COASTAL PLANNING & ENGINEERING OF NORTH CAROLINA, INC.

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July 15, 2014

David W. Cooke
Regional Supervisor for Resource Evaluation
Bureau of Ocean Energy Management
Gulf of Mexico OCS Region
1201 Elmwood Park Boulevard
New Orleans, LA 70123-2394

Subject: Final Report and Submission of Reconnaissance Geophysical Survey Results (BOEM Authorization for Geophysical Prospecting for Mineral Resources or Scientific Research on the Outer Continental Shelf Related to Mineral Other Than Oil, Gas, and Sulphur: Authorization Number E13-002)

Dear Mr. Cooke:

This letter serves as the required final report and submittal of geophysical data associated with the activities authorized by BOEM Authorization E13-002. Section III (B) of the authorization requires a final report be submitted within 30 days of completion of field activities.

Coastal Planning & Engineering of North Carolina, Inc. (CPE-NC) requested authorization from BOEM in order to conduct a reconnaissance level High Resolution CHIRP Sub-bottom profiler, sidescan sonar, single beam bathymetric sounding, and magnetometer survey to determine the estimates of quantity and quality of sediments located in Federal waters and identify any potential environmental or cultural resources for avoidance offshore Dare County, North Carolina. CPE-NC proposed 150 meter (m) line spacing throughout all three of the survey Areas (A, B, and C). In order to get basic coverage of each survey area, line spacing was conducted at 300 m and filled in at 150 m as time allowed. A total of 69.1 nautical miles of geophysical survey data were collected along 58 tracklines within Areas A, B, and C. A crew of five (5) scientists and technicians mobilized to Morehead City, North Carolina on Saturday, June 7th, 2014 to mobilize the survey vessel, *M/V* Thunderforce. The crew mobilized the *M/V* Thunderforce at the Portside Marina in Morehead City and departed at 22:30 the evening of June 7th. The vessel transited north until arrival at survey Area A at 21:00 on June 8th, 2014. Geophysical survey operations began the morning of June 9th, 2014 and continued through June 13th, 2014. Limited geophysical data was collected on June 11th and June 12th, 2014 due to weather and equipment maintenance. Upon completion of geophysical data on June 13, 2014, the vessel began transit to Morehead City where demobilization was completed on June 15th, 2014.

CPE-NC utilized a Trimble real-time kinematic (RTK) global positioning system (GPS) and a navigation computer running Hypack 2014 and 2013a software. An EdgeTech 3200 Sub-Bottom Profiler with 512i towfish was utilized to conduct the sub-bottom profile surveys. EdgeTech 4125 and EdgeTech 4200-HFL sidescan sonar systems were utilized to image the seafloor. A Geometrics G-882 Digital Cesium Marine Magnetometer was utilized to perform an investigation of magnetic anomalies in the vicinity of proposed vibracore operations. The hydrographic survey data was collected using an Odom Hydrographic Systems, Inc.'s Hydrotrac, single frequency portable hydrographic echo sounder.

The RTK GPS system was fixed to the vessel and positioned atop the main cabin and the Odom Hydrographic echo sounder was fixed to a pole mount on the starboard side of the vessel. The sidescan sonar, sub-bottom profiler and magnetometer were towed from the stern of the vessel; furthermore the sidescan sonar and magnetometer were towed at a distance to ensure each system was within 15 m and 6 m above the seafloor, respectively. Cable lengths of

each system were entered into Hypack in order to account for the layback and provide accurate positioning of each system.

Daily Logs:

Day 1. June 7, 2014: Survey crew arrived in Morehead City, North Carolina to mobilize vessel. Upon completion of mobilization, the vessel departed Portside Marina, Morehead City at 22:30 to begin overnight transit to survey Area A.

Day 2. June 8, 2014: Transit continued north towards survey Area A. Arrive in vicinity of Area A at 21:00. The vessel anchored for the night.

Day 3. June 9, 2014: Survey gear was deployed from the vessel at 07:00 and survey operations began at 07:30 in Area A. A total of 29 survey lines were completed in Area A. The vessel departed survey Area A at 21:00 to transit to survey Area B where the vessel anchored for the night. Weather conditions throughout the day were calm to moderate with seas less than 1 m and wind between 0 and 5 knots out of the south, southeast and building to 1 to 2 m and 5 to 10 knots in the evening.

