

W00350

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

DESCRIPTIVE REPORT

Type of Survey: External Source Data

Registry Number: W00350

LOCALITY

State(s): New Jersey

General Locality: New Jersey Coastline

Sub-locality: Sea Bright to Sandy Hook

2014

NOAA National Geodetic Survey
Remote Sensing Division

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION		REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		W00350
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 Jersey	
General Locality:	New Jersey Coastline	
Sub-Locality:	Sea Bright to Sandy Hook	
Scale:	Variable	
Dates of Survey:	11/25/2013 to 07/20/2014	
Project Number:	OSD-RSD-16	
Data Source:	NOAA Remote Sensing Division	
Chief of Party:	Michael Aslaksen, Chief, Remote Sensing Division	
Soundings by:	Topo-bathymetric Lidar	
Imagery by:	N/A	
Verification by:	Atlantic Hydrographic Branch	
Soundings Acquired in:	Meters at Mean Lower Low Water	
Remarks:		
<p><i>The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Revisions and Red notes were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. Page numbering may be interrupted or non-sequential. All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.</i></p>		

<p align="center">Descriptive Report Summary to Accompany</p> <p align="center">W00350</p> <p align="center"><i>W00350 has been designated a sub-region of W00302</i></p>	
Project	OSD-RSD-16
Survey	W00350
State	New Jersey
Locality	New Jersey Coastline
Sub Locality	Long Beach Island to Sea Bright
Scale of Survey	Variable
LASER Used	Riegl VQ-820G Lidar Sensor
Horizontal Datum	North American Datum of 1983
Vertical Datum	Mean Lower Low Water (MLLW)
Vertical Datum Correction	VDATUM
Projection	Latitude-Longitude (NAD83) - UTM Zone 18
Field Unit	Dewberry, Quantum Spatial, RC&A, Woolpert
Survey Dates	Nov. 25 2013 to July 20 2014
Chief of Party /Data Originator	NOAA Remote Sensing Division Chief, Mike Aslaskan

A. Area Surveyed

This topo-bathy lidar survey was acquired in accordance with the requirements defined in the National Geodetic Survey (NGS) Sandy Supplemental Statement of Work Volume 4. Please see the NGS Remote Sensing Division (RSD) DR/DAPR report for any deviations from this requirement.

The data set contains outer coast and inlet data from Cape May to Sandy Hook, NJ. This is a subset of a larger Post Hurricane Sandy topo-bathy lidar data set that extends from South Carolina to New York. The entire data set spans 140 blocks and has been broken down into four sections for submission to the Office of Coast Survey (OCS). This data set contains block 97 through block 118, as outlined in Figure 1. See Appendix A. Bathymetric Coverage for grid coverage by block.

Data were acquired within the following survey limits:

Table 1 Bounding Coordinates

Northeast Limit	Southwest Limit
40.48 N	38.92 N
73.97 W	74.97 W

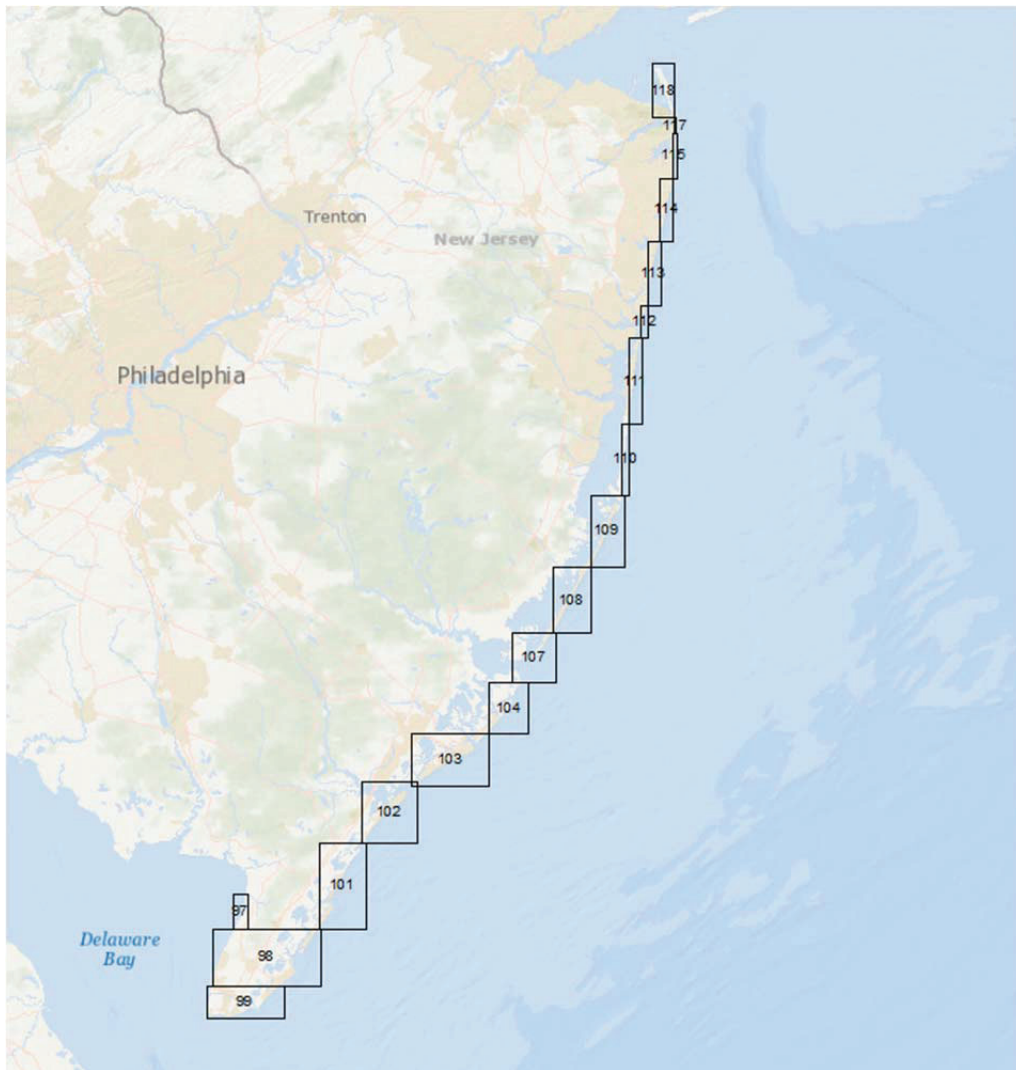


Figure 1 Image depicts region of coverage broken up by assigned block, 97 through 118. The data contains topo-bathy lidar coverage of inlets and near shore outer coast, gridded at 3m resolution. See Appendix A for bathymetric coverage by block.

B. Survey Purpose

The purpose of this survey was to update the national shoreline after Hurricane Sandy by the NOAA Remote Sensing Division (RSD). Data collection and processing was managed by private contractor, Dewberry. The survey limits and methods were determined by RSD.

C. Intended Use of Survey

In conjunction with RSD's Geographic Cell shoreline product (GC11175), data is adequate to supersede soundings and intertidal areas and add or modify features to the chart. The coverage meets Office of Coast Survey (OCS) Reconnaissance Coverage requirements for lidar data. The data should not be used to disprove submerged features due to excess water column noise described in Section D. Data Acquisition and Processing.

