

**F00453**

NOAA FORM 76-35A

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

## DESCRIPTIVE REPORT

*Type of Survey* Hydrographic / Side Scan Sonar

*Field No.* WH-10-11-99

*Registry No.* F00453

### LOCALITY

*State* New Jersey / Delaware  
North Atlantic Ocean/

*General Locality* Delaware Bay

*Locality* Delaware Bay and Approaches

1999

CHIEF OF PARTY  
LCDR Gerd F. Glang

LIBRARY & ARCHIVES

DATE

August 9, 2001

REGISTRY NUMBER:

F-00453

**HYDROGRAPHIC TITLE SHEET**

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

FIELD NUMBER:

WH-10-11-99

State: New Jersey-Delaware

General locality: North Atlantic Ocean / DELAWARE BAY

Locality: Approaches to Delaware Bay DELAWARE BAY AND APPROACHES

Scale: 1: 10,000 Date of survey: August 18 - October 31, 1999

Instructions dated: July 1, 1999 Project Number: OPR- D392-WH-99

Vessel: NOAA Ship WHITING

Chief of Party: LCDR Gerd F Glang

Surveyed by: LCDR Gerd F. Glang, LT L. Krepp, ENS M. Moser, ENS G. Imahori, U.L. Gardner, P. Lewit, C. Clemens, C. Kemp,

Soundings taken by echo sounder, hand lead-line, or pole: Echotrac DF 3200 MK II Precision Survey Echosounder

Graphic record scaled by: WHITING Personnel

Graphic record checked by: WHITING Personnel

Protracted by: N/A Automated plot by: HP-750C HP DESIGNJET 2500 CP

Verification by: Hydrographic Surveys Division ATLANTIC HYDROGRAPHIC BRANCH PERSONNEL

Soundings in: Feet:  Fathoms:  Meters:  at MLW:  MLLW:  (\*):