Day 4. June 10, 2014: Survey gear was deployed from the vessel at 08:30 and survey operations began at 09:30. A total of 12 survey lines were completed at 300 m spacing in Area B. At 13:10 the vessel began transit to Area C. Survey operations began in Area C at 14:00 and continued through 14:30, completing two (2) survey lines. Equipment maintenance occupied the remainder of daylight hours. The vessel anchored adjacent to Area C for the night. Weather conditions throughout the day were favorable with seas less than 1 m and wind between 0 and 5 knots out of the south.

Day 5. June 11, 2014. Survey gear was deployed from the vessel at 07:00 and survey operations began at 07:40. A total of two (2) survey lines were completed in Area C due to weather delays and equipment maintenance. The vessel anchored adjacent to Area C overnight. Weather conditions were calm to moderate with light to heavy showers and seas 1 m with winds 5 knots from the south.

Day 6. June 12, 2014. Due to equipment maintenance, survey gear was deployed from the vessel at 15:00 and survey operations began at 15:30. Four (4) survey lines were completed in Area C and the vessel anchored adjacent to Area C for the night. Weather conditions were moderate; seas were between 1 and 2 m with winds at 10 knots out of the south.

Day 7. June 13, 2014. Survey gear was deployed from the vessel at 06:30 and survey operations began in Area C at 08:00. A total of eight (8) survey lines were completed in Area C at 300 m spacing before transiting to Area B at 15:45. One (1) survey line was completed in Area B before the vessel began transit to Area S-1, an area within state waters. One (1) line was completed in Area S-1 at 22:50 and the vessel began overnight transit to Morehead City, North Carolina. Weather conditions were moderate with 1 m seas and winds at 10 knots from the south, southeast.

Day 8. June 14, 2014. Transit continued south towards Portside Marina in Morehead City, North Carolina. The survey vessel anchored for the night outside the Morehead City inlet.

Day 9. June 15, 2014. The vessel arrived at Portside Marina in Morehead City, North Carolina in the early afternoon to demobilize marking the completion of preliminary data collection.

Environmental Observations and Preliminary Results:
During the course of the investigation, no hydrocarbons or known signatures characteristic of hydrocarbons were observed in the geophysical data. As indicated in Authorization E13-002, Protected Species Observers (PSO) were utilized to monitor the exclusion zone in order to limit or eliminate harassment to marine mammals at all times during survey operations in Federal Waters. In addition, survey operations were conducted during daylight hours only to ensure that sufficient light was available to conduct PSO monitoring. No adverse effects on the environment, aquatic life or archaeological resources were observed as a result of survey activities.

An analysis of the sidescan sonar data indicates no presence of hardbottom habitats or consolidated rock exposures outcropping on the seafloor within the datasets collected in Areas A, B, and C. Furthermore, this observation is generally supported by the regional geology of the northern North Carolina continental shelf. Areas A, B, and C are located within the Albemarle embayment, which contain a ~90-meter thick quarternary stratigraphic record (Mallinson *et al.*, 2005 and Mallinson *et al.*, 2010). Recent work conducted by Theiler et al. (2014), suggests the Pliocene-Pleistocene boundary, which dips southward, is at a depth of ~80 meters offshore Kitty Hawk, NC. The seafloor in the vicinity of Areas A, B, and C were described by Theiler et al. (2014) as a largely patchy veneer of fine-grained Holocene sediments overlying Pleistocene sediments. The sidescan data indicated a generally fine to medium coarse sandy bottom with intermittent sand waves and exposed mud features.

The sub-bottom data was correlated to previously collected geotechnical data (vibracores and washbores). A preliminary assessment of the sub-bottom data presents sporadic to organized sand hill formations of target sediment deposits within survey Areas A, B, and C. Area A was determined to have a higher volume of target sediment on the southern portion, likely consisting of medium to coarse sands with some shell overlaying finer grained material (muds). Generally, the feature is approximately 9-14 feet thick, with some areas potentially being 17 feet thick. Target sediments in Area B appear to be associated with individual sand hill features spread throughout the area. Like Area A, the sand hill formations appear to be medium to coarse grained sand with intermittent shell layers, overlaying fine grain sediments. Due to some variability in the vibracores, washbores and the sub-bottom data, the preliminary analysis yielded a potential thickness of approximately 9 feet. Target sediments in Area C are concentrated on both the eastern and western portion of the area, overlaying a channel which is partially exposed across the center of the survey area. The target sediments appear to be mostly organized in large sand hills oriented southwest to northeast, with the exposed channel feature interrupting the formation across the center. Due to a lack of preliminary geotechnical data in Area C, it is not possible to accurately estimate the thickness of the sand throughout the area; however the average thickness ranges from 8-12 feet. The sub-bottom data did not indicate any environments with signatures similar to hardbottom habitats or ledged outcrops.