D. Data Acquisition and Processing

For a description of original data acquisition and processing systems, survey equipment, quality control procedures and data processing methods the following documents have been included with this data submission from the Remote Sensing Division and contractor:

DR_DAPR_VA1408_W00300_signed (RSD)

Supplemental_Sandy_Final_Report_of_Survey_20151030 (Dewberry)

Analysis for charting and additional product generation, as discussed in this document, was performed by the Sandy Integrated Ocean and Coastal Mapping Group at the UNH/NOAA Joint Hydrographic Center.

The lidar las files and aerial imagery were processed in ArcMAP 10.4.0, LP360 2015.1.76.7 for ArcMAP extension and Caris Base Editor 4.1. In LP360 the data was reviewed to confirm classification was correct, point source IDs were assigned to flight lines, data was in MLLW, fliers were removed, and to identify any additional features, not included in the RSD shoreline files. The aerial imagery was combined by block in ArcMAP and exported to GeoTIFF for ease of use within Caris. Caris Base Editor was used for final grid creation in CSAR and BAG format and S-57 feature file attribution.

Seven classes of data, identified in the following table, were extracted by RSD from the full lidar data set, converted to MLLW, inverted to Z positive down, and clipped to MHW for chart submission.

Table 2 Lidar Classes Submitted from RSD

Lidar Class	Category
1	Unclassified
2	Ground
25	Water Column
26	Bathymetry
27	Water Surface
29	Submerged Features
30	S-57 Features

Class 2 ground and class 26 bathymetry represent the bare earth points. Chart features are not represented in these classes. Class 29 and 30 are reserved for features. An aquaculture facility, within Blocks 97 and 98, was classified to Class 30, as depicted in Figure 2. No other blocks contained classified features within Class 29 or 30. All additional features, including those represented in the shoreline file, are located in class 1 unclassified, along with noise and other miscellaneous points not classified. Occasionally, features are also included in class 25 water column or 27 water surface.



Figure 2 Class 30 lidar points (yellow) representing aquaculture facility between blocks 97 and 98. Green line represents border between blocks. These features were delineated in the RSD shoreline GC11175 (blue lines).

The algorithm used to automatically classify the ground points for land and bathymetric elevations tracks and selects the bottom edge of the data set. This can result in data points not included in the ground or bathymetry class that may otherwise be considered ground or seafloor. As a consequence, the density of the gridded data can be reduced or shoal depths excluded. In the following image (Figure 3) the bottom edge of the bathymetry is classified bathy (red), while the top edge is classified water column (light blue). Of these classes, only the bathymetry class (red points) would be included in an elevation model.

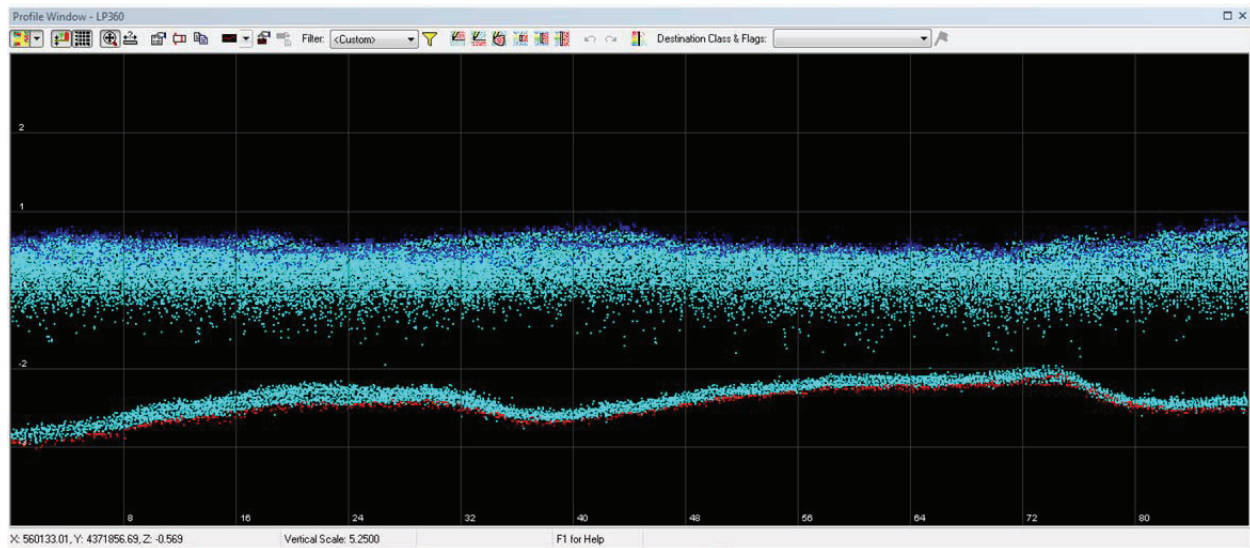


Figure 3 LP360 profile of shoal points on sand waves included in water column class (light blue), which ends up being excluded from the bare earth model. The surrounding classified bathymetry (red points) demonstrate how the bottom tracking algorithm only classifies the bottom edge of the ground/bathy points. This image also demonstrates the noise in the water column, extending down from the water's surface. Block 107.

In LP360, the chart, LAS files, aerial imagery, and final shoreline GC11175 were used to search for and identify any additional features in the data, not included in the RSD shoreline. Increased noise in the system, due to an increase in the sensitivity of the sensor to improve bathymetric measurements, as described on page 31 of the RSD DR DAPR, hindered identification of submerged features. The majority of features identified were above water. The features are digitized at survey scale and included in the final feature file W00302_FFF.000. The features include pilings, shoreline construction, obstructions and cartographic notes.

While reviewing the las files, the data were found to be in appropriate format for grid generation. All files were in the correct datum, there were no fliers, and data was classified appropriately. The only issue to note is that point source ID's were not assigned for blocks 99 – 118. This inhibited identification of features across multiple flight lines.

A 3 m grid surface was generated for the entire data set and used to make additional product layers. At this resolution, 94% of nodes have 5 soundings or more (Figure 4). An additional 1m surface was created for reference. The flight lines were collected at 20% sidelap, which limits the dataset to meeting OCS Reconnaissance Coverage requirements for lidar. The RSD and contractor reports mistakenly state 50% sidelap. This discrepancy was confirmed with RSD.

