DESCRIPTIVE REPORT F00690

Project	OPR-G329-TJ-16
Survey	F00690
State	Georgia and South Carolina
Locality	Savannah
Sub Locality	Approaches to Savannah
Scale of Survey	1:20,000
Sonars Used	Kongsberg EM 2040 MBES
Horizontal Datum	WGS 84
Vertical Datum	Mean Lower Low Water (MLLW)
Vertical Datum Correction	Ellipsoidal Reference
Projection	Latitude-Longitude (WGS84) – UTM Zone 17N
Field Unit	NOAA Ship *Thomas Jefferson*
Survey Dates	10/26/2016, 11/6/2016
Chief of Party	CDR Chris van Westendorp, NOAA

A. Area Surveyed

F00690 was surveyed with a Kongsberg EM 2040 multibeam echosounder (MBES) aboard National Oceanic and Atmospheric Administration (NOAA) Ship *Thomas Jefferson*. This survey was conducted over two days, October 26 and November 6, 2016 (DN300 and DN311, respectively). The data were acquired to standards set forth in the NOAA Hydrographic Surveys Specifications and Deliverables, the NOAA Field Procedures Manual, and the NOAA Ship *Thomas Jefferson* Data Acquisition and Processing Report (DAPR).

Data were acquired within the following limits (Fig. 1):

Northeast Limit	Southwest Limit
32° 01’ 51.5”N	31° 46’ 09.6”N
080° 22’ 34.1”W	080° 36’ 03.1”W

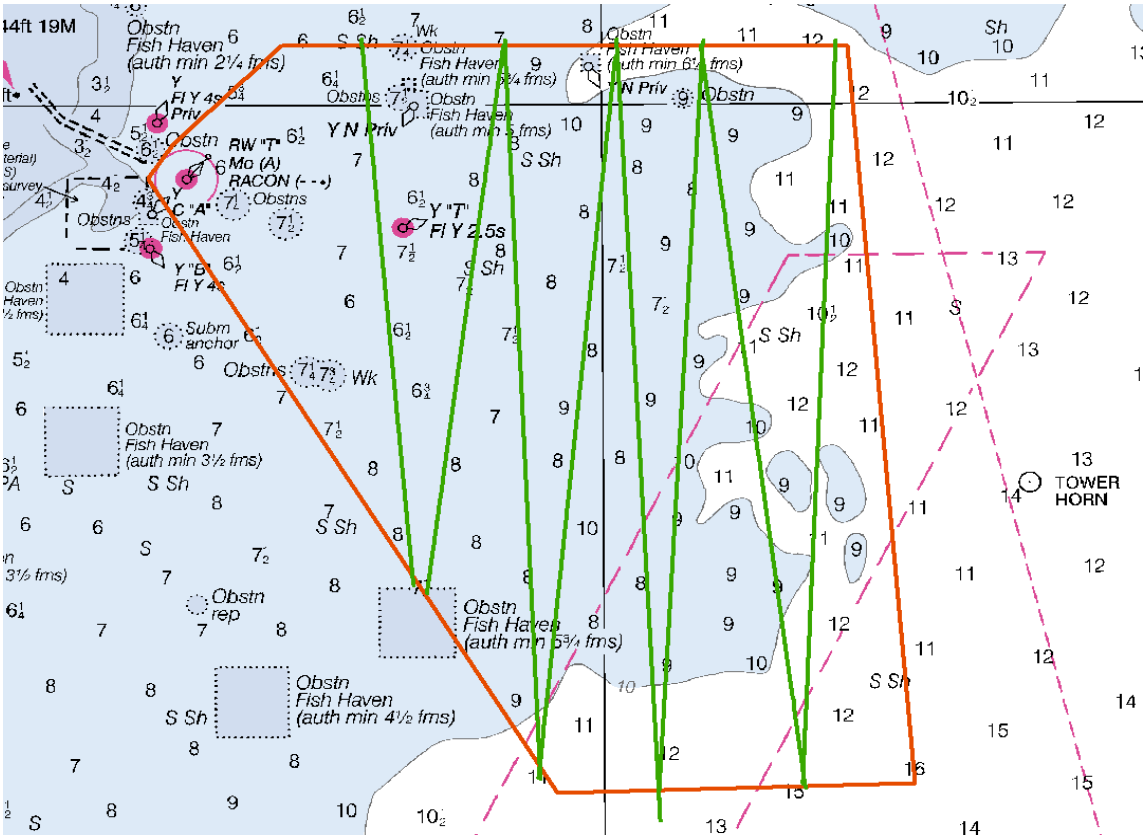


Fig. 1: Lines run for F00690 against the assigned area

B. Survey Purpose

The purpose of this survey was to obtain crossline data over the original Survey Request Form (SURF) area in order to draw comparisons with historic National Ocean Service (NOS) bathymetric data and to provide data from which an analysis of changes from previously-surveyed and charted soundings can be produced. This examination complements the principal survey of this project, updating NOS nautical charting products in the approach to Savannah Outer Harbor Channel.

