W00207

NOAA FORM 76-35A

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

DESCRIPTIVE REPORT

Type of Survey: Hydrographic Survey

Field No.: NOAA Ship Nancy Foster (R-325)

Registry Number: W00207

LOCALITY

State: Puerto Rico

General Locality: Vieques Island

Sub-locality: Southern Coast of Vieques Island

2008

CHIEF OF PARTY

NOAA

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NOAA FORM 77-28 (11-72) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

W00207

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:	**Puerto Rico**
General Locality:	**Vieques Island**
Sub-Locality:	**Southern Coast of Vieques Island**
Scale:	**1:10,000**
Date of Survey:	**26 March 2008 to 5 April 2008**
Instructions Dated:	**12 February 2008**
Project Number:	**NF-08-06-SEAS**
Vessel:	**NOAA Ship *Nancy Foster***
Chief of Party:	
Surveyed by:	***Nancy Foster* Personnel**
Soundings by:	**Kongsberg SIMRAD EM1002 Multi-beam echosounder**
Graphic record scaled by:	**N/A**
Graphic record checked by:	**N/A**
Protracted by:	**N/A** Automated Plot: **N/A**
Verification by:	***Atlantic Hydrographic Branch***
Soundings in:	**Meters at MLLW**

Remarks:

1) All Times are in UTC.
2) This is a Navigable Area Hydrographic Survey.
3) All soundings corrected with verified water levels and preliminary zoning.
4) Projection is WGS84, UTM Zone 20N.

Bold, italic, red notes in the Descriptive Report were made during office processing.

Project: NF-08-06-SEAS
Registry #: W00207
State: Puerto Rico
Locality: Vieques Island
Sublocality: South Coast of Vieques Island
Surveyed by: NOAA Ship *Nancy Foster* (R-325)

Note: This Descriptive Report (DR) was generated by AHB personnel as no DR was produced or submitted by the field unit or Chief Scientist.

I. Background

The bathymetry data for this project was part of an Office of Response and Restoration cruise to assist in prioritizing conservation efforts and assist with the cleanup and restoration of Vieques coastal waters. Multibeam echosounder data were collected in shelf waters between 10 meters water depth and the shelf break along the south coast of Vieques. Data were collected aboard NOAA Ship *Nancy Foster* (NF) from 26 March to 5 April 2008.

II. Equipment

a. Vessel

The NOAA Ship NANCY FOSTER (R352) is 57 meters in length, has a beam of 12 meters and draws approximately 3 meters of water. During the Charleston, South Carolina drydock period in November of 2005, numerous survey hardware and software installations were implemented by NOAA's Aviation and Marine Operations division (NMAO) to make multibeam data acquisition a more integral component of the ship's research support. NMAO funded the permanent installation of a Simrad EM1002 multibeam sonar, an Applanix POS/MV positioning system, ancillary sensors and support equipment. ***Concur. See DAPR "NF-08-04-SEAS" submitted with the H-Cell deliverable for detailed documentation of system calibrations, data acquisition, and data processing.***

b. Sonar Systems

The Simrad EM1002 multibeam echosounder is permanently hull-mounted between two fiberglass hydrodynamic fittings starboard of the keel line, aft of the bow. The EM1002 is a 95-kHz system with a 150° swath consisting of 111 individually formed, electronically roll-stabilized 2° beams, with a maximum ping rate of 10Hz, depending on water depth. The EM1002 has three different automatically adjusted pulse lengths to maximize coverage in deeper waters at 0.2, 0.7 and 2 milliseconds respectively. A combination of phase and amplitude detection is used, resulting in measurement accuracy practically independent of beam angle. The system is compensated in real-time for sound velocity changes at the transducer array, to assist the electronic beam steering capabilities of the EM1002. The EM1002 sonar system is

controlled with a UNIX based operator system (SUN Solaris 8) that utilizes the Common Desktop Environment and Kongsberg's MERLIN V 5.2.2 acquisition and control program.

c. Vessel Positioning & Orientation

The Applanix POS/MV 320 V4 (POS) is a vessel positioning and orientation system. The GPS aided Inertial Motion Unit (IMU) provides measurements of roll, pitch and heading that are all accurate to ± 0.02°. Heave measurements supplied by POS maintain an accuracy of 5% of the measured vertical displacement or ± 5cm for swell periods of 20 seconds or less. The accuracy and stability of measurements delivered by the system remain unaffected by vessel turns, changes of speed, wave-induced motion (sea state dependent), or other dynamic maneuvers. The IMU is located on the keel line in the forepeak void, port of the EM1002 transducer.

