight.

184. As noted above, Dr. Oertel relied on a -7.4 feet/year post-groin shoreline change rate from 1990 to 2012 south of the south groin for his comparative analysis with pre-groin shoreline changes. Oertel, SI WD-4, p. 37, ¶ 77. Dr Oertel, however, provides no data to support this -7.4 figure other than to cite to a Figure 21 which he prepared and which provides no information other than to simply set forth a conclusory number. No information is provided as to

how this number was derived. Dr. Oertel essentially cites to himself as authority for the amount of shoreline change without any data that can be verified. It simply has no indicia of reliability.

185. Moreover, the -7.4 figure is inconsistent with the data that Sea Island submitted in its permit application. In the permit application, Dr. Oertel states that the rate of shoreline change for the area in question was -9.6 feet/year from 1990 to 2008 and -2.8 feet/year from 2008 to 2012. Joint Ex. 1, Attachment D (Oertel/Basco Report) at 10. This would result in a weighted average from 1990 to 2012 of -8.4 feet/year or a foot more than the conclusory rate Dr. Oertel presented in his written testimony. This is a significant difference that further calls into question the reliability of Dr. Oertel's analysis.

186. It is also worth noting that despite potential margins of error that exist at several critical steps when utilizing a numerical proxy (as Dr. Oertel has done here), including the use of an outdated and inaccurate land-based datum (NGVD29), necessary conversions of land-based datums to tidal-based datums, and interpolations of tidal gauge data, Dr. Oertel sets forth no potential margins of error with his shoreline rate change calculations even though he agrees it is good scientific practice to do so. Oertel, Vol. III, p. 591, l. 20-24; p. 595, l. 15-25; p. 596, l. 1-6. This omission stands in stark contrast to Dr. Jackson's data which has conservative, yet small, potential rates of error for all of his calculations.

187. Finally, while not attempting to quantify the effects as Dr. Jackson has done, Dr. Basco forthrightly admitted that, at least in part, the south groin is responsible for the adverse downdrift effects on the shoreline. Basco, SI WD-5, pp. 48-49, ¶¶ 88, 90. Consistent with that acknowledgment, Dr. Basco also testified that one of the alternatives Sea Island considered, in lieu of the currently proposed project, was the installation of a system that would allow sand to

bypass the south groin. Basco, SI WD-5, pp. 25-26, ¶ 44, Table 2. Sea Island rejected that altenative.

e. Conclusions regarding shoreline retreat caused by existing groins

188. Based on the above discussion, I find that Sea Island has not properly established a reliable and verifiable rate of shoreline change that existed either prior to or after the installation of the south groin.

189. Without this data, I am precluded from finding that the rate of pre-groin shoreline change is comparable to the rate of post-groin shoreline change. In all likelihood, however, the proper application of all data sets considered by Dr. Oertel would lead to the conclusion that the rate of pre-groin shoreline change south of the south groin is substantially less than either the -7.4 or -8.4 feet/year post-groin shoreline change, even if Dr. Oertel's post-groin figures were somehow found to be reliable.

190. Unlike Dr. Oertel, Dr. Jackson's methodology is verifiable, is easier to quantify and apply, contains results with fully-disclosed, small potential margins of error, and uses the most advanced technology currently available. Also unlike Dr. Oertel, Dr. Jackson's calculations consider both long-term and short-term trends and are tied to the specific relevant sections of the shoreline north and south of the south groin so that direct comparisons can be made. Additionally, Dr. Jackson gave credible, compelling testimony on the witness stand.

191. Dr. Webb, using a slightly different analysis, derived results for shoreline change similar to those of Dr. Jackson. Although Dr. Webb's calculations have a larger potential margin of error than Dr. Jackson's, Dr. Webb forthrightly acknowledged his potential margin of error unlike Dr. Oertel who refused to set forth any potential margin of error even though one must exist. Furthermore, Dr. Webb's calculations, unlike Dr. Oertel's, are tied to the specific relevant

sections of the shoreline north and south of the south groin so that direct comparisons can be made.

192. I find that under all of the circumstances, Dr. Jackson's and Dr. Webb's calculations are more reliable and more credible than Dr. Oertel's.

193. The Court adopts Dr. Jackson's shoreline change rates which may be summarized as follows:

a. prior to installation of the south groin, the rate of shoreline change north and south of the south groin's current location was fairly comparable over a 119-year period;

b. after installation of the south groin, the rate of shoreline change north and south of the south groin dramatically changed with the south area substantially retreating and the north area accreting for the 1988-2015 time period;

c. after installation of the south groin, the downdrift area from the groin retreated at more than double the rate of the updrift area for the 2003-2015 time period; and

d. after installation of the south groin, shoreline change on the south side of the south groin suddenly and dramatically changed for the worse as evidenced by:

i. more than a 37-fold increase in shoreline retreat compared to the prior 119 years (-.08 meters/year versus -3.02 meters/year);

ii. more than a four-fold increase in shoreline retreat compared to the prior 55 years (+.83 feet/year versus -3.02 feet/year**);** and

iii. the loss of over 300 feet of beach width.

194. Additionally, I specifically find that both Dr. Jackson and Dr. Webb have convincingly demonstrated that the current groins on Sea Island have caused the substantial rate

of shoreline retreat that has occurred south of the south groin since the groins were installed and the retreat of almost 3,000 feet at the southern tip of the Spit. It is undeniable that the purpose of a non-permeable groin, such as the existing south groin on Sea Island and the proposed groin, is to block and trap sand on the updrift side and prevent it from bypassing to the downdrift side. It is also undeniable that groins cause erosion and decreased beach width on the downdrift side. Based on all of the evidence in this case, that is precisely what the current groins on Sea Island have accomplished.

iii. The proposed groin will exacerbate the adverse impacts of the existing groins and potentially cause a breach in the Spit.

195. As stated by Dr. Webb, the proposed groin will exacerbate the adverse impacts of the existing groins. More specifically, it will further deplete the availability of sand in the littoral system by impounding an additional 1,200 feet of available shoreline sediments that are part of the current beach. As with the existing groins, this will lead to an increase in downdrift erosion and shoreline retreat as those shorelines respond to yet another sand deficit in the littoral system. Webb, P. WD-2, p. 32, ¶ 78.

196. This reduction in sediment availability will further reduce the length, area, and volume of the Spit, just as the existing project reversed a nearly 130-year trend of elongation of the Spit to the south. Webb, P. WD-2, p. 32, ¶ 79.

197. The Committee and Sea Island's contention that the current groins allow sand to bypass the south groin is belied by my findings on downdrift shoreline retreat and by photographic evidence in this case showing Sea Island personnel removing sand that was attempting to bypass the south groin which Sea Island does on a routine basis. SI Ex. 51; Webb, P. WD-2, p. 38, ¶ 93; Sea Island's construction of a breakwater after the initial installation of the south groin to insure that no sand would bypass the south groin, Joint Ex. 1, Attachment D

(Oertel/Basco Report) at 15; and Sea Island's admission that the current groins have retained at least 90% of all sand originally deposited in the groin field, Joint Ex. 1, Attachment D (Oertel/Basco Report) at 15.

198. Sea Island's sand bypass contention is also contrary to the great weight of scientific evidence presented in this matter including the unbiased testimony of Drs. Young, Jackson, and Webb who have no financial interest in this case; the statement of 43 leading coastal scientists from around the world (P. Ex. 36); and the Army Corps of Engineers Coastal Engineering Manual (P. Ex. 33 (USACOE Manual) at Part V, Chapter 3, p. V-3-59, 61, 67-68).

199. The Court finds that Sea Island's proposed groin will have similar adverse effects on the sand-sharing system and the downdrift shoreline that the current groins have had. The proposed groins will be impermeable, and therefore will not allow sand bypass. Even if sand initially is added seaward of the toe of the groin, once that sand bypasses the groin, all remaining sand will be trapped in accordance with the design and purpose of the groin. Thus, as noted by Dr. Webb, any sand bypass will be a short-term, one-time event. Webb, P. WD-2, p. 38, ¶ 92.