Table 3 Bathymetric Surfaces

Surface Name	Surface Type	Resolution	Depth Range (m)	Surface Parameter	Purpose
W00302_LI_3m_MLLW	BAG/CSAR	3m	7.65 to -5.78	Shoalest Depth	Reconnaissance Coverage
W00302_LI_1m_MLLW	BAG/CSAR	1m	7.65 to -5.78	Shoalest Depth	Reference

The following four additional files were created from the 3 m surface and submitted with the data set;

- survey scale sounding layer with 40 m radius spacing (HOB)
- contour file containing NOAA rounded 3, 6, 12 and 18 ft contours (HOB)
- coverage polygon (HOB)
- block 97 through 118 outlines, as seen in Figure 1 (SHP)

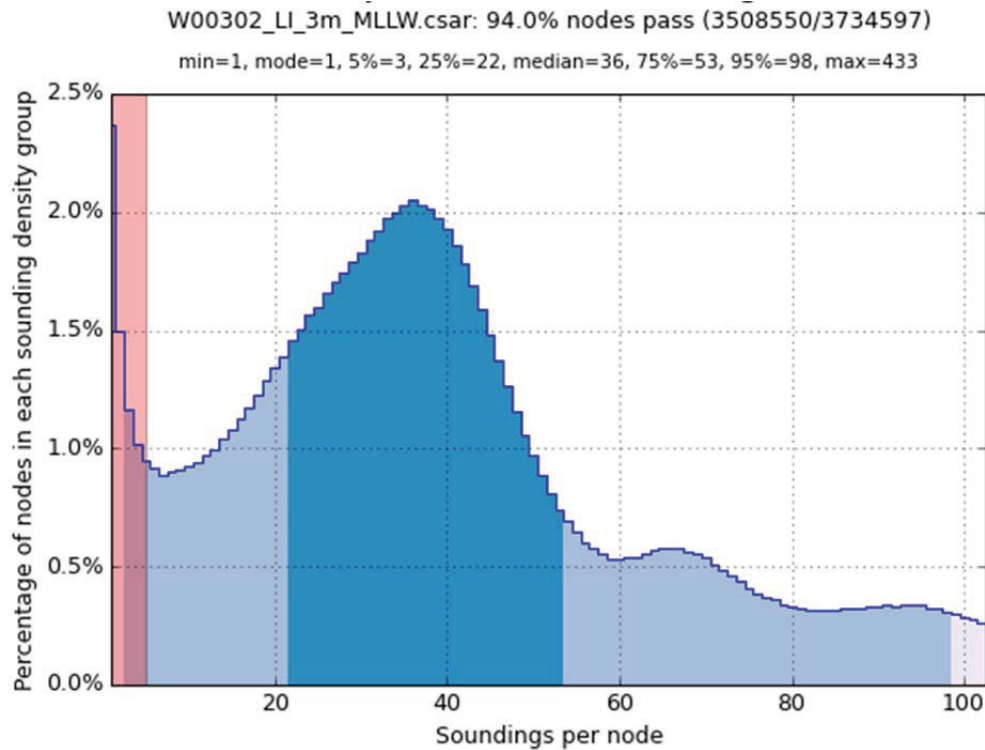


Figure 4 Representation of sounding density per node for the 3 m surface

E. Uncertainty

The standard deviation for the 3 m gridded surface ranges from 0 to 2.7 m with an average of 4 cm. These values are reflective of the bottom detection algorithm used to classify bottom points and not necessarily the standard deviation of the full ground points.

For information on positional accuracy of the data refer to pg 41, section 5.0 Uncertainty, of the RSD DR DAPR.

F. Results and Recommendations

The following are the largest scale RNCs and ENC, which cover the survey area, 1:80,000 and higher, used to compare with W00302:

Table 4 Rasters and ENCs used for chart comparison

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
12214	1:80,000	49	11/1/2010	8/9/2016	7/23/2016
12304	1:80,000	47	10/1/2014	8/9/2016	7/23/2016
12316	1:40,000	35	10/1/2012	8/9/2016	8/20/2016
12317	1:10,000	33	3/1/2015	8/9/2016	7/23/2016
12318	1:80,000	35	4/1/2010	8/9/2016	8/6/2016
12323	1:80,000	26	12/1/2012	8/9/2016	7/23/2016
12324	1:40,000	35	3/1/2012	8/9/2016	7/23/2016
12326	1:80,000	53	1/1/2016	8/9/2016	7/23/2016
12327	1:40,000	106	3/1/2016	8/9/2016	7/23/2016
12401	1:15,000	11	10/1/2011	8/9/2016	7/23/2016

ENC	Scale	Edition	Update Application	Issue Date
US4DE11M	1:80,000	29	5/11/2015	6/17/2016
US4DE12M	1:80,000	20	7/13/2016	7/13/2016
US4NJ22M	1:80,000	15	10/29/2015	5/20/2016
US4NJ23M	1:80,000	11	1/22/2013	1/14/2016
US4NY1AM	1:80,000	28	6/24/2015	7/11/2016
US5NJ20M	1:40,000	16	6/16/2015	8/16/2016
US5NJ21M	1:15,000	8	1/9/2013	11/4/2015
US5NJ24M	1:40,000	11	12/27/2013	7/5/2016
US5NJ25M	1:20,000	5	4/20/2015	8/8/2016
US5NJ30M	1:20,000	19	3/26/2015	7/6/2016
US5NY18M	1:15,000	37	7/20/2016	7/20/2016

The dataset was reviewed for dangers to navigation, areas of significant bathymetric cover related to chart scale, and areas of significant shoreline change that may warrant return by a hydrographic platform. Survey scale soundings generated from the three meter surface were used to evaluate differences with the chart.

Of the eighteen blocks of data submitted, all have significant bathymetric coverage (SBC) that could be used to update soundings or contours on the chart. The following table lists each block with corresponding RNCs and ENCs that cover the area. Blocks are considered insignificant bathymetric coverage if the laser did not penetrate the water surface, there are no data below MLLW, or the bathymetric coverage is so close to shore it would not warrant a sounding on the largest scale chart.

Table 5 Survey blocks and corresponding RNC's and ENC's

Block	SBC	1:10,000	1:15,000	1:40,000	1:80,000	ENC
97	Y				12304	US3DE12M
98	Y			12316	12318, 12214, 12304	US5NJ24M, US4NJ22M, US4DE12M, US4DE11M
99	Y	12317		12316	12318, 12214, 12304	US4DE11M, US5NJ21M, US5NJ24M
101	Y			12316	12318	US4NJ22M, US5NJ24M
102	Y			12316	12318	US4NJ22M, US5NJ24M, US5NJ20M
103	Y	12318_2		12316	12318	US4NJ22M, US5NJ24M, US5NJ20M, US5NJ25M
104	Y			12316	12323	US4NJ22M, US5NJ20M
107	Y			12316	12323	US4NJ22M, US5NJ20M, US4NJ23M
108	Y			12324	12323	US5NJ30M, US5NJ20M, US4NJ23M
109	Y			12324	12323	US5NJ30M, US4NJ23M
110	Y			12324	12323	US5NJ30M, US4NJ23M
111	Y			12324	12323	US5NJ30M, US4NJ23M
112	Y			12324	12323	US5NJ30M, US4NJ23M
113	Y			12324	12323, 12326	US5NJ30M, US4NJ23M, US4NY1AM
114	Y			12324	12326	US4NY1AM, US5NJ30M
115	Y			12324	12326	US4NY1AM, US5NJ30M
117	Y			12324	12326	US4NY1AM, US5NJ30M
118	Y		12401	12324, 12327	12326	US4NY1AM, US5NY18M

At the time of submission of the data to the processing branch, shoreline GC11175 had not been applied to the charts. The NJ coast has not varied as much as southern areas of the Sandy project, however some change is still seen at inlet mouths, as demonstrated in Figure 5 and along coastal stretches.