The POS obtains its positions from two dual frequency Trimble Zephyr GPS antennae. The two POS antenna are located above the bridge deck on the port side. An auxiliary Trimble DSM 132 DGPS system provided an RTCM differential data stream to the POS. The DSM 132 receives differential beacon transmittals from a U.S Coast Guard Continually Operating Reference Station (CORS) station selected by the operator. Vessel motion data were supplied from the POS system via serial communications to the EM1002 Processing Unit (PU). The POS also provided the pulse per second (PPS) strobe and the NMEA ZDA message that the EM1002 uses to continually synchronize the system clock.

d. Sound Velocity

The NANCY FOSTER is equipped with a hull-mounted SBE 45 thermosalinograph (TSG), near the EM1002 transducer. The TSG measures near-surface conductivity and temperature to calculate sound velocity in real-time. The data from the TSG streamed to the EM1002's MERLIN acquisition and control software to aid in electronic beam steering. The primary CTD's for determining sound velocity throughout the water column were a Seabird Electronics SBE-911 and a SBE-19 Plus. Sound velocity casts were deployed approximately every four hours during survey operations. Sound velocity casts were processed with NOAA's Velocwin V8.85 software and converted to Simrad & CARIS format.

e. Acquisition Systems

The EM1002 MERLIN V5.2.2 acquisition and control system is based on the Sun Microsystems Solaris 8 UNIX operating system. The MERLIN system integrated the auxiliary sensors with the sounding data from the Processing Unit (PU) to create "datagrams". The datagrams combine the positioning, attitude, sound velocity and sounding data. The data was logged in the .ALL format. HYPACK Max 2008 provided the navigation information to the helms display and was used along with MapInfo to create line plans for the project areas. Coverage BASE surfaces were created with

CARIS's HIPS and SIPS during data acquisition to verify coverage. The BASE surfaces were then exported in GeoTiff format to Hypack for creating holiday line plans.

III. Quality Control

The HIPS conversion wizard uses the .ALL format to convert the multibeam data into CARIS HDCS data files. The vessel configuration file (R352_MB.hvf) includes the patch test results, dynamic draft, waterline and the Total Propagated Error values (HVF & TPE Report, Appendix E). The data was projected to the WGS 1984, Universal Transmercator Zone 20, Northern Hemisphere (WGS84 UTM20N). All the acquired data was converted and preliminary processed in the field.

AHB Processing consisted of data cleaning in HIPS Subset Editor and CUBE surface creation. Subset editing enabled the processor to evaluate each swath against its neighboring swath while identifying potential tidal and motion artifacts. The verification and alignment of features from adjacent lines also confirmed sensor offsets. CUBE surfaces were created to illustrate adequate sonar coverage and to also identify systematic errors or artifacts within the data set. Final branch-generated bathymetric surfaces are as follows:

Surface Name	Resolution (meters)	Depth Threshold (meters)
AHB9_2m_CUBE_Final	2	0-52
AHB10_2m_CUBE_Final	2	0-52
W00207_AHB_4m_CUBE_Final	4	46-115
W00207_AHB_8m_CUBE_Final	8	103-350
W00207_AHB_16m_CUBE_Final	16	350-1000
W00207_AHB_Combined_Final_16m	16	0-1000

a. Tide Corrections to Echosoundings

The operating water level stations at Vieques, PR (975-2695) and Charlotte Amalie, VI (975-1639) provided water level reducers for this survey. Verified water levels and preliminary tide zoning (I905NF2008CORP.zdf) from CO-OPS were applied to all multibeam echosounding data for tide correction to Mean Lower-Low Water (MLLW). ***Concur.***

b. Sound Velocity Corrections to Echosoundings

The Kongsberg SIMRAD EM1002 multibeam echosounder, through SIMRAD software, applies sound velocity profiles in real time to bathymetry data. Analysis of crossline coverage, bathymetric grids, and subset data in Caris HIPS shows no apparent sound velocity artifacts. ***Concur.***

