

W00481

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Service

DESCRIPTIVE REPORT

Type of Survey: Navigable Area

Registry Number: W00481

LOCALITY

State(s): New York

General Locality: New York Bight

Sub-locality: New York Wind Energy Area

2018

CHIEF OF PARTY
LTjg Jennifer Kraus

LIBRARY & ARCHIVES

Date:

HYDROGRAPHIC TITLE SHEET

W00481

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s): **New York**

General Locality: **New York Bight**

Sub-Locality: **New York Wind Energy Area**

Scale: **40000**

Dates of Survey: **09/07/2018 to 09/29/2018**

Instructions Dated: **N/A**

Project Number: **ESD-AHB-19**

Field Unit: **NOAA Ship *Nancy Foster***

Chief of Party: **LTjg Jennifer Kraus**

Soundings by: **Kongsberg Maritime EM 2040 (MBES)**

Imagery by: **Kongsberg Maritime EM 2040 (MBES)**

Verification by: **Atlantic Hydrographic Branch**

Soundings Acquired in: **meters at Mean Lower Low Water**

Remarks:

The purpose of this survey is to provide contemporary data to update National Oceanic and Atmospheric Administration (NOAA) nautical charts. Any revisions to the Descriptive Report (DR) applied during office processing are shown in red italic text. The DR is maintained as a field unit product, therefore all information and recommendations within this report are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the NOAA nautical chart products. All pertinent records for this survey are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via <https://www.ncei.noaa.gov/>.

Products created during office processing were generated in NAD83 UTM 18N, MLLW. All references to other horizontal or vertical datums in this report are applicable to the processed hydrographic data provided by the field unit.

DESCRIPTIVE REPORT SUMMARY

A. Area Surveyed

The hydrographic survey NF-18-07 was conducted as a resurvey of the NF-17-09 (W00438) benthic habitat mapping for the NCCOS project #255 titled "Comprehensive Seafloor Substrate Mapping and Model Validation in the New York Bight". Full bathymetry and backscatter coverage was collected using a Reson 7125 and EM710 MBES in the New York Wind Energy Area (NYWEA) from survey NF-17-09, but poor weather conditions and high sea state degraded the quality of large areas within the AOI and caused severe vessel motion artifacts and drops in the POS MV. BOEM provided funds to resurvey these afflicted areas the following year with the NF-18-07 cruise to supersede NF-17-09 multibeam data and provide better bathymetry and backscatter models for habitat mapping. All 40 square miles of the low quality NF-17-09 data were resurveyed by the NF-18-07 cruise using the new EM2040 (300 khz), however severe weather and high seastate also affected the resurvey. The weather resulted in poor quality data from vessel motion artifacts and POS MV drop outs as well. In addition to the NYWEA AOI, another was surveyed to the south of the NY regional study area (Figure 1) called the Hudson South Auxilliary Area. This area had not been previously surveyed by NOS or OCS and was exploratory for hard bottom essential fish habitat for the NYWEA project. Only 11 square miles of EM710 and EM2040 bathymetry and backscatter transects were collected by NF-18-07 , or less than 10% of the Hudson South AOI. The survey lines do not overlap to create a continuous surface for benthic habitat mapping, but were useful to understand general patters of geomorphology and range of depth.

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
40° 23' 0.29" N	39° 51' 56.32" N
73° 40' 49.72" W	73° 4' 44.22" W