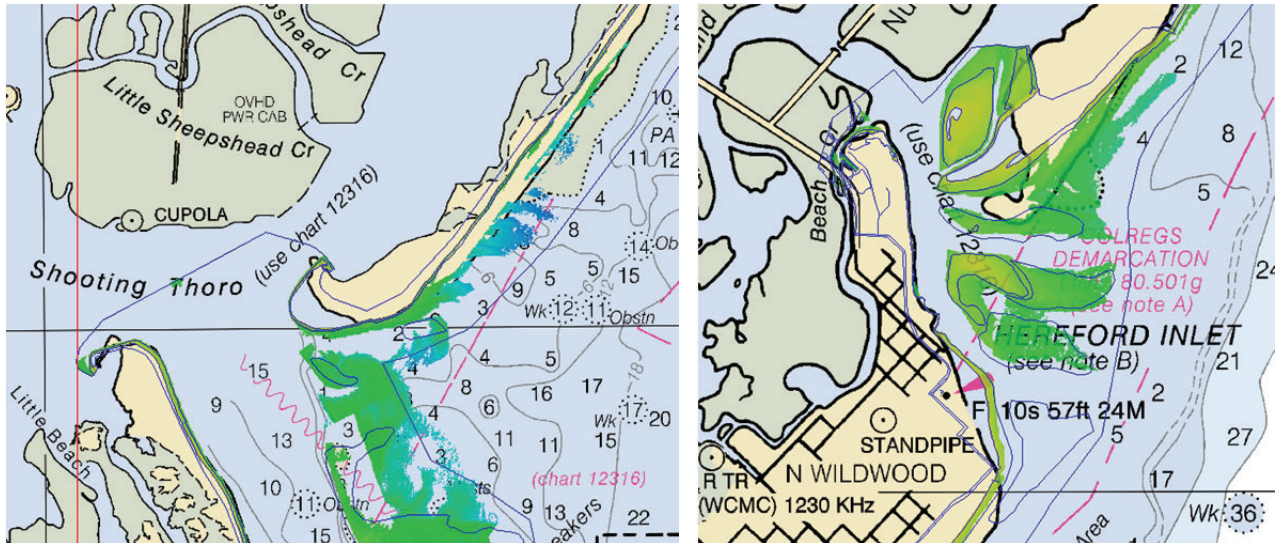


Figure 5 W00302 3m grid and GC11175 shoreline against chart in Little Egg Inlet (left) and Hereford Inlet (right) demonstrate new shoreline morphology.

The charted navigation aids, aids represented in the lidar and imagery, and 1st District local notice to mariners (2013 - 2016) were cross referenced for inconsistencies. General agreement between floating aids and chart position was seen throughout the data set, except block 98, where charted private navigational aids were not seen in the lidar or imagery.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water. VDatum was used by RSD to convert the las files from the Geoid to MLLW. The horizontal datum for this project is North American Datum of 1983 (NAD83). For more details on the positioning methods used see the RSD DR DAPR submitted with this dataset.

H. Additional Results

Gaps in coverage exist due to flight line patterns and environmental conditions as seen in Figure 6.

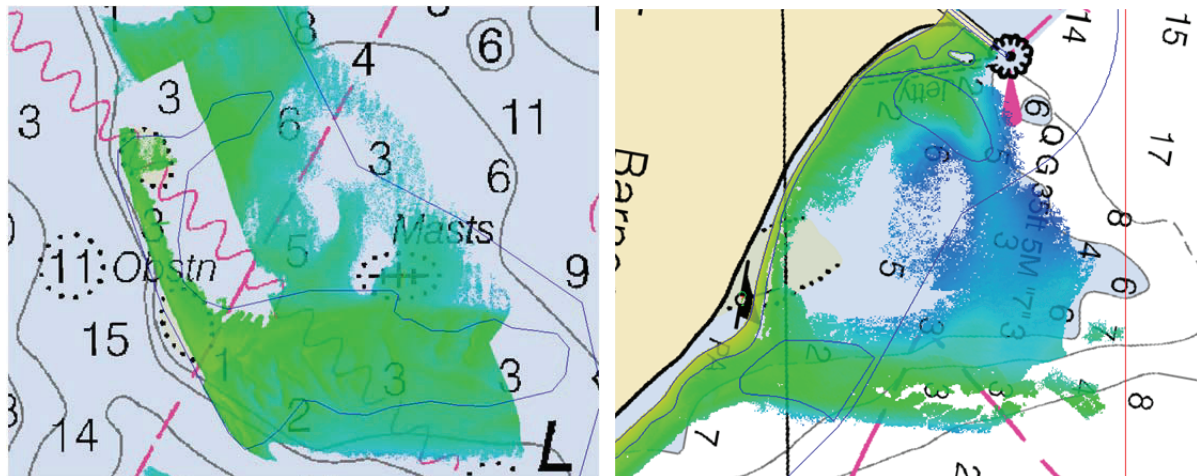


Figure 6 Examples of gaps in lidar coverage due to flight line patterns and variable lidar extinction depths from W00302

Six out of eight recent Office of Coast Survey Hydrographic surveys archived at National Center for Environmental Information (NCEI) provide enough area of overlap (although still small) for comparison with W00302. The majority of the surveys are part of the same project, OPR-C308-KR-13, collected post Hurricane Sandy, between 2013 and 2014. Those acoustic surveys were found to have a good average agreement with the lidar of less than half a meter. Table 6 breaks the differences down by survey. One additional survey, H11709, collected in 2007, wraps around Sandy Hook and overlaps in areas where Sandy Hook has migrated seaward, as seen in Figure 7. An average difference in these areas of approximately 5m over a seven year period reflects the transient nature of the seabed in this area and possible need for frequent resurvey.

Table 6 Bathymetric Surveys used for comparison with W00302


Survey	Year	Project	Vicinity	Avg. Diff. (m)
H12687	2014	OPR-C308-KR-13	Hereford Inlet	0.03
H12599	2014	OPR-C308-KR-13	Corson Inlet	-0.236
H12598	2014	OPR-C308-KR-13	Absecon inlet	-0.244
H12597	2014	OPR-C308-KR-13	Little Egg Inlet	0.317
H12596	2013	OPR-C308-KR-13	Barnegat Inlet	0.445
H11709	2007	OPR-B310-TJ-07	Sandy Hook	-5.62



Figure 7 Area of overlap (magenta) between survey H11709 (blue) and W00300 (green) at Sandy Hook. W00302 was found on average 5.62 m shoaler, due to the changing morphology of the point over the seven year period between surveys. Background chart 12401, 1:15,000.