Bathymetric data were edited and reduced with HYPACK, Trimble Business Center and CPE-NC's internal software programs. RTK tide data collected was compared to the NOAA Tide Station at the Duck Field Research Facility Pier (8651370). The raw digital data were viewed in HYPACK and a comma delimited file was created and exported for further analysis and contouring. Final bathymetric data products are provided in units of U.S. survey feet referenced horizontally to the North Carolina State Plane Coordinate System (NAD83) and vertically to the North American Vertical Datum (NAVD88).

Magnetometer data were post processed and reviewed by Tidewater Atlantic Research, Inc. to determine if the remote sensing data identified any signatures associated with submerged cultural resources at locations selected for coring. In Area A, 22 lines of magnetic and acoustic data were examined. No anomalies, sidescan sonar or sub-bottom profiler

signatures were present at any of the 147 proposed core sites. No additional investigation or avoidance is recommended in conjunction with coring at the proposed sites in Area A.

In Area B, 12 lines of magnetic and acoustic data were examined. No anomalies, sidescan sonar or sub-bottom profiler signatures were present at any of the 46 proposed core sites. No additional investigation or avoidance is recommended in conjunction with coring at the sites in Area B.

In Area C, 13 lines of magnetic and acoustic data were examined. No anomalies, sidescan sonar or sub-bottom profiler signatures were present at 79 of the 83 proposed core sites. No additional investigation or avoidance is recommended in conjunction with coring at 79 of the proposed sites in Area C. At four (4) of the initially proposed core locations, one on survey line 711 and three on line 717, magnetic and acoustic signatures confirm a high potential for association with submerged cultural resources. On survey line 711, a magnetic signature could be associated with potentially significant submerged cultural resources and avoidance of the site was recommended. On survey line 717, three magnetic signatures and two sonar images could also be associated with potentially significant submerged cultural resources. Those initially proposed core sites will be avoided.

Data Products:

Sidescan sonar and CHIRP sub-bottom data were processed in Chesapeake Technology, Inc.'s SonarWiz5 software. Sub-bottom data were compared to previously collected washbores and vibracores. Geotechnical data was plotted on the sub-bottom data for reference purposes. Sub-bottom files formatted in SEG-P1 as stipulated by the conditions of the Authorization are included on the enclosed CD as reference to this letter report. An overview map as well as individual maps for Areas A, B, and C with as-run survey lines are also provided as attachments to this letter report. Final data products will be available to BOEM by December 31, 2014. CPE-NC will provide a copy of the final borrow area development and compatibility analysis report to BOEM upon its completion, which is anticipated to be prior to December 31, 2014.

Summary of Findings:

CPE-NC collected a total of 69.1 nautical miles of geophysical survey data along 58 tracklines within survey Areas A, B, and C between June 9th and June 13th, 2014 off the coast of northern Dare County, North Carolina. Based on preliminary geotechnical data, a preliminary analysis of the shallow penetration sub-bottom data indicate that there is a presence of target material in the datasets collected in survey Areas A, B, and C. Although some of the data were collected at 300 m spacing to achieve basic coverage, in order to accurately estimate the volume of target material within each survey area, a cultural resource survey will be required. Data collected during that survey will be compared with existing geophysical and geological datasets. The sidescan sonar data, along with the shallow penetration sub-bottom data, do not indicate the presence of hardbottom or ledged outcrops in the areas proposed for vibracoring operations.

List of Attachments:

Attachment 1 – Overview Map of Dare County Survey Areas A, B, and C.