C. Intended Use of Survey

The examination is intended for comparison to historical and charted soundings as stated above.

D. Data Acquisition and Processing

Data were acquired and processed in accordance with the DAPR for project OPR-G329-TJ-16.

E. Uncertainty

E.1. Total Propagated Uncertainty (TPU, Fig. 2)

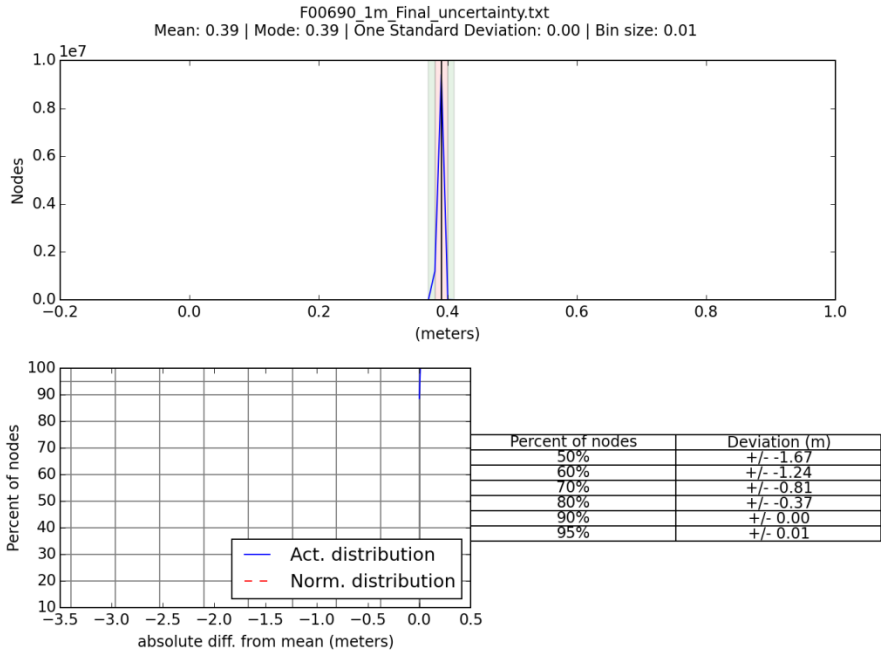
The following uncertainty values were used:

Input	
Source	Selection
Tide	
Measure	0.14600000000000000 (m)
Zoning	0.11 (m)
Sound Speed	
Measured	1 (m/s)
Surface	0.20000000000000000 (m/s)
Uncertainty Source	
Source	Custom
Position	Realtime
Sonar	Realtime
Heading	Realtime
Pitch	Realtime
Roll	Realtime
Vertical	Vessel
Tide	Static
Sweep parameters	
Peak to peak heave	0 (m)
Maximum Roll	0.0

Fig. 2: TPU values used for processed data

E.2. Uncertainty

Over 99.5% of the data acquired meets IHO Order 1a specifications with a median uncertainty of 0.39m and a mean uncertainty of 0.39m (Fig. 3).



Percent of nodes	Deviation (m)
50%	+/- -1.67
60%	+/- -1.24
70%	+/- -0.81
80%	+/- -0.37
90%	+/- 0.00
95%	+/- 0.01

Fig. 3: Uncertainty statistics for the surveyed data

E.3. Internal Consistency

A crossline comparison was conducted using mainscheme data from H12960, an object detection hydrographic survey that covered the northern portion of F00690's crosslines (Fig. 4). Results showed a mean difference of -0.038cm between the datasets (Fig. 5).