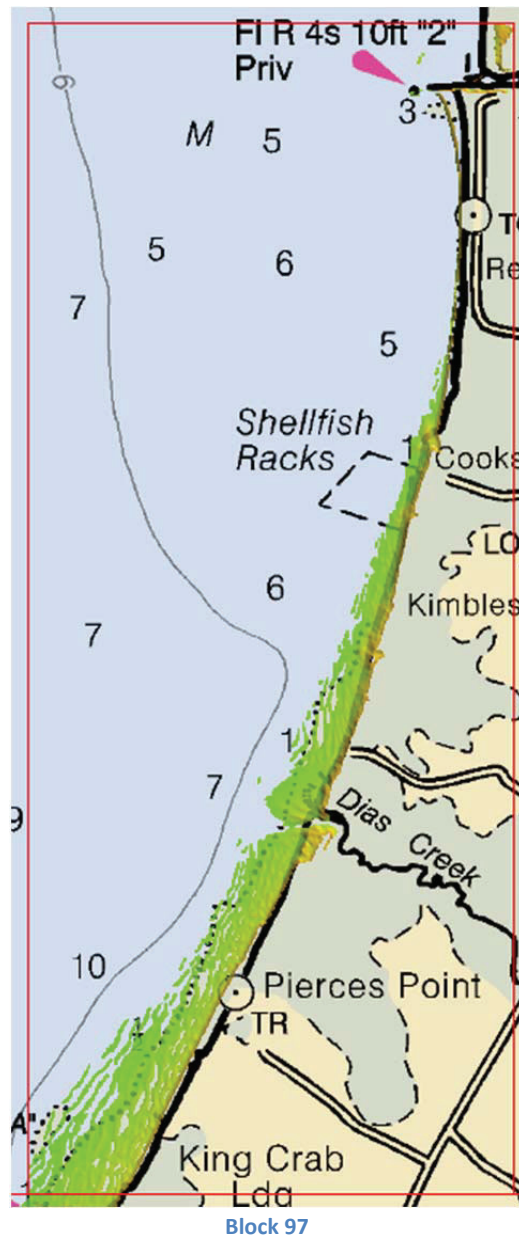
I. Approval

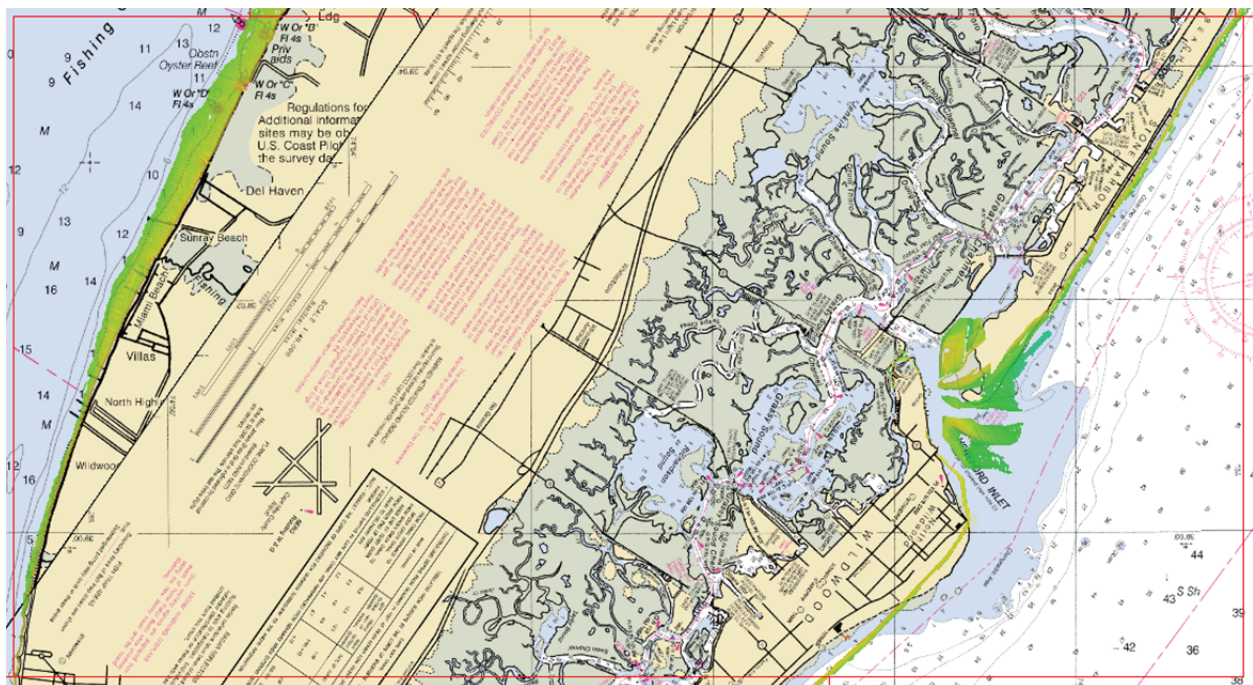
All records from RSD are included with the JHC IOCM products for final review and processing to the Processing Branch. The survey data meets or exceeds requirements for reconnaissance lidar data as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are 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	Approver Title	Approval Date	Signature
Andrew A. Armstrong, III	Co-Director, JHC	9-24-2016	

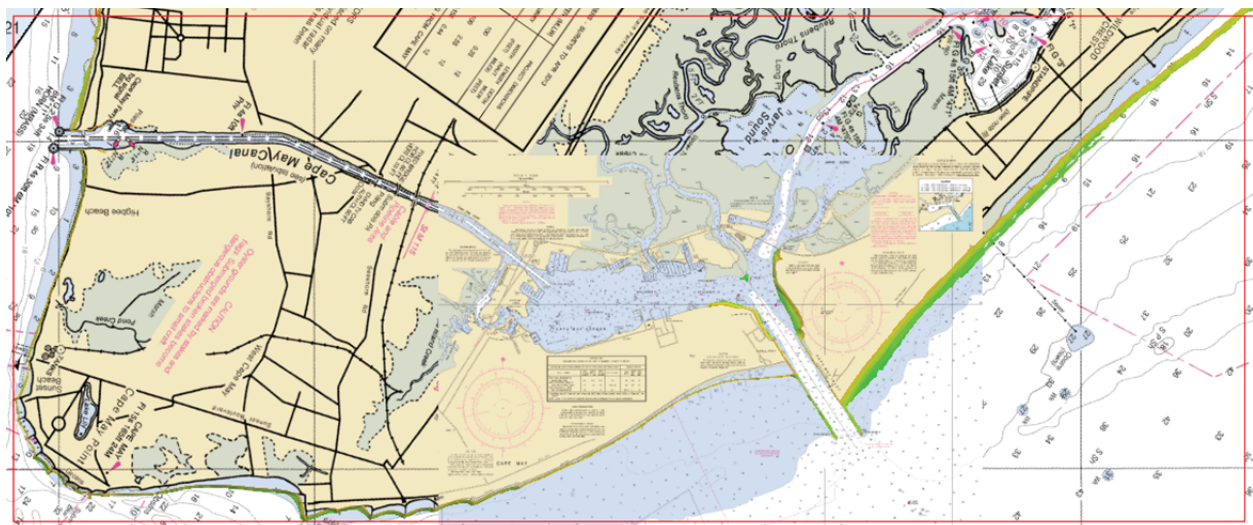
Appendix A. Bathymetric Coverage

Images contain bathymetric coverage grid W00302_LI_3m_MLLW by block, over the largest scale chart.