IV. Chart Comparison

a. Chart 25650 – W00207 soundings generally agree with charted soundings within 1 fathom. The charted western shoals (6-9 fathoms) have migrated west approximately 900 meters. The charted 100-fathom contour appears to have remained in place with respect to survey bathymetry. ***Concur.***

b. Chart 25664 - W00207 soundings generally agree with charted soundings within 5 feet. The charted 60 and 120-foot contours appear to have generally remained in place with respect to survey bathymetry. ***Concur.***

c. ENC US5PR56M – This electronic chart was compiled from raster chart 25664, and survey comparison results match those listed in IV.b. ***Concur.***

d. ENC US4PR30M – This electronic chart was compiled in meters from raster charts 25664 and 25650. Survey comparison results generally match those listed in IV.a. and IV.b. ***Concur.***

V. Assessment of Accuracy and Suitability for Charting

Horizontal and vertical controls used during this survey are consistent with meeting the requirements of IHO Order 1 in water 0-100 meters and IHO Order 2 in water deeper than 100 meters. AHB assessment of complete coverage bathymetric soundings with respective navigation and uncertainty measurements supports this conclusion. Therefore, it has been determined through the Survey Acceptance Review process that this data is of suitable quality for nautical chart update purposes. ***Concur.***

For further information regarding survey operations and data processing, please see the H-Cell Report.

This Document is for Office Process use only and is intended to supplement, not supersede or replace, information/recommendations in the Descriptive or Evaluation Reports

AHB COMPILATION LOG

General Survey Information	
REGISTRY No.	***W00207***
PROJECT No.	***NF-08-06-SEAS***
FIELD UNIT	***NOAA SHIP NANCY FOSTER***
DATE OF SURVEY	***2008/03/26-2008-04/05***
LARGEST SCALE CHART	***25664_1, edition 34, 20070507, 1:25,000***
ADDITIONAL CHARTS	***25650_1, edition 16, 20090107, 1:100,000***
SOUNDING UNITS	***25664_1 feet and 25650_1 fathoms***
COMPILER	***Allison Stone/Katrina Wyllie***

Source Grids	**File Name** H:\Compilation\W00207_Vieques-NF-08\AHB_W00207\SAR Final Products\GRIDS
	W00207_AHB9_2m_CUBE_Final.csar
	W00207_AHB10_2m_CUBE_Final.csar
	W00207_AHB_4m_CUBE_Final.csar
	W00207_AHB_8m_CUBE_Final.csar
	W00207_AHB_16m_CUBE_Final.csar
Surfaces	**File Name** H:\Compilation\W00207_Vieques-NF-08\AHB_W00207\COMPILE\Working
Combined	**W00207_16m_Combined.csar**
Interpolated TIN	\Interpolated TIN**W00207_16m_InterpTIN.csar**
Shifted Interpolated TIN	\Shifted Surface**W00207_16m_InterpTIN_Shifted_lessthanequalto10fm.csar**
	\Shifted Surface**W00207_16m_InterpTIN_Shifted_greaterthan10fm.csar**
Product Surface	\Product Surface**W00207_16mres_150mrad_ProductSurface.csar**
Final HOBs	**File Name** H:\Compilation\W00207_Vieques-NF-08\AHB_W00207\COMPILE\Final_Hobs
Survey Scale Soundings	**W00207_SS_Soundings.hob**
Chart Scale Soundings	**W00207_CS_Soundings.hob**
Contour Layer	**W00207_Contours.hob**
Meta-Objects Layer	**W00207_MetaObjects.hob**
Features	**W00207_Features.hob**

Meta-Objects Attribution	
Acronym	**Value**
M_COVR	
CATCOV	Coverage Available
SORDAT	20080405
SORIND	US,US,graph,W00207
M_QUAL	
CATZOC	Zone of confidence U (data not assessed)
INFORM	NOAA Ship Nancy Foster
POSACC	10.0000m
SORDAT	20080405
SORIND	US,US,graph,W00207
SUREND	20080405
SURSTA	20080326
DEPARE	
DRVALV 1	33.4416ft

DRVALV2	1943.1759ft
SORDAT	20080405
SORIND	US,US,graph,W00207
M_CSCL	
CSCALE	100,000
SORDAT	20080405
SORIND	US,US,graph,W00207

SPECIFICATIONS:

I. COMBINED SURFACE:
   a. Number of ESAR Final Grids: 5
   b. Resolution of Combined (m): 16

II. SURVEY SCALE SOUNDINGS (SS):
   a. Radius
   b. Shoal biased
   c. Use Single-Defined Radius (mm at Map Scale): ; Radius Value = 1:25,000
   d. Queried Depth of All Soundings
      i. Minimum: 33.44160ft
      ii. Maximum: 1943.1759ft