Attachment 2 – As Run Lines Area A

Attachment 3 – As Run Lines Area B

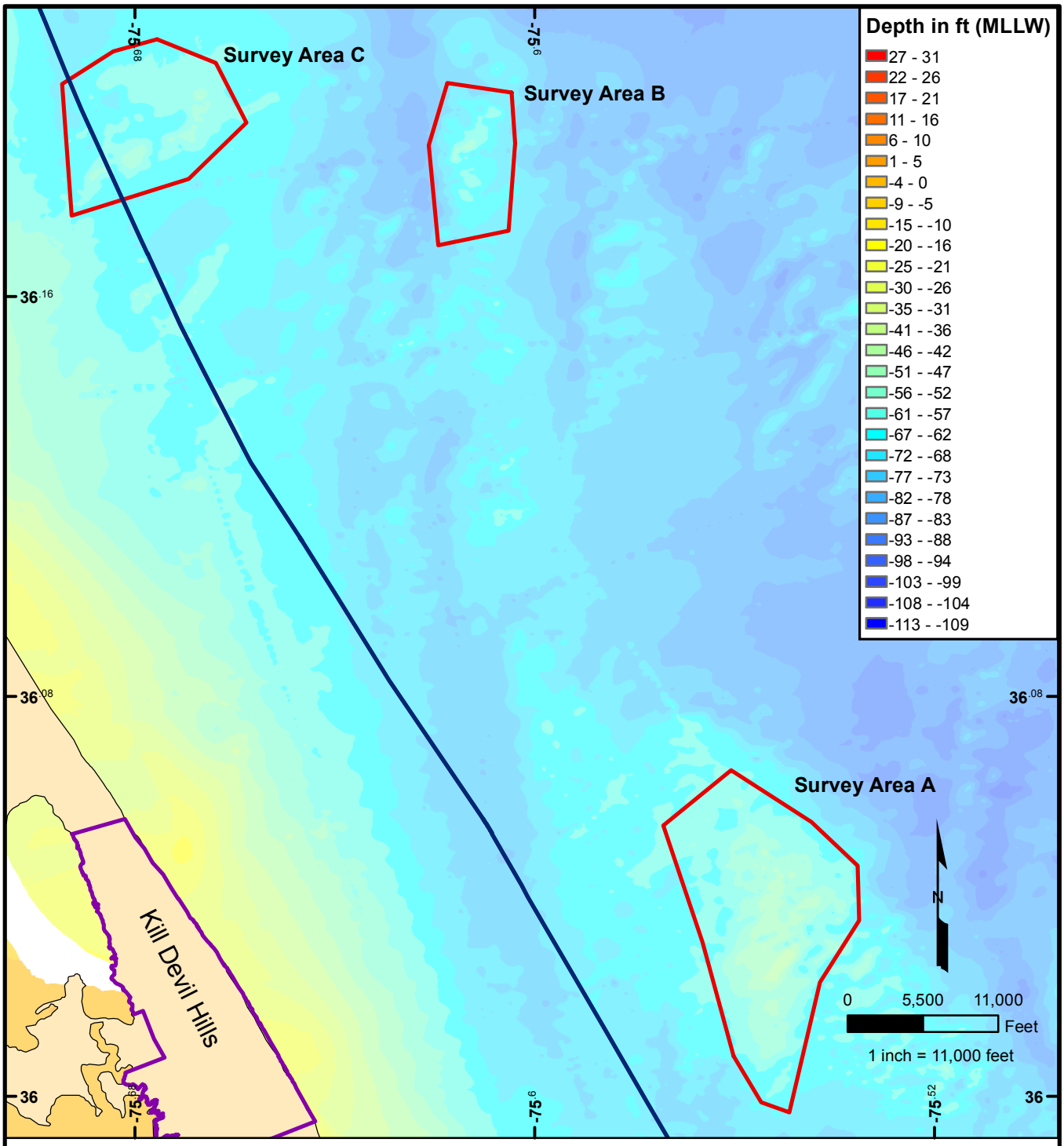
Attachment 4 – As Run Lines Area C

Copies of this report have been submitted to the Towns of Duck, Kitty Hawk, and Kill Devil Hills. Please feel free to contact me with any questions or comments regarding this submittal.

Very truly yours,

COASTAL PLANNING & ENGINEERING OF NORTH CAROLINA, INC.

Kenneth Willson
Project Manager



Notes:

1. Coordinates are in decimal degrees based on WGS 1984.
2. Bathymetric surface was created based on NOAA NOS Hydrographic Survey data, depth is in feet, MLLW.
3. Investigation area falls within protraction grid NJ18-11.

