Announcement M13AS00014: Hurricane Sandy Coastal Recovery and Resiliency - Resource Identification, Delineation and Management Practices

Agreement: M14AC0007: Maryland Cooperative Agreement: Round 2

Maryland Department of Natural Resources, Maryland Geological Survey;

Offshore Sand Resources in South-Central Maryland Shoal Fields

Lead Agency:

Maryland Department of Natural Resources, Maryland Geological Survey

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Summary Report

Cooperative Agreement Outputs including Project Deliverables:

Van Ryswick, S.M., Nicholson, B.C., and Connallon, C.B. Offshore Sand Resources in South-Central Maryland Shoal Fields: BOEM/Maryland Cooperative Agreement Technical Report.

After Hurricane Sandy in 2012, there was interest in developing more resilient shorelines to reduce their damage and erosion when exposed to powerful storms. In 2015, 2016 and 2017 the Bureau of Ocean Energy Management (BOEM) funded offshore surveys to identify new sand resources along the Atlantic coast to build an inventory of offshore sand resources. The inventory will aid the development of coastal resilience to protect infrastructure and habitat. To this end, BOEM initiated the Atlantic Sand Assessment Project (ASAP) to identify new sand resource potential from geological and geophysical research. Chicago Bridge & Iron Company (CB&I) was contracted by BOEM to carry out the ASAP and collect the relevant offshore data, including side scan imagery, seismic profiles, vibracores and grab samples (**Figure 1**). As part of a multi-state cooperative agreement through BOEM, the Maryland Geological Survey (MGS) defined the shoal boundaries and estimated the sand volume of a shoal field off the coast of Maryland. This project is considered a successor to a series of similar studies performed in the 1990s that more accurately defined sand resource potential in shoal fields along Maryland's coastline.

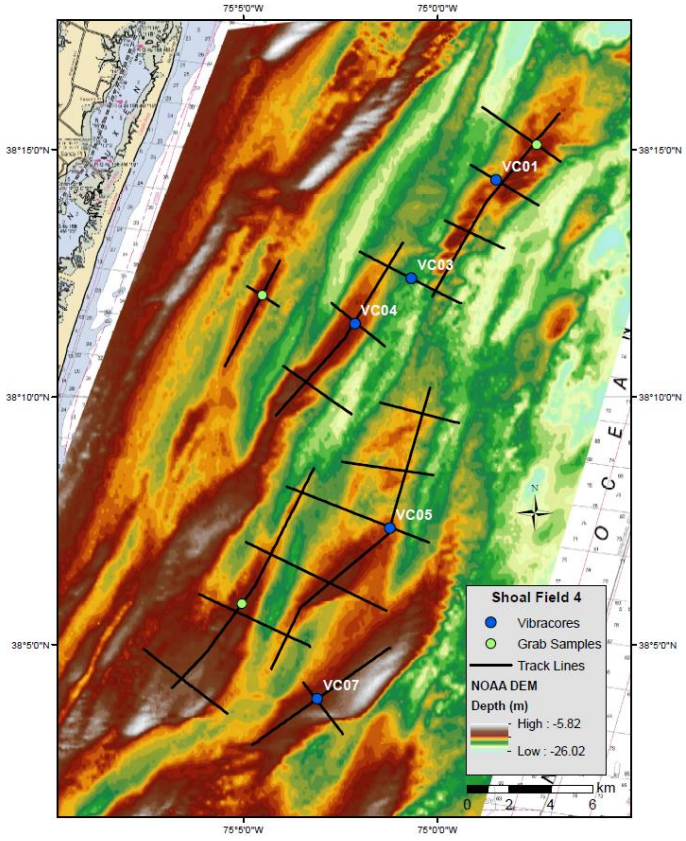

Figure 1: Interpolated bathymetry raster of the study area. Data shown include seismic track-lines, vibracore, and grab sample locations used throughout this study.

To estimate shoal volume, MGS used Sonar Wiz 5 to analyze seismic profiles and vibracore logs to delineate the depth of shoal base. Specifically, vibracore logs were a valuable control point to verify the transition between the upper, surficial sand layers and underlying mud or clay layers while analyzing the seismic profiles. Once this sand-clay transition layer was delineated, it was exported into ArcGIS 10.1, where MGS was able to perform interpolation measures to produce a thickness layer for each shoal within the shoal field. Shoal extents were limited to one meter thickness in accordance with previous studies where one meter thickness is the required limit for efficient sand dredging. Once the thickness layer was available, ArcGIS calculated the total area and volume of sand material in the shoal field. Sediment volume calculations are shown below in **Table 1**. Total shoal volume is nearly 160 million cubic meters over an area of 67 million square meters.

Table 1: Individual shoal statistics. Asterisk (*) indicates 'million'.