Remarks: All Times UTC

Basic Hydrographic and 200% Side Scan Sonar

Grid Zone 18 Northern Hemisphere

HAND WRITTEN NOTES IN THE DESCRIPTIVE REPORT WERE  
MADE DURING OFFICE PROCESSING

AWOIS/SURF ✓ 7/18/00 SJV

**TABLE OF CONTENTS**

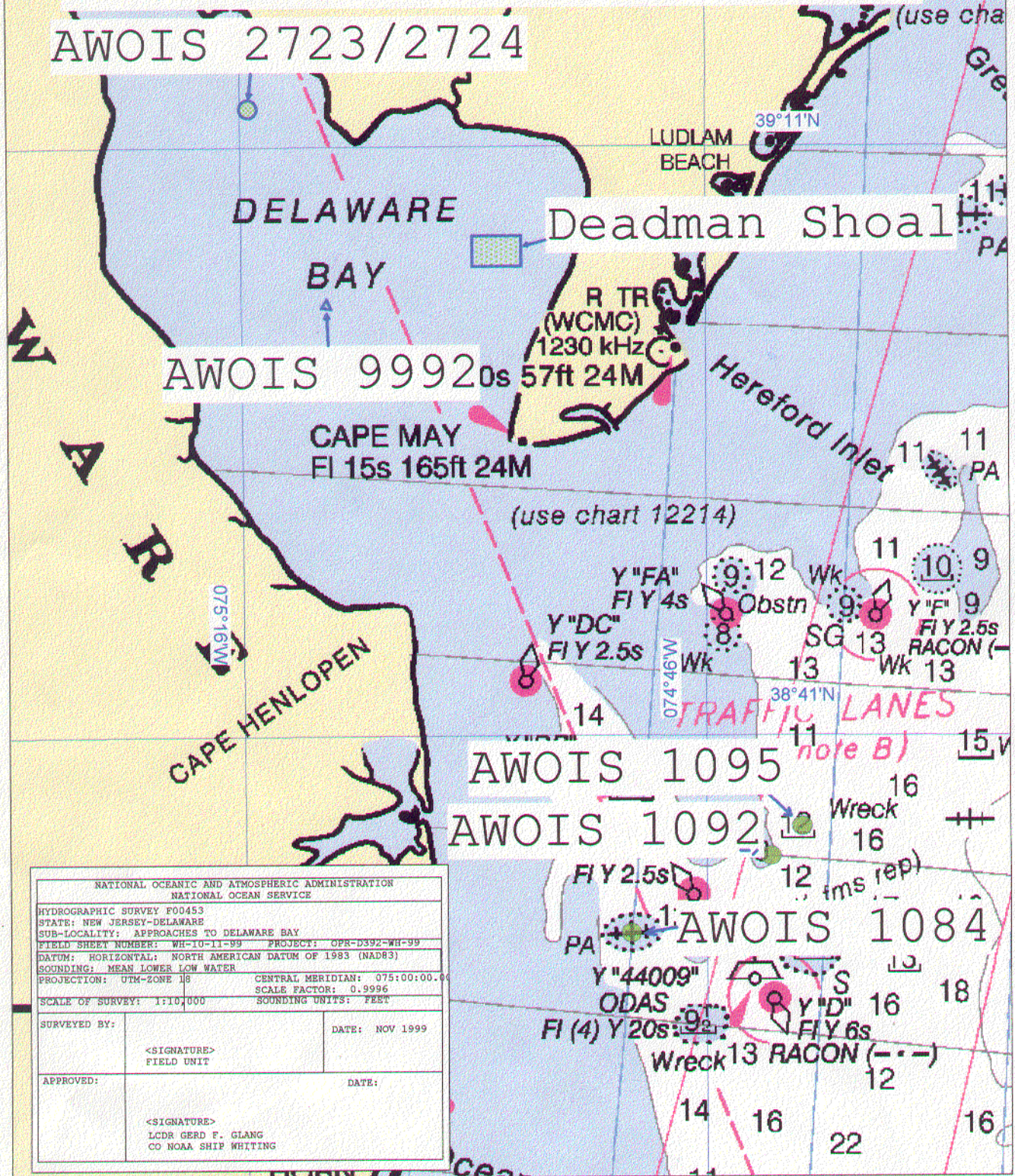
A. PROJECT . . . . . 2  
B. AREA SURVEYED . . . . . 2  
C. SURVEY VESSELS . . . . . 4  
D. AUTOMATED DATA ACQUISITION AND PROCESSING . . . 4  
E. SONAR EQUIPMENT . . . . . 5  
F. SOUNDING EQUIPMENT . . . . . 7  
G. CORRECTIONS TO SOUNDINGS . . . . . 7  
H. HYDROGRAPHIC POSITION CONTROL . . . . . 9  
I. SHORELINE . . . . . 11  
J. CROSSLINES . . . . . 11  
K. JUNCTIONS . . . . . 11  
L. COMPARISON WITH PRIOR SURVEYS . . . . . 11  
M. ITEM INVESTIGATION REPORTS . . . . . 12  
N. COMPARISON WITH THE CHART . . . . . 20  
O. ADEQUACY OF SURVEY . . . . . 21  
P. AIDS TO NAVIGATION . . . . . 21  
Q. STATISTICS . . . . . 21  
R. MISCELLANEOUS . . . . . 22  
S. RECOMMENDATIONS . . . . . 22  
T. REFERRAL TO REPORTS . . . . . 22  
\* APPENDICES . . . . . i - xii  
\* SEPARATES