200. In addition, the location of the proposed groin makes it particularly problematic. The proposed project site is located immediately north of a vulnerable area of the Spit referred to as a borrow pit. Webb, P. WD-2, p. 32, ¶ 80; *see also* P. Ex. 11, 77, and 78b.

201. This is problematic because even if the proposed groin permits some sand bypass (which the Court has found otherwise), any bypassed sand will not collect at the base of the groin on the downdrift side, but will travel further down the beach along lower (submerged) portions of the shoreline. As a result, the area immediately downdrift of the proposed groin – where the borrow pit is located – will not receive any of the bypassed sand. Webb, P. WD-2, p. 4, ¶ 18.

This effect could be critical because the borrow pit is a low-lying, low density area with a high risk of being breached by the ocean.

202. Dr. Webb used LiDAR data collected by the U.S. Army Corps of Engineers to determine the volume density of this portion of the Spit. LiDAR data is a high resolution collection of elevation data that represents terrain features. By using these data, Dr. Webb was able to determine the volume of sand relative to a chosen elevation (in this case, 0 NAVD). Webb, P. WD-2, pp. 32-37, ¶¶ 80-90. His volume density analysis is shown in Petitioners' Exhibit 75. As shown in that exhibit, there is a substantial decrease in the volume density of the island immediately south of the proposed groin location. In fact, the volume density is 50% lower there than it is near the existing south groin. That means that if the borrow pit area experiences an accelerated rate of erosion, as would happen if the proposed groin were built, the Spit could breach at this location. Webb, P. WD-2, pp. 32-37, ¶¶ 80-90.

203. A breach of the Spit would have major impacts to the sand-sharing system not only on Sea Island, but on St. Simons Island immediately downdrift. Webb, P. WD-2, pp. 37-38, ¶ 91.

204. Sea Island also argues that its proposed groin is "tapered" and would have less impact because it would be shorter than the south groin. According to Dr. Webb, however, in order for tapering to work at all, the tapering must involve a series of groins that are progressively shorter in length, and there must be progressive bypassing of sand at all groins in the project. Webb, P. WD-2, p. 38, ¶ 94. That is not the case here.

205. Sea Island argues that the current noticeable "offset" in the shoreline on the downdrift side of the south groin is explained by the existence of rock revetments on the updrift side of the groin. Sea Island contends that the revetments prevented erosion from occurring on

the updrift side, but the lack of revetments on the downdrift side allowed natural erosion to continue on the downdrift side thereby causing the erosion offset.

206. Sea Island's contention, however, is belied by the existence of rock revetments *prior* to installation of the south groin with no resulting erosion offset on the south side of the current groin's location. The erosion offset only began *after* the south groin was installed.

207. Installation of the rock revetments began in 1977 and resulted in armoring the entire developed portion of Sea Island from the northern end of the island to the area of the south groin by 1982. Joint Ex. 1, Attachment D (Oertel/Basco Report) at 12; Bucey, Vol. III, p. 490, l. 1-25; p. 491, l. 1-6; SI Ex. 5. Dr. Basco testified that the revetments had been in place for 10 years before the south groin was installed. Basco, SI WD-5, p. 48, ¶ 88.

208. As shown in an aerial photograph taken in 1988 shortly before the installation of the south groin, the shoreline is a linear line as depicted by a visible, stable vegetation line at the toe of the dunes both north of the current groin (where the rock revetments existed) and south of the current groin (where no rock revetments existed) – there is no erosion offset south of the current groin's location as of 1988. *See* P. Exs. 12 and 67.

209. At the time that the 1988 photograph was taken, the entire shoreline north of the south groin had been protected by rock revetments for several years. If the rock revetments explained the erosion offset that occurred subsequent to the installation of the south groin, it is only logical that there would have been a developing offset prior to installation of the south groin. However, the 1988 photo documents that there was none. Instead, the offset only began *after* the south groin was installed. As depicted in a 2015 aerial photograph, the erosion offset had noticeably progressed by 2015. *See* P. Ex. 67. Thus, the existence of the rock revetments

cannot explain the erosion offset south of the south groin. The obvious culprit is the south groin itself.

D. Impact of the Proposed Groin on Recreational Use and Enjoyment of Public Properties Impacted by the Project.

210. The impacts to wildlife and the sand-sharing system described above will also impair recreational use and enjoyment of the public portion of the Spit, which is used by many individuals for paddling, wildlife viewing, walking, and other forms of recreation.

211. For example, Charles Hardin runs a windsurfing and standup paddleboarding company that operates in Glynn County. Mr. Hardin regularly surfs and paddleboards near the Spit and testified that he is aware of many other people who enjoy using the spit for recreating, surfing, and paddleboarding as well. Hardin, Vol. II, p. 363, l. 11 - p. 365, l. 1.

212. Mr. Hardin's business, Whitecap Wind Surfing and Standup Paddleboarding, provides equipment and instruction to other members of the public who want to learn how to surf and paddleboard in the area. Hardin, Vol. II p. 363, l. 11; p. 365, l. 1. He testified that the Spit provides a unique place to surf because the sand bar breaks make it an excellent place to teach individuals to surf. *Id.*

213. Hyde Post is a resident of St. Simons Island who has owned a home on East Beach immediately across Gould's Inlet from the Spit since the mid-1980's. Post, Vol. II, p. 368, l. 1-9. Mr. Post regularly uses Gould's Inlet and the Spit for recreation, including fishing, kayaking, swimming, and spending time at the beach. Post, Vol. II, p. 368, l. 25; p. 369, l. 23. He testified that he enjoys the natural beauty of the Spit, particularly the "unbelievable" bird life. Post, Vol. II, p. 369, l. 24; p. 370, l. 1.

214. Bob Sattelmeyer is a resident of St. Simons Island who has owned a home on East Beach for over fifteen years. Sattelmeyer, Vol. II, p. 387, l. 6-9. Mr. Sattelmeyer testified that

he kayaks to the Spit from Gould's Inlet. He is particularly interested in birdwatching and has participated in a number of surveys that are sponsored by DNR and other conservation organizations to monitor the bird populations and movement in the area. Sattelmeyer, Vol. II, p. 387, l. 20; p. 388, l. 1. A number of these birds are federally threatened under the Endangered Species Act, including the Red Knot and the Piping Plover. Sattelmeyer, Vol. II, p. 388, l. 2-11.

215. Holly Patton is a resident of St. Simon's who has owned a home on East Beach for over twenty years. Patton, Vol. II, p. 384, l. 20-25. Ms. Patton testified that she frequently uses the Spit for recreation, often two to three times per week in the summer. She enjoys walking along the beach and observing sea turtles and shore birds and testified that the Spit is very important to locals. Patton, Vol. II, p. 385, l. 19; p. 386, l. 4.

216. In sum, many individuals use the public portions of the Spit seaward of the high water line to recreate and view wildlife. By causing increased erosion and reducing habitat on the Spit, the proposed groin will unreasonably interfere with the public's recreational use and enjoyment of the public portions of the Spit.

E. Existence of a Reasonable or Viable Alternative

217. According to Dr. Robert Young and Dr. Bret Webb, Sea Island could accomplish the purpose of its proposed project – namely, to "stabilize the eroding beach south of the existing south groin and to provide storm protection to the adjacent upland" – without constructing the proposed groin or any other structure. Webb, P. WD-2, pp. 38-39, ¶ 95; Young, P. WD-1, pp. 4-5, ¶ 12. Dr. Webb and Dr. Young agree that beach nourishment without a groin is both a reasonable and viable alternative to Sea Island's proposed project. Webb, P. WD-2, p. 38-39, ¶ 95; Young, P. WD-1, p. 6, ¶ 20 *et seq*.

i. Beach nourishment without a groin is the preferred method for stabilizing and restoring shorelines in the United States and has been used in over 96% of similar projects in the Southeast over the past ten years.