III. INTERPOLATED TIN SURFACE:
   a. Resolution (m): 16
   b. Natural Neighbor
   c. Shifted value: -0.229meters *(≤ 10 fathoms)* and -1.372 meters *(> 10 fathoms)*

IV. CONTOURS:
   a. Use a Depth List: W00207_NOAA_depth_curves_list_FM.txt
      W00207_NOAA_depth_curves_list_FT.txt
   b. Line Object: DEPCNT
   c. Value Attribute: VALDCO

V. FEATURES:
   a. Total Number of Features: 0

VI. CHART SURVEY SOUNDINGS (CS):
   a. Radius
   b. Shoal biased
   c. Use Single-Defined Radius: Sounding Space Range Table
      i. W00207_25k_CS_SSR.txt
      ii. W00207_100k_CS_SSR.txt
   d. Filter: Interpolated != 1

ATLANTIC HYDROGRAPHIC BRANCH
H-CELL REPORT to ACCOMPANY
SURVEY W00207 (2008)

This H-Cell Report has been written to supplement and/or clarify the original descriptive Report. Sections in this report refer to the corresponding sections of the Descriptive Report.

A. AREA SURVEYED

Southern Coast of Vieques Island, Puerto Rico

This hydrographic survey was conducted in accordance with the Cruise Plan for project **NF-08-06-SEAS**, Coastal Monitoring and Assessment Project in conjunction with NOAA's Coral Reef Conservation Program. HSD Operations Branch project instructions were not provided. Registry number W00207 was assigned by the Atlantic Hydrographic Branch.

The bathymetry data for project **NF-08-06-SEAS** was part of an Office of Response and Restoration cruise to assist in prioritizing conservation efforts and assist with the cleanup and restoration of Vieques coastal waters. Multibeam echosounder data were collected in shelf waters between 10 meters water depth and the shelf break along the south coast of Vieques. Data were collected aboard NOAA Ship *Nancy Foster* (NF) from 26 March to 5 April 2008.

Refer to the DAPR "*NF-08-04 DAPR.pdf*" accompanying this survey for detailed documentation of system calibrations, data acquisition, and data processing.

B. DATA QUISITION AND PROCESSING

B.1 DATA PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

CARIS Bathy DataBASE version 2.3 SP1 HF 1-16
CARIS Bathy DataBASE version 2.1 SP1 HF 1-10
CARIS S-57 Composer version 2.0 HF 1-4
DKART INSPECTOR, version 5.0 Build 732 SP1
CARIS HOM version 3.3 SP3 HF 8

B.2. QUALITY CONTROL

W00207 is a one hundred percent multibeam only survey. The survey and reports were determined to be of good quality and adequate to supersede all prior surveys in common areas, and for application to the relevant NOS nautical charts.

B.2.1. H-Cell

AHB personnel utilized the source depth grids for the survey's nautical chart update product by combining the depth thresholded final grids at 2, 4, 8, and 16 meter resolutions at a combined resolution of 16 meters. The combined grid was then used to create a product surface grid with a resolution of 16m. The survey scale selected soundings were extracted from the 16 meter resolution product surface at a scale of 1:25,000 and 1:100,000.

The chart scale soundings were selected from the filtered interpolated surface using sounding space range files for the 25,000 chart scale and for the 100,000 chart scale. The chart scale selected soundings are a subset of the survey scale selected soundings. The surface model was referenced when selecting the chart scale soundings, to ensure that the selected soundings portrayed the bathymetry within the common area.

A TIN (Triangulated Irregular Network) surface was created from the survey scale soundings from which an interpolated surface was generated for the purpose of automatically generating NOAA rounded depth contours. These contours were minimally edited and forwarded to MCD for reference only. The contours were utilized during chart scale sounding selection and quality assurance efforts at AHB. The depth contours are incorporated into the SS H-Cell product as per 2009 H-Cell Specifications.

The pre-compilation products or components (Stand Alone HOB files (SAHOB)) are detailed in the Compile Log attached directly before this H-Cell Report. The SAHOB files included depth areas (DEPARE), depth contours (DEPCNT), sounding selections (SOUNDG), Meta objects (M_COVR, M_QUAL, M_CSCL), Features (SBDARE) and cartographic Blue Notes ($CSYMB).

