# Summary Report for Announcement M14AC00012: South Carolina Offshore Sand Resources – Data Inventory and Needs Assessment

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# 1. Cooperative Agreement Outputs

## *1.1. Geographic Information System (GIS) Data: Technical Summary*

The geospatial inventory compiled for this Bureau of Ocean Energy Management (BOEM) – funded cooperative project has greatly enhanced our overall state of knowledge regarding the type, quality, and quantity of data that exist offshore of South Carolina. Having these enhanced datasets in an accessible format, which will be accomplished through integration of the data into BOEM's Marine Minerals Program Geographic Information System (MMPGIS) and a South Carolina Department of Natural Resources (SCDNR)-hosted web-served database, will improve the ability of federal, state, and local entities to be able to make informed decisions about offshore sand resources. Using these data to identify gaps in coverage will also assist planning efforts for future data collection work on South Carolina's Outer Continental Shelf (OCS). This project not only expanded on coverage from existing datasets (Southeast Area Monitoring and Assessment Program – South Atlantic, 2001; Weinbach and Van Dolah, 2001; Boynton et al., 2013), it also added a variety of new data that was previously not available in a digital format. The project also added significant value to existing datasets through the construction of a comprehensive spatial database of sand resource data to be used in evaluating OCS sand resources, the removal of duplicate data where present in the final database, and the application of the data inventory to a state-wide coastal beach nourishment needs assessment. Additional metadata records were compiled for many of the existing datasets. Data that have not been included in past resource assessment studies, notably vibracores collected for beach nourishment and monitoring studies by private companies or the U.S. Army Corps of Engineers and records for surveys that contain only navigation data or were not in a GIS-compatible format, were identified and acquired for inclusion in the inventory database.

The focus area for this project is located within the 3 to 8 nautical mile (nm) OCS offshore of the coast of South Carolina, and covers approximately 3,108 square kilometers. The seafloor in these federal waters is classified as submerged land, and its potential sand and gravel resources are under the administration of BOEM. Over 6,000 geotechnical samples and 18,800 km of trackline were compiled into the inventory database, and of this total, 2,080 geotechnical records and 5,600 km of trackline located within the area of focus were analyzed to assess the needs of beach communities for nourishment-quality sand (Figures 1 and 2).

Following data acquisition and management, the GIS data inventory was analyzed to inform a needs assessment portion of the project, the goals of which were to (1) identify areas with potential sand resources for future exploration, and (2) identify areas lacking data. The potential for beach communities to utilize offshore sand resources within the 3-8 nm OCS was also analyzed based on nourishment history, frequency, volume, and past source locations for nourishment projects.

### *Data Accumulation and Sources*

Given the spatial scope of the project focus area, the primary source that contributed to the initial hard bottom characterization dataset was the multi-year SEAMAP Bottom Habitat Project (SEAMAP-SA, 2001). Another significant source of data was a regional ocean sediment database created for the South Carolina Energy Office (Van Dolah et al., 2011). Additional data were obtained from reports of beach nourishment studies and ocean dredge material disposal sites. Many of the nearshore studies that were used to inform or obtain data for this project utilized coring and high-resolution seismic reflection profiling to determine the thicknesses of surficial sand lenses. Others also evaluated the characteristics of surficial sediments collected in conjunction with benthic community sampling for various environmental research projects in offshore borrow areas and on nourished beaches. Many of these datasets were originally compiled by the South Carolina Task Force on Offshore Resources through funding from the Minerals Management Service Office of International Activities and Marine Minerals (INTERMAR), summarized in Weinbach and Van Dolah (2001).

Newer geotechnical and geophysical (post-1999) data that have been incorporated into the current inventory are derived from a variety of agencies, institutions, and private entities. The new geotechnical data are primarily concentrated in borrow sites or potential borrow areas for the following beach communities and associated investigators: DeBordieu Beach (Coastal Science Associates, Applied Technology and Management, Tidewater Atlantic Research, Inc., and Athena Technologies), Folly Beach (U.S. Army Corps of Engineers, Athena Technologies) Hunting Island (Coastal Science & Engineering, U.S. Army Corps of Engineers, CSE-Baird), Hilton Head Island, and Daufuskie Island (Applied Technology and Management, Athena Technologies). The U.S. Army Corps of Engineers, Charleston District, also provided vibracore data concentrated in vicinity of Charleston Harbor and Folly Beach. Where available, descriptive core log information for offshore vibracores has been compiled for reference.

Geophysical trackline data were acquired and integrated into the database for surveys conducted by universities, federal and state agencies, and private companies. The South Carolina Coastal Erosion Study (Barnhardt, 2009), a collaborative, multi-year effort to collect geophysical and geotechnical data in South Carolina's Long Bay region, was also used extensively to enhance the value of the inventory dataset. This single study includes a total of 722 sediment grabs and 4,035 km of geophysical trackline. Georeferenced sidescan sonar backscatter mosaics were included in the database where available. Any raw geophysical data were compiled for database inclusion. Location information for 19 vibracores and 11 surficial sediment grabs were also obtained through BOEM Atlantic Sand and Gravel Assessment (ASAP) contractor Chicago Bridge & Iron Company (CB&I) from field data collected in 2015. Final core log and surficial grab sample data from this survey will be added to the database for South Carolina when available, and tracklines for geophysical (sidescan sonar backscatter, seismic reflection (chirp subbottom profiler), and swath bathymetry) data will be processed and analyzed under the second iteration of state cooperative funding.

Online data portals were also used extensively in this project as a means of identifying new geophysical and geotechnical data for inclusion in the database. Several of these are federal data viewers created and maintained by the National Oceanic and Atmospheric Administration (NOAA) and the United States Geological Survey (USGS). Others are state-specific and provided jurisdictional boundaries and information for past beach nourishment projects (SCDHEC, 2016; WCU, 2016).

### Data Management

The geographic data layers collected for this inventory and needs assessment were placed into two ArcGIS geodatabases. The Inventory Geodatabase includes the data in their original form as they were received from the source or previous study. Because some of these datasets contained duplicate information, detailed in the Needs Assessment section of the technical report associated with this project (Tweel et al., 2016), a second Needs Assessment Geodatabase was created to house filtered datasets that were used in the analysis. The final $1 \times 1$ km$^2$ grids created during the analysis are housed in this geodatabase.

The inventory geodatabase is structured into five feature datasets and a collection of spatially-referenced geophysical imagery. The feature datasets are: Avoidance, Beach, Boundaries, Bottom, Geophysical, and Geotechnical. All feature classes are in a geographic coordinate system, which was common to a majority of the native data incorporated. The exception was the Beach dataset, which is in State Plane.