218. Dr. Young is a Licensed Professional Geologist, Elected Fellow of the Geological Society of America, Professor of Geology at Western Carolina University, and the Director of the Program for the Study of Developed Shorelines (PSDS), a joint research and policy center at Duke and Western Carolina Universities. Young, P. WD-1, p. 2, ¶ 2.

219. The primary mission of Dr. Young's PSDS is to conduct scientific research into coastal processes, storm impacts, and sea level rise, and to translate that science into management and policy recommendations. Young, P. WD-1, p. 2, ¶ 5. The PSDS specializes in evaluating the design and implementation of coastal engineering and restoration projects and helping communities develop coastal adaptation studies. Young, P. WD-1, pp. 2-3, ¶ 6.

220. The PSDS maintains a national database of every beach and dune construction project for the entire country. Young, P. WD-1, p. 3, ¶ 7. This database is known as the Beach Nourishment Database, and it is the most comprehensive catalog of beach and dune restoration projects available. Young, P. WD-1, p. 3, ¶ 7. Through this database, the PSDS has been tracking beach nourishment activities on Sea Island for more than 20 years. Young, P. WD-1, p. 3, ¶ 7.

221. As part of this work, Dr. Young is currently funded by the United States Geological Survey ("USGS") to map, in detail, every beach nourishment project on the United States East Coast. Young, P. WD-1, pp. 3-4, ¶ 8. Through this work, Dr. Young is very familiar with beach nourishment project design, frequency, cost, and efficacy nationally. Young, P. WD-1, pp. 3-4, ¶ 8.

222. The beach nourishment projects mapped by Dr. Young have been implemented in areas with a wide variety of coastal features including barrier islands with longshore transport rates and inlet settings similar to that of the proposed project. Young, P. WD-1, pp. 6-7, ¶ 22. According to Dr. Young, beach nourishment without a groin is, by far, the most common configuration for beach nourishment projects in the United States. Young, P. WD-1, p. 6-7, ¶ 22.

223. For example, in 2011, the Town of Nags Head, N.C. built a 10-mile-long beach nourishment project at a cost of $36 million (locally financed) without a groin anywhere near the project. Young, P. WD-1, p. 7, ¶ 23.

224. Likewise, Carolina Beach, N.C. has 31 nourishment episodes since 1955 placing around 19 million cubic yards of sand at a cost of over $80 million (adjusted for inflation). Young, P. WD-1, p. 7, ¶ 24.

225. Wrightsville Beach, N.C. has had 25 nourishment episodes since 1939 placing just over 15 million cubic yards of sand. Young, P. WD-1, p. 7, ¶ 24.

226. Projects have also been placed adjacent to inlets without the construction of groins including a project on the Isle of Palms, S.C. that was awarded special recognition by the American Shore and Beach Preservation Association. Young, P. WD-1, p. 7, ¶ 25.

227. After Hurricane Sandy devastated the New Jersey coast, the Army Corps of Engineers implemented 22 beach nourishment projects, covering almost the full length of the state. Young, P. WD-1, p. 8, ¶ 26. A list of those projects is attached as Petitioner's Exhibit 62. Young, P. WD-1, p. 8, ¶ 26. Not one of them involved the construction of a groin or other artificial shoreline stabilization device. Young, P. WD-1, p. 8, ¶ 26. Some portions of the New Jersey shore do have small, existing groins built many decades ago. Those groins, however are not even considered in the Corps' project design, and where possible, the USACE has been

altering the groins to allow sand passage down the shore, effectively trying to rehabilitate the sand sharing system. Young, P. WD-1, p. 8, ¶ 26.

228. Closer to home, in the past 10 years, there have been 139 beach nourishment projects in the southeastern United States. Young, P. WD-1, p. 8, ¶ 27; *see also* Webb, P. WD-2, pp. 38-39, ¶ 95 (noting that almost every beach nourishment (and/or renourishment) project in Florida over the past twenty years has been done without a groin). A list of those projects is attached as Petitioner's Exhibit 63. Young, P. WD-1, p. 8, ¶ 27.

229. Of those 139 projects, 134 of them –**over 96%** – thought it reasonable to proceed without a groin or other artificial shoreline stabilization device. Young, P. WD-1, p. 8, ¶ 27.

230. Only five included a groin. Young, P. WD-1, p. 8, ¶ 27. Of those five, three were built at the very end of the island – unlike Sea Island's proposed groin – where they would have less potential to cause downdrift harm to neighboring shorelines. Young, P. WD-1, p. 8, ¶ 27. The other two projects used groins because of special circumstances not related to cost. Young, P. WD-1, p. 8, ¶ 27. There are no such special circumstances with respect to Sea Island's proposed project. Young, P. WD-1, p. 8, ¶ 27.

231. The bottom line is that beach nourishment without a groin is now the preferred method in the United States for restoring shorelines. Young, P. WD-1, p. 9, ¶ 29. And it works. Young, P. WD-1, p. 9, ¶ 29.

232. Dr. Basco agrees: "Beach nourishment with periodic renourishment (maintenance) has become the preferred alternative for many coastal cities in the US that experience long-term erosion." Basco, SI WD-5, p. 26, ¶ 46.

233. This preference is consistent with the mandate in the Shore Protection Act which provides that (a) shoreline stabilization activities, including groins, should be permitted only

when the applicant has demonstrated that no reasonable or viable alternative exists, and (b) beach restoration and renourishment techniques are preferable to the construction of shoreline stabilization devices such as groins. Young, P. WD-1, p. 9, ¶ 29; *see also infra* § II(C)(iii) (addressing applicability of O.C.G.A. § 12-5-239(c)(3)(C)).

ii. A beach nourishment project without a groin on Sea Island is both a viable and a reasonable alternative.

234. According to Dr. Young and Dr. Webb, Sea Island could achieve its stated project purpose by nourishing the beach without constructing a groin, as has been done in over 96% of recent nourishment projects in the Southeast. Webb, P. WD-2, pp. 38-39, ¶ 95; Young, P. WD-1, p. 6, ¶ 20; Webb, Vol. I, p. 115, l. 3-17; Young, Vol. I, p. 47, l. 5-20.

235. Sea Island, however, argues that beach nourishment without a groin is not a reasonable or viable alternative because (1) a 1,200 beach nourishment project in the project area would require unreasonable maintenance and renourishment intervals; and (2) extending a nourishment project south of the project area to Gould's Inlet would violate the Conservation Easement (SI Ex. 1) that protects the southern portion of the Spit.

236. With respect to Sea Island's first point, Petitioners do not dispute that a 1,200 foot beach nourishment project would require short renourishment intervals, but they have not recommended such a project as an alternative. *See* Webb, P. WD-2, pp. 38-39, ¶ 95 (recommending nourishment to Gould's Inlet); Webb, Vol. I, p. 117, l. 6-18; Young, Vol. I, p. 45, l. 12-25.

237. Instead, Petitioners recommend a renourishment project beginning at the existing south groin and extending south to Gould's Inlet. Therefore, the question is whether such an extension would be a reasonable or viable alternative.

238. Sea Island argues that an extension of the renourishment project south to Gould's Inlet would not be reasonable or viable because it would violate an existing Conservation Easement and because it might not meet a five factor "constraints" test that Sea Island's engineer, Dr. David Basco, believes should apply. Without citing any authority to support his novel approach, the five "constraints" that Dr. Basco speculates must be met or overcome are science and engineering concerns, cost, potential environmental issues, potential political, social, or institutional constraints, and aesthetic concerns. Basco, Vol. IV, p. 698, l. 21-25; p. 699, l. 1-7.

239. With respect to Sea Island's first point, even a cursory reading of the Conservation Easement establishes that it would not preclude a nourishment project extending to Gould's Inlet so long as the project did not cross the high water line. The legal description for the Conservation Easement provides that the easement applies only to property landward of the high water line.[13] SI Ex. 1, Appx. A. The issue, then, is whether a nourishment project completed seaward of the high water line is a reasonable or viable alternative to the construction of a groin.