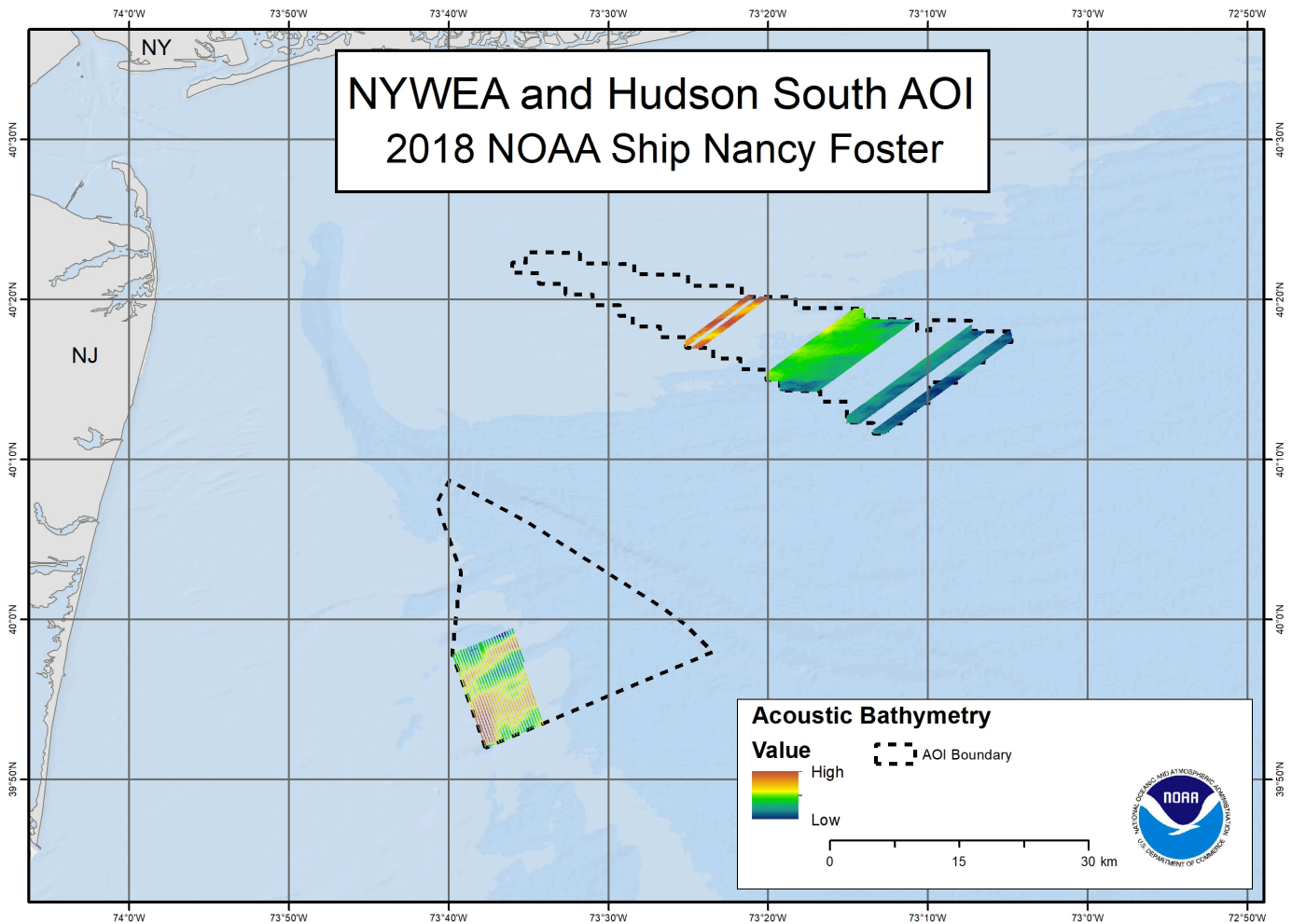


Figure 1: (Figure 1) The proposed NYWEA and Hudson South AOI with mapping coverage of both NF-18-07 survey areas.

B. Survey Purpose

The intent of this survey was to collect bathymetry and backscatter data to characterize the seafloor depth, roughness, hardness, composition, habitats and topography. The data collection focused on two locations 1) NYWEA and the 2) Hudson South AOI. Extensive acoustic, sediment sampling, and ground-truthing studies were conducted by NOAA NCCOS within NYWEA. This project was funded by the Bureau of Ocean Energy Management (BOEM). The Area of Interest (AOI) was chosen in consultation with BOEM to explore and characterize the ocean floor in a potential wind energy area. The New York biogeographic assessment explicitly identified the need for further site-specific baseline habitat and geologic information within the New York Wind Energy Area (NYWEA) to allow managers to better evaluate the potential impacts of offshore wind development in this area.

C. Intended Use of Survey

The survey is partially adequate to supersede previous data.

The NYWEA call area that was a resurvey was not adequate to supersede the previous NF-17-09 (W00438) survey or existing charted soundings. The Hudson South auxiliary area may be of some use for nautical charting and supersede existing charted soundings.