*\* DATA FILED WITH ORIGINAL FIELD RECORDS*

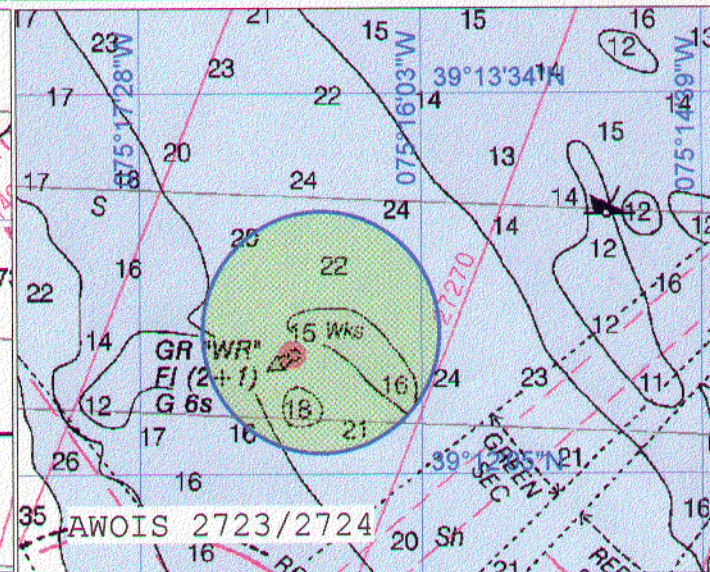
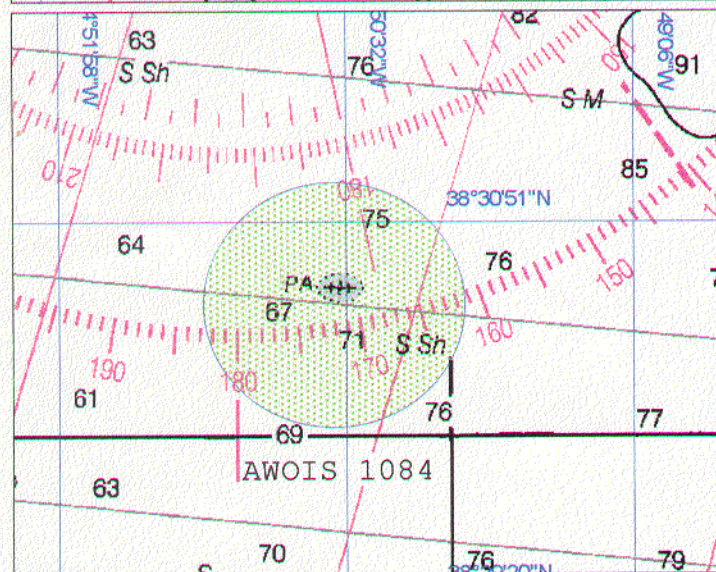
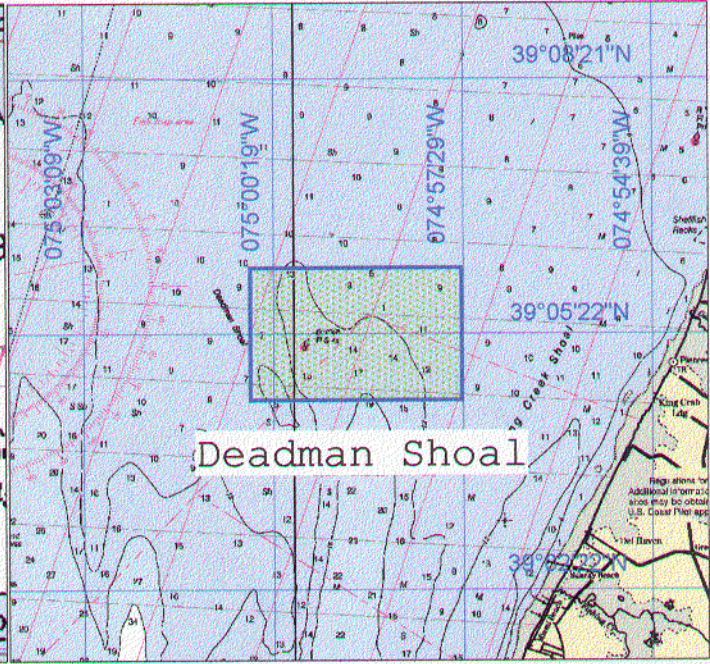
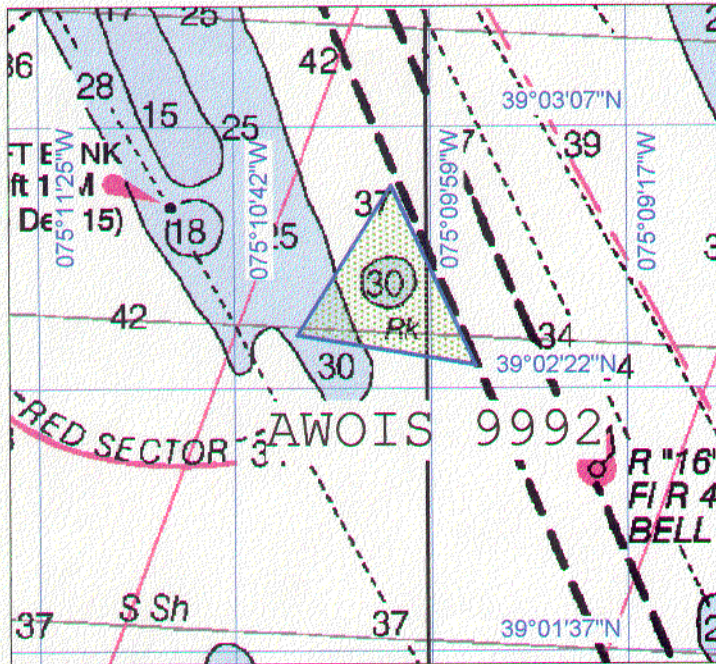
Atlantic City