240. The evidence presented at the hearing showed that it is. Dr. Young testified that "[c]learly a beach nourishment project without the groin, properly designed" was a reasonable and viable alternative to construction of a groin, and that he was not aware of any reason that beach nourishment without a groin, if properly implemented, would not work in this case. Young, Vol. I, p. 45, l. 5-20. He also testified that he was aware of the constraints contained in the Conservation Easement, and that the project could be completed successfully below the high water line to avoid these constraints. Young, Vol. I, p. 45, l. 17-20; p. 48, l. 4-12.

[13] The only exception to the high water line delineation is if Sea Island could demonstrate that it has a legal interest in property seaward of the high water line (which would generally be contrary to well-established Georgia law in the absence of a King's Grant). *See, e.g., State v. Ashmore*, 236 Ga. 401, 409-413 (1976). In that event, the Conservation Easement would extend to the point that coincides with Sea Island's legal interest. Sea Island, however, has presented no evidence that it has any established legal interest in any property on the Spit seaward of the high water line. Therefore, the Conservation Easement stops at the high water line.

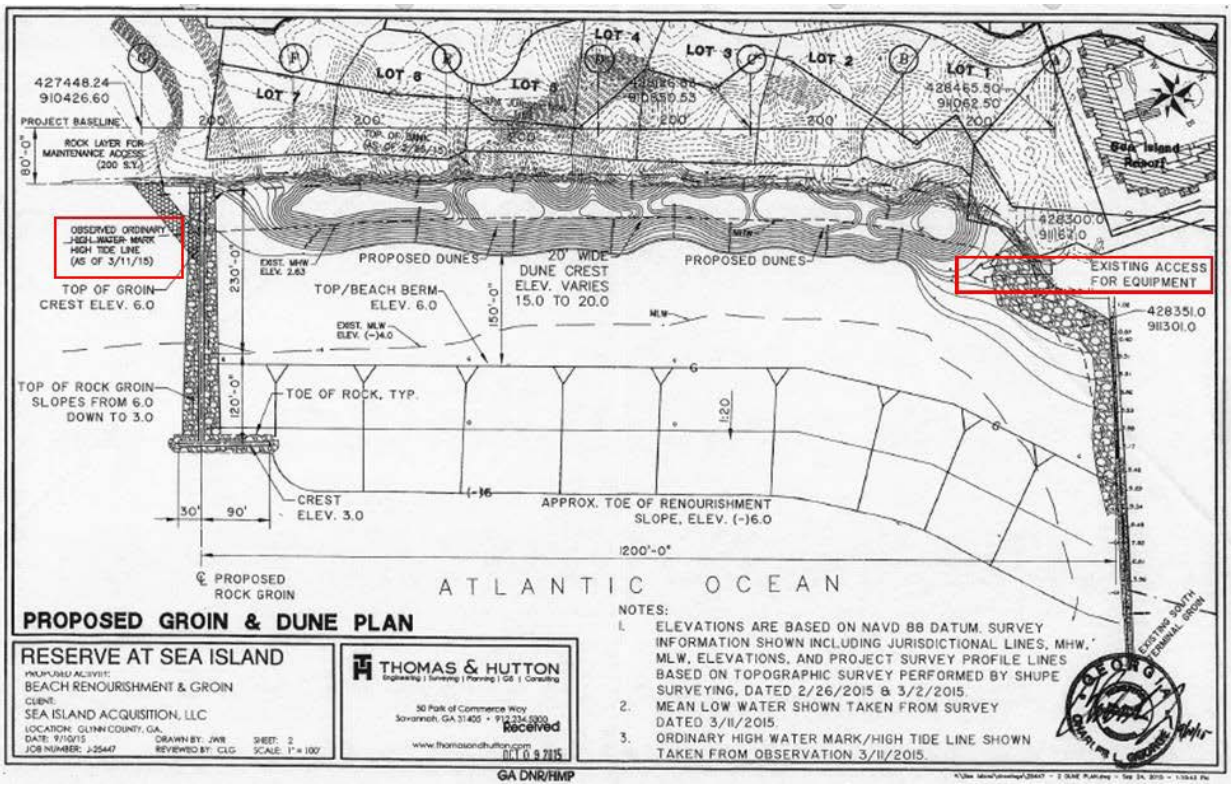
241. Dr. Webb also testified that a beach nourishment project without a groin, extending south to Gould's Inlet, was a reasonable and viable alternative to the proposed project. Webb, Vol. I, p. 153, l. 2-12. Like Dr. Young, Dr. Webb testified that he was aware of the constraints in the conservation easement, Webb, Vol. I, p. 118, l. 11-19, but that a renourishment project without a groin could be constructed successfully seaward of the high water line. Webb, Vol. I, p. 155, l. 19; p. 156, l. 17. In support of his conclusion, Dr. Webb noted that other successful renourishment projects had recently been constructed entirely seaward of the mean high water line, including recent projects in New York and Alabama. Webb, Vol. I, p. 161, l. 7; p. 162, l. 5.

242. Under this alternative, the renourishment design proposed by Sea Island, with dunes, could be constructed in the project area and then extended south down the Spit without dunes (where they are not needed to protect any structures), remaining seaward of the high water line on the south portion of the Spit so as not to run afoul of the Conservation Easement. Mechanized land equipment, among other construction options, could be used on the beach during low tide to avoid restrictions on vehicle use on property protected by the Conservation Easement. Webb, Vol. I, p. 161, l. 19-22 (discussing use of land-based equipment at low tide).

243. According to Dr. Webb, the project would require approximately 500,000 cubic yards of sand. To calculate this number, Dr. Webb estimated the length of the shoreline from the existing south groin to Gould's Inlet and applied a beach fill density of 100 cubic yards per running foot, which accounts for the fact that the renourished shoreline could be tapered as it reached Gould's Inlet. Webb, Vol. I, p. 115, l. 1-17. Dr. Webb explained that this number (100 cubic yards per running foot) is common in modern nourishment projects in the United States. Webb, Vol. I, p. 116, l. 22; p. 117, l. 5. Using the estimated length and beach fill density, Dr.

Webb calculated that approximately 500,000 cubic yards of sand would be needed and explained that the sand could be taken from compatible, suitable offshore sources (or other possible sites), as is frequently done in other nourishment projects. Webb, Vol. I, p. 18, l. 25.

244. Dr. Webb testified that based on the location of the high water line on the Spit, a nourishment project conducted entirely below the high water line would not be significantly different in width than the nourishment project proposed by Sea Island, as shown in Joint Ex. 1 below. As Sea Island acknowledged on several occasions (and the Court observed on the site visit), the high water line near the project area extends nearly to the dunes. *See* SI Ex. 20; *see also* Webb,Vol. I, p. 155, l. 25; p. 156, l. 2 (explaining that the mean high water line was very close to the base of the eroding dunes). As a result, the nourishment project proposed by Sea Island is designed to fall largely seaward of the mean high water line anyway, and the planned access point for the mechanized equipment is located below the mean high water line as well.



See Joint Ex. 1, Attachment C at 2 (red markings added).

245. In response to Dr. Webb and Dr. Young's recommended alternative, Dr. Basco conceded that a longer nourishment project would "definitely" address his concerns about the half-life of a shorter nourishment project. Basco, Vol. IV, p. 722, l. 25 - p. 723, l. 7.

246. He explained, however, that he had not considered the viability of a nourishment project without a groin extending to Gould's Inlet and constructed seaward of the high water line outside the confines of the property protected by the Conservation Easement. Basco, Vol. IV, p. 721, l. 1; p. 722, l. 11; p. 722, l. 14-24; p. 725, l. 19-21; p. 754, l. 10-18 (noting that "there's a lot of unknowns that I would need to find out" and that it was Petitioners' "job" not his "to come up with all of these answers to all of these concerns"). When asked about several existing nourishment projects constructed below mean high water or mean low water, Dr. Basco was largely unfamiliar with the projects, or at least any specific details about the projects. Basco, Vol. IV, p. 710, l. 6; p. 712, l. 12. In fact, he was even uncertain about whether he had ever designed such a project himself. Basco, Vol. IV, p. 750, l. 8-20.