Other authoritative base data have also been developed in conjunction with the sand resource assessment component, including artificial reef habitats, borrow areas, and data relating to beach nourishment project extent, cost, frequency, and volumes. To assess the potential for utilization of offshore sand resources by beach communities along the South Carolina coast, a comprehensive beach nourishment database was compiled from various sources (Van Dolah et al., 2011; SCDHEC, 2016; WCU, 2016). This contains information relating to nourishment volume, cost, spatial extent, and borrow area location. The final database contains a variety of data representing offshore bottom type information derived from both geophysical and geotechnical samples collected between the 1960s and present day.
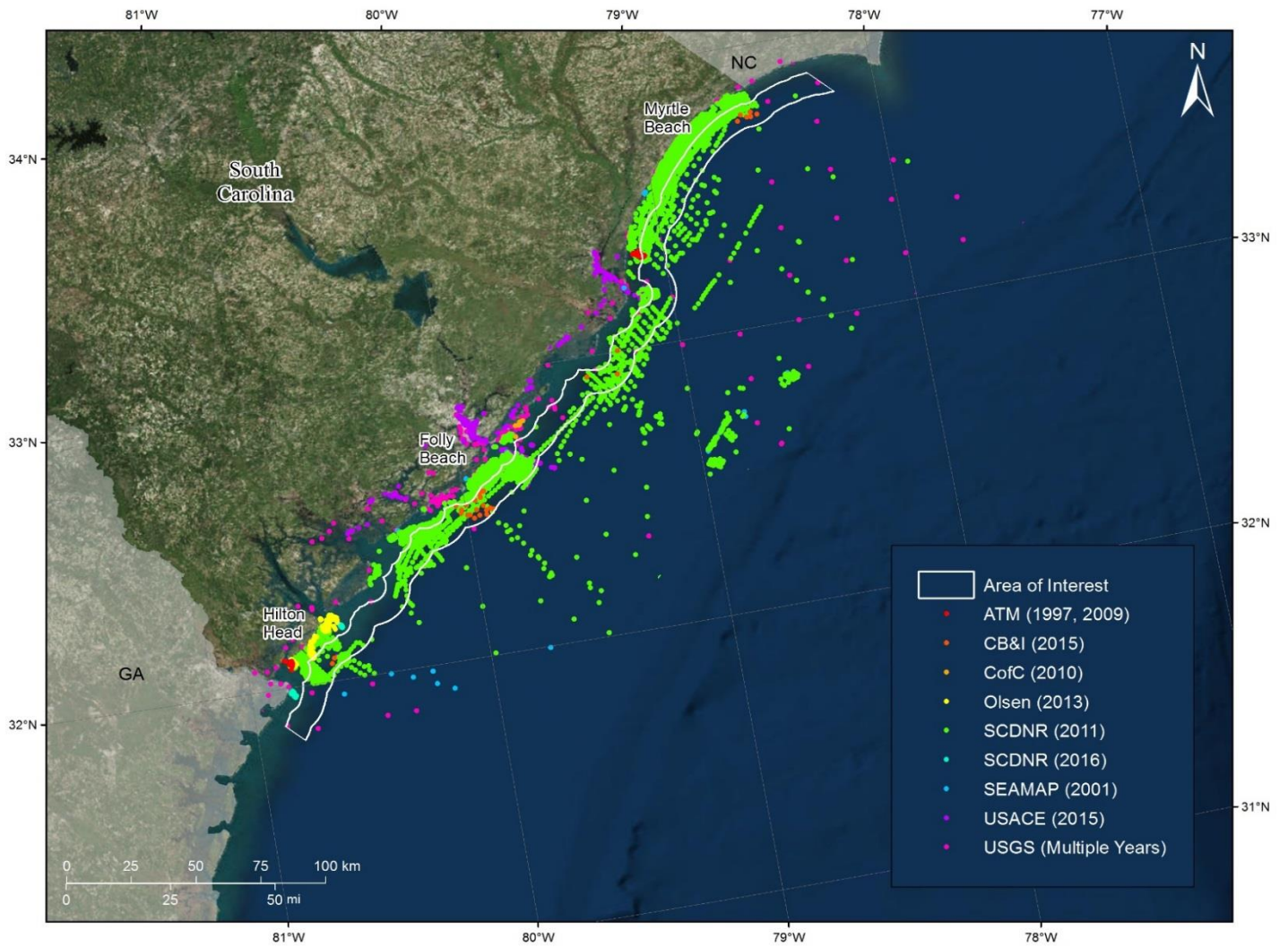
**Figure 1.** The 3-8 nm study area boundaries and geotechnical data coverage offshore of South Carolina. Over 6,000 records are in the geotechnical data category for the project, with 2,080 records within the boundary of the 3-8 nm study area.
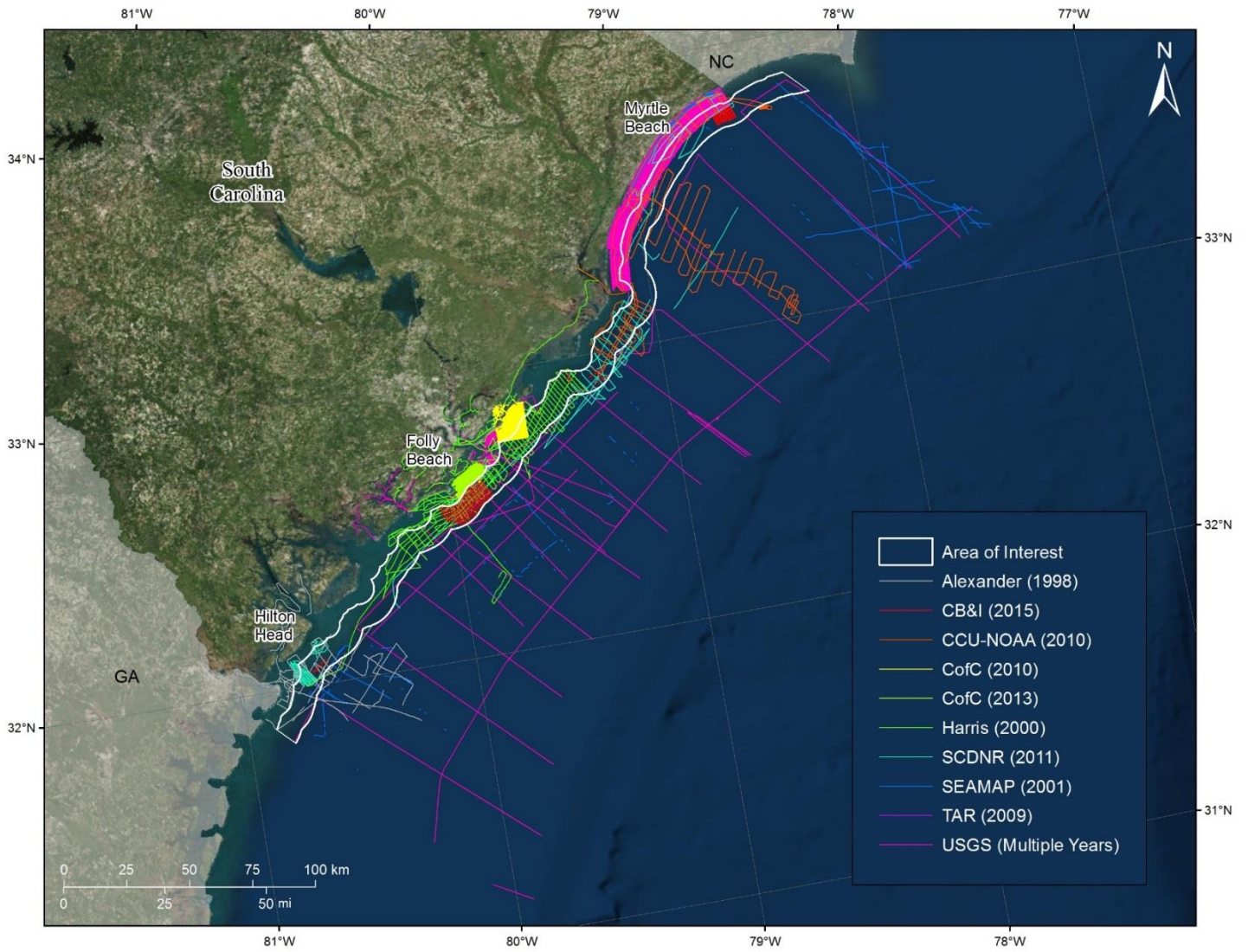
**Figure 2.** The 3-8 nm study area boundaries and geophysical data coverage offshore of South Carolina. Approximately 18,800 km of trackline were compiled for the study, with 5,600 km total within the boundary of the 3-8 nm study area.