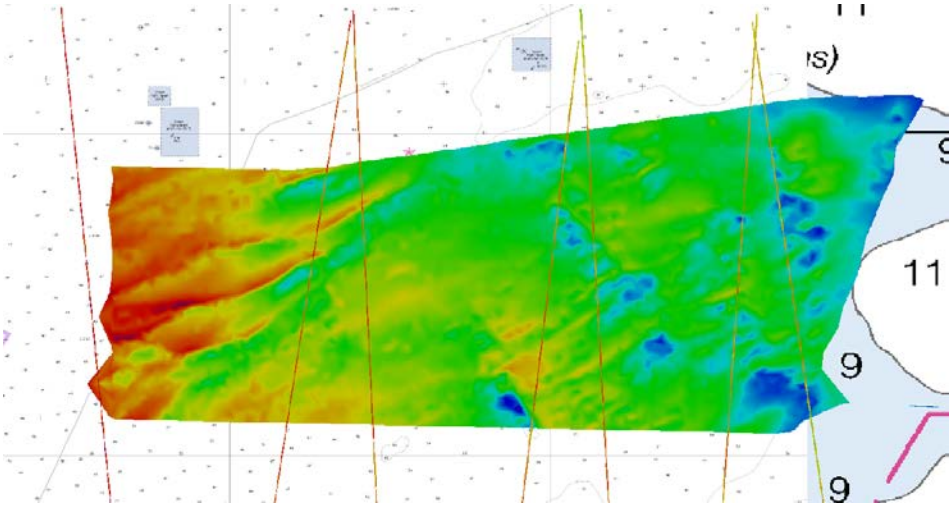


Fig. 4: F00690 crosslines over H12950 mainscheme bathy

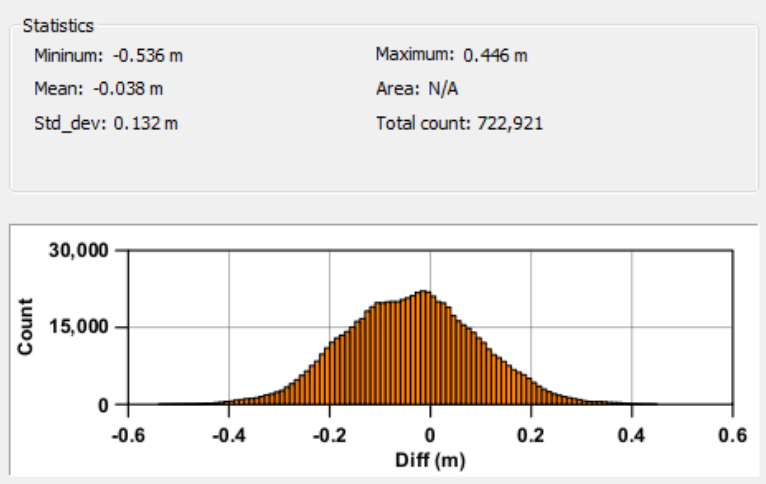


Fig. 5: Crossline comparison statistics for F00690

F. Results and Recommendations

These crosslines were run to assess differences in historical surveyed data versus modern data. The process of comparison was as follows:

1. Process acquired data
2. Create CUBE surface of acquired data
3. Create Digital Elevation Model (DEM) of historical data
4. Difference surfaces (historical - modern)

The DEM used to show the historical data (Fig. 6) was generated from a series of surveys, ranging from 1972 to 2005 (Fig. 7). Historical data were downloaded from the National Center for Environmental Information (NCEI) as point data, and interpolated into a surface using ArcMap.

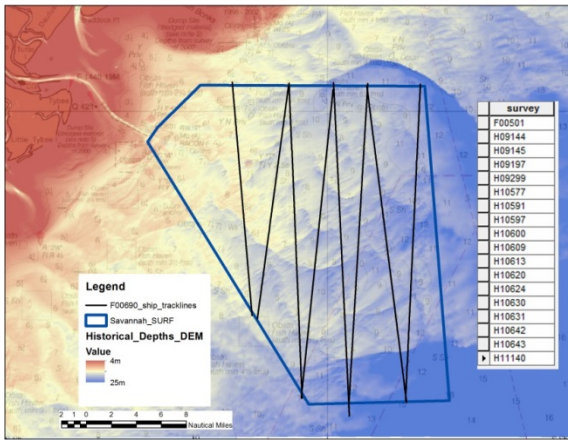


Fig. 6: DEM of historical survey data with SURF area and crosslines. List of surveys shown in table to right.