247. Dr. Basco acknowledged that had he considered nourishment to Gould's Inlet below the high water line, he "could have looked at the literature of how to build and where the projects are existing in terms of, oh, there's a few projects here and there and all of that." Basco, Vol. IV, p. 722, l. 2-11. But because he did not, he acknowledged, "there's a lot of unknowns that I would need to find out." Basco, Vol. IV, p. 754, l. 10-18.

248. Thus, Dr. Basco is not in any position to dispute the expert testimony of Dr. Webb and Dr. Young that beach nourishment without a groin is a reasonable and a viable alternative to Sea Island's proposed project.

249. As noted above, Dr. Basco speculated that there *could* be constraints based on science and engineering issues, cost, environmental concerns, political, social, or institutional

restraints, and aesthetics. He cited to no authority requiring consideration of these factors. He also did not argue that any of his stated constraints *would* apply in this case to prevent a renourishment project extending to Gould's Inlet. He could hardly do so given that he did not consider nourishment south of the project area as a potential alternative, and admittedly does not have sufficient information to evaluate such an alternative, he is no position to opine whether such an alternative is reasonable or viable.

250. In any event, there is adequate evidence in the record that addresses Dr. Basco's concerns.

251. First, with respect to science and engineering issues, Dr. Basco testified that his primary concern was whether mechanized equipment could be used without going above the mean high water line. Basco, Vol. IV, p. 699, l. 10-12. Dr. Basco acknowledged that, "if there was the ability to run mechanized equipment on this beach," it could be built "normally." Basco, Vol. IV, p. 718, l. 19-23. Dr. Webb has testified that such equipment could be used, and his testimony stands unrebutted. Webb, Vol. I, p. 161, l. 19-22. He also testified that other means, including water-based means, could be used as well. *Id.*[14]

252. Thus, Sea Island has not offered any evidence to contradict Dr. Webb's testimony that, from an engineering standpoint, nourishment extending to Gould's Inlet can be accomplished. Moreover, given that the limiting boundary is the high water line, not the mean high water line as assumed by Dr. Basco in his testimony, which runs essentially to the base of the dunes on the Spit, Dr. Webb has reasonably concluded that such a project could be done. At

[14] Dr. Basco also acknowledged that mechanized equipment could be used for at least another 1,200 feet, or a total of 2,400 feet, south of the proposed project. However, he had not performed the necessary analysis to determine if mechanized equipment could proceed further down the shoreline. Basco, Vol. IV, p. 717, l. 22-25; p. 718, l. 1-5. The shoreline is approximately one mile long between the south groin and Gould's Inlet, so Dr. Basco has acknowledged that mechanized equipment could proceed south for about one-half of the Spit.

low tide, there would be plenty of room for mechanized equipment to make its way down the beach to Gould's Inlet. It is worth noting that Petitioners' proposed alternative would not require the construction of dunes south of Sea Island's eight-lot development because there will never be any structures needing protection further south due to the Conservation Easement. Dr. Basco admitted that no dunes would be needed under those circumstances. Vol. IV, p. 756, l. 11-16.

253. Dr. Basco ultimately conceded that such a project would be "technically feasible." Basco, Vol. IV, p. 726, l. 2-8 and 15-23.

254. With respect to the cost issue, several of the 157 beach nourishments without groins on Dr. Young's list of projects throughout the southeastern United States and New Jersey in the past 10 years are exponentially larger and more expensive projects than this one. P. Exs. 62 and 63. Dr. Young specifically discussed some of those projects in his testimony including the Nags Head, North Carolina 10-mile, $36 million nourishment project and others.

255. In contrast, this would be a very small project, running for approximately one mile and requiring only an additional 380,000 cubic yards of sand (above the 120,000 cubic yards that Sea Island already intends to use). Indeed, this project would be a fraction of the 3.5 mile-long existing project on Sea Island that required approximately 2,150,000 cubic yards of sand.[15]

256. Cost is not an issue, particularly when Sea Island plans to sell each one of the eight lots for $3.9 million to $5.6 million for a total amount ranging from $31.2 million to $44.8 million. Steilen, Vol. IV, p. 811, l. 14-17. Without a proper nourishment project, the real cost will be the negative downdrift impacts that Dr. Basco fails to discuss in this portion of his testimony.

[15] This figure includes the initial 1.8 million cubic yards to construct the project in 1990 and a supplemental infusion of roughly 350,000 cubic yards in 1997. Joint Ex. 1 at Attachment D, p. 15.

257. Dr. Basco's environmental concern is the source of the sand. Basco, Vol. IV, p. 742, l. 19-24. However, Dr. Webb has testified that it could be obtained offshore. Webb, Vol. I, p. 18, l. 25. Again, this is a reasonable assumption given that Sea Island has implemented at least three nourishment projects since 1987 totaling approximately 2,350,000 cubic yards of sand, most of which was obtained offshore from Pelican Spit.[16] It is also a reasonable assumption when one considers the large number of completed and ongoing nourishment projects in the past 10 years in the southeastern United States where sand in much greater numbers than required here has been obtained (including 22 projects with sand volumes between one million cubic yards of sand and over four million cubic yards of sand). P. Ex. 63.

258. Dr. Basco's political, institutional, and social concern is the Conservation Easement possibly precluding the project. Basco, Vol. IV, p. 743, l. 5-7. As already demonstrated, this is not a legitimate concern.

259. Dr. Basco did not elaborate on his aesthetic constraint for obvious reasons – it weighs in favor of the proposed alternative. A longer stretch of renourished beach is undeniably preferable to a truncated 1,200-foot beach bounded by two ugly rock groins.

260. Based upon all of the evidence presented in this matter, the Court finds that Petitioners have shown beyond a preponderance of the evidence that there is both a viable and a reasonable alternative to the proposed project and that Sea Island did not present sufficient evidence to rebut Petitioners' showing.

[16] This figure includes the 2,150,000 cubic yards used for the existing project and approximately 200,000 cubic yards used for the 1987 project. Oertel, Vol. IV, p. 652, l. 9-15.

II. CONCLUSIONS OF LAW

Based upon the above findings of fact, the Court makes the following conclusions of law:

A. Standard of Review

261. The Rules of Administrative Procedure enacted by the Office of State Administrative Hearings (OSAH) provide that a party challenging the grant of a license by a state agency bears the burden of proof. Ga. Comp. R. & Regs. r. 616-1-2-.07; *see also* O.C.G.A. § 50-13-2(3) (license defined to include permit).

262. Under the OSAH rules, the Court "shall make an independent determination on the basis of the competent evidence presented at the hearing." Ga. Comp. R. & Regs. r. 616-1-2-.21(1).

263. Hearings "shall be de novo in nature, and the evidence on the issues in a hearing shall not be limited to the evidence presented to or considered by the Referring Agency prior to its decision." Ga. Comp. R. & Regs. r. 616-1-2-.21(3).

264. Under this scheme, the Court does not provide "judicial review," but instead issues the final decision of the Committee.

B. Standing

265. The Shore Protection Act provides that whenever any person is aggrieved or adversely affected by any order or action of the Shore Protection Committee, that person may request and obtain a hearing by filing a petition no later than thirty days after issuance of the Committee's order or action. O.C.G.A. § 12-5-244. A person is "aggrieved" or "adversely affected" if they will suffer an "injury in fact" to an interest within the "zone of interests" protected or regulated by the Act. *Id.*

266. An organization may establish standing in two ways -- by demonstrating that it has standing in its own right or by demonstrating that it has standing on behalf of its members in a representative capacity. *See Aldridge v. Ga, Hospitality Ass'n*, 251 Ga. 234, 235-236 (1983).

267. Petitioners submitted affidavits showing that they and their members would suffer injuries to their recreational, educational, scientific, aesthetic, and other interests because of the Committee's decision to issue the permit. *See* OHM Am. Pet., Exs. B-E; ARK/Surfrider Pet., Exs. 2-7.

268. Sea Island and the Committee did not challenge Petitioners' standing to bring this action.

269. The interests claimed by Petitioners and their members fall squarely within the zone of interests protected by the Shore Protection Act. Thus, the Court finds that the Petitioners have standing to challenge the permit.