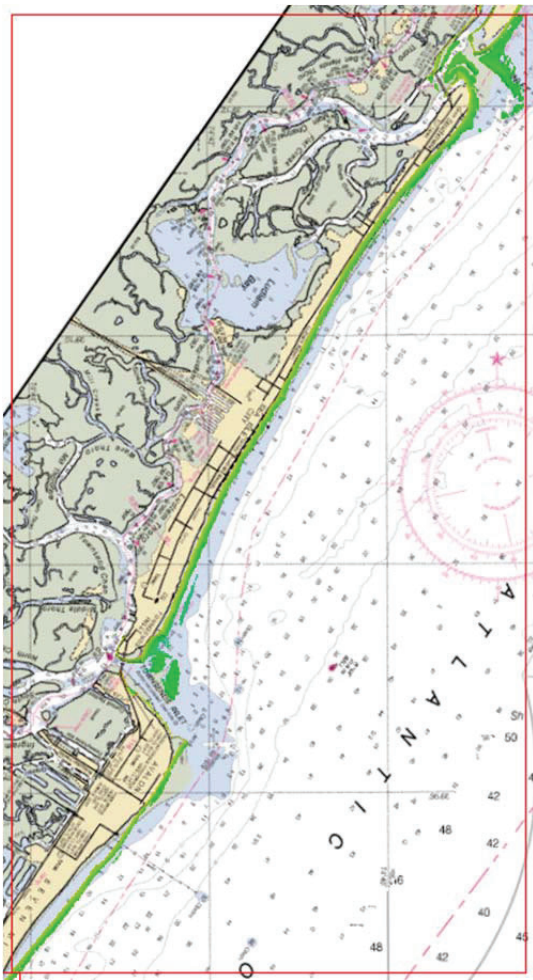




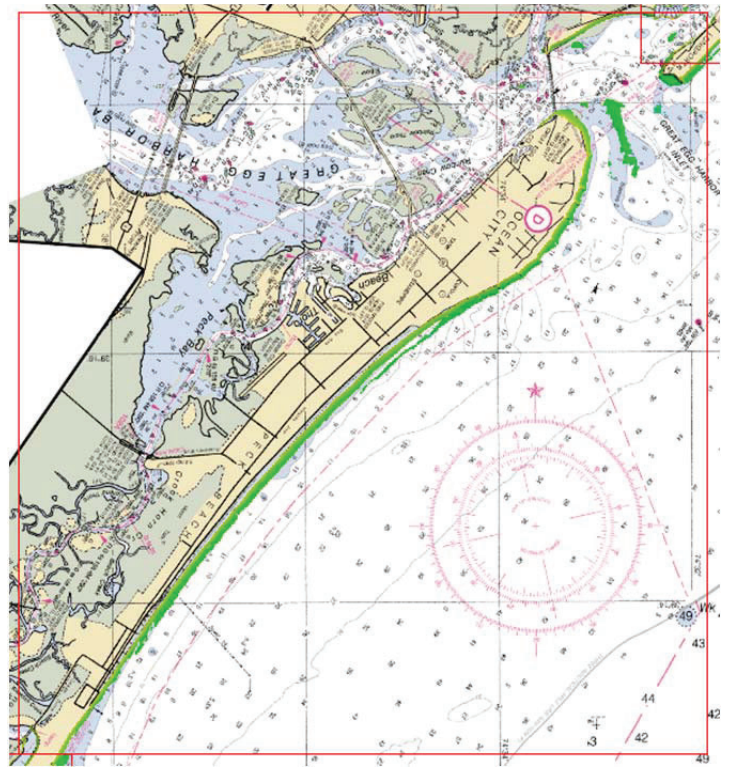
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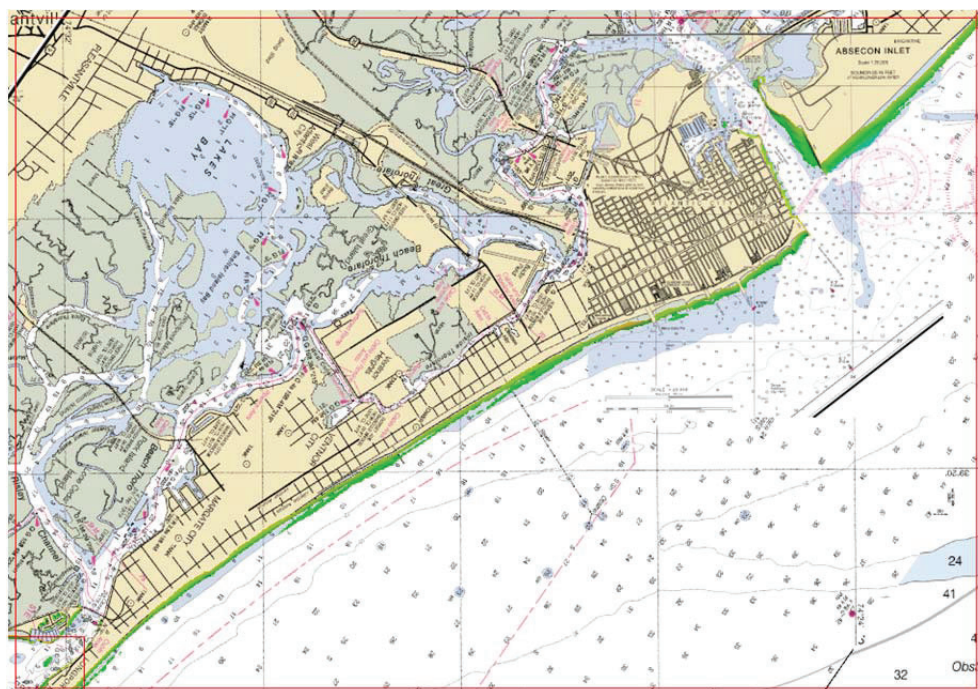
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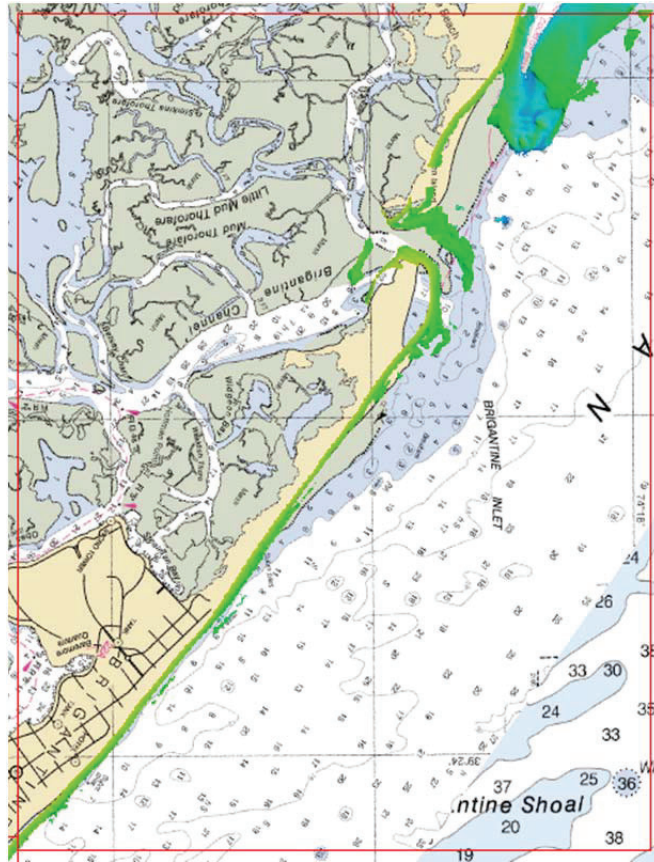
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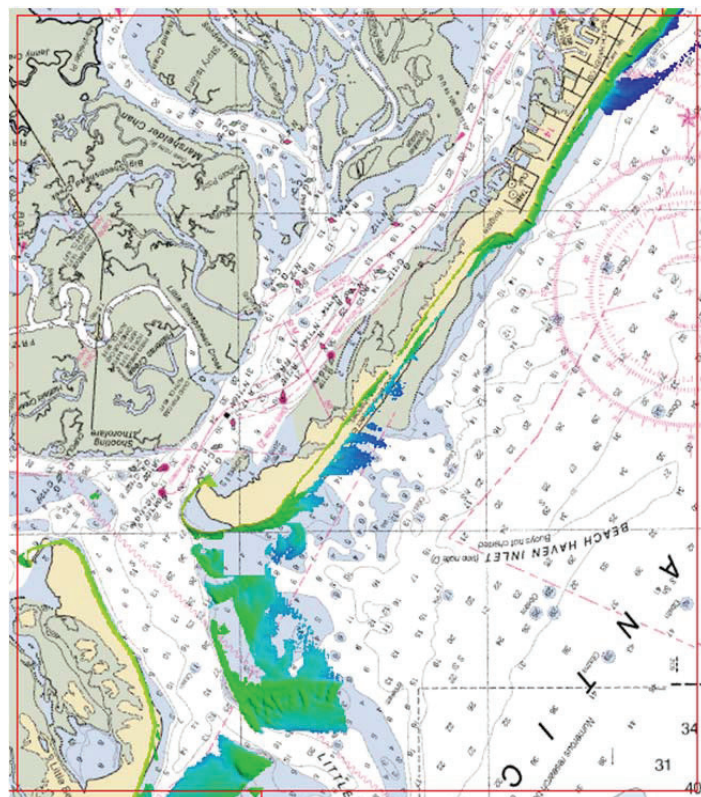