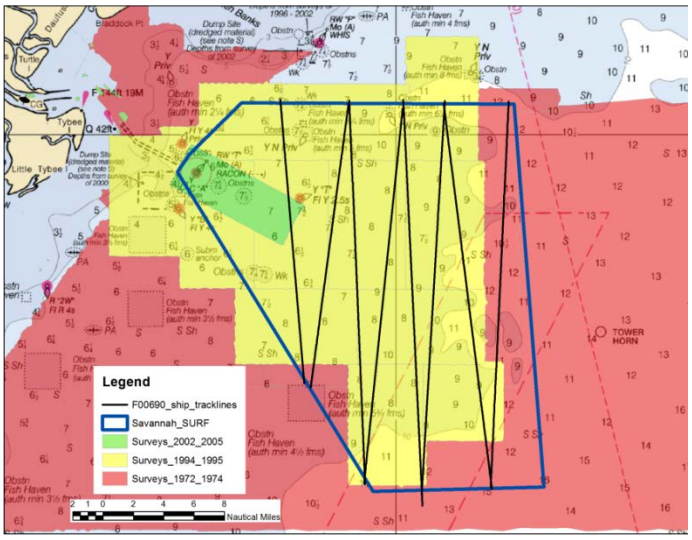


Fig. 7: Historical surveys colored with respect to survey date

The entire survey area trends to a general increase in depth (deepening). The current survey data averages 0.4m deeper than historical, with a greatest localized deepening of 1.099m. With one exception (southeastern portion noted below), the deepening trend is evenly distributed throughout the surveyed depths; the Hydrographer concludes there is no navigationally significant shoaling or deepening. Similarly, the data reveal minimally different areas compared with historical surveys or charted soundings; the Hydrographer does not recommend additional survey beyond what has already been assigned and/or completed.

The southeastern portion of the SURF request area showed signs of being deeper than charted (no greater than 0.8m). However, that section was surveyed between 1972 and 1975 while the bulk of the area was surveyed much more recently; differences may be a function of survey age and technology.

No anthropogenic features (e.g. wrecks or debris), were found within the survey data of this field examination.

Comparison to existing Electronic Navigational Charts (ENCs) in the area can be found in section F.1.

The following surfaces were created from the processed data, with associated statistical distribution (Fig. 8):

Surface Name	Surface Type	Resolution (m)	Depth Range (m)
F00690_1m_mllw_final	CUBE Surface	1	12.14-32.11
Historical Soundings Minus F00690	Difference Surface	1	-1.37 – -0.06

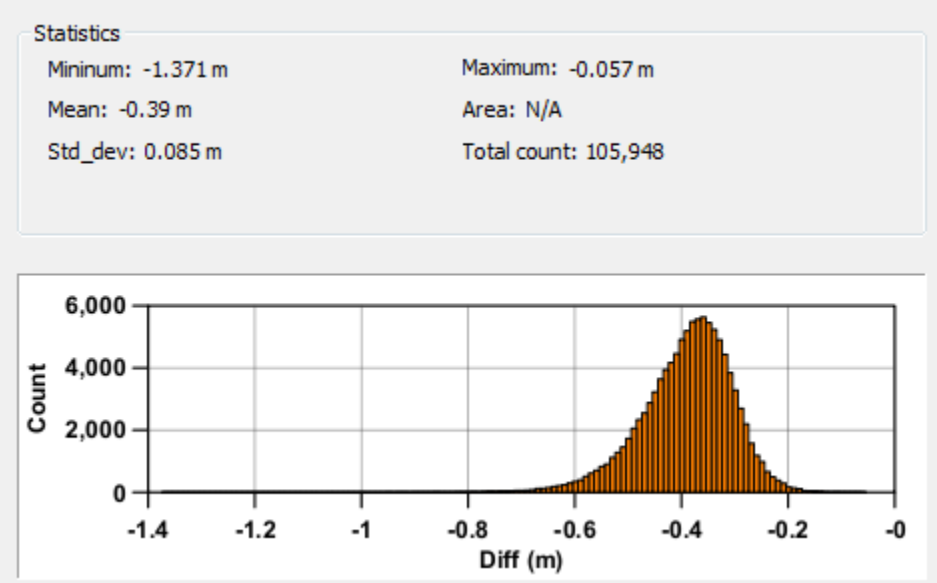


Fig. 8: Statistical distribution of depth differences between historical and modern data

F.1. Chart Comparisons

Using the DToN Scanner function of Pydro QC Tools, a comparison was made between ENC US5GA20M and F00690 data, revealing a number of discrepancies between charted and survey soundings; no discrepancies exceed 1m (Fig. 9).