All of the components with the exception of the sounding selection and depth contours were inserted into one feature layer (including the Blue notes, as dictated by Hydrographic Technical Directive 2008-8 and HSD's H-Cell Specifications 2009). The SAHOB H-Cell layers were exported to S-57 format for the H-Cell deliverable. W00207 H-Cell chart scale soundings were selected based upon the scale of the applicable chart. The H-Cell's SS deliverable includes survey scale soundings selected and depth contours.

The SAHOB's were exported from CARIS Bathy DataBASE to a metric S-57 file (W00207_SS_metric.000 and W00207_CS_metric.000). These files were then opened in CARIS HOM and were converted from metric to chart units (feet) and exported for final delivery to MCD as W00207_SS.000 and W00207_CS.000. The final deliverables are two S-57 files; one that contains the chart scale soundings, meta objects, features, and blue notes (W00207_CS.000), and one that contains the survey scale sounding selections and depth contours (W00207_SS.000). Quality assurance checks were made utilizing CARIS S-57 Composer 2.0 validation checks and dKart Inspector 5.0 tests.

Chart compilation was performed by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver

Spring, Maryland.
W00207 CARIS H-Cell final deliverables include the following products:

W00207_CS.000	1:25,000 Scale	W00207 H-Cell with Chart Scale Selected Soundings
W00207_SS.000	1:10,000 Scale	W00207 Survey Scale Selected Soundings

B.2.2. Junctions

Survey W00207 (2008) junctions with survey H12006 (2009) to the south. Survey H12006 is in AHB's Compilation queue at the time of W00107 submission.

C. VERTICAL AND HORIZONTAL CONTROL

Vertical and horizontal controls were adequately addressed in the Descriptive Report.

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON

Pasaje de Vieques and Radas Roosevelt
25664_1 (16th Edition, May/06)
Corrected through NM 06/26/2010
Corrected through LNM 06/15/2010
Scale 1:25,000

Virgin Passage and Sonda de Vieques
25650_1 (34th Edition, April/04)
Corrected through NM 06/26/2010
Corrected through LNM 06/15/2010
Scale 1:100,000

ENC Comparison **US5PR56M**
Pasaje de Vieques and Radas Roosevelt
Edition 5
Application Date 2008-11-03
Issue Date 2009-01-07
Chart 25664_1

US4PR30M
Virgin Passage and Sonda de Vieques
Edition 5
Application Date 2008-11-03
Issue Date 2009-07-01
Chart 25650_1

D.1.1 Hydrography

The charted hydrography originates with prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section "D" and Appendix I and II of the Descriptive Report. The following exceptions are noted:

a. The field unit did not obtain bottom samples; therefore charted coral seabed characteristics (SBDARE) were retained as charted. Charted "rky" seabed area characteristics were blue noted for removal as newly digitized rocky seabed areas are included in W00207_CS.000.
b. This survey should supersede the wire drag green tint area on raster chart 25664_1.

D.2. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland. See Section D.1. of this report for a list of the Raster Charts and Electronic Navigation Charts (ENC) used for compiling the present survey:

D.3. ADEQUACY OF SURVEY

The present survey is adequate to supersede the charted bathymetry within the common area. Any features not specifically addressed either in the H-Cell BASE Cell File or the Blue Notes should be retained as charted. Refer to the Descriptive Report for further recommendations by the hydrographer.

APPROVAL SHEET
W00207

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth contours, disposition of critical depths, cartographic symbolization, and verification or disproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with National Ocean Service and Office of Coast Survey requirements except where noted in the Descriptive Report and the H-Cell Report.

All final products have undergone a comprehensive reviews per the Hydrographic surveys Division Office Processing Manual and are verified to be accurate and complete except where noted.

Allison C. Stone
Hydrographic STEP Intern
Atlantic Hydrographic Branch

Digitally signed by Katrina Wyllie
DN: cn=Katrina Wyllie, o=NOAA, ou=AHB, email=katrina.wyllie@noaa.gov, c=US
Date: 2010.07.19 16:37:10 -04'00'

Katrina Wyllie
Hydrographic Intern
Atlantic Hydrographic Branch

I have reviewed the H-Cell files, accompanying data, and reports. This survey and accompanying Marine Chart Division deliverables meet National Ocean Service requirements and standards for products in support of nautical charting except where noted.

Richard T. Brennan
I am approving this document
2010.07.28 22:04:26 -04'00'

Approved: _____

Richard T. Brennan
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch

Rachel Medley
2010.07.30
16:20:00 -04'00'