The intent of this survey was to collect bathymetry and backscatter imagery of the seafloor in the mid-Atlantic region study area (Figure 2). Previous efforts to characterize the ocean floor were conducted in New York as part of the NY Department of State's renewable energy planning effort in July 2013. However, NOAA's previously released predictive models of seafloor substrate and sediment composition for the New York region were identified as needing additional ground-truthing and model validation to assess the model predictions and ensure reliability. The New York biogeographic assessment explicitly identified the need for further site-specific baseline habitat within NYWEA and the mid-Atlantic region so that managers are better able to evaluate the potential impacts of offshore wind development at this location.

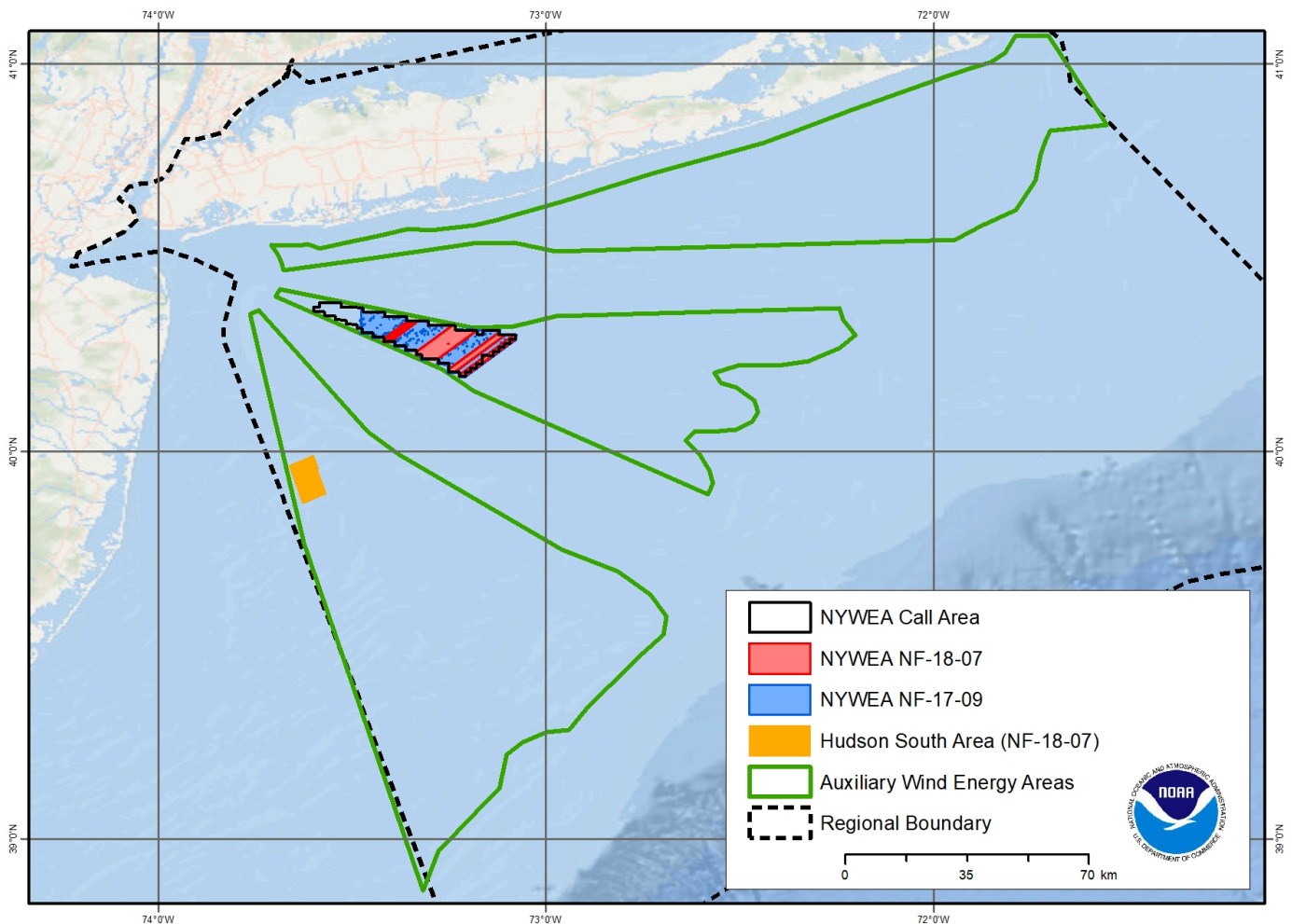


Figure 2: (Figure 2) A map of the study area used for this survey.