Legend:

- Survey Areas
- Federal/State Boundary
- Town Limit

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TITLE:

Northern Dare County Cooperative Sand Search
Dare County, North Carolina
Survey Area

DATE: 07/14/14	BY: ABV	COMM. NO.: 151167	FIGURE NO. 01

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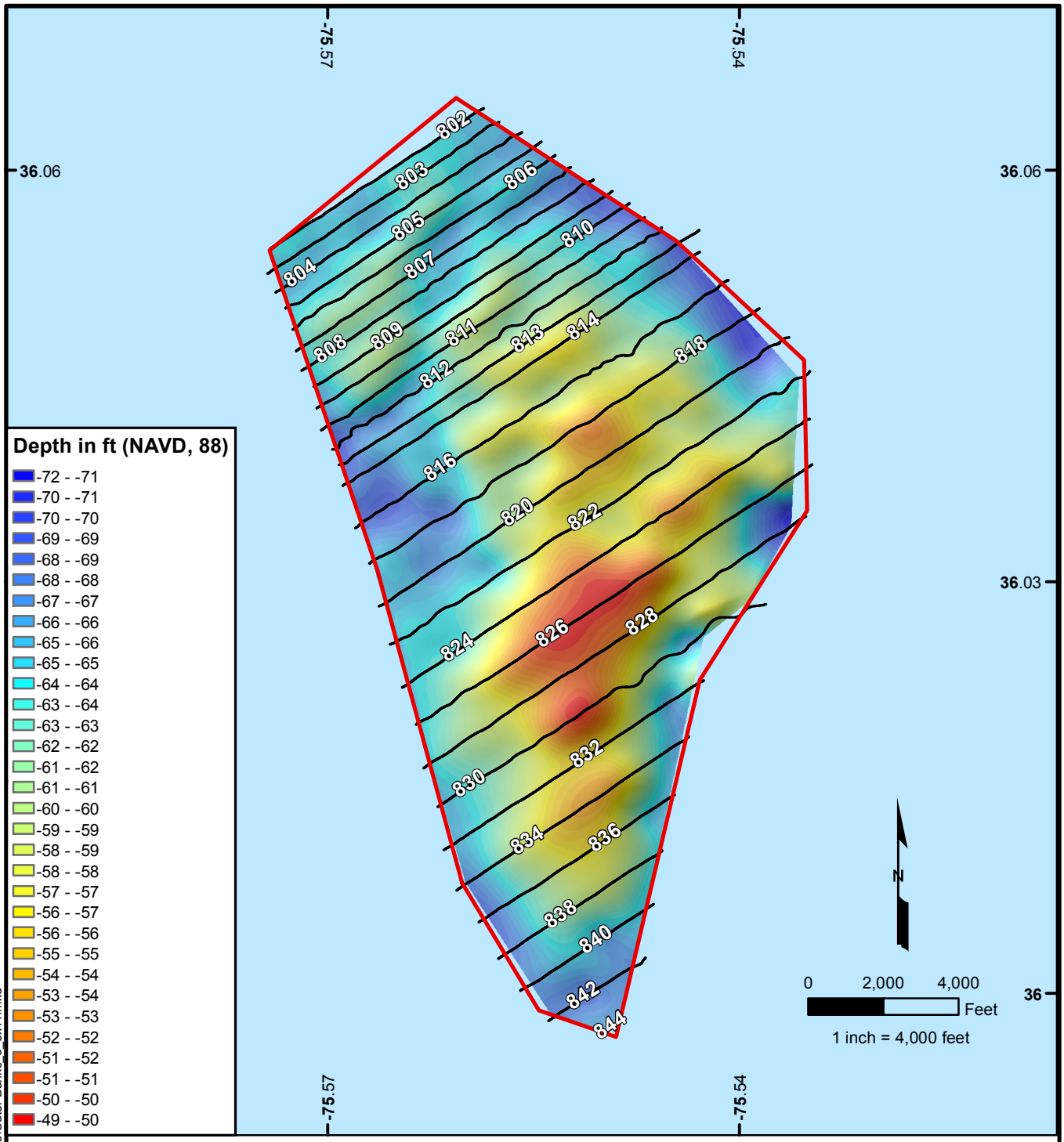

Notes:

1. Coordinates are in decimal degrees based on WGS 1984.
2. Bathymetric surface was created by CPENC, depth is in feet, NAVD 1988.
3. Investigation area falls within protraction grid NJ18-11.