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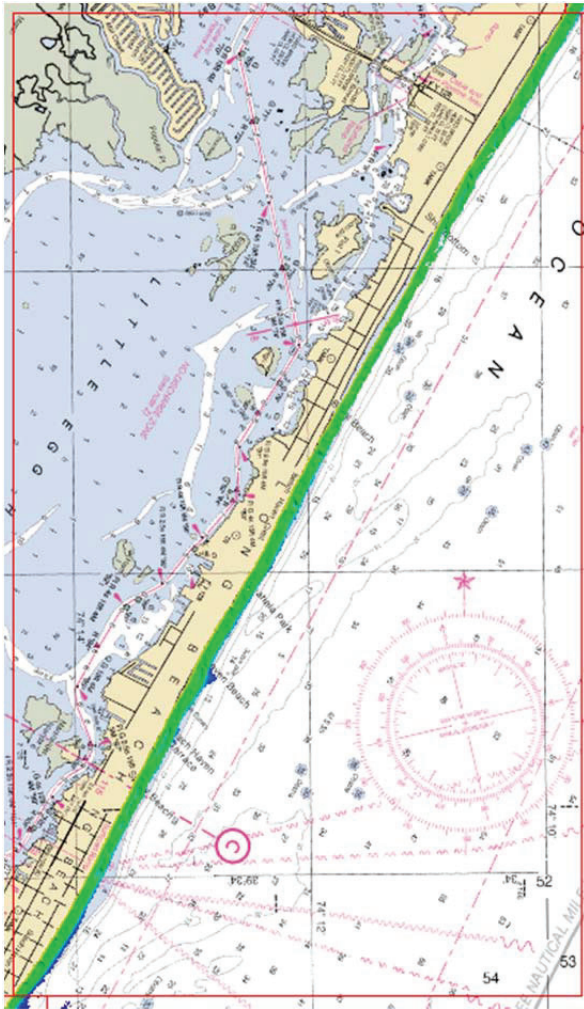
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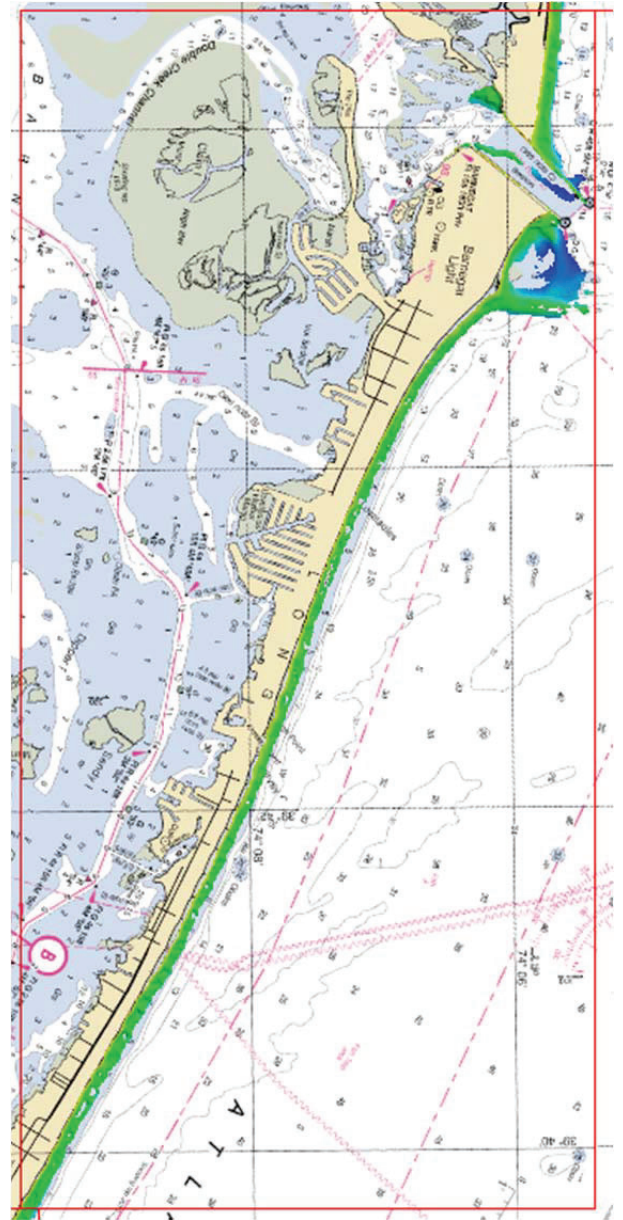
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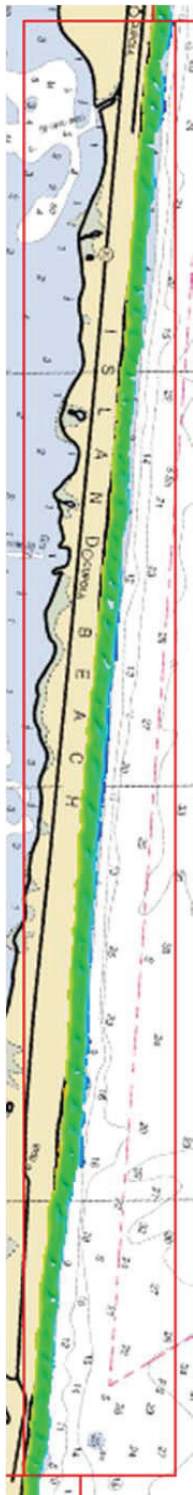
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Block 108



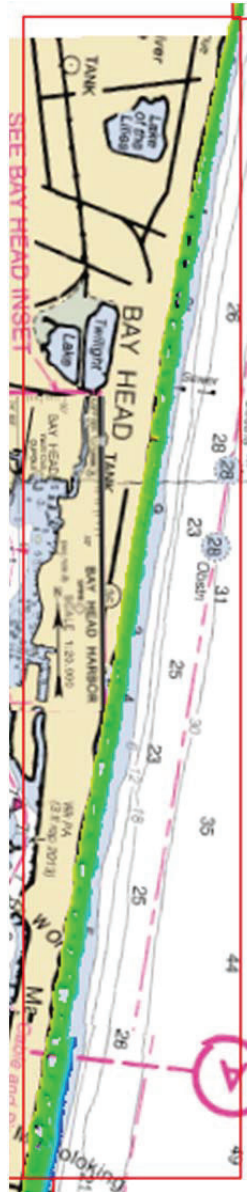
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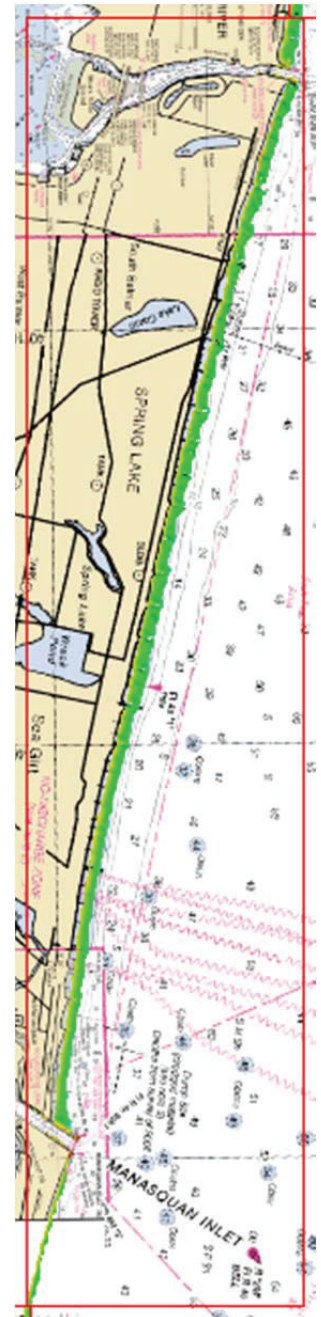
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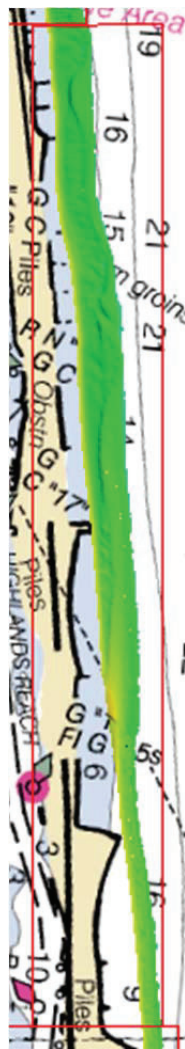
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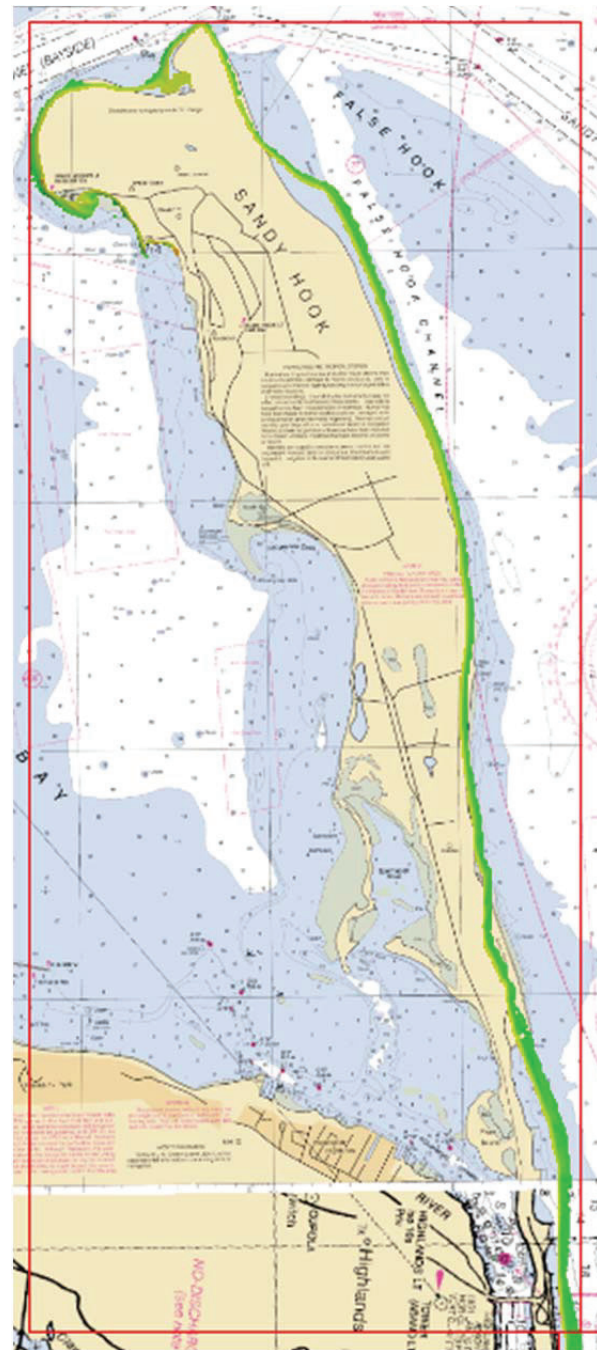
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APPENDIX I

TIDES AND WATER LEVELS

Survey W00350 does not include supplemental tide or water level information.

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

Survey W00350 does not include supplemental survey records or correspondence.

APPROVAL PAGE

W00350

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 NGDC for archive

- W00350_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records

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.



Digitally signed by
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DN: c=US, o=U.S. Government, ou=DoD,
ou=PKI, ou=NOAA,
cn=COUSINS.JASMINE.LYN.1242470776
Date: 2017.06.23 10:44:06 -04'00'

Approved: _____

LCDR Briana Welton Hillstrom, NOAA
Chief, Atlantic Hydrographic Branch