C. The Shore Protection Act

i. Legislative Intent and Statutory Framework

270. The General Assembly enacted the Shore Protection Act (SPA) to protect Georgia's sand-sharing system. O.C.G.A. § 12-5-231. As recognized by the General Assembly, "this sand-sharing system is a vital area of the state and is essential to maintain the health, safety, and welfare of all the citizens of the state." *Id*.

271. In enacting the SPA, the General Assembly recognized that "this natural resource system is costly, if not impossible, to reconstruct or rehabilitate once adversely affected by man related activities and is important to conserve for the present and future use and enjoyment of all citizens and visitors to this state and that the sand-sharing system is an integral part of Georgia's barrier islands, providing great protection to the state's marshlands and estuaries." *Id*.

272. The SPA was thus enacted to "protect this vital natural resource system by allowing *only* activities and alterations of the sand dunes and beaches which are considered to be in the best interest of the state and which do not substantially impair the values and functions of the sand-sharing system." *Id*. (emphasis added).

273. Given the importance of the sand-sharing system, the SPA, "being for the welfare of the state and its inhabitants," directs that it "shall be liberally construed to effect the purposes [t]hereof." *Id*.

274. To receive a permit for a shoreline engineering project under the SPA, an applicant must demonstrate that "the proposed project will insofar as possible minimize effects to the sand-sharing mechanisms from storm-wave damage and erosion both to the subject parcel and at other shoreline locations." O.C.G.A. § 12-5-239(c)(3)(B).

275. The applicant must also demonstrate that "no reasonable or viable alternative exists." O.C.G.A. § 12-5-239(c)(3)(C); *see also infra* § II(C)(iii). For purposes of this analysis, "beach restoration and renourishment techniques are preferable to the construction of shoreline stabilization activities." *Id*.

276. Because the Shore Protection Act does not define the term "viable," the Court must apply the term's ordinary meaning. O.C.G.A. § 1-3-1(b). The Merriam-Webster Online Dictionary defines viable as "capable of being done or used."; *see also Mornay v. Nat'l Union Fire Ins. Co. of Pittsburgh, P.A.*, 331 Ga. App. 112, 115 (2015) ("The term 'capable' is not defined in the statute, and we therefore look to its plain and ordinary meaning as defined by dictionaries.") (using definition supplied by Merriam-Webster online dictionary). Thus, while the term "reasonable" may account for other considerations such as cost, viable is focused only on technical feasibility – or whether something is capable of being done.

277. The applicant must also demonstrate that the proposed project is in the public interest. O.C.G.A. § 12-5-239(i). The SPA allows only activities "which are considered to be in the best interest of the state . . . ." O.C.G.A. § 12-5-231.

278. The SPA directs the Committee to consider the following factors in determining whether a project is in the public interest:

> (1) Whether or not unreasonably harmful, increased alteration of the dynamic dune field or submerged lands, or function of the sand-sharing system will be created;
>
> (2) Whether or not the granting of a permit and the completion of the applicant's proposal will unreasonably interfere with the conservation of marine life, wildlife, or other resources; and
>
> (3) Whether or not the granting of a permit and the completion of the applicant's proposal will unreasonably interfere with reasonable access by and recreational use and enjoyment of public properties impacted by the project.

O.C.G.A. § 12-5-239(i).

ii. Petitioners' Claims Under the Shore Protection Act

279. Petitioners have asserted the following claims:[17]

a. The issuance of the permit violates O.C.G.A. § 12-5-239(i) because the proposed project is not in the public interest. First, the proposed project creates an unreasonably harmful, increased alteration of the function of the sand-sharing system. *See* O.C.G.A. § 12-5-239(i). Second, the granting of the permit and the completion of Sea Island's proposal will unreasonably interfere with the conservation of marine life, wildlife, and other resources. *See* O.C.G.A. § 12-5-239(i). Third, the granting of the

[17] Petitioners also alleged that the permit violates O.C.G.A. § 12-5-239(g) because the permit did not comply with other federal and state statutes. This claim was dismissed by the Court in its Order on Respondent and Intervenor's Partial Motions to Dismiss.

permit and the completion of Sea Island's proposal will unreasonably interfere with reasonable access and recreational use and enjoyment of public properties impacted by the project.

b. The issuance of the permit violates O.C.G.A. § 12-5-239(c)(3)(C) because beach nourishment without a groin is a reasonable and viable alternative that Sea Island did not consider.

c. The issuance of the permit violates O.C.G.A. § 12-5-239(c)(3)(B) because the proposed project does not minimize "the effects to the sand-sharing mechanisms from storm-wave damage and erosion . . . at other shoreline locations." O.C.G.A. § 12-5-239(c)(3)(B). Instead, the proposed groin would accelerate erosion on the southern, or downdrift, side of the proposed groin and directly impact the sand-sharing system.

280. As set forth in the above findings of fact, Petitioners showed at the hearing by a preponderance of the evidence that the permit violates O.C.G.A. §§ 12-5-231, 12-5-239(c)(3)(B), and O.C.G.A. § 12-5-239(i) because the proposed project would cause an unreasonable impact to the sand-sharing system, the proposed project would create an unreasonable impact on federally and state protected wildlife, and the proposed project is contrary to the public interest and not in the best interest of the state. Petitioners likewise showed by a preponderance of the evidence that the permit violates O.C.G.A. § 12-5-239(c)(3)(C) because there is a reasonable or viable alternative to building a groin. The Committee and Sea Island's legal arguments relating to the applicability of O.C.G.A. § 12-5-239(c)(3)(C) and the sufficiency of the special conditions are addressed below.

iii. O.C.G.A. § 12-5-239(c)(3)(C) applies because the proposed groin is a shoreline stabilization device.

281. The Committee suggests that O.C.G.A. § 12-5-239(c)(3)(C), which prohibits construction of a "shoreline stabilization device" if a reasonable or viable alternative exists, does not apply because a groin is not a "shore stabilization" device. In support of its position, the Committee relies on O.C.G.A. § 12-5-232(17), which defines "shoreline engineering activity" as follows:

> "Shoreline engineering activity" means an activity which encompasses any artificial method of altering the natural topography or vegetation of the sand dunes, beaches, bars, submerged shoreline lands, and other components of the sand-sharing system. This includes, but is not limited to, such activities as: (A) Grading, clearing vegetation, excavating earth, or landscaping, where such activities are for purposes other than erection of a structure; (B) Artificial dune construction; (C) Beach restoration or renourishment; (D) Erosion control activities, including, but not limited to, the construction and maintenance of groins and jetties; (E) **Shoreline stabilization activities, including, but not limited to, the construction and maintenance of seawalls and riprap protection**; and (F) The construction and maintenance of pipelines and piers.

O.C.G.A. § 12-5-232(17) (emphasis added).

282. The Committee argues that because groins "are [not] referenced under the 'shoreline stabilization' subset" of the above definition, they, by definition, are not a "shoreline stabilization" activity. Burgess, SPC WD-1, p. 17, ¶ 33. The Committee likewise argues that because groins are referenced in the "erosion control" subset of the definition, they cannot also be a "shoreline stabilization" activity.

283. This argument is contrary to well-established canons of statutory construction.

a. The phrase "shoreline stabilization activities" is not defined in the Shore Protection Act.

284. The Shore Protection Act, O.C.G.A. § 12-5-232, defines twenty-one terms. "Shoreline stabilization activities" is not one of them.

285. Instead, the Act indicates only that the phrase "includ[es] but [is] not limited to . . . seawalls and riprap protection." O.C.G.A. § 12-5-232(17).

286. Although the word "includes" "may sometimes be taken as synonymous with 'means,'" that is not the case here. *See Berryhill v. Georgia Cmty. Support & Solutions, Inc.*, 281 Ga. 439, 440 (2006).