# FIELD EXAMINATIONS

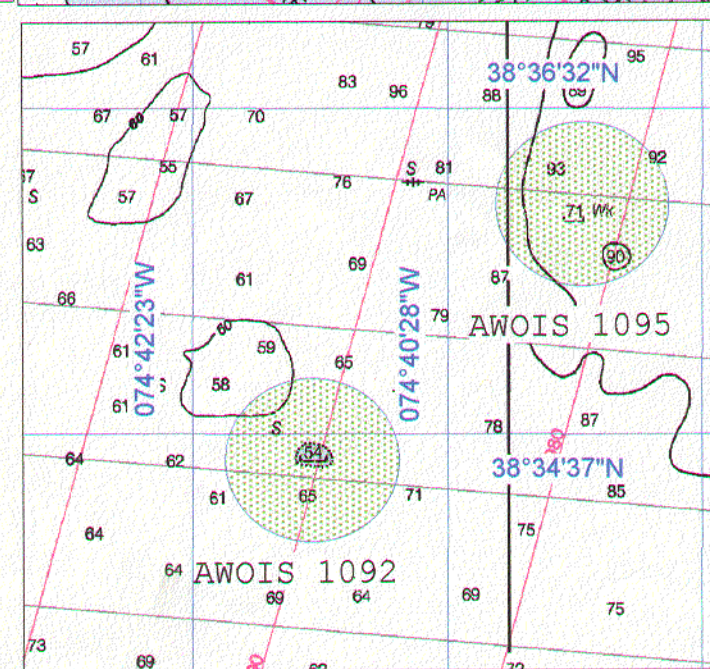
AWOIS 2723/2724



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE	
HYDROGRAPHIC SURVEY F00453	
STATE: NEW JERSEY-DELAWARE	
SUB-LOCALITY: APPROACHES TO DELAWARE BAY	
FIELD SHEET NUMBER: WH-10-11-99	PROJECT: OPR-D392-WH-99
DATUM: HORIZONTAL: NORTH AMERICAN DATUM OF 1983 (NAD83)	
SOUNDING: MEAN LOWER LOW WATER	
PROJECTION: UTM-ZONE 18	CENTRAL MERIDIAN: 075:00:00.00
SCALE OF SURVEY: 1:10,000	SCALE FACTOR: 0.9996
SOUNDING UNITS: FEET	
SURVEYED BY:	DATE: NOV 1999
<SIGNATURE> FIELD UNIT	
APPROVED:	DATE:
<SIGNATURE> LCDR GERD F. GLANG CO NOAA SHIP WHITING	



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SERVICE		
HYDROGRAPHIC SURVEY F00453		
STATE: NEW JERSEY-DELAWARE		
SUB-LOCALITY: APPROACHES TO DELAWARE BAY		
FIELD SHEET NUMBER: WH-10-11-99	PROJECT: OPR-D392-WH-99	
DATUM: HORIZONTAL: NORTH AMERICAN DATUM OF 1983 (NAD83)		
SOUNDING: MEAN LOWER LOW WATER		
PROJECTION: UTM-ZONE 18	CENTRAL MERIDIAN: 075:00:00.000	SCALE FACTOR: 0.9996
SCALE OF SURVEY: 1:10,000	SOUNDING UNITS: FEET	
SURVEYED BY:	<SIGNATURE> FIELD UNIT	DATE: NOV 1999
APPROVED:	<SIGNATURE> LCDR GERD F. GLANG CO NOAA SHIP WHITING	DATE:



**A. PROJECT**

A.1. This basic hydrographic survey was conducted in accordance with Hydrographic Survey Letter Instructions OPR-D392-WH-99, Delaware Bay and Approaches, New Jersey - Delaware.