D. Data Acquisition and Processing

Chief Scientist Tim Battista (NCCOS/NOAA) directed mission planning and objectives for the benthic habitat mapping research. The hydrographic survey party was led by NOAA Corps Officer LTjg Jen Kraus (NCCOS/NOAA) along with CSS Inc. contractor Will Sautter (NCCOS/NOAA). The survey was carried out on the NOAA Ship Nancy Foster from September 4, 2018 through September 29, 2018.

-Sonar Systems

In February 2018, a Kongsberg EM2040 (200, 300, or 400 kHz) wide band high-resolution shallow water multibeam (6000 m max depth) MBES was installed, replacing the Reson SeaBat 7125-SV2 system. During the NF-18-07 surveys, EM2040 acquisition was conducted using the 300 kHz frequency to reduce any potential interference with the EK60 fisheries sonar. A deep-water (40-2,500 m depth) Kongsberg EM710 MKII MBES system, with 40-100 kHz range, is also permanently hull-mounted on the Nancy Foster, starboard of the keel line. During NF-18-07, EM710 acquisition was conducted using the 40-100 kHz frequency range in Kongsberg's "very shallow" mode. The EM710 sonar was only used for acquisition in the Hudson South-Auxilliary Area survey starting on September 24.

-Acquisition

Multibeam survey data was intended to be collected to the International Hydrographic Organization (IHO) Order 1 (<100 m depth) accuracy standards using work flows defined by the NOAA Field Procedures Manual and Hydrographic Survey Specifications and Deliverables Manual (IHO 2008; NOS 2015). This included maintaining acquisition and preliminary processing logs, real-time quality assurance, and quality control of the incoming data. All sonar range adjustments during acquisition were dictated by changes in water depth. Other sonar parameters remained constant to maximize backscatter quality and consistency throughout the survey. However, due to time constraints from the inclement weather, cross line analysis was not conducted for either of the two NF-18-07 datasets therefore both surveys do not comply with all of the IHO and HSSD requirements.

Hypack/Hysweep software was used for 7125-SV2 bathymetry acquisition and vessel navigation. The system provided precise time tagging of the sensor data and real-time data displays for quality control. Hypack data are output in three formats: .RAW, .HSX, and .7K. Kongsberg Seafloor Information System (SIS) software stored the EM2040 and the EM710 MKII bathymetric data in .ALL format. An Applanix Position and Orientation System for Marine Vessels (POS/MV) Global Positioning System (GPS) inertial system was used to measure real-time attitude, heading, heave, and position for the Hypack and SIS systems. Fugro Marinestar Regional GNSS 9G2/VBS satellite-based service was used for positioning corrections. An OceanScience uCTD (underway Conductivity, Temperature, and Depth) measured sound speed profiles while the vessel was underway. CTDs were cast off the aft deck with a tethered free-fall probe and retrieved with a powered level-winding winch. After each uCTD launch, the data were downloaded and processed with UCast software and concatenated using NOAA Pydro Velocipy software.

-Survey Coverage

The NYWEA was completed in 2017 during the NF-17-09 mission, however much of the data was of poor quality due to rough weather. During the 2018 NF-18-07 mission, coverage in the NYWEA was focused on resurveying over existing coverage from 2017 that had low data quality. Once the resurveying was completed in the NYWEA, data acquisition was moved to the Hudson South AOI. Due to time constraints, mechanical errors, and poor weather conditions, coverage was not obtained over the entire proposed area, and only approximately 11 square miles out of 147 total square miles were acquired in the Hudson South AOI. During the limited time left to survey for this mission, data acquisition was focused on the south west corner of the AOI. The Hudson South line plans were merely for exploration of the seafloor, and did not have any overlapping survey lines. According to the seafloor prediction model, this area was likely to have hard bottom features and were therefore of interest to the mapping team.

-Multibeam Acquisition

Hypack/Hysweep software was used for bathymetry acquisition and vessel navigation. Hypack data are output in three formats: .RAW, .HSX, and .7K. Kongsberg Seafloor Information System (SIS) software stored the EM2040 and the EM710 MKII bathymetric data in .ALL format. An Applanix Position and Orientation System for Marine Vessels (POS/MV) Global Positioning System (GPS) inertial system was used to measure real-time attitude, heading, heave, and position for the Hypack and SIS systems. Fugro Marinestar Regional GNSS 9G2/VBS satellite-based service was used for positioning corrections. An OceanScience uCTD (underway Conductivity, Temperature, and Depth) measured sound speed profiles while the vessel was underway. CTDs were cast off the aft deck with a tethered free fall probe and retrieved with a powered level-winding winch. After each uCTD launch, the data were downloaded and processed with UCast software and concatenated using NOAA Pydro Velocity software.