Shoal ID	**Area (*m^2)**	**Volume (*m^3)**	**Maximum thickness (m)**	**Mean thickness (m)**
N	7.68	19.47	4.98	2.54
O	16.67	40.01	5.94	2.40
P	0.38	0.92	3.59	2.41
Q	9.11	16.93	4.18	1.86
T	1.42	2.66	3.04	1.88
U	14.63	34.52	4.87	2.36
V	1.98	3.07	2.43	1.56
W	15.16	42.26	7.43	2.79
Total:	**67.03**	**159.84**		

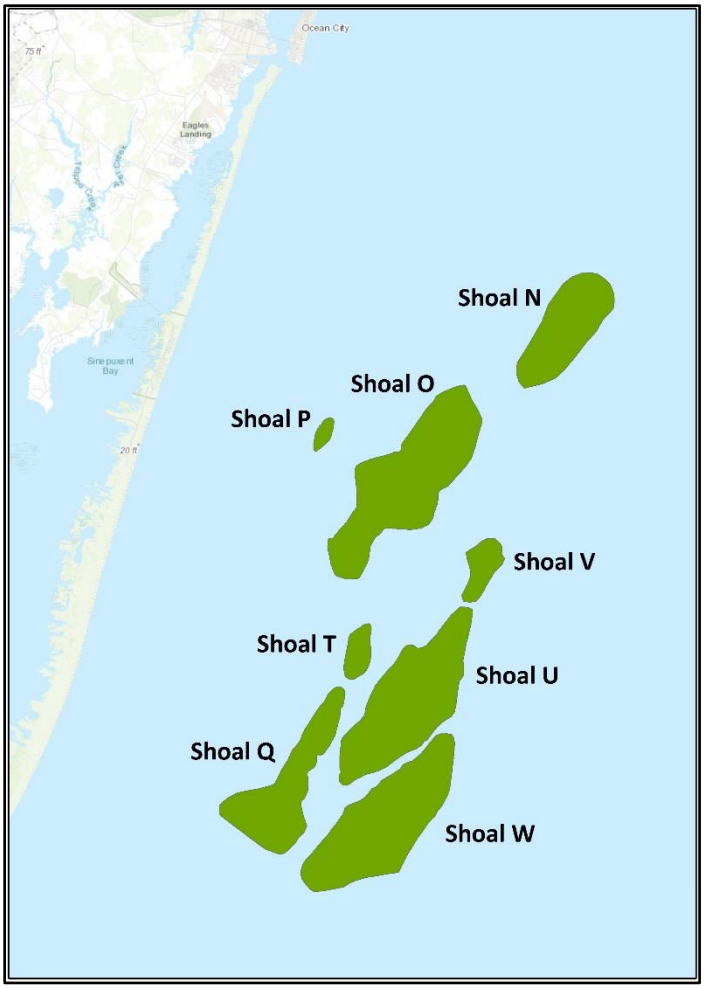

Figure 2: Location and extent of identified shoals. Ocean City, Maryland is labeled near the top of the map, for reference. Shoal numbers match with Shoal IDs in Table 1.

Covering an area over 180 square kilometers, MGS identified eight individual shoals (**Figure 2**) ranging in depth between 9.4 meters at the most shallow point and 23.3 meters at the deepest. Paleochannel features are visible in seismic images but occur below the shoal base and bulk core statistics indicate shoal-sand size varies between medium and coarse sand that is poorly to moderately sorted. Mean grain size for the whole field varies between 0.33 and 0.88 millimeters. Previous shoal studies in this area determined sand resource potential by comparing the shoal mean grain size and sorting to that of native Ocean City beach sand. This helps to gauge how well shoal sand would match the beach sand for replenishment, and accounts for the additional sand required to maintain the beach deposit once equilibrium is reached. Comparing each vibracore bulk-calculated parameter reveals all samples, including grab samples, exceed the threshold for high resource potential for Ocean City beaches. Thus indicating, at least for shoals that have been sampled here, that the shoals in this study area have a high resource potential. MGS anticipates this shoal field will be a valuable part of the Atlantic sand inventory for replenishing and reinforcing coastal beaches.

Associated Cooperative Agreement Outputs (Presentations):

American Shore and Beach Preservation Association (ASBPA) Annual Conference:

MGS presented a "Comparison of Seabed Classification Methodologies Using Side Scan Sonar Data Along Maryland's Atlantic Coastline" during the poster session at the ASBPA Annual Conference held October 25-28, 2016.

Presentation and Demo for Illinois Geological Survey:

On August 15, 2017 MGS hosted a meeting and data acquisition field trip with staff from the Illinois Geological Survey demonstrating the use of acoustic mapping technologies for seabed mapping in interpretations to assist with their future endeavors to map sand resource and sand movement on the Great Lakes.

Associated Cooperative Agreement Outputs (Web Served Databases):

An interactive map will be hosted via MGS on ArcGIS Online that will include seismic lines, vibracores, and grab sample data as well as DEMs and sand thickness layers.