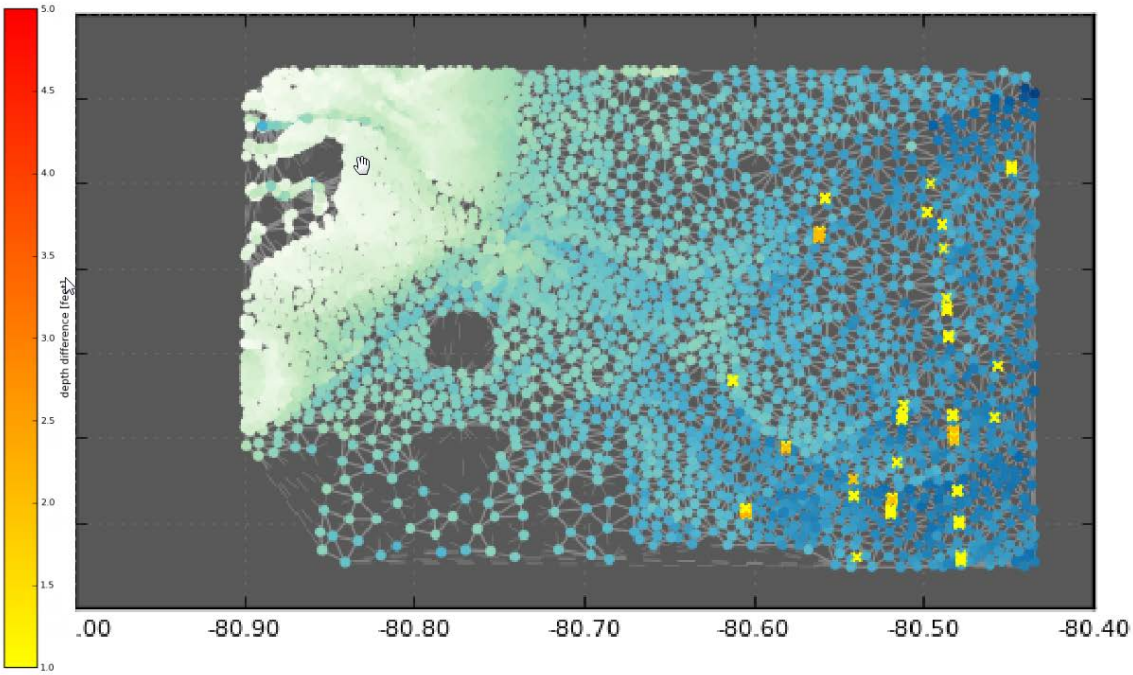


Fig. 9: Locations of depth differences versus ENC flagged by DToN Scanner.

The ENC comparison tool relies on a Triangulated Irregular Network (TIN) to find depths

that lie outside of the predicted range in a given area. DToN Scanner yielded over 200 points that lay outside of the Total Vertical Uncertainty (TVU) margin for the depths in question; however, none of them exceeded a value of 2.2' (0.66m). As none of the differences exceed 2.2', in depths ranging from 50-60', the Hydrographer assesses none represent a danger to navigation or require urgent action.

F.2. Features

No features were found in the data collected.

F.3. Cross-line Comparison

Refer to section E.3. for cross-line comparison.

F.4. Junction Surveys

Refer to section E.3. for junction survey analysis.

F.5. Density

No density requirements were set for this examination.

F.6. Acoustic Backscatter

Acoustic backscatter data were acquired but not processed for this examination.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water (MLLW). MarineStar RT3P was used to reference survey data to World Geodetic System 1984 (WGS 84), and a VDatum separation model was used to transform ellipsoidal heights to MLLW. Observed water levels and discrete zone tides correction were used to verify accuracy of the ellipsoidal reference model. The following National Water Level Observation Network (NWLON) station served as datum control for this survey:

Station Name	Station ID
Fort Pulaski, GA	8670870

The horizontal datum for this project is WGS84, Universal Transverse Mercator (UTM) Zone 17N. Horizontal positioning was corrected using MarineStar RT3P. Refer to the OPR-G329-TJ-16 DAPR for more information.

H. Approval

These data are suitable for comparison to charted soundings. All records are forwarded for final review and processing to the Processing Branch.

Approver Name	Approver Title	Date	Signature
Christiaan van Westendorp, CDR/NOAA	Commanding Officer, Chief of Party		VAN WESTENDORP.CHRISTIAAN.HENRY.1012828175 c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=VAN WESTENDORP.CHRISTIAAN.HENRY.1012828175 2017.02.07 09:41:11 -05'00'
Matthew Forrest, LT/NOAA	Field Operations Officer		 Digitally signed by FORREST.MATTHEW.ROBERT.1362733100 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=FORREST.MATTHEW.ROBERT.1362733100 Date: 2017.02.07 14:39:08 Z
Peter Gleichauf, LTJG/NOAA	Sheet Manager		GLEICHAUF.PETER.ROLFE.1472631248 Digitally signed by GLEICHAUF.PETER.ROLFE.1472631248 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=NOAA, cn=GLEICHAUF.PETER.ROLFE.1472631248 Date: 2016.11.19 01:07:08 Z