-Delayed Heave

Delayed heave was applied in post-processing with SBETs for 99% of the data using the Qimera work flow from the POS (.000) files processed with the PosPac software. These files logged positioning information from the pair of GPS antennae on the mast linked to an Applanix IMU unit aboard the ship. There were several issues creating SBETs from the POS files due to gaps in data logging from the Marine Star system, excessive vessel motion from the high seastate, and anomalies in the navigation data (Figure 3). On Sept 7, 2018, the POS unit had stopped logging for approximately 45 minutes while still writing a .000 file and thus the SBET was unable to be created successfully. The file was sent to Applanix to confirm that POS data was dropped and contractors at SolmarHydro assisted in creating the SBET for this day by interpolating the navigation for the drop out and splitting the POS file into 2 separate SBET files. On September 19th, 2018 the Marine Star system lost vertical reference for three survey lines and displayed the depths roughly as sea level (or a 32m vertical offset). This data had to have TCARI tide files applied instead of GPS tide from the SBETS using CARIS HIPS and SIPS since Qimera had not been updated to apply .tc grids. There was another anomaly from the SBETS that resulted in a 1.2m offset in large portions of the survey area. The cause of this offset is unknown, but likely due to the heavy weather and high seastate. After testing the data without any SBETS applied and noticing very little difference, these offsets were corrected by exporting the afflicted areas separately and applying the stand alone version of Vdatum to the data to ensure that the final product was in MLLW. This did bring the average vertical offset of these areas back to less than 1m, however a slight vertical "step" can still be seen in the final merged bathymetric surface on the second to the eastern most area surveyed.

-Sound Speed Methods

Surface sound speed was collected from a probe mounted to the hull of the NOAA Ship Nancy Foster and applied to the MBES in real time through SIS. Sound speed profiles were acquired using an OceanScience uCTD while the vessel was underway at least once every four hours, when a significant change in surface sound speed was observed, or when surveying in a new area. After each uCTD launch, the data was downloaded and processed with UCast software and concatenated using NOAA Pydro Velocipy software. A total of 41 casts were applied to all survey lines using the "Nearest in distance within time" profile selection method in Qimera.

-Backscatter Data

The mapping team used the QPS Fledermaus Geocoder Toolbox (FMGT) software to process the backscatter information and create intensity mosaics. The mosaics were cleared of acoustic noise and refraction artifacts by merging the final cleaned bathymetry generic sonar files (GSF) exported from CARIS (NF-17-09) and Qimera (NF-18-07). The final EM2040, and EM710 backscatter mosaics were exported as Geotiffs with the same IHO depth to resolution standards as the bathymetry surfaces for the NYWEA and the Hudson South AOI.