*1.2 Needs Assessment Technical Report Summary*

**Tweel, A., Koch, E., Luciano, K., Treadaway, D., Sanger, D., and Howard, S. 2016. Assessment of South Carolina Offshore Sand Resources with Emphasis on Community Needs and Data Gaps. Technical report prepared by the South Carolina Department of Natural Resources, Marine Resources Research Institute and Geological Survey for the Bureau of Ocean Energy Management. 36 pp.**

Recent storm events have revealed a need to further assess offshore sand resources and potential community demand for these resources. Beaches along coastal South Carolina have undergone at least 78 nourishment projects since 1968, totaling approximately 58 million cubic yards of sediment. With few exceptions, these projects seek sand at increasing distances, and therefore cost, from where placement is desired. Because of this trend, increasing exploitation for sand in the Outer Continental Shelf area (OCS) is anticipated. This report presents an assessment of sediment data availability in the OCS, and aims to identify where more thorough exploration may be warranted, as well as areas where data gaps exist, particularly in areas where demand for beach-compatible sand is high or has the potential to increase.

Numerous investigations of sand resources have been conducted in South Carolina, primarily for specific nourishment projects (e.g., Van Dolah et al., 1992; Katuna et al., 1993; Morton and Miller, 2005), but also to support regional mapping efforts such as the USGS South Carolina Coastal Erosion Study (Barnhardt, 2009). The South Carolina Department of Natural Resources (SCDNR) has also conducted research on sediment and benthic community recovery following beach nourishment for several decades (e.g., Van Dolah et al., 1992; Jutte et al., (1999, 2001); Bergquist et al., 2008; Wren et al., 2010; Bergquist, Crowe, and Levisen (2009, 2011); Crowe and Sanger, 2014; Crowe et al., 2015). This research has included both dredged borrow areas and beach-front areas where fill has been placed. SCDNR also conducted regional-scale research as part of the South Carolina Task Force on Offshore Resources, a collaboration between the State of South Carolina and the Minerals Management Service (MMS) (Bury and Van Dolah, 1995; Weinbach and Van Dolah, 2001).

These data syntheses were further refined for projects conducted for the SC Energy Office and Governor's South Atlantic Alliance (GSAA) (Van Dolah et al., 2011; Boynton et al., 2013). This analysis builds on this previous work to include more recent datasets (Luciano and Harris, 2013; Crowe and Sanger, 2014; Crowe et al., 2015), as well as a more comprehensive assessment of data types and data gaps. An additional component is the inclusion of beach nourishment history along the South Carolina coast, which aids in identifying locations and volumes of potential future projects. The merging of these two datasets helps ensure that the utility and benefit of future data collection is maximized.