287. By appending the phrase "but not limited to," the legislature plainly intended the word "includes" to be construed as "a broad term of illustration or enlargement." *Id.* at 442; *cf. Wetzel v. State*, 298 Ga. 20, 32 (2015) ("When viewed in this way, it becomes clear that "including" is used in [the statute] to expand, rather than to limit, [the preceding phrase]."); *see also* Black's Law Dictionary (10th ed. 2014) ("The participle including typically indicates a partial list. . . . But some drafters use phrases such as including without limitation and including but not limited to which mean the same thing.").

288. Thus, the phrase "shoreline stabilization activities" is undefined, and ordinary rules of statutory construction apply.

b. Because "shoreline stabilization activities" is not defined, the Court looks to the ordinary meaning of the phrase or the meaning attached to it by experts in the coastal geology and engineering fields.

289. In interpreting statutes, courts apply the ordinary meaning to all undefined words, except words of art or words connected with a particular field or subject matter, which are given the meaning attached to them by experts in that field. O.C.G.A. § 1-3-1(b).

290. A shoreline stabilization activity, by its ordinary and technical meaning, is an activity intended to "stabilize" a beach or shoreline.

291. "The purpose of th[is] project," according to Sea Island, "is to **stabilize** the eroding beach . . . ." *See* Joint Ex. 1 at 1 (emphasis added); *see also* Joint Ex. 1 at 7 (recognizing

that O.C.G.A. § 12-5-239(c)(3)(C) requirement for alternatives analysis applied to proposed project); Sea Island Motion to Intervene as Respondent, Jan. 28, 2016, at 2 (noting that purpose of project is to stabilize beach); Response of Sea Island to ARK Petition, Jan. 28, 2016, at ¶ 1 (same); Sea Island Motion to Dismiss, Feb. 22, 2016, at 2 (same). Thus, it follows that the proposed project is plainly a shoreline stabilization activity.

292. To find otherwise would lead to the absurd result that an activity specifically undertaken to "stabilize" a shoreline is not a "shoreline stabilization activity." Such an absurd and unreasonable result is not permitted under Georgia law. *See Fulton Cty. Bd. of Tax Assessors v. Whit*e, 302 Ga. App. 512, 514, (2010) ("It is the duty of [this] court ... to consider the results and consequences of any proposed statutory construction and not so construe a statute as will result in unreasonable or absurd consequences not contemplated by the legislature.").

293. Experts in the shoreline geology and engineering fields – including DNR employees and Sea Island's own experts – also characterize groins like the one proposed here as shoreline stabilization activities.

294. Chapter 3 of the United States Army Corps of Engineers Shoreline Engineering Manual (authored by Dr. Basco) categorizes groins as "shoreline stabilization structures" throughout the chapter. *See* P. Ex. 33 (USACE Shoreline Engineering Manual) at V-3-3 (noting that "groins, breakwaters, etc." are used for "erosion mitigation and shoreline stabilization"); V-3-4 (including groins under the "Shoreline Stabilization Structures and Facilities" category of Table V-3-2); V-3-7 (discussing groins under ¶ 3, titled "Shoreline Stabilization"); V-3-33 *et seq*. (discussing groins throughout Section V-3-3, titled "Beach Stabilization Structures"); V-3-59 (noting that groins are the "most common shore-connected beach stabilization structure"); V-

3-87 (discussing groins in ¶ A(1)(a), titled "Beach Stabilization Structures and Beach Nourishment").

295. Dr. Basco also categorizes groins as "beach stabilization structures" multiple times in his written direct testimony. Basco, SI WD-5, p. 23, ¶ 42 and Figure 12(b). In addition, the feasibility study he prepared for Sea Island in 2014 is titled "Feasibility-Level Study of Alternatives for Shoreline Stabilization of Tract IX Property." SI Ex. 36 at 8.

296. Dr. Oertel discusses "groins or other shoreline stabilization devices" in his written direct testimony, indicating that he too characterizes groins as a type of shoreline stabilization device. *See* Oertel, SI WD-4, p. 52, ¶ 121. In addition, Dr. Oertel co-authored with Dr. Basco the feasibility report examining "shoreline stabilization of Tract IX property" for Sea Island. SI Ex. 36 at 8.

297. Dr. Young testified at the hearing, "Groins are clearly a shoreline stabilization activity. . . . [I]t's not my opinion, it's everybody's opinion." Young, Vol. I, p. 44, l. 3-6.; *see also* Young, Vol. I, p. 46, l. 6-15; Young, P. WD-1, p. 2, ¶ 6 ("I am very familiar with a wide variety of shoreline stabilization devices, including groins, jetties, seawalls, and revetments."); Young, P. WD-1, p. 13, ¶ 45 (calling groins "hard stabilization" devices); Young, P. WD-1, p. 9, ¶ 29 ("shoreline stabilization structures, including groins . . .").

298. Dr. Webb examined the "what shoreline stabilization projects" had previously been constructed along the Sea Island shoreline and included the existing groins in his analysis of previous shoreline stabilization structures. Webb, P. WD-2, p. 9, § V. Dr. Webb also recognized that the stated purpose of the project, according to Sea Island, is to "stabilize" the beach. Webb, P. WD-2, p. 3, ¶ 12.

299. In a letter discussing the negative impacts of groins, forty-three leading coastal scientists from around the world stated that the North Carolina ban on groins is based on "150 years of documentation of the negative impacts of shoreline stabilization," indicating that they too characterize groins as shoreline stabilization devices. P. Ex. 36 at 1.

300. Dr. Rusenko and Mr. Dodd, who both testified to their familiarity with groins in relation to their work as turtle biologists, also indicated that groins were shoreline stabilization devices in their testimony at the hearing. Dodd, Vol. II, p. 275, l. 8 ("[A]s a result of the groins, we now have shore stabilization on the north end of the island."); Rusenko, Vol. II, p. 209, l. 23-25; p. 210, l. 1-2 (affirmatively answering question regarding his experience with "shoreline stabilization devices including groins"); *see also* P. Ex. 6 (WRD Comments) at 1 (noting the purpose of the project is to stabilize the beach).

301. In fact, prior to reversing its position in response to this litigation, the Coastal Resources Division itself described groins as shoreline stabilization devices. The Staff Findings and Recommendations (Joint Ex. 2) plainly signaled that the alternatives analysis required by O.C.G.A. § 12-5-239(c)(3)(C) applied in this case and explicitly stated, "**Construction of shoreline stabilization will occur in the form of the proposed permanent T-head groin** constructed of stone." Joint Ex. 2 at 5 (emphasis added); *see also* SPC Ex. 4 at 2 ("It is the responsibility of the applicant to demonstrate that . . . no feasible alternative sites exist."). At the hearing, Mr. Burgess acknowledged that these findings reflected the official position of CRD regarding the permit and that Brad Gane, the chief of ecological services at CRD, and Spud Woodward, the director of the CRD, reviewed the findings before they were submitted and that all of their comments and concerns were incorporated into the final version. Burgess, Vol. II, p. 396, l. 2-25; p. 397, l. 1-25; p. 398, l. 1.

302. In sum, Sea Island has acknowledged on multiple occasions that the purpose of the project is to stabilize the beach, all four coastal engineering or geology experts who submitted written direct testimony described groins as shoreline stabilization devices, the USACE's shoreline engineering manual describes groins as shoreline stabilization structures, and 43 of the world's leading coastal scientists signed on to a letter suggesting that groins are shore stabilization devices. And, prior to the hearing on this matter, CRD took the position that groins were shoreline stabilization structures.

303. What's more, this eleventh-hour interpretation is also contrary to statements previously made in this litigation by both Sea Island and the Committee. In support of its Motion to Dismiss, Sea Island argued, "[I]t is [Petitioners'] responsibility to affirmatively demonstrate the existence of a reasonably or viable alternative." Sea Island Reply in Support of Motion to Dismiss, March 14, 2016, at 4; *see also* Motion to Dismiss, Feb. 22, 2016, at 19. Likewise, the Committee took the position that "Petitioners . . . are now required to show that such alternatives in fact exist . . . ." SPC Reply in Support of Motion to Dismiss, March 14, 2016, at 6.