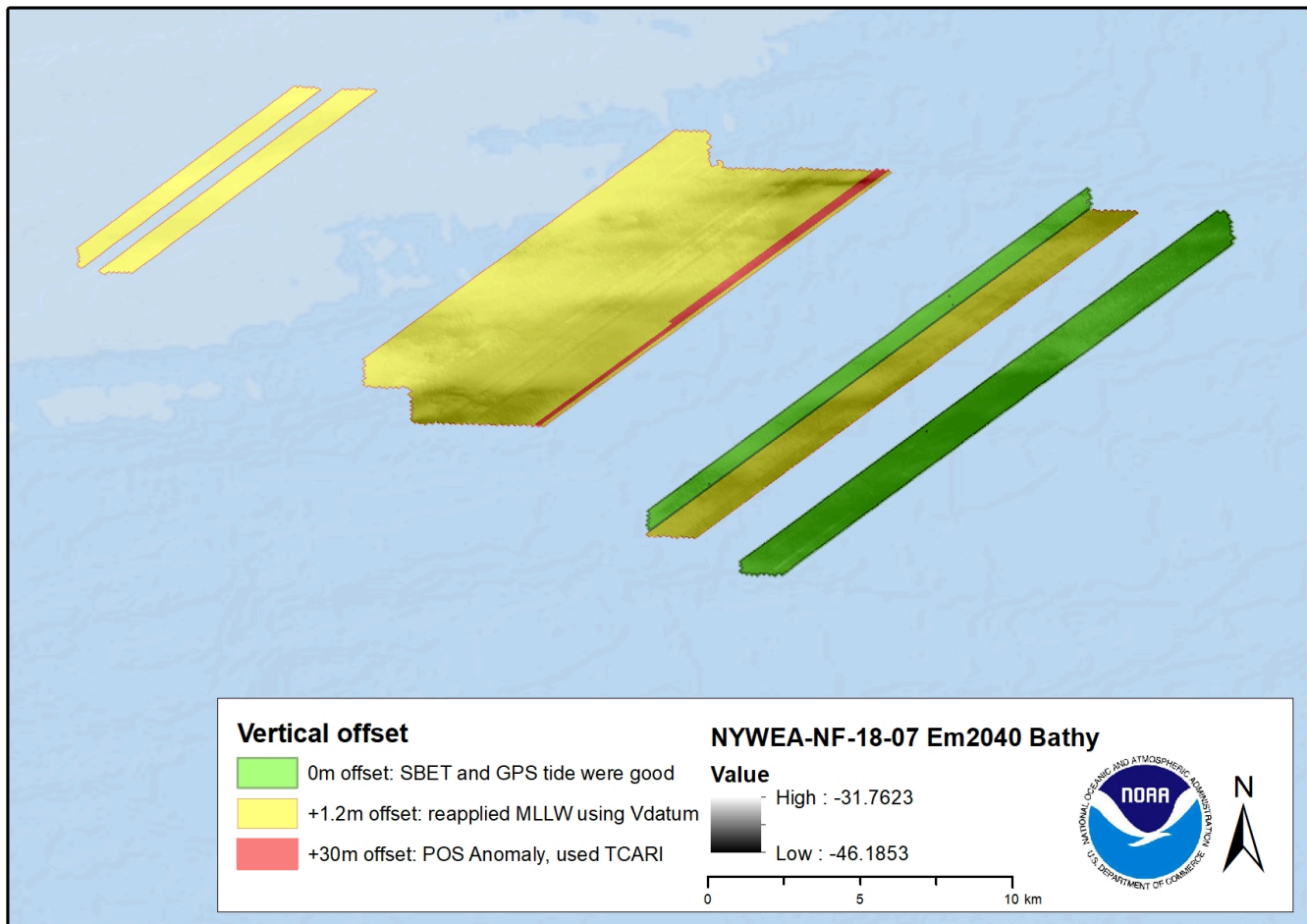


Figure 3: (Figure 3) A map of the NYWEA NF-18-07 survey that illustrates the areas affected by different vertical offsets during the multibeam processing.

E. Uncertainty

Total propagated uncertainty was calculated and applied to generate CUBE surfaces. TPU values for the survey were derived from a combination of fixed values for the equipment and vessel characteristics, as well as field assigned values for sound speed uncertainties. A Vdatum separation model (SEP) with GNSS Vertical Referencing Method was applied to vertically transform the data to the ellipsoid (NAD83). However, transformation to the ellipsoid using this method was not accurate for several large areas due to anomalies with the GPS system during bad weather. This resulted in several lines with major vertical offsets from the rest of the ellipsoidally referenced surface. Therefore, Vdatum was reapplied using the stand alone software from vdatum.noaa.gov or had the SBETS removed and used TCARI tides in CARIS using the same work flow utilized in NF-17-0 instead (See "Delayed Heave" in Data Acquisition and Processing chapter). Tides were applied using a TCARI grid and the data was vertically referenced to Mean Low Low

Water (MLLW) using Vdatum. Since the NYWEA NF-18-07 is not recommended to supersede charting or previously surveyed data, no TPU compliance or uncertainty standard testing was produced.