Legend:

- Survey Lines
- Survey Area

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TITLE:

Northern Dare County Cooperative Sand Search
Dare County, North Carolina
Survey Area A

DATE: 07/14/14	BY: ABV	COMM. NO.: 151167	FIGURE NO. 02

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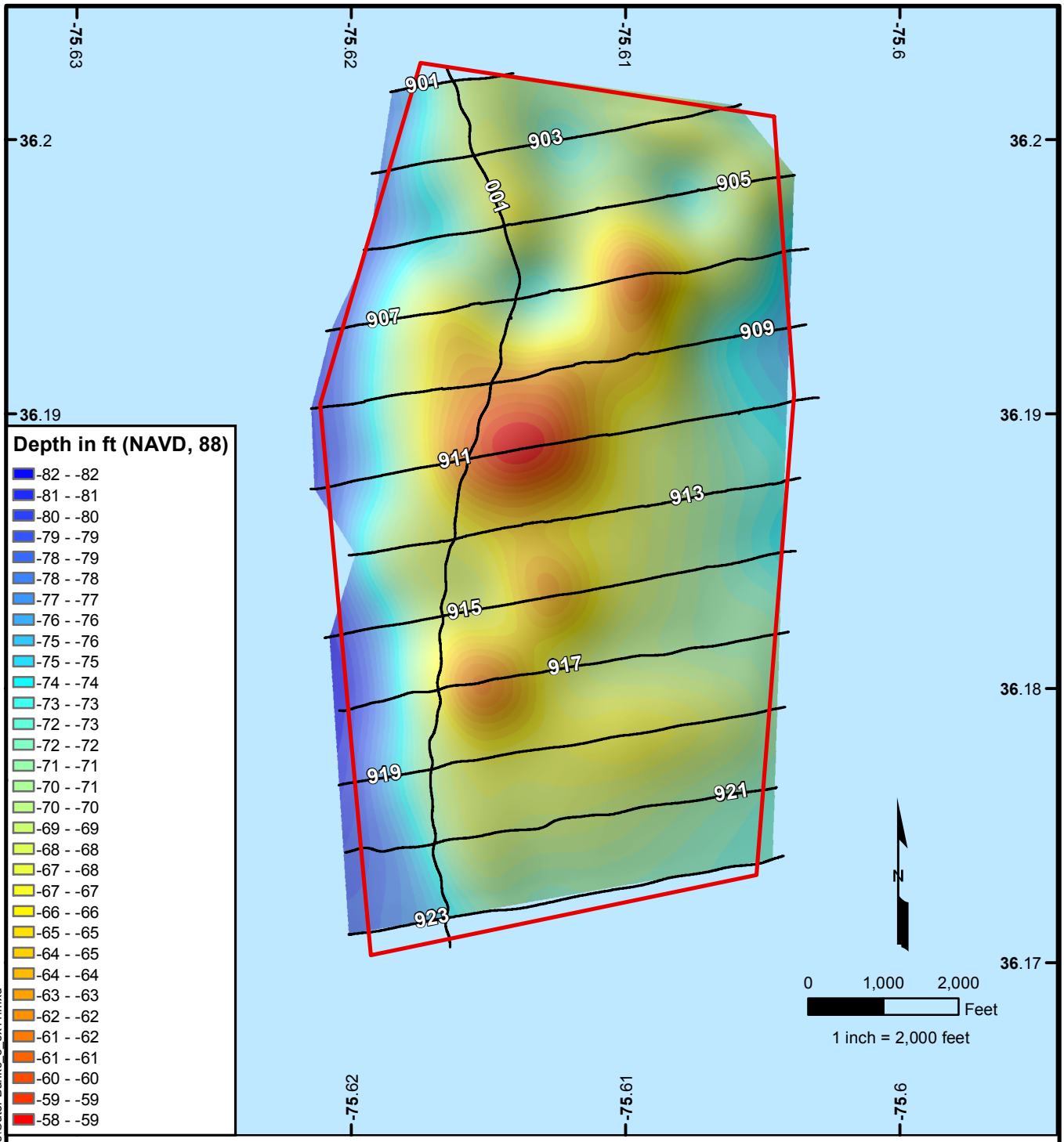

Notes:

1. Coordinates are in decimal degrees based on WGS 1984.
2. Bathymetric surface was created by CPENC, depth is in feet, NAVD 1988.
3. Investigation area falls within protraction grid NJ18-11.

Legend:

Survey Lines

Survey Area

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TITLE:

Northern Dare County Cooperative Sand Search
Dare County, North Carolina
Survey Area B

DATE: 07/14/14	BY: ABV	COMM. NO.: 151167	FIGURE NO. 03

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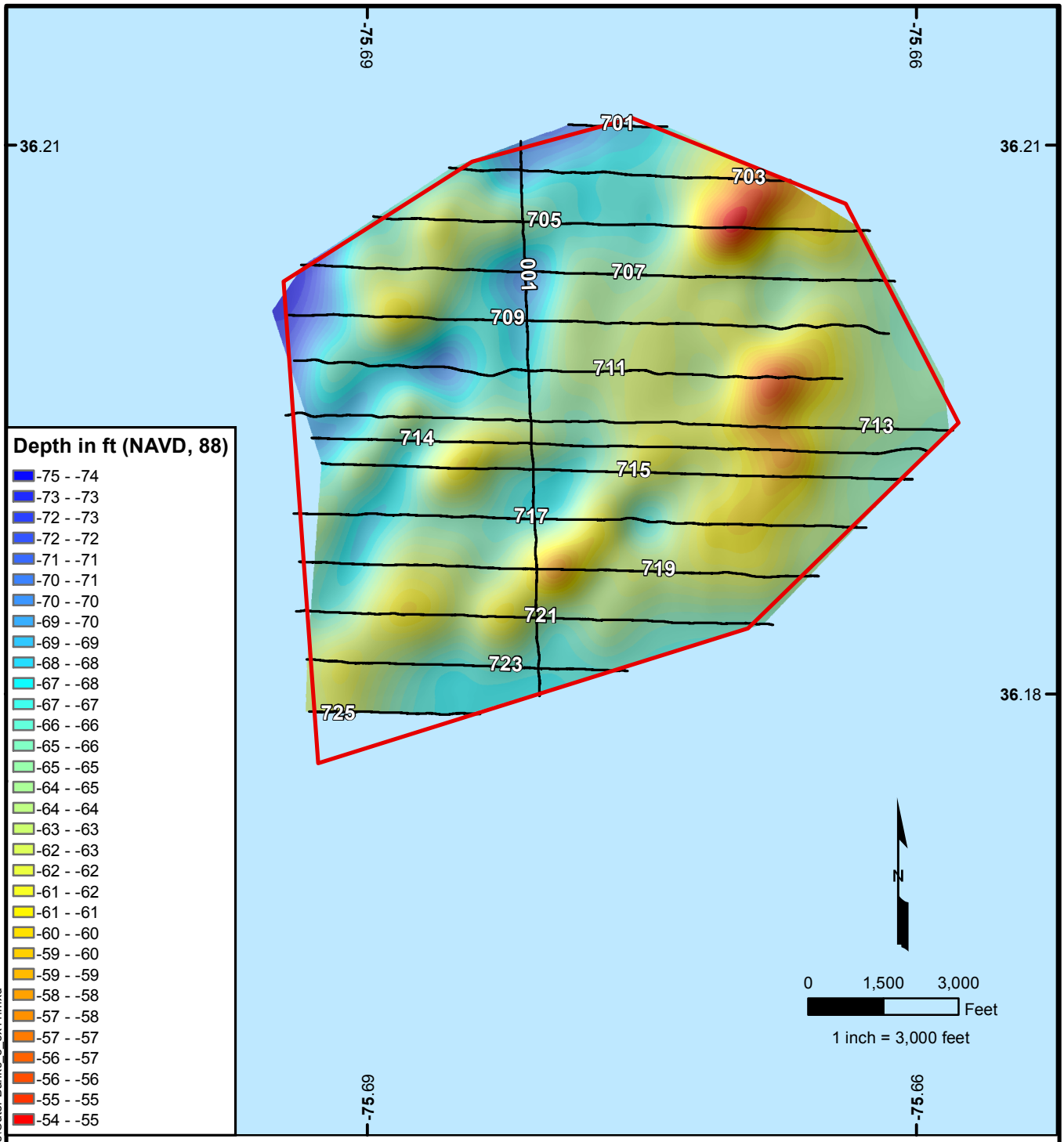

Notes:

1. Coordinates are in decimal degrees based on WGS 1984.
2. Bathymetric surface was created by CPENC, depth is in feet, NAVD 1988.
3. Investigation area falls within protraction grid NJ18-11.

Legend:

- Survey Lines
- Survey Area

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TITLE:

Northern Dare County Cooperative Sand Search
Dare County, North Carolina
Survey Area C

DATE: 07/14/14	BY: ABV	COMM. NO.: 151167	FIGURE NO. 04

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