304. In light of these considerations, the Committee's argument that O.C.G.A. § 12-5-239(c)(3)(C) does not apply is unpersuasive. *Cf. Animal Legal Def. Fund v. U.S. Dep't of Agric.*, 789 F.3d 1206, 1221 (11th Cir. 2015) (internal quotations omitted) ("An after-the-fact rationalization of agency action—an explanation developed for the sole purpose of defending in court the agency's acts—is not entitled to deference.").

c. The Court also looks to the intent of the legislature in interpreting the meaning of "shoreline stabilization activities."

305. In addition to being contrary to the ordinary and technical uses of the phrase "shoreline stabilization device," the Committee's interpretation is also contrary to the legislative intent of the Shore Protection Act.

306. In interpreting statutes, "a cardinal rule is that the court must first ascertain the legislative intent in enacting the law and then construe the law to implement that intent." *State v. Jackson*, 197 Ga. App. 619, 620 (1990); *see also Maxwell v. State*, 282 Ga. 22, 23-24 (2007) (internal quotations omitted) ("[I]n construing language in any one part of a statute, a court should consider the entire scheme of the statute and attempt to gather the legislative intent from the statute as a whole."); O.C.G.A. § 1-3-1.

307. "[C]ourts cannot pronounce a statutory interpretation that would thwart the legislative purpose of a particular statute." *Agricredit Acceptance, LLC v. Hendrix*, 32 F. Supp. 2d 1361, 1366 (S.D. Ga. 1998).

308. The intent of the Shore Protection Act is to "protect [the sand-sharing system] by allowing only activities and alternations of the sand dunes and beaches which are considered to be in the best interest of the state and which do not substantially impair the values and functions of the sand-sharing system." O.C.G.A. § 12-5-231.

309. Given the legislative intent, it would make no sense to require an alternatives analysis for the "construction and maintenance of seawalls and riprap protection," but not require an alternatives analysis for the construction of groins or other structures that also threaten the sand-sharing system.

310. The statute contains no language suggesting such an unsupported distinction was intended. And contrary to the Committee's argument, the rules of statutory construction permit

overlapping categories in which an action may fall under more than one term or category – particularly where, as here, the categories are illustrative and not intended to narrow the scope of the statute.

311. In other words, nothing prohibits a groin from being considered both a "shoreline stabilization" activity and an "erosion control" activity. Although not all erosion control activities may be shoreline stabilization activities, and not all shoreline stabilization activities may be erosion control activities, affirmative evidence in the record suggests that *groins* are indeed both. *See, e.g.*, P. Ex. 33 at V-3-3 (noting that groins are used for "erosion mitigation and shoreline stabilization"); V-3-7 (noting that groins are a "shoreline stabilization" measure used to "moderate the coastal sediment transport processes to reduce the local erosion rate").

312. In sum, O.C.G.A. § 12-5-239(c)(3)(C) applies in this case because a groin is a shoreline stabilization structure within the meaning of the Shore Protection Act.

iv. The special conditions included in the permit do not bring the permit into compliance with the Shore Protection Act.

313. O.C.G.A. § 12-5-239(3)(B) provides that a permit may be issued only when "[t]he proposed project will insofar as possible minimize effects to the sand-sharing mechanisms . . . ."

314. Sea Island and the Committee contend that special conditions contained in the permit minimize the effects to the sand-sharing system insofar as possible, and thus that the permit was properly granted. *See* Burgess, SPC WD-1, p. 10, ¶ 20. Specifically, Mr. Burgess testified that Special Conditions 5 and 8 would minimize the impacts to the sand-sharing system by requiring monitoring of the project site and the area immediately south of the project site following construction of the proposed groin. Burgess, SPC WD-1, ¶ 21, pp. 10-11. He further testified that Special Condition 2 would minimize impacts to the sand-sharing system by

allowing the Department of Natural Resources to require that Sea Island adjust or remove the groin under certain circumstances. *Id*.

315. This argument fails for three reasons. First, Petitioners have shown by a preponderance of the evidence that a reasonable and viable alternative – nourishment without a groin – exists and would satisfy the stated purpose of the project. Thus, the proposed project plainly does not minimize effects to the sand-sharing system insofar as *possible*, because there is a viable alternative that would have fewer negative impacts on the sand-sharing system.

316. Second, there is no guarantee that the Department would require Sea Island to remove the groin in the event of adverse impacts. Shore Protection Act permit number 149, which permitted the existing groins, contains a substantively similar provision and DNR has never considered removal of the existing groins despite significant scientific evidence that those groins have contributed to substantial downdrift erosion, as set forth in the above Findings of Fact.

317. Third, even if enforced, the special conditions would do nothing to reverse the damage already done to the sand-sharing system between the construction of the groin and the removal of the groin. As noted by the General Assembly, the sand-sharing system "is costly, if not impossible, to reconstruct or rehabilitate once adversely affected by man related activities and is important to conserve for the present and future use and enjoyment of all citizens and visitors to this state . . . ." In light of this policy consideration, the Court finds that the backwards-looking special conditions in the permit are not sufficient to minimize impacts to the sand-sharing conditions insofar as possible.

318. Finally, even if the special conditions minimized impacts insofar as possible, thus complying with O.C.G.A. § 12-5-239(3)(B), the proposed groin would still impact the sand-

sharing system to such a degree that it would impair the public interest, thus violating O.C.G.A. §§ 12-5-231 and 239(i)(1). As noted above, O.C.G.A § 12-5-231 states that a permit may only be granted if the proposed project is "in the best interest of the state." O.C.G.A. § 12-5-239(i)(1) instructs that one relevant factor in this determination is "whether or not unreasonably harmful, increased alteration of the . . . function of the sand-sharing system will be created." O.C.G.A. § 12-5-239(i)(1). Thus, the Committee may not grant a permit for a project that would impact the sand-sharing system to such a degree that it would impair the public interest, regardless of whether its impacts may have been minimized insofar as possible.

319. The preponderance of the evidence presented at the hearing shows that the proposed project would impact the sand-sharing system to such a degree that it would not be in the best interest of the state; thus, the permit was wrongfully issued under O.C.G.A. §§ 12-5-231 and 239(i), regardless of whether the special conditions comply with O.C.G.A. § 12-5-239(3)(B).

III. DECISION

For the reasons set forth in the above Findings of Fact and Conclusions of Law, the decision of the Shore Protection Committee is hereby REVERSED and Shore Protection Act Permit No. 438 is hereby VACATED**.**

Respectfully submitted this 30th day of June, 2016.

GREENLAW

/s/ Steven D. Caley
Steven D. Caley
Georgia Bar No. 102866
104 Marietta Street, Suite 430
Atlanta, GA 30303
Phone: (404) 659-3122
Fax: (404) 522-5290
scaley@greenlaw.org

Counsel for Petitioners Altamaha Riverkeeper, Inc. and Surfrider Foundation

SOUTHERN ENVIRONMENTAL LAW CENTER

/s/ Megan L. Hinkle
Megan L. Hinkle
Georgia Bar No. 877345
William W. Sapp
Georgia Bar No. 626435
Helen Barnes
Georgia Bar No. 733522
Ten 10th Street NW
Suite 1050
Atlanta, Georgia 30309
Phone: (404) 521-9900
Fax: (404) 521-9909
bsapp@selcga.org
mhinkle@selcga.org
hbarnes@selcga.org

Counsel for Petitioner One Hundred Miles

CERTIFICATE OF SERVICE

I hereby certify that I have on this day served a copy of the above "Petitioners' Proposed Findings of Fact and Conclusions of Law" by electronic mail (per agreement of counsel) upon the following parties:

James D. Coots
Georgia Department of Law
40 Capitol Square SW
Atlanta, GA 30335
jcoots@law.ga.gov

Patricia Barmeyer
Randall J. Butterfield
King & Spalding, LLP
1180 Peachtree Street NE
Atlanta, GA 30309
pbarmeyer@kslaw.com
rbutterfield@kslaw.com

This 30th day of June, 2016.

/s/ Steven D. Caley

.