F. Results and Recommendations

The following are the largest scale ENC's, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US4NY1BM	1:80000	6	10/04/2017	02/06/2018	NO
US3NY01M	1:400000	39	12/22/2017	01/09/2010	NO

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
HudsonSouth_SonarProcessing_NF18_EM710_Uncertainty_2m.tif	Uncertainty	2 m	0 N/A - 1.4778 N/A	Node Standard Deviation of Depth	accuracy
HudsonSouth_SonarProcessing_NF18_EM710_Backscatter_2m.tif	Backscatter	2 m	10 N/A - -70 N/A	Intensity (dB)	substrate analysis
HudsonSouth_SonarProcessing_NF18_EM710_Bathy_2m.tif	Bathymetry	2 m	-23.0266 m - -65.2731 m	Depth	topographic assessment
HudsonSouth_SonarProcessing_NF18_EM2040_Uncertainty_2m.tif	Uncertainty	2 m	0 N/A - 1.90306 N/A	Node Standard Deviation	Accuracy
HudsonSouth_SonarProcessing_NF18_EM2040_Backscatter_2m.tif	Backscatter	2 m	10 N/A - -63.0808 N/A	Intensity (dB)	substrate analysis
HudsonSouth_SonarProcessing_NF18_EM2040_Bathy_2m.tif	Bathymetry	2 m	-25.945 m - -56.0161 m	Depth	topographic assessment
NYWEA_SonarProcessing_NF18_Em2040_Backscatter_4m.tif	Backscatter	4 m	-41.1737 N/A - 9.67895 N/A	decibels	resurvey
NYWEA_SonarProcessing_NF18_Em2040_Uncertainty_4m.tif	Uncertainty	4 m	0 N/A - 1.38975 N/A	Node Standard Deviation	accuracy
NYWEA_SonarProcessing_NF18_Em2040_Bathy_4m.tif	Bathymetry	4 m	-31.7623 m - -46.1853 m	depth	Resurvey

No chart comparison was done for this survey.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water. The vertical control method used was .

A Vdatum separation model (SEP) with GNSS Vertical Referencing Method was applied to vertically transform the data to the ellipsoid (NAD83). However, transformation to the ellipsoid using this method was unsuccessful for several lines due to anomalies with the GPS system during bad weather. This resulted in several lines with major vertical offsets from the rest of the ellipsoidally referenced surface. Therefore, these lines were subsequently processed in CARIS using the same work flow utilized in NF-17-09. Tides were

applied using a TCARI grid and the data was vertically referenced to Mean Low Low Water (MLLW) using Vdatum.

The horizontal datum for this project is North American Datum of 1983 (NAD 83). The projection used for this project is Universal Transverse Mercator (UTM) Zone 18.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Atlantic City, NJ-8534720
Cape May, NJ-8536110
Lewes, DE-8557380
Sandy Hook, NJ-8531680
Montauk, NY-8510560

The list referring to "DGPS Stations" are actually NWLON stations that provided residuals for this project.

The horizontal datum for this project is North American Datum 1983. The projected coordinate system for this survey UTM NAD83, Zone 18N. Data were acquired with Marinestar correction on ITRF2014. The difference between ITRF2014 and NAD83(2011) in this area is approximately a meter horizontally. Navigation and attitude data were adjusted in PosPac to NAD83 by exporting a custom SBET using NAD83 (2011) 2017.756 mapping frame.

H. Additional Results

Vertical Offsets

All vertical offsets that were described were compared to the bathymetry from NF-17-09 for reference. Vertical offsets are unknown for the Hudson south area since there were no overlapping survey lines or previously collected multibeam in that area.


It was determined by NCCOS that the NYWEA NF-18-07 data was not adequate to supersede the data that was collected from the NF-17-09 surface, thus not adequate to superede nautical charts in that area. However the Hudson South NF-18-07 data may still be suitable to update charts or pervious surveys if the Atlantic Hydrographic Branch deems it necessary pending on their analysis of existing data.

I. Approval

As Chief of Party, field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Survey Summary Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys Specifications and Deliverables, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are partially adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Survey Summary Report.

Approver Name	Title	Date	Signature
Tim Battista	Chief Scientist	04/24/2019	
Jennifer Kraus	Chief of Party	04/24/2019	KRAUS.JENNIFER.S ARAH.1015738320 Digitally signed by KRAUS.JENNIFER.SARAH.101573 8320 Date: 2019.04.25 15:15:10 -04'00'
Will Sautter	Scientist	04/24/2019	

APPROVAL PAGE

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Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NCEI for archive

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Processed survey data and records
- GeoPDF of survey products
- Collection of Backscatter mosaics

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved: _____

Commander Meghan McGovern, NOAA

Chief, Atlantic Hydrographic Branch