A.2. The original instructions are dated July 1, 1999.

A.3. There is one change to the original project instructions. This change specifies that sheets "E" and "F" be combined into a single 1:20,000 scale survey designated as sheet "E"; sheets "G" and "H" were combined into a single 1:20,000 scale survey designated as sheet "F"; and sheets "I", "J", "K", "L", "M", and "N" were combined into a single 1:40,000 scale survey designated as sheet "G". At present, no written change has been received from N/CS31.

A.4. This Descriptive Report applies to FIELD EXAMINATIONS of OPR-D392-WH, survey registry number F-00453. Survey F-00453 lies in multiple locations north and south of the entrance to Delaware Bay. See section B.2 for exact survey boundaries.

A:5. Project OPR-D392-WH responds to requests from The Pilots' Association Bay and River, Delaware, and the Mariners Advisory Committee for the Bay and River, Delaware. Both groups are concerned with routing vessel traffic in and out of Delaware Bay. The acquisition of modern hydrography and the detection or disapproval of wrecks and obstructions will provide more options for vessel traffic management.

**B. AREA SURVEYED**

B.1. This survey covers the approximate center third portion of the navigable area of the southeast approaches to Delaware Bay, New Jersey - Delaware.

B.2. The survey comprises six investigations with the following boundaries, starting at the NE corners of the respective search areas and proceeding counter-clockwise:

Sheet "15":

FE North (AWOIS 2723/2724)

<u>Latitude</u>	<u>Longitude</u>
39°13'05.7"N	075°14'47.5"W
39°13'06.1"N	075°15'46.7"W
39°12'00.0"N	075°15'49.2"W
39°12'02.1"N	075°14'52.3"W

FE South (AWOIS 9992)

<u>Latitude</u>	<u>Longitude</u>
39°02'57.0"N	075°09'52.2"W
39°02'58.5"N	075°10'25.8"W
39°02'47.3"N	075°10'31.9"W
39°02'26.8"W	075°09'46.0"W

AWOIS 1095 *1084*

<u>Latitude</u>	<u>Longitude</u>
38°31'07"N	074°50'30" W
38°30'14"N	074°50'13" W
38°30'11"N	074°50'38" W
38°30'52"N	074°50'52" W

AWOIS 1092

<u>Latitude</u>	<u>Longitude</u>
38°34'34"N	074°41'05" W
38°34'21"N	074°41'06" W
38°34'10"N	074°41'13" W
38°34'05"N	074°41'28" W
38°34'09"N	074°41'42" W
38°34'15"N	074°41'55" W
38°34'27"N	074°41'58" W
38°34'39"N	074°41'46" W
38°34'44"N	074°41'34" W

AWOIS ~~1084~~ *1095*

<u>Latitude</u>	<u>Longitude</u>
38°36'14"N	074°39'26" W
38°35'55"N	074°39'18" W
38°35'48"N	074°39'27" W
38°35'51"N	074°39'39" W

FE East (Deadman Shoal)

<u>Latitude</u>	<u>Longitude</u>
39°05'57.7"N	074°58'00.3"W
39°05'58.5"N	075°00'37.1"W
39°04'39.9"N	075°00'37.9"W
39°04'39.8"W	074°58'16.4"W

B.3. Data collection for this field exam began on ~~July 17~~, 1999, (DN ~~198~~). Data collection ended on October ~~17~~, 1999 (DN ~~290~~).

*230*

*31*

*304*

*Aug. 18*

**C. SURVEY VESSELS**

C.1. The following vessels were used during this survey:

Vessel	EDP Number	Operations
NOAA Ship WHITING	2930	Hydrography and Side Scan Operations
NOAA Launch 1014	2932	Hydrography, Dive, and Side Scan Operations
NOAA Launch 1015	2931	Hydrography and Side Scan Operations

C.2. No unusual vessel configurations were used during this survey.

**D. AUTOMATED DATA ACQUISITION AND PