F00660

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey **Field Examination Survey**

Registry No. **F00660**

LOCALITY

State **Massachusetts**

General Locality **Buzzards Bay and Vicinity**

Sub-locality **Wasque and Tuckernuck Shoals**

2015

CHIEF OF PARTY
Shepard M. Smith, CAPT/NOAA

LIBRARY & ARCHIVES

DATE

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. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via https://www.ncei.noaa.gov/.

Descriptive Report

Descriptive Report Accompany F00660	
Project	OPR-B367-TJ-15
Survey	F00660
State	Massachusetts
Locality	Buzzards Bay and Vicinity
Sub Locality	Wasque and Tuckernuck Shoals
Scale of Survey	1:20,000
Sonars Used	RESON 7125-SV1, SV2 ODOM CV100
Horizontal Datum	North American Datum of 1983 (NAD83)
Vertical Datum	Mean Lower Low Water (MLLW)
Vertical Datum Correction	SEP Model
Projection	(NAD83) - UTM Zone 19N
Field Unit	NOAA Ship Thomas Jefferson
Survey Dates	10/8/2015 – 10/10/2015
Chief of Party	CAPT Shepard M. Smith, NOAA

A. Area Surveyed

F00660 was surveyed with RESON 7125 systems on the Thomas Jefferson's survey launches. In addition, data was collected from Z-Boats 1 and 2 with an ODOM Single beam CV-100. Data were acquired from 10/7/2015 to 10/8/2015. To meet Set Line Spacing requirements, data was acquired, processed and compiled in accordance with NOS Hydrographic Surveys Specifications and Deliverables Section 5.2.2.3 and the 2014 Field Procedures Manual. This examination is within the following limits:

Northeast Limit	Southwest Limit
43 °22-37.2 N	41 °16-58.9 N
70 °11-23.6 W	70 °28-24.9 W

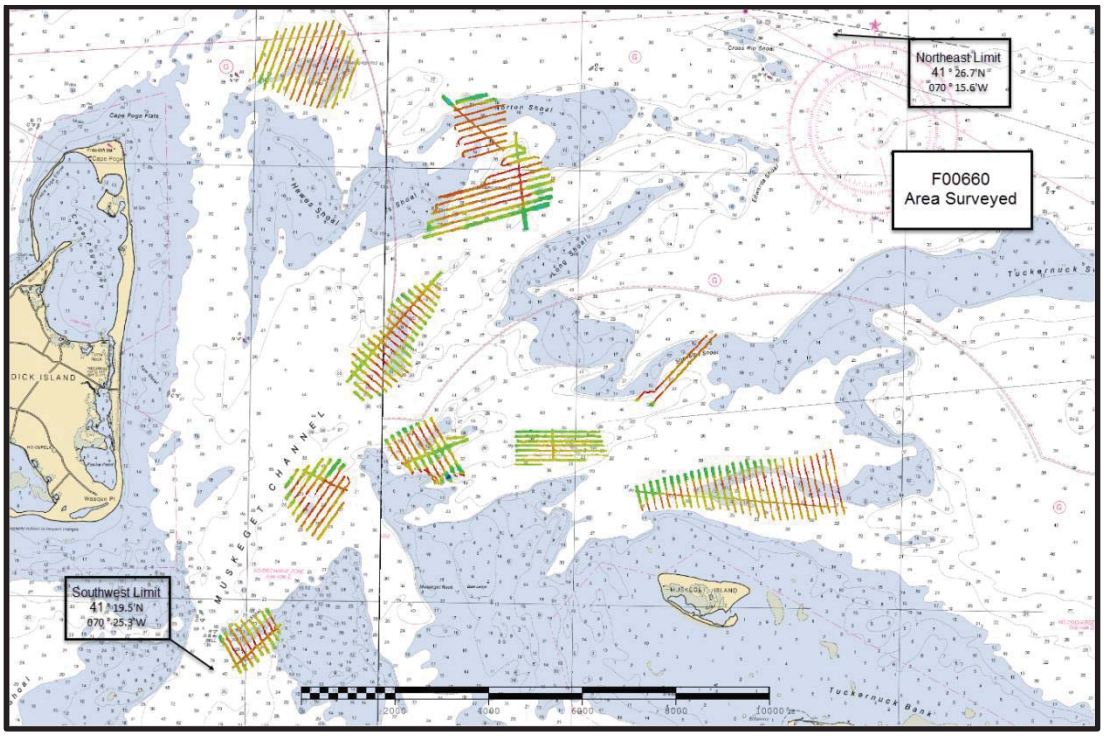

Figure 1: Survey F00660 50cm CUBE surface overlain on Chart 13237.

B. Survey Purpose

The purpose of survey F00660 was to delineate the extent and least depth of shoals identified by satellite derived bathymetry in the vicinity of Muskeget Channel, between Martha's Vineyard and Nantucket Island. Accurate soundings provided by the field unit will be available for the processing branch and Marine Charting Division in the validation of satellite derived bathymetry (SDB).

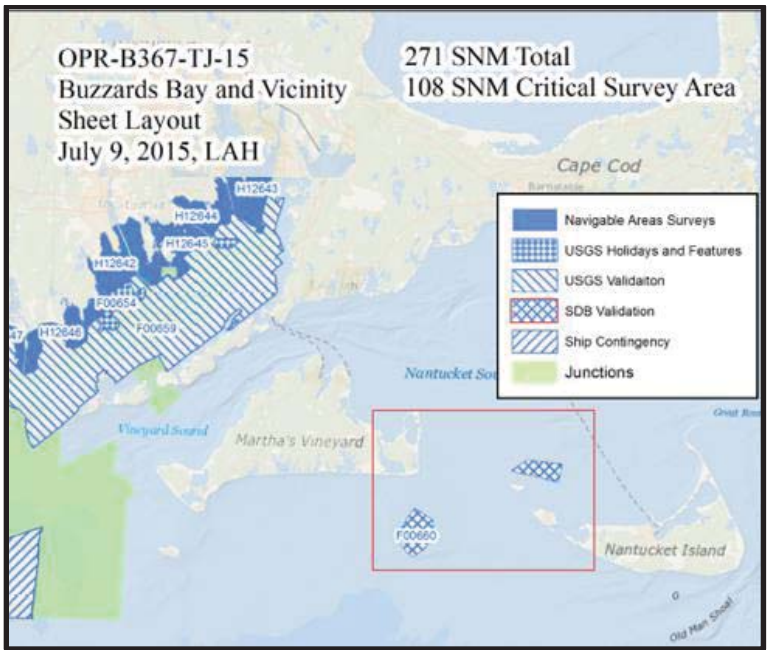

Figure 2: Buzzards Bay and Vicinity Sheet Layout with SDB area highlighted. Image from *Thomas Jefferson* Project Instructions 2015.

C. Intended Use of Survey

This survey is intended to be used in conjunction with complementary satellite derived bathymetry (SDB). The sonar data will be used to both calibrate the SDB and to evaluate the accuracy and reliability of the SDB. In addition, the sonar provides high confidence depths over dangerous shoals for direct chart application.

D. Data Acquisition and Processing

All data were acquired and processed in accordance the Field Procedures Manual (2014), Hydrographic Specifications and Deliverables (2015), Project Instructions and the accompanying Data Acquisition and Processing Report for OPR-B367-TJ-15, except that this survey had wider line spacing than required for a standalone survey, and no developments over shoals were completed. In addition, the line spacing was designed in consultation with the SDB analysis team.

E. Uncertainty

E.1 Total Propagated Uncertainty (TPU)

Total Propagated Uncertainty values for survey F00660 were derived using the combination of: real time uncertainties for vessel motion; various values for equipment and vessel characteristics; assigned values for sound speed uncertainties. The real time uncertainties for vessel motion were roll, pitch, gyro, navigation, and elevation. For the MBES, Post-Processed Precise Point Position (5P) solutions for vertical and horizontal uncertainties were derived using Marinestar GPS data and were applied to the soundings via SBET RMS files generated by Applanix POSPac MMS 7.1 SP2. For the VBES, conventional differential GPS positioning was

used. The raw CTD casts were examined in Velocipy. Figure 3 shows the values that were used to calculate TPU.

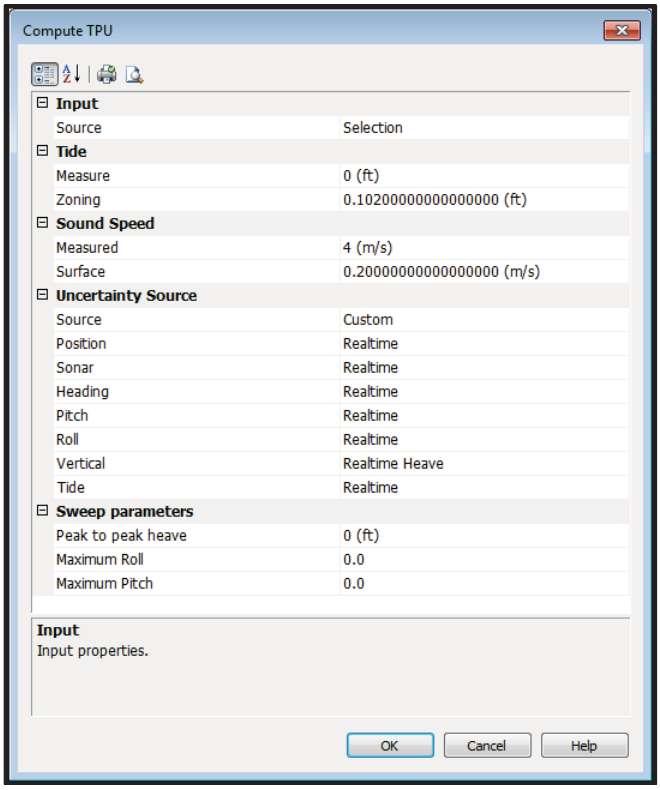

Figure 3: Shows the TPU values used to calculate CUBE surfaces for F00660.

E2. Internal Consistency

The internal consistency between the MBES and VBES was checked using a CARIS HIPS/SIPS difference surface. A difference surface computed in CARIS HIPS/SIPS between MBES and VBES data averaged 0.3m with a maximum difference as of 0.7m (Figure 4). This is likely due to the difference between the 5P solution and conventional zoned tides.

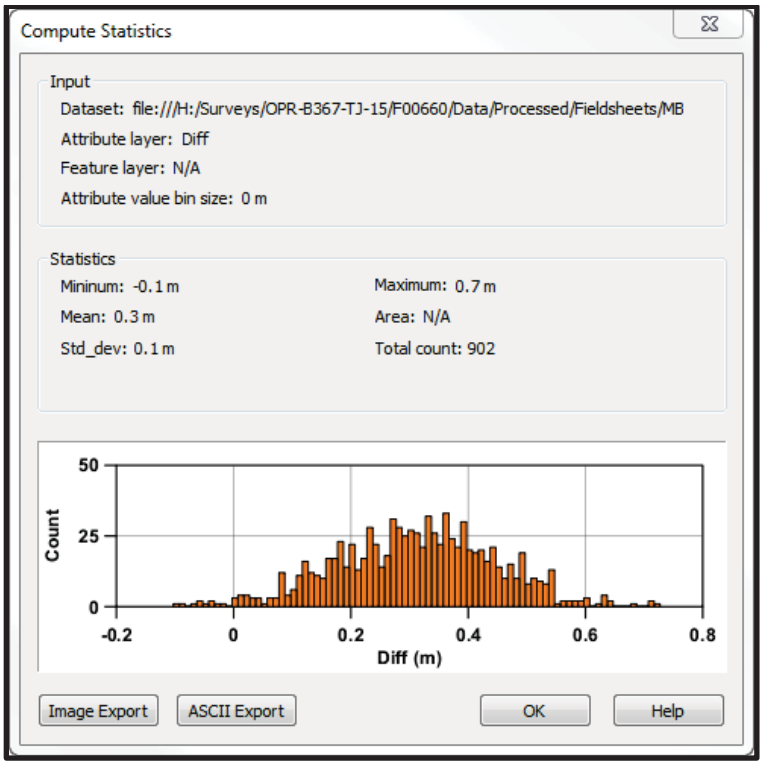

Figure 4: A cross section of seven track lines in F00660 indicating a 0.3m difference between the multibeam and vertical beam

F. Results and Recommendations

In collaboration with LT Anthony Klemm and Dr. Shachak Pe'eri at the Marine Chart Division of Coast Survey (MCD), the necessary resolution grids for for SDB validation were 2m. The combined 50 cm VBES and MBES met the density requirements for Set Line Spacing and more accurately portrayed the shifting shoals.

The following grids were created in CARIS HIPS/SIPS for submission to both the processing branch and to MCD for SDB validation:

Surface Name	Surface Type	Resolution (m)	Depth Range (m)
F00660_MB_VB_50cm_MLLW	CUBE Base Surface	0.5	1-26
F00660_MB_VB_50cm_MLLW_FINAL	CUBE Base Surface	0.5	1-26
F00660_VB_2m_MLLW	CUBE Base Surface	2	1-26
F00660_VB_2m_MLLW_FINAL	CUBE Base Surface	2	1-26
F00660_MB_2m_MLLW	CUBE Base Surface	2	1-26
F00660_MB_2m_MLLW_FINAL	CUBE Base Surface	2	1-26

Table 2: List of surfaces created for F00660.

F1. DTONS

A total of 4 DTONS were identified and submitted for updates to the chart (Table 3) on October 30, 2015. The corresponding documentation is included in Appendix 1 of this report.

DToN No.	Latitude	Longitude	Depth (m)	Figure No.
1.1	41-19'24.0" N	070-25'01.1" W	2.68	Figure 5
1.2	41-21'13.0" N	070-24'06.8" W	2.37	Figure 6
1.3	41-21'30.5" N	070-20'30.9" W	1.38	Figure 7
1.4	41-23'29.6" N	070-19'23.6" W	3.47	Figure 8

Table 3: Table of DTONS.

F2. Chart Comparisons

This survey is adequate to supersede previous data. In comparison to current NOAA RNCs and ENCs (Table 4), it is clear most of the shoals in the area have shifted significantly. Each area is displayed independently in the figures below. F00660 was compared with the following RNCs, which cover the survey area:

Chart	Scale	Edition	Edition Date	NM Date
13241	1:40,000	18	03/01/2014	08/08/2015
13233	1:40,000	18	01/01/2011	08/15/2015
13237	1:80,000	40	03/01/2007	09/10/2015
13200	1:400,000	36	11/01/2008	09/10/2015
12300	1:400,000	47	05/01/2008	06/01/2015
13009	1:500,000	33	05/01/2007	05/01/2015
13006	1:675,000	34	05/01/2007	07/01/2015
5161	1:1,058,400	13	10/01/2003	none
13003	1:1,200,000	49	04/01/2007	09/10/2015

Table 4: List of ENCs and RNCs that include F00660

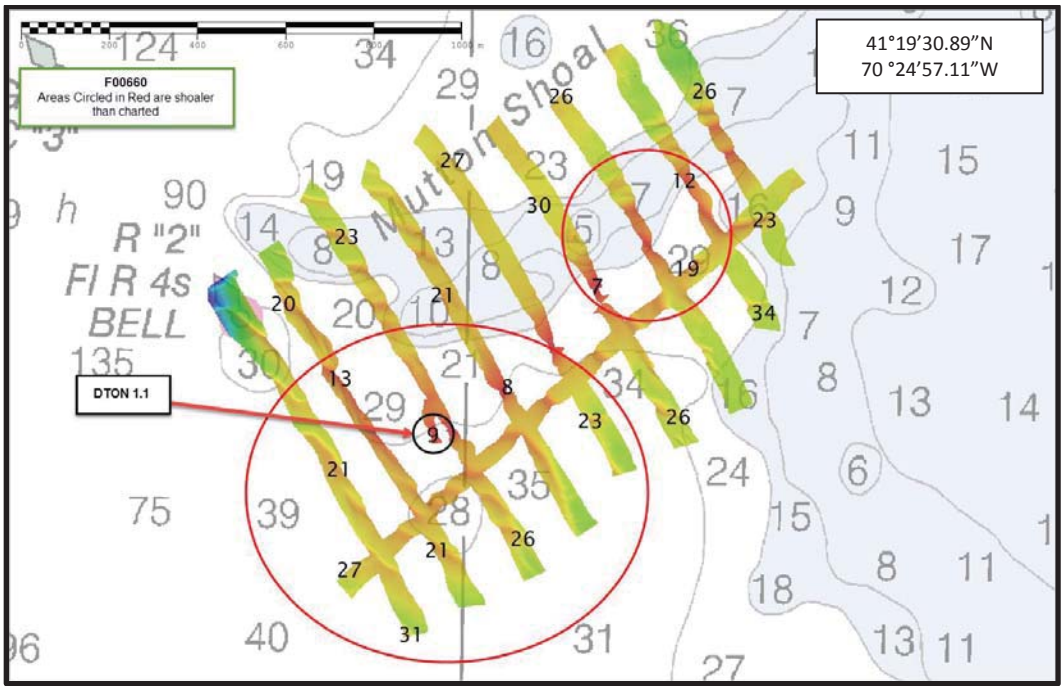

Figure 5: Images are for chart comparison 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

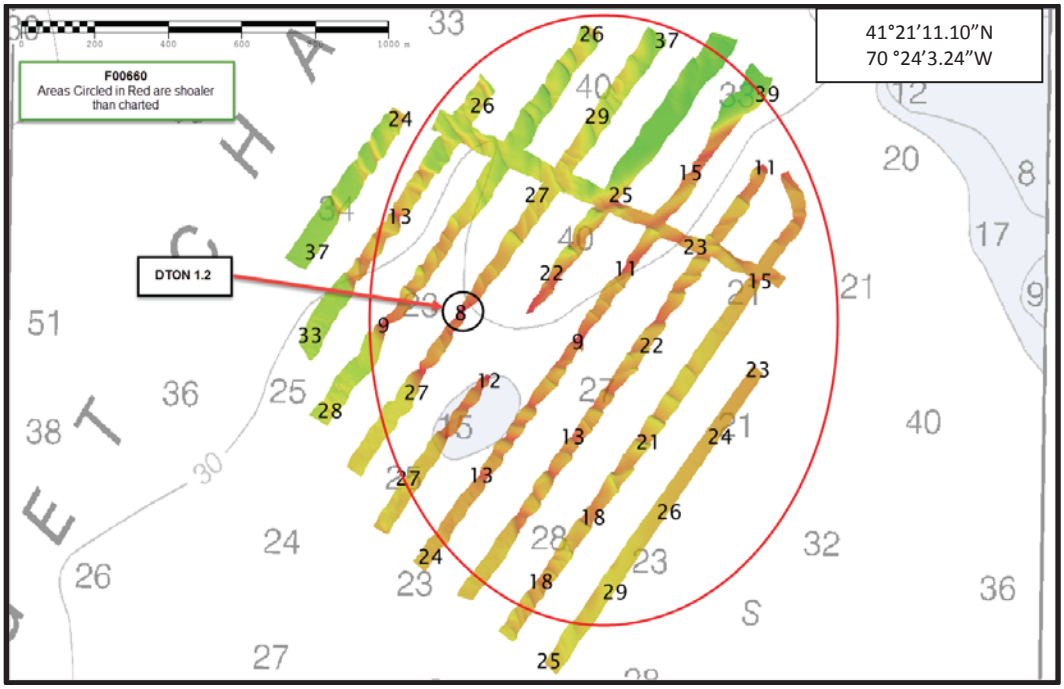

Figure 6: Images are for chart comparison 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

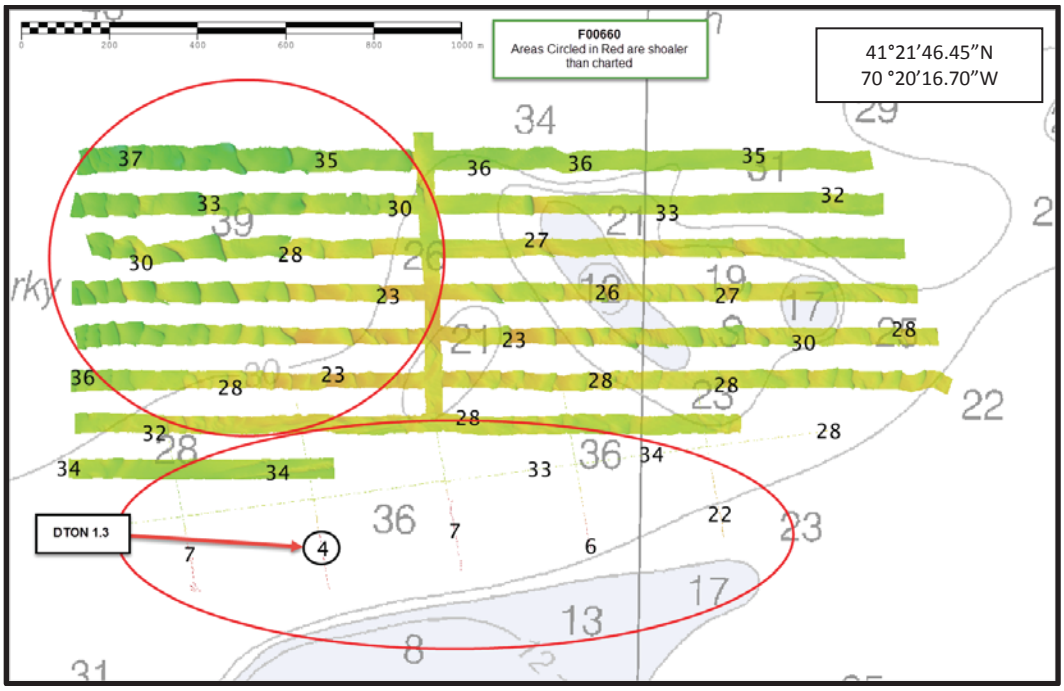

Figure 7: Images are for chart comparison 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

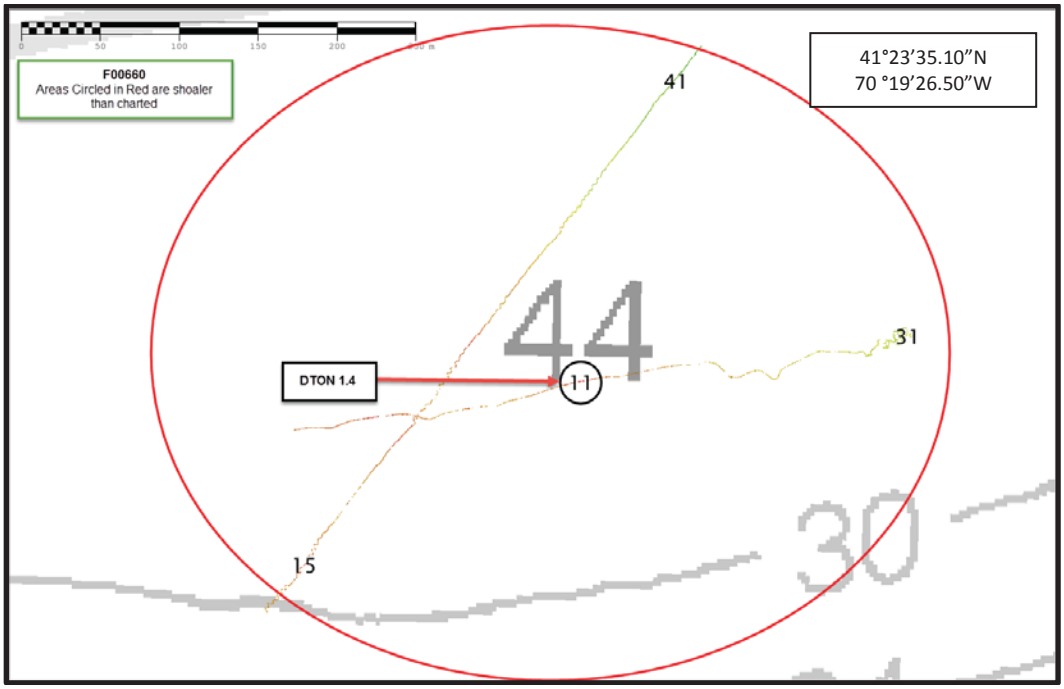

Figure 8: Images are for chart comparison 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

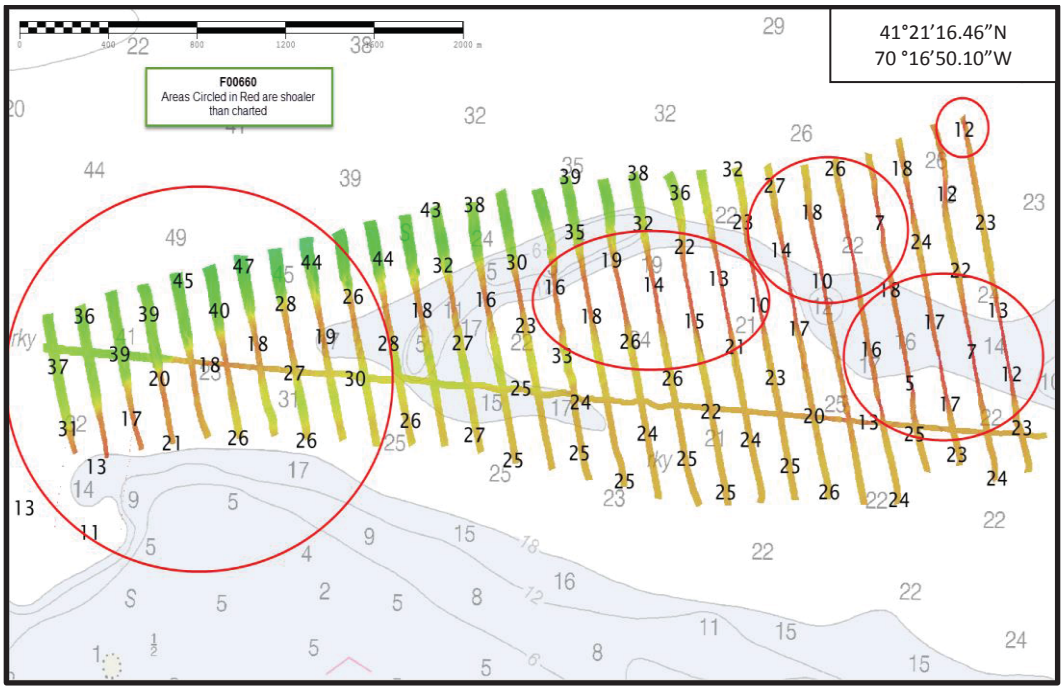

Figure 9: Images are for chart comparison 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

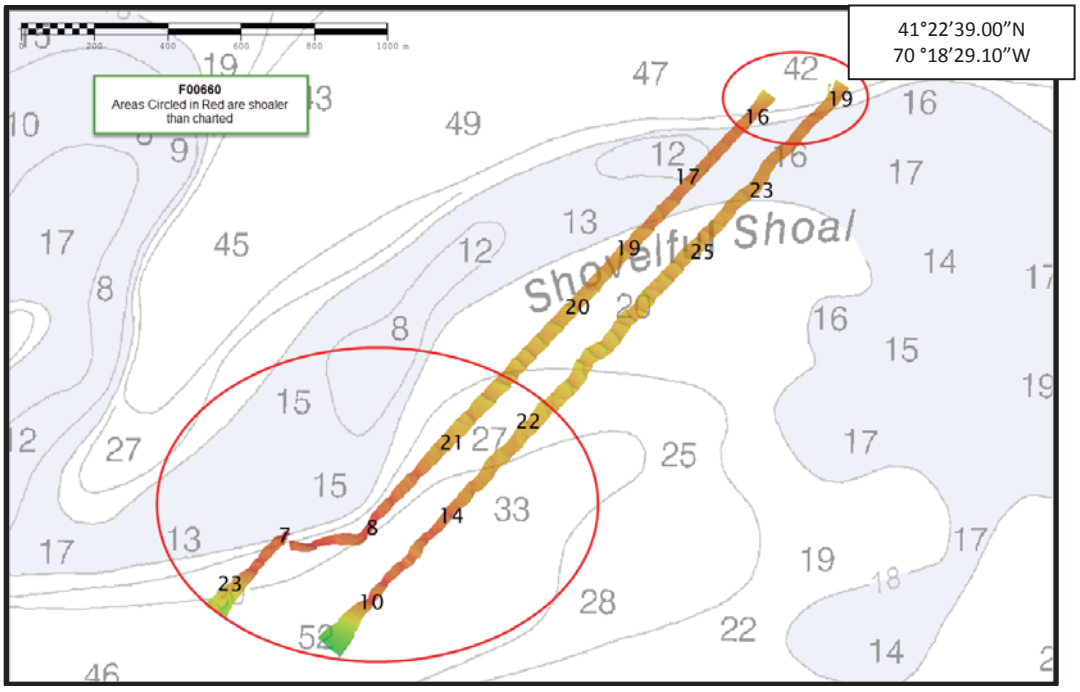

Figure 10: Images are for chart comparison 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

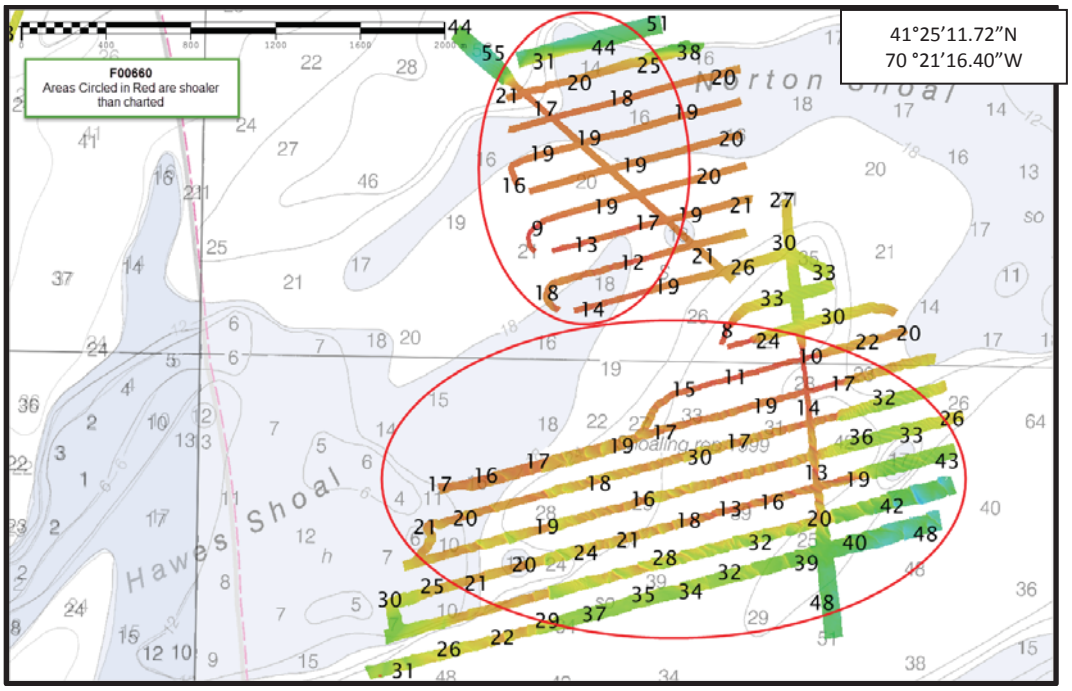

Figure 11: Images are for chart comparison 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

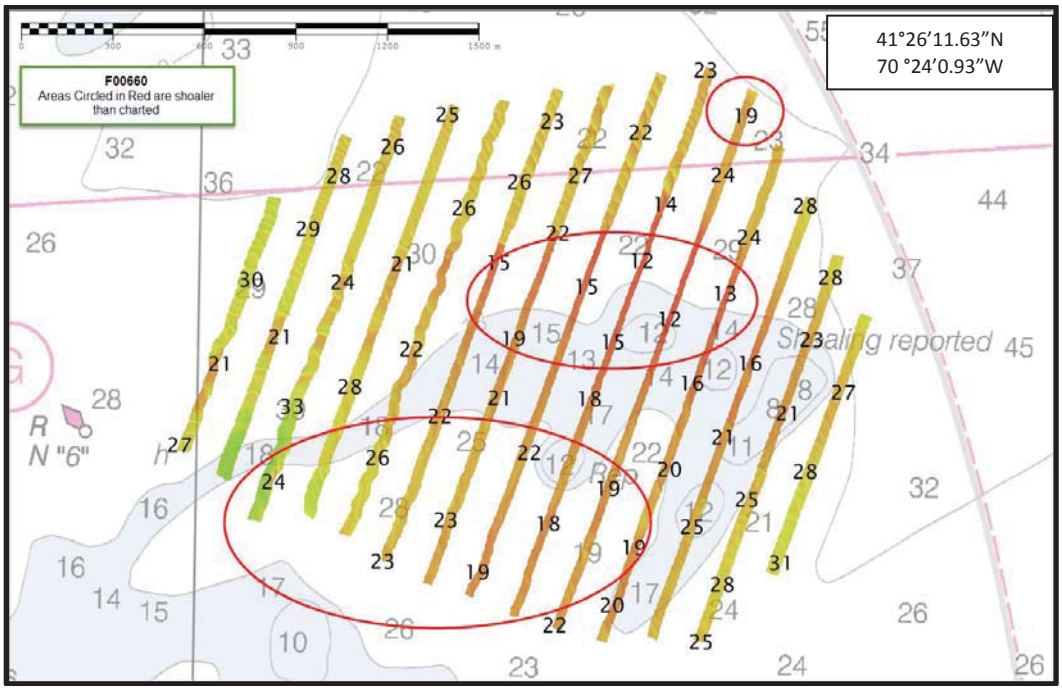

Figure 12: Images are for chart comparison 13241 and 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

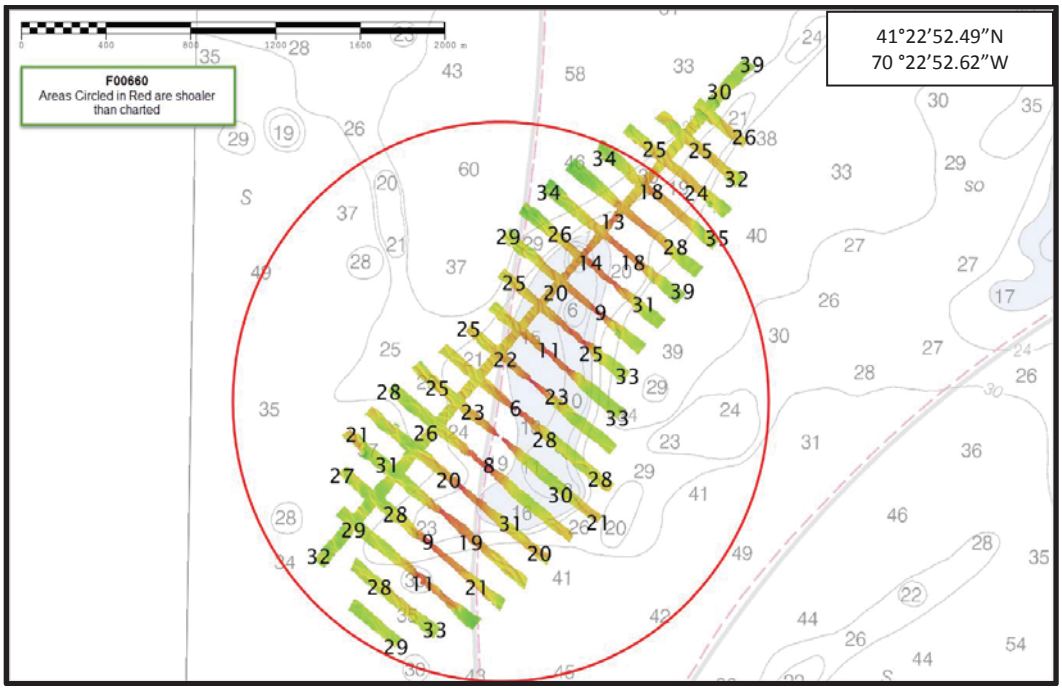

Figure 13: Images are for chart comparison 13241 and 13233 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

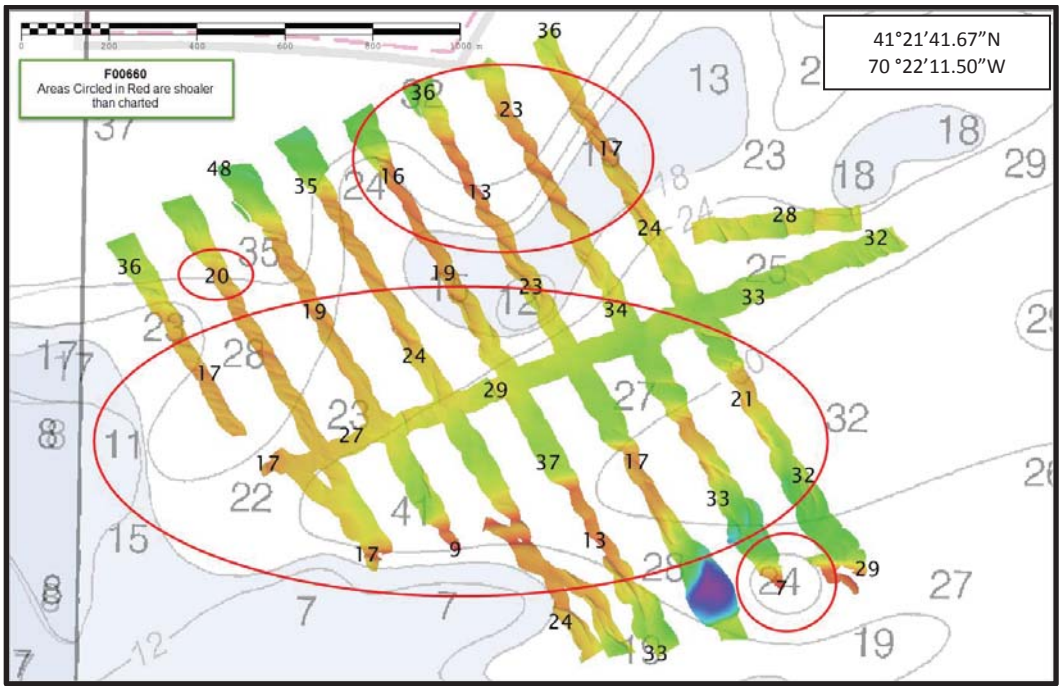

Figure 14: Images are for chart comparison 13241 to F00660 50cm CUBE surface with red circles identifying the shoal depths.

F3. Cross-line Comparison

For survey F00660, one crossline per line area was completed. A crossline for the North West line area (41°26’11.63”N, 070°24’0.93”) was not run due to time constraints; however, no data quality issues were evident in the data set. Crosslines were compared to mainscheme using 50 cm grids of each dataset individually, then differencing those surfaces. *The percentage of crosslines to mainscheme lines is not mentioned in the DR. The total mileage for mainscheme lines is 82.33. The total mileage of crosslines is 9.64. Therefore the percentage of crosslines acquired is 11.70% meeting spec requirements.*

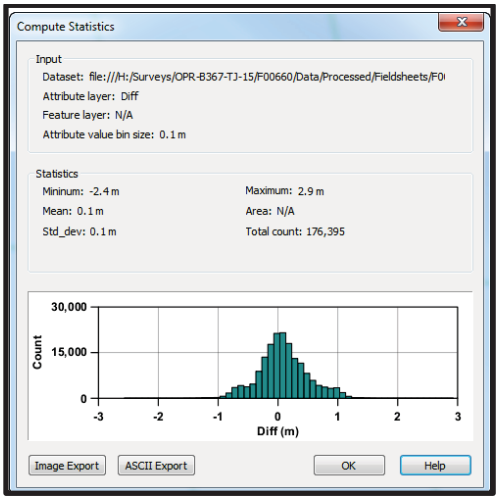

Figure 15: F00660 Difference statistics of crossline data versus mainscheme data.

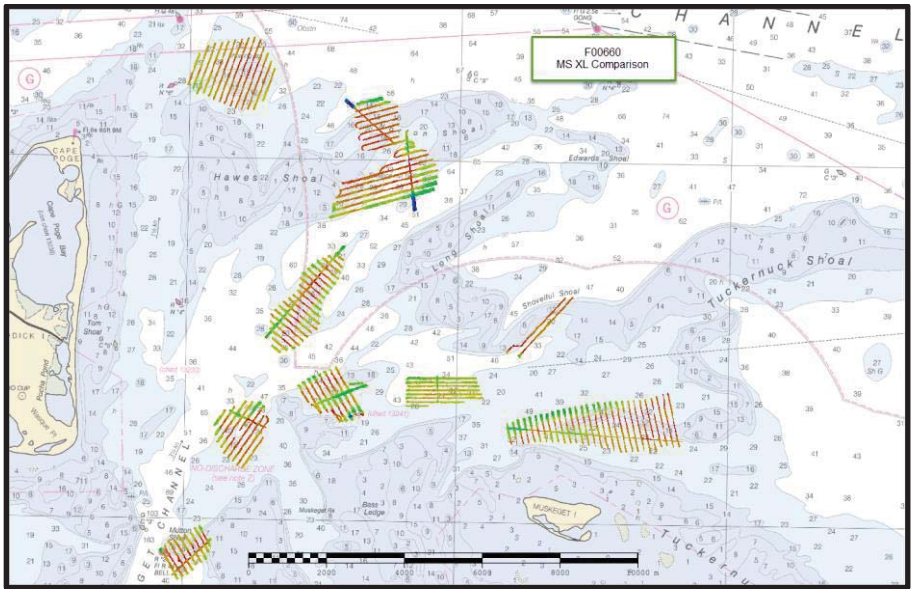

Figure 16: F00660 Crosslines on top of mainscheme over chart 13237

F4. Junction Surveys

No junction surveys were examined.

F5. Density

Given the amount of time, weather window, size and complexity of the survey area, shoals were not developed to object detection standards. 98.24% of nodes in the finalized 50 cm surface meet the Set Line Spacing density requirements as defined in HSSD section 5.2.2.3.

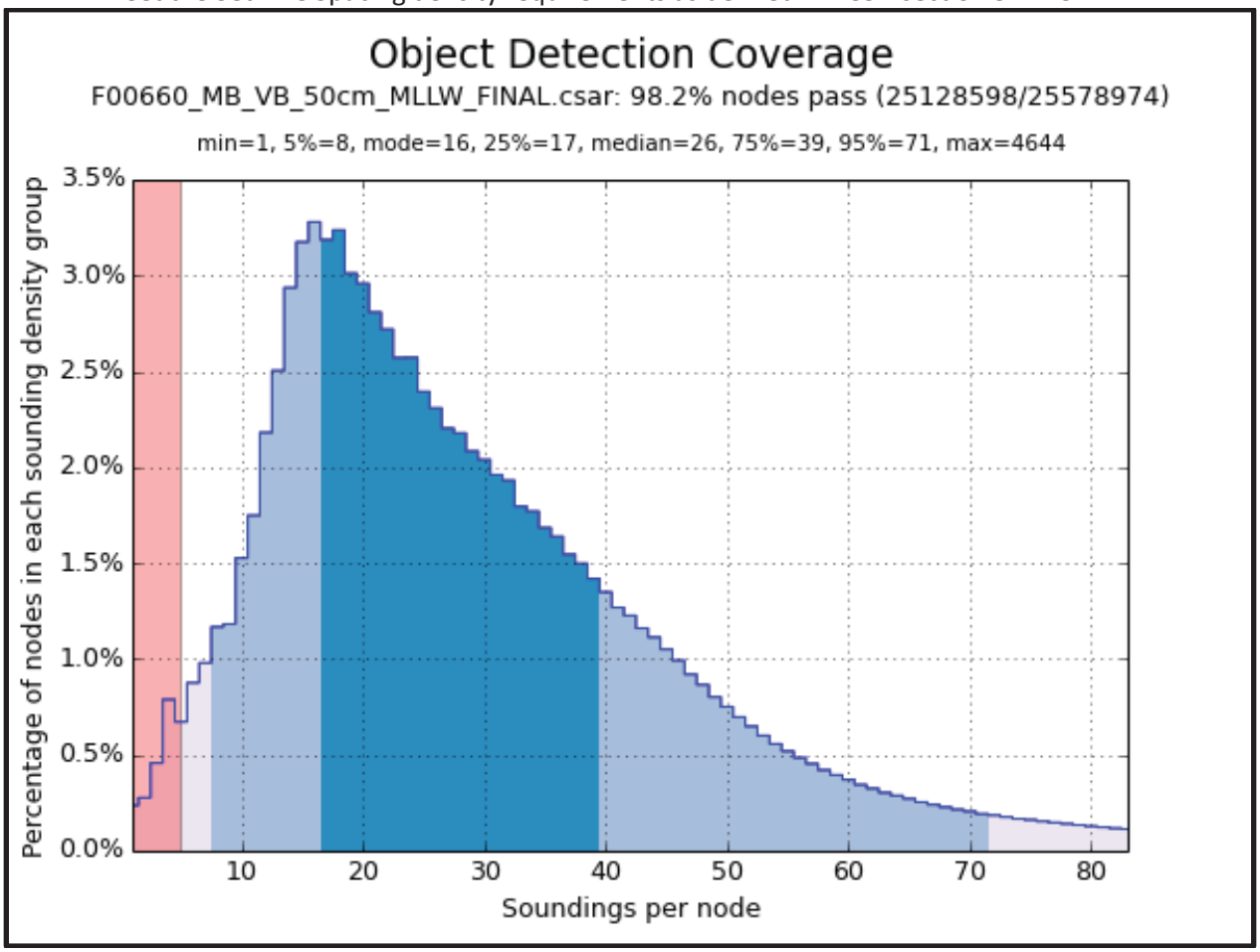

Figure 17: Surface statistics verifying 98.24% of the survey meets IHO specifications of 5 soundings per node.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water. VDatum was the vertical control method used for data acquired by the survey launches. Traditional tides were applied to data collected by the Z-Boats. The horizontal datum for this project is North American Datum of 1983 (NAD83). A compilation of final tides for the dates of this survey were obtained from CO-OPS and entered into CARIS. The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Nantucket Island, MA	8449130
Newport, RI	8452660

F00660 meets IHO uncertainty standards with more than 99.9% of nodes passing (Figure 18). See Field Procedures Manual 4.2.3.8 for more information.

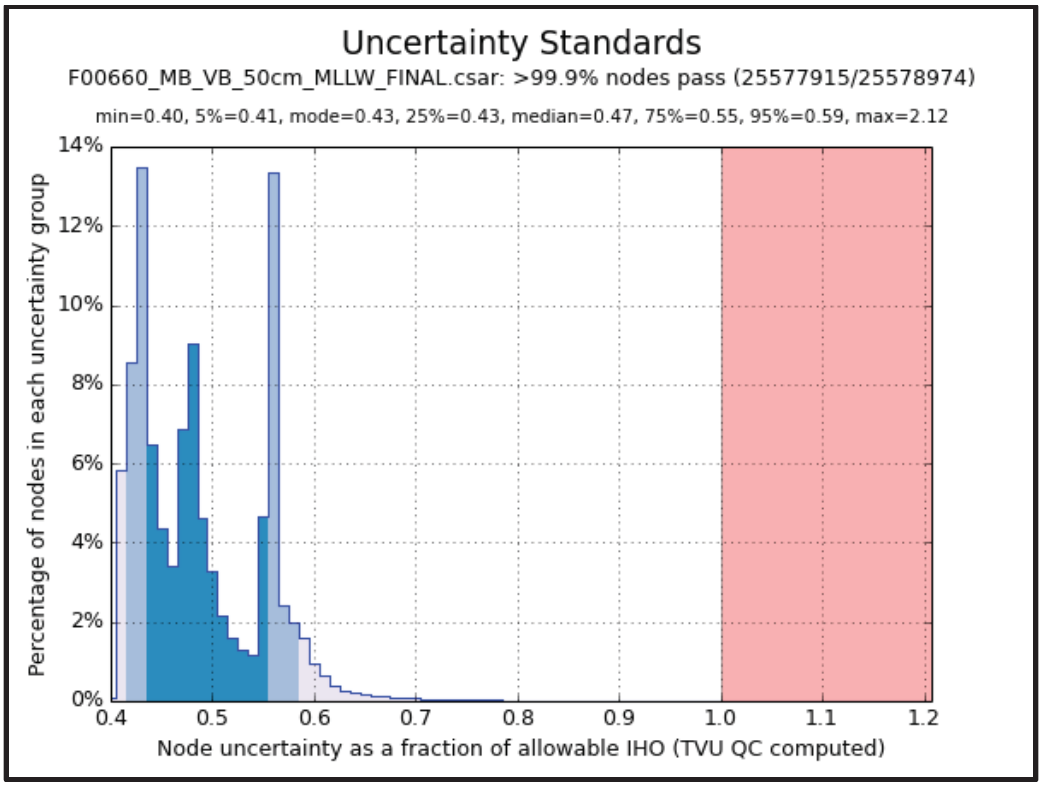

Figure 18: Graph created in Pydro Contribs for F00660 CUBE surface statistics verifying 99.9% of nodes pass IHO uncertainty standards.

H. Approval

The survey data meets the requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual. These data are adequate to supersede charted data in their common areas. This survey is complete; however additional work may be required in the area to update the larger area of shifting shoals. All records are forwarded for final review and processing to the Processing Branch.

Approver Name	Approver Title	Approval Date	Signature
CAPT Shepard M. Smith	Chief of Party		
LT Joseph K. Carrier	Operations Officer		
ENS Marybeth Head	Sheet Manager		

APPENDIX I

TIDE NOTE AND GRAPHICS

UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : October 29, 2015

HYDROGRAPHIC BRANCH: Atlantic
HYDROGRAPHIC PROJECT: OPR-B367-TJ-2015(Revised)
HYDROGRAPHIC SHEET: F00660

LOCALITY: Wasque and Tuckernuck Shoals,Nantucket Sound,MA
TIME PERIOD: October 07 - October 08, 2015

TIDE STATION USED: 8449130 Nantucket Island,MA
Lat.41° 17.1' N Long. 70° 05.8' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.985 meters

TIDE STATION USED: 8452660 Newport, RI
Lat. 41° 30.3' N Long. 71° 19.6' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.099 meters

REMARKS: RECOMMENDED GRID

Please use the TCARI grid "B367TJ2015_FTN.tc" as the final grid for project OPR-B367-TJ-2015(Revised), Registry No. F00660, during the time period between October 07 and October 08, 2015.

Refer to attachments for grid information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

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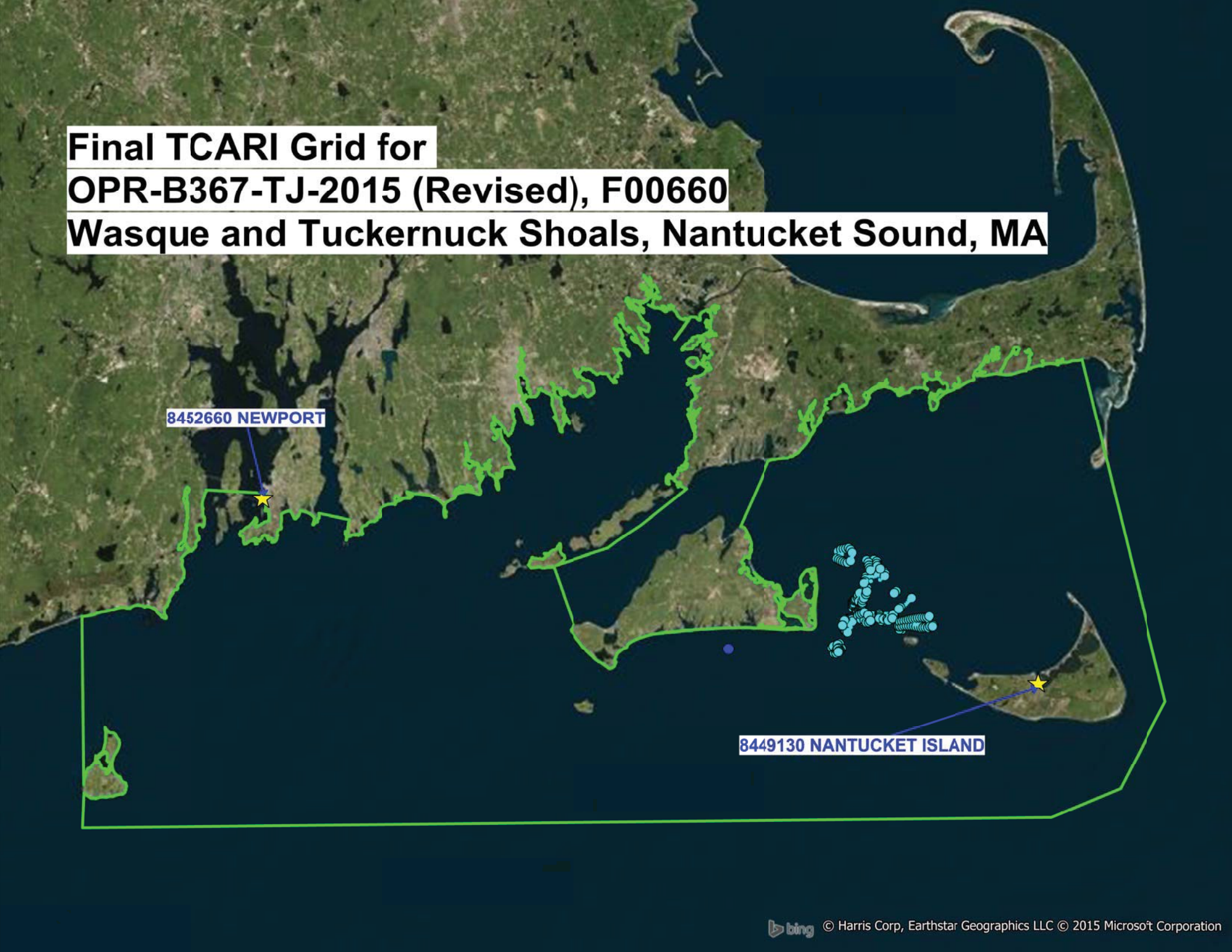
CHIEF, PRODUCTS AND SERVICES BRANCH


Final TCARI Grid for
OPR-B367-TJ-2015 (Revised), F00660
Wasque and Tuckernuck Shoals, Nantucket Sound, MA
8452660 NEWPORT
8449130 NANTUCKET ISLAND
bing © Harris Corp, Earthstar Geographics LLC © 2015 Microsoft Corporation

APPENDIX II

SUPPLEMENTAL SURVEY RECORDS AND CORRESPONDENCE

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov>

Survey F00660 Request for Information

Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> Thu, Apr 7, 2016 at 7:52 AM
To: Anthony Klemm - NOAA Federal <anthony.r.klemm@noaa.gov>
Cc: Marybeth Head - NOAA Federal <marybeth.head@noaa.gov>, Shachak Peeri - NOAA Affiliate <shachak.peeri@noaa.gov>, "CO.Thomas Jefferson - NOAA Service Account" <co.thomas.jefferson@noaa.gov>, "OPS.Thomas Jefferson - NOAA Service Account" <ops.thomas.jefferson@noaa.gov>, Castle Parker - NOAA Federal <castle.e.parker@noaa.gov>, Kayla Johnson - NOAA Affiliate <kayla.johnson@noaa.gov>, Patrick Keown - NOAA Federal <patrick.keown@noaa.gov>, Lucy Hick - NOAA Federal <lucy.hick@noaa.gov>, Matthew Jaskoski - NOAA Federal <matthew.jaskoski@noaa.gov>

Thanks Anthony. This will be sufficient for our purposes.

Thanks,

Tyanne

On Wed, Apr 6, 2016 at 4:09 PM, Anthony Klemm - NOAA Federal <anthony.r.klemm@noaa.gov> wrote:

> Hi Tyanne,
>
> This consultation was given in person when I was aboard the TJ, or over the phone. I agree with both of the assertions above. There was no need for 50cm grids for the SDB validation, and 2m was the resolution requested from the TJ.
>
> I believe the line spacing was chosen to be 150m, after consultation with the CO and FOO, the 1976 Hydrographic Manual (HSSD section 5.2.2.3 does not provide sufficient guidance for this type of hydrographic survey data collection), and timely decisions based on the reduced number of days available for the field examination due to mechanical issues with the ship. The intent was to collect splits when time allowed, but due to time limitations, the TJ used their time to collect set line spacing over a wider geographic selection of shoals, instead of focusing on just a few, in order to better suit the SDB validation requirements.
>
> Let me know if you have any questions, or I misstated the decision process. It has been quite a few months.
>
> Best,
> Anthony
>
> LT Anthony Klemm, NOAA
> NOAA's Marine Chart Division
> 1315 East West Highway
> SSMC 3, 7336
> Silver Spring, MD 20910
> Office: 301-713-2724 x167
> Learn about NOAA nautical charts - www.nauticalcharts.noaa.gov
>
> On Wed, Apr 6, 2016 at 2:09 PM, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> wrote:
>
> > I wanted to bring in the Project Managers, LT Klemm, Dr. Pe'eri and the CO into this conversation. Please see the email below. If no written correspondence was made during this time if the Project Managers, LT Klemm or Dr. Pe'eri could confirm the following deviations from the PIs/HSSD:
> >
> > - "In collaboration with LT Anthony Klemm and Dr. Shachak Pe'eri at the Marine Chart Division of Coast Survey (MCD), the necessary resolution grids for for SDB validation were 2m. The combined 50 cm VBES and MBES met the density requirements for Set Line Spacing and more accurately portrayed the shifting shoals."
> > - A change in the line spacing was made– what was the new agreed upon line spacing for this project? The DR indicates it was a "wider line spacing".

> Thanks for the help and clarification. We will be adding this information as an appendix to the DR.
>
> Tyanne
>
> On Wed, Apr 6, 2016 at 1:35 PM, Tyanne Faulkes - NOAA Federal <tyanne.faulkes@noaa.gov> wrote:
>> Good afternoon Marybeth,
>>
>> I am taking a look at the SAR conducted for your survey F00660. I see you have documented in the DR that there were deviations from the line spacing and resolution requirements after consultation from the SDB analysis team. I wanted to see if you could please provide me with the correspondence between the field and LT Klemm, Dr. Pe'eri, and/or your project manager. I would prefer the emails to be provided in a PDF format.
>>
>> Thanks,
>>
>> Tyanne
>>
>> –
>> Tyanne Faulkes
>> Physical Scientist
>> NOAA's National Ocean Service
>> Office of Coast Survey, Hydrographic Surveys Division
>> Atlantic Hydrographic Branch
>> 757.441.6746 x 103
>
> –
> Tyanne Faulkes
> Physical Scientist
> NOAA's National Ocean Service
> Office of Coast Survey, Hydrographic Surveys Division
> Atlantic Hydrographic Branch
> 757.441.6746 x 103

–
Tyanne Faulkes
Physical Scientist
NOAA's National Ocean Service
Office of Coast Survey, Hydrographic Surveys Division
Atlantic Hydrographic Branch
757.441.6746 x 103

APPROVAL PAGE

F00660

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

- F00660_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records

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

Approved: Briana J. Welton

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Lieutenant Commander Briana Welton, NOAA
Chief, Atlantic Hydrographic Branch