Results of the needs assessment indicate that the highest annualized sand usage in the state took place at Folly Beach and Hilton Head Island (Figure 3). As a region, the Grand Strand has placed the most sand along its beaches, but this region is also much larger than beaches along the southern South Carolina coast, and has consequently drawn from sand resources along a 75 km stretch of state and OCS bottoms, as well as several terrestrial borrow areas. Total sand placement for this region is approximately $19.0 \times 10^6$ CY over 28 events since 1979. Within the Grand Strand, annualized sand placement is greatest at Myrtle Beach, but return frequencies are similar, ranging from 5-9 years between events.
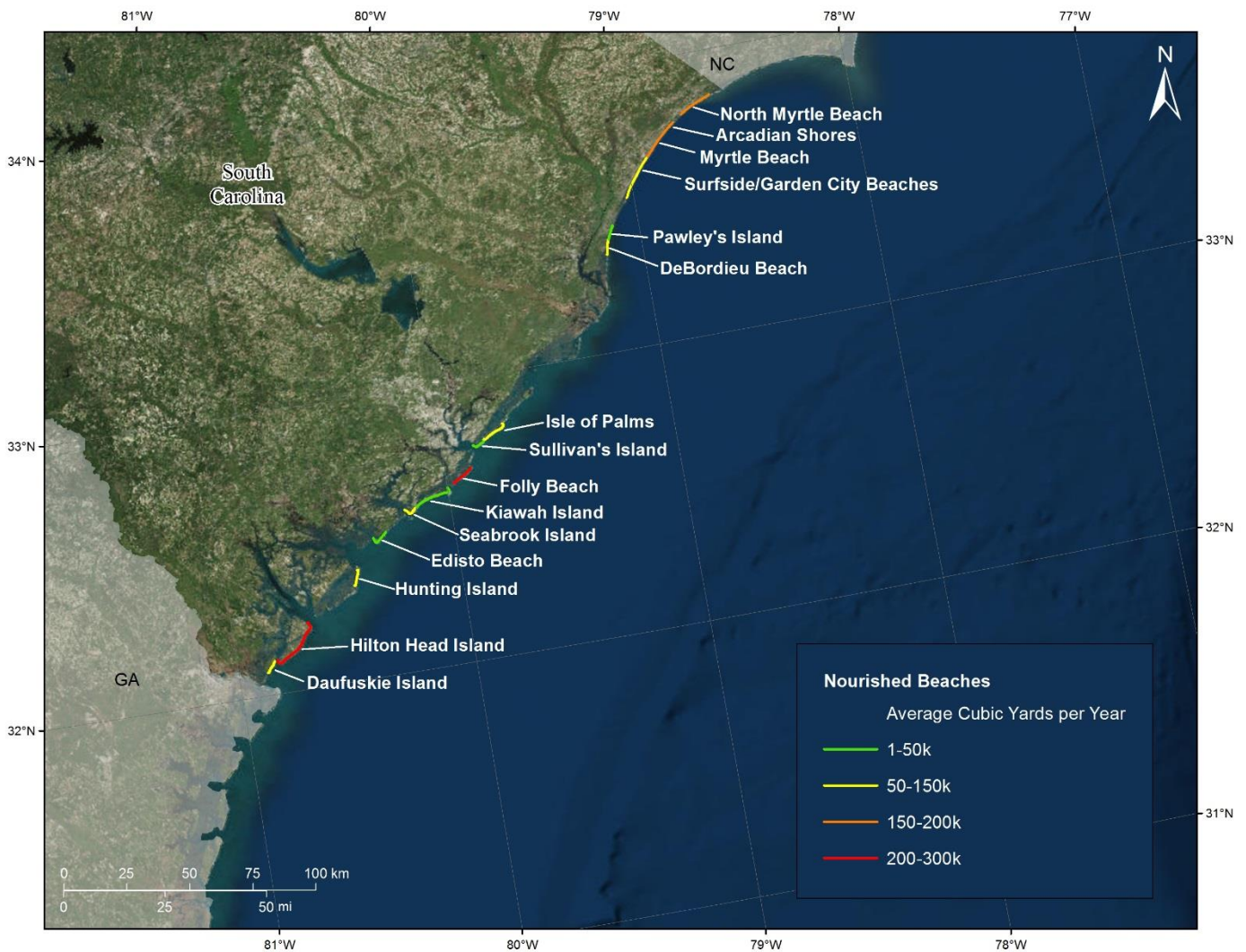
**Figure 3.** Nourished beaches where calculation of sand placement rate was possible based on available data. Beach segments depict entire beach length, not necessarily portion nourished.

Data density and quality are generally proportional to patterns of sand resource use (Figure 4), with the most continuous data coverage occurring along 75 km of coastline on the Grand Strand. However, despite its history of large nourishment projects, the Grand Strand OCS just inside of 8 nm is data poor, and several areas contain no data. This most likely results from the availability of usable sand closer to placement areas. Coastal South Carolina between Winyah Bay and Dewees Island is lacking coverage of geotechnical data, but there are no populated beaches in this stretch, and therefore little demand at this time for nourishment. The OCS offshore of Folly Beach has the greatest data density and quality, but also a high demand for sand resources, as the two largest current borrow areas have refilled with sediments too fine to use in future projects. Analysis at higher resolution reveals several areas that warrant further exploration. Data coverage near Hilton Head Island is sporadic, and geotechnical data is lacking in a large portion of the OCS area. Previous nourishment projects at Hilton Head, including a planned 2016 nourishment, have often utilized sand from the updrift (north) side of ebb tidal deltas near the inlet mouths, well inside of the OCS. Previous monitoring has

demonstrated that these types of borrow areas have a greater tendency to fill with beach-compatible sand and therefore can often be used more than once (Bergquist et al., 2009, 2011). A more detailed assessment of beach community sand use, data availability, and data needs is included in the full technical report (Tweel et al., 2016).
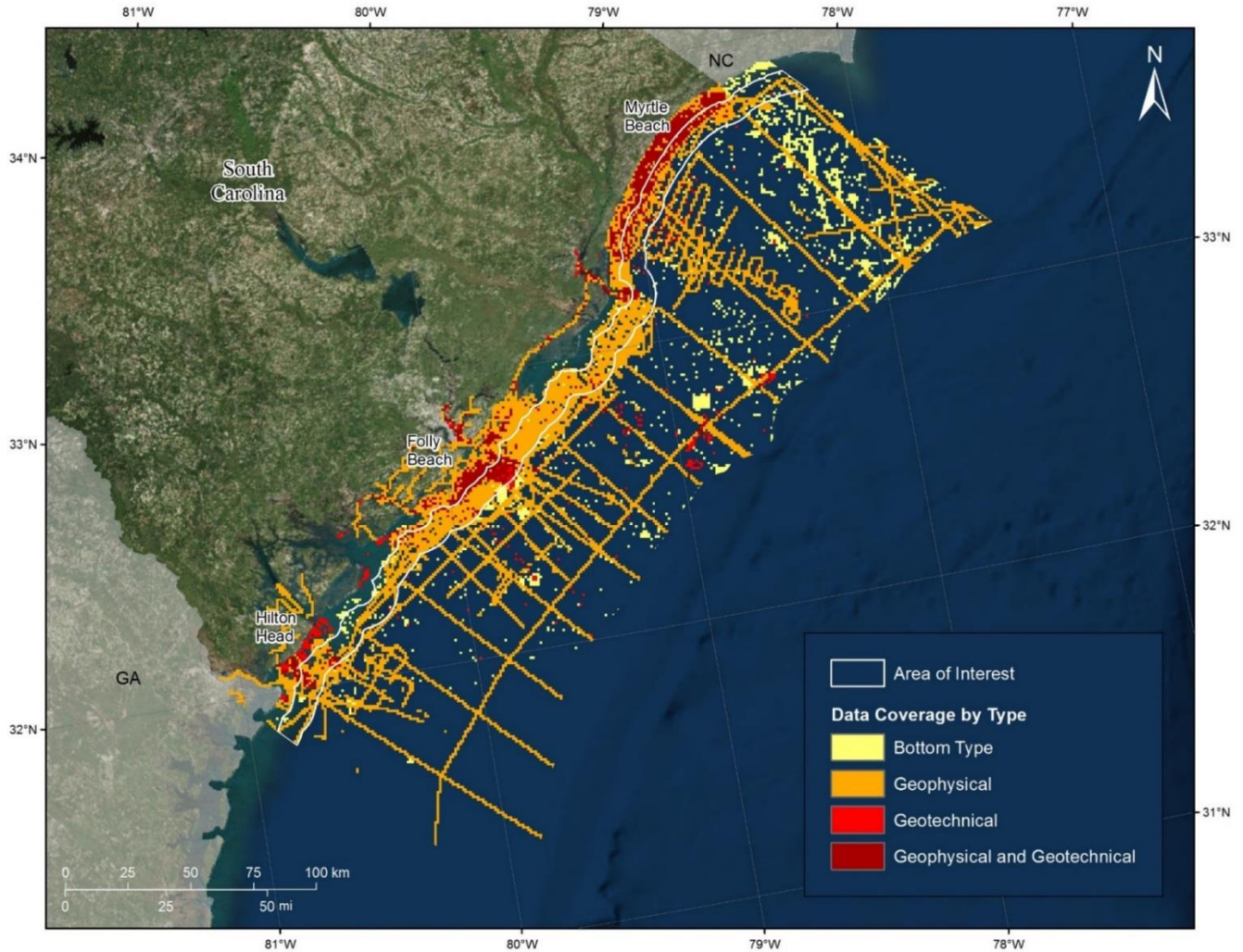


**Figure 4.** This map presents a grid of composite data coverage by data type (1 km$^2$ grid). The darker colors represent higher quality data. Inferred bottom type is classified as lower quality than the information collected through geophysical surveys, vibracores, and surficial grab samples. The highest quality coverage includes a combination of both geophysical and geotechnical data.

## II. Associated Cooperative Agreement Outputs: Map Products

**Gayes, P.T., Philip, R., Doar, W.R., Luciano, K., Howard, C.S.** *In Preparation*. **Onshore-Offshore Map Compilation: Long Bay, South Carolina.**

In 2016, Coastal Carolina University (CCU) and the South Carolina Geological Survey (SCGS) will jointly produce a map series merging offshore and nearshore geophysical and geotechnical data collected through the USGS-funded Coastal Erosion Study with onshore geologic map information compiled by the SCGS. The Coastal Erosion Study, a collaborative effort conducted by the USGS and CCU in the 1990's to early-2000's, collected geophysical (sidescan sonar, chirp subbottom profiler, and ground-penetrating radar) and geotechnical (grabs, vibracores, rotosonic cores) data in an effort to better understand the stratigraphy and surficial sediment distribution of Long Bay, SC. These data are compiled in the dataset used for the South Carolina BOEM state cooperative project and were used for the offshore resources needs assessment (Tweel et al., 2016). This Long Bay onshore-offshore mapping compilation effort will merge interpreted Coastal Erosion Study datasets with onshore geologic information from ten USGS quadrangles: Little River, Wampee, Hand, Ocean Forest, Myrtle Beach, Surfside Beach, Brookgreen, Magnolia Beach, Waverly Mills, and North Island (Figure 5). The resulting composite maps will provide continuous geologic information from offshore to onshore, which is significant particularly as the state of South Carolina is currently investigating the possibility of siting offshore wind energy in the Long Bay region of the state. The project will eventually incorporate geophysical data collected by CB&I offshore of Long Bay in 2015 into the Little River Quadrangle section of the compilation.
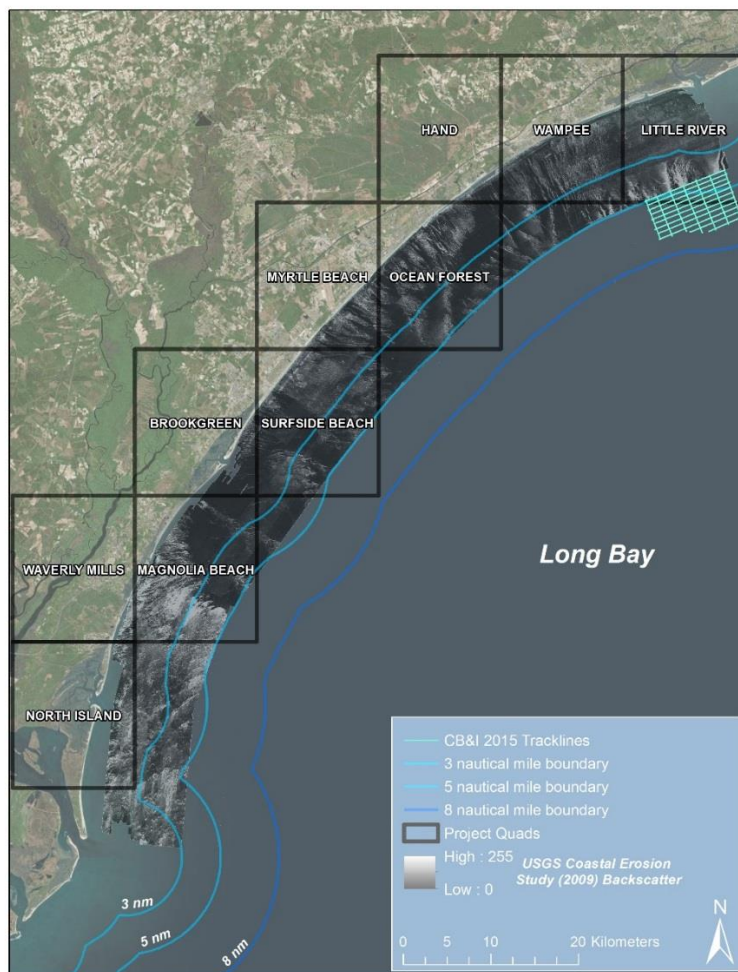


**Figure 5.** This map depicts the project area for SC Geological Survey/Coastal Carolina University Long Bay onshore-offshore map compilation.

**Harris, M.S. *In Review*. Surficial geology and modern sediment thicknesses offshore of Folly Beach, South Carolina: Interpretations from chirp subbottom profiler and sidescan sonar survey data. Map data prepared by the College of Charleston, Department of Geology and Environmental Geosciences, for the South Carolina Department of Natural Resources.**

A geophysical survey was conducted offshore of Folly Beach, South Carolina by the offshore mapping group within the Department of Geology and Environmental Geosciences at the College of Charleston in 2013. Project goals included surficial and shallow stratigraphic mapping, with the goal of identifying and delineating potential sand resources offshore of Folly Beach, SC. Shallow seismic reflection and acoustic backscatter data (Figure 6) were collected with a chirp subbottom profiler and sidescan sonar, respectively, and incorporated with existing seismic data (Harris, 2005) to provide information pertaining to modern sediment thicknesses and distribution of surficial sediments. Backscatter data show a series of shore-perpendicular linear ripple scour depressions interspersed by areas of sand and fine-grained material. Interpreted surficial seafloor geology and sediment thickness information has already proven useful to the Charleston District of the U.S. Army Corps of Engineers, who are responsible for coordinating renourishment projects at Folly Beach and are currently investigating offshore sand resources for future needs. Raw data files (.XTF and SEG-Y) from this project will reside with the College of Charleston, SCDNR, and at the National Centers for Environmental Information (NCEI) (formerly the National Geophysical Data Center (NGDC)).
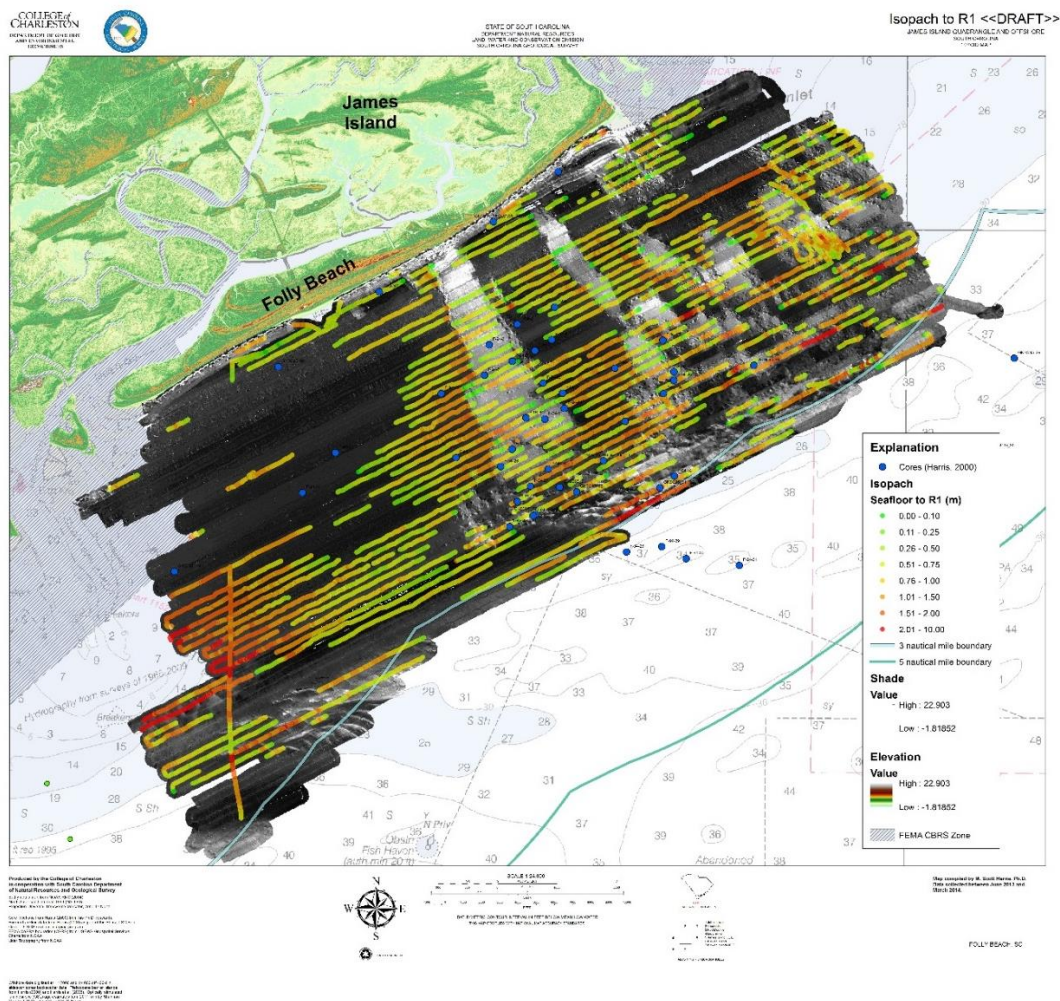


**Figure 6.** The project area extent for College of Charleston 2013 Folly Beach offshore surficial geology and modern sediment thickness study.

**III. Associated Cooperative Agreement Outputs: Presentations with Abstracts**

**Lennon, G., 2015. The BOEM state cooperative offshore sand resources project in South Carolina. Presentation to the Folly Beach Garden Club, Folly Beach, SC, May 26, 2015.**

South Carolina's participation in the BOEM offshore sand resources data inventory and needs assessment project was explained and project details were discussed using pictures and graphics from geological and geophysical work in state and federal waters. Illustrations and examples were also drawn from the BOEM website. The status of the U.S. Army Corps of Engineers sponsored nourishment project on Folly Beach was compared with the Corps' other projects in South Carolina. The erosional history of Folly Island and long-term implications were discussed.

**Tweel, A., and Luciano, K., 2015. South Carolina Offshore Sand Resources: Data Inventory and Needs Assessment Project. South Carolina Beach Advocates 2015 Annual Meeting, North Myrtle Beach, SC, September 29-30, 2015.**

The BOEM-funded offshore sand resources data inventory and needs assessment project in South Carolina aims to assess the distribution of data between 3 and 8 nautical miles offshore while also compiling information pertaining to the needs of coastal areas within the state for nourishment-quality sand resources. General project goals, as well as data acquisition techniques and sources, were discussed along with a preliminary overview of the needs assessment being conducted by BOEM state collaborative project partners within the South Carolina Department of Natural Resources. A preliminary needs assessment based on compiled geophysical and geotechnical datasets illustrated data coverage and potential needs in state waters, OCS waters, the Low Country, and the Grand Strand. As beachfront managers and end-users for renourishment sand, the Beach Advocates group represents stakeholders who have a vested interest in the results of this project.

**Tweel, A., Luciano, K., Koch, E., Sanger, D., and Howard, S., 2016. South Carolina Offshore Sand Resources: Data Inventory and Community Needs. Geological Society of America Southeastern Annual Meeting, Columbia, South Carolina, March 31-April 1, 2016.**

We compiled and reassessed old and new data on sand resources in the Outer Continental Shelf area of South Carolina. The goal of this project was to collect and organize all known data into a spatial database that can be evaluated for data gaps, such that future data collection can be directed towards areas needing information of any particular type. A second goal was to construct beach nourishment timelines, both historical and anticipated, for South Carolina beach communities. We have synthesized these two datasets to identify areas most suitable for new data collection.

**Luciano, K., Tweel, A., Lennon, G., Koch, E., Sanger, D, and Howard, S., 2016. Assessment of South Carolina Offshore Sand Resources: Data Inventory and Future Research Efforts. American Shore and Beach Preservation Association 2016 Annual Meeting, Long Branch, NJ, October 25-28, 2016.** *(To be presented)*

Following the widespread impacts of Hurricane Sandy along the Atlantic coastline in 2012, the Bureau of Ocean Energy Management (BOEM) provided funding for a series of state-level projects to assist with identifying sand resources in the Outer Continental Shelf (OCS) that could be mobilized for future renourishment needs. South Carolina's state cooperative project partnership has focused on developing a framework for locating OCS sand resources for the state, improving knowledge of the scope and characteristics of existing datasets, and identifying future needs and target areas for data collection efforts within the 3-8 nautical mile OCS. Our work partially built on prior multi-year data collection and analysis efforts on the part of state, local, and federal governments, most notably a multi-year effort by the South Carolina Task Force on Offshore Resources in the 1990s. Project data were also acquired from universities and private consulting firms hired to supply community-specific data relating to renourishment projects. These data were integrated along with information pertaining to the renourishment demands of individual beach communities to provide an assessment of future need for these resources. Associated metadata records provide survey-specific information that

can be used to assess the potential value of historical data records to future sand-resource assessments. Additional work for this project will focus on processing and detailed analysis of a dataset collected by BOEM contractor CB&I in 2015 to better understand the distribution and volume of sand situated within shoals in the 3-8 nautical mile OCS offshore of South Carolina. Knowledge of the spatial scope and renourishment potential of these sand resources will improve coastal resilience to significant storm impacts in the future.

**Tweel, A., Luciano, K., Koch, E., Sanger, D., and Howard, S. 2016. Assessment of South Carolina Offshore Sand Resources with Emphasis on Community Needs and Data Gaps. American Shore and Beach Preservation Association 2016 Annual Meeting, Long Branch, NJ, October 25-28, 2016.** *(To be presented)*

Recent storm events and their impacts have revealed a need to further assess offshore sand resources and potential community demand for these resources. Beaches along coastal South Carolina have undergone at least 78 nourishment projects since 1968, totaling approximately 58 million cubic yards of sediment. With few exceptions, these projects sought sand at increasing distances, and therefore cost, from where placement was desired. Because of this trend, increasing exploitation of sand in the Outer Continental Shelf area (OCS) is anticipated. This study presents an assessment of sediment data availability in the OCS, and aims to identify where more thorough exploration may be warranted, as well as areas lacking data altogether.

This analysis builds upon previous work to include more recent datasets, as well as a more comprehensive assessment of data types and data gaps. An additional component is the inclusion of beach nourishment history along the South Carolina coast which aids in identifying locations and volumes of potential future projects. The merging of these two datasets helps ensure that the utility and benefit of future data collection is maximized. Beach communities with the highest annualized sand usage were Folly Beach and Hilton Head Island. As a region, the Grand Strand has placed the most sand along its beaches, but this region is also much larger than beaches along the southern South Carolina coast, and has consequently drawn from sand resources along a 75 km stretch of state and OCS bottoms.

Data densities and data quality are generally proportional to patterns of sand-resource use. Despite its history of large nourishment projects, however, the Grand Strand OCS just inside of 8 nm is data poor, and several areas contain no data. This most likely results from the availability of usable sand closer to placement areas. Coastal South Carolina between Winyah Bay and Dewees Island is lacking coverage of geotechnical data, but there are no populated beaches in this stretch, and therefore little demand, at this time, for nourishment. Folly Beach OCS has the greatest data density and quality, but also a high demand for sand resources, as these borrow areas often refill with sediments too fine to use in future projects. Analysis at finer resolution reveals several areas that warrant further exploration. Data coverage near Hilton Head Island is sporadic, and geotechnical data is lacking in a large portion of the OCS area. Previous nourishment projects at Hilton Head, including a planned 2016 nourishment, tend to utilize ebb tidal deltas near the inlet mouths, well inside of the OCS. Previous monitoring has demonstrated that these types of borrow areas have a greater tendency to be used more than once. Future work may focus on data collection and further analysis in areas where demand is anticipated and data density is limited.

**IV. Associated Cooperative Agreement Outputs (Training)**

**Tweel, A., Koch, E., Luciano, K., and Lennon, G., Attended, Coastal GeoTools 2015. North Charleston, South Carolina, March 30-April 2 (2015).** Andrew Tweel, Erin Koch, Katie Luciano, and Gered Lennon attended the 2015 Coastal GeoTools conference to watch presentations on a wide variety of topics dealing with the application of geospatial data to decision-making. ArcGIS applications and web outputs, particularly the use of GIS Story Maps to display data for users, were a topic of interest. Attendees also met with Lora Turner, Oceanographer from BOEM's Marine Minerals Program, to discuss data acquisition and GIS database management plans for the SC state cooperative project.

**Koch, E., Attended, ESRI USER Conference and Preconference Training. San Diego, California, July 18-23 (2015).** Erin Koch, GIS Manager, participated in the 2015 ESRI User Conference and Preconference Training titled *Skills Review for ArcGIS Desktop Professional*. As part of the grant agreement with BOEM, the GIS personnel responsible for data management and archiving of spatial data was provided with additional training opportunities to the benefit of the cooperative agreement. By attending the conference, Erin Koch is up-to-date on data standards associated with managing GIS and spatial datasets. She also attended several technical sessions on geodatabase management and the creation of federally compliant metadata.

**Koch, E., Attended, ESRI Oceans Forum. Redlands, California, November 4-6 (2015).** Erin Koch, GIS Manager, participated in a unique conference with other ocean GIS community agencies to develop and explore new concepts in ocean analytics and applications. Other agencies in attendence included NOAA, USGS, BOEM, and other state and federal Marine Resource GIS professionals. Erin Koch, as our South Carolina cooperative representative, was able to meet and discuss the progress of this project with BOEM representatives and with the Quantum Spatial team for the geodatabase development. She was able to preview the MMPGIS data viewer, and learned about utilizing marine spatial planning for recreational and economic ocean resources.

**Luciano, K., Attended, ChesapeakeTech SonarWiz Software Geophysical Acquisition and Processing Training, Charleston, South Carolina, December 8-10 (2015).** Katie Luciano attended a 3-day training workshop on processing sidescan sonar, subbottom profiler, magnetometer, and multibeam bathymetry geophysical data using ChesapeakeTech SonarWiz software. Training will be used for future processing of data acquired using SCDNR sidescan sonar instrumentation, and for interpreting geophysical data acquired by CB&I for the second iteration of the state cooperative work. The workshop also included a boat-based field demonstration to showcase EdgeTech's 6205 combined swath bathymetry and sidescan sonar in Charleston Harbor. Contacts were made with BOEM representatives Leighann Brandt and Paul Knorr.

**Luciano, K., Attended, AGU Ocean Sciences Meeting. New Orleans, Louisiana, February 21-26 (2016).** Katie Luciano attended the American Geophysical Union's Ocean Sciences Meeting, a conference of nearly 4,000 attendees focused on disciplines ranging from physical, chemical, and biological oceanography to plankton communities and estuarine science. Presentations on offshore mapping, physical oceanographic processes, and science communication were attended. Several presentations, notably from Lamont-Doherty and the USGS, provided information on geophysical data portals that were used in data accumulation for the state cooperative project.

**V. Associated Cooperative Agreement Outputs (Web Served Databases)**

A database will be served through the S.C. Department of Natural Resources, Geographic Information System website. The geodatabase will contain spatial location and identification information for geotechnical, geophysical, and other sand resources related themes. Whenever possible the source data will be included if it is not being hosted elsewhere. Derivative and interpreted layers associated with the Needs Assessment analysis will also be included in the geodatabase. Future plans are to include a web mapping application that allows the public to view available information without downloading the GIS data. [http://www.dnr.sc.gov/gis/](http://www.dnr.sc.gov/gis/)

## VI. Associated Cooperative Agreement Outputs

1.  *BOEM State Cooperative Representative (NC, SC, Georgia) Meeting with CB&I to discuss Atlantic Sand and Gravel Assessment project data collection: Resulting Geophysical Trackline and Geotechnical Grab Sample and Vibracore Location Suggestions*

On January 27, 2015, CB&I hosted a meeting at the South Carolina Department of Natural Resources office with the U.S. Army Corps of Engineers – Charleston and Wilmington Districts and other regional partners from North Carolina and Georgia working on the BOEM Atlantic Sand and Gravel Assessment Project (ASAP). The goal of the meeting was to discuss CB&I's plans to acquire geophysical and geotechnical data in the OCS offshore of South Carolina, North Carolina, and Georgia. For South Carolina, total of 475 km of trackline, 20 vibracores, and 10 grab samples were suggested in areas that were prioritized based on proximity to beach communities or other coastal areas that have or may have future need for renourishment-quality sand (Figure 8). Suggestions for priority areas included Hilton Head (6.2 km and 2 grabs), Folly/Kiawah (347 km and 20 vibracores), Cape Romain (11.2 km and 1 grab), and Long Bay (110.6 km and 7 grabs). These suggestions were incorporated in to CB&I's data acquisition tracklines for their project. While the final locations of geotechnical (grab and vibracore) samples were decided during the survey by CB&I, all trackline suggestions resulting from this meeting were ultimately incorporated into CB&I's survey design.
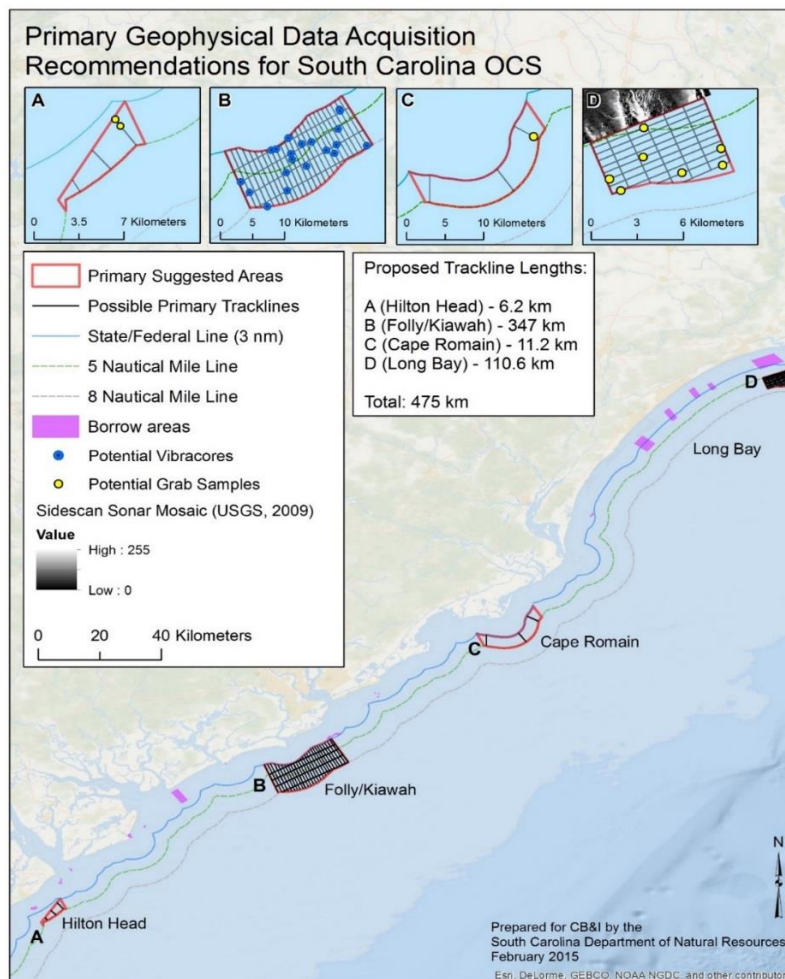


**Figure 8.** Final map provided to CB&I for geophysical trackline and geotechnical grab and core recommendations for South Carolina in 2015. This map was produced as a result of decisions made at the meeting on 1/27/2015.

2. *Recommendations to the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management (SCDHEC – OCRM) and BOEM for areas in the 3-8 nm OCS north of Charleston, SC that would benefit from additional geophysical coverage*

**Based on data coverage and needs assessment results from state cooperative project, suggestions were provided to SCDHEC – OCRM and BOEM to inform possible geophysical trackline that may be collected by the NOAA ship Nancy Foster in transit north from Charleston to Long Bay, SC. These suggestions were made based on areas that were originally identified by CB&I in the state cooperative meeting on 1/27/2015 as possible sand resource areas, based on NOAA bathymetric data layers. Many of these potential sand resource areas in the 3-8 nm distance from shore have minimal or no associated data. Suggestions also took the proximity of these areas of interest to beach communities with nourishment needs into account. The text below is a summary of these recommendations, provided by SCDNR 7/26/2016.**

*Using the compiled datasets that SCDNR reviewed within the 3-8 nm area of interest for the BOEM Atlantic Sand and Gravel Assessment Project (ASAP) with CB&I in 2015, we recommend that any future geophysical tracklines collected by the NOAA ship Nancy Foster en route north from Charleston to Long Bay focus on potential areas with large sand bodies that were identified by CB&I in their pre-survey reconnaissance efforts. Prior to formalizing the tracklines for the South Carolina section of their survey, CB&I used NOAA bathymetry data to create a map that identified potential surficial sand bodies based on seafloor elevation.*

*Pre-survey discussions with SCDNR and the US Army Corps of Engineers, Charleston District led CB&I and BOEM to focus on four areas of interest for their 2015 survey: Hilton Head Island, offshore of Folly/Kiawah Islands, Cape Romain, and Long Bay (offshore of North Myrtle Beach). Based on the presence of other possible areas with sand resources that were not investigated in the 3-8 nm focus area, we recommend that any potential geophysical data collection efforts be used to gather data in these potential shoal areas offshore of the Isle of Palms and the northern part of Winyah Bay, closer to Pawley's Island.*

*Based on known geophysical data coverage and a consideration of nourishment needs in Long Bay, we also recommend any possible data collection be focused in the 5-8 nm area offshore of Garden City, Surfside Beach, and North Myrtle Beach where data gaps exist.*

*Any data collected for these areas could be used to inform future investigations for nourishment-quality sand resources in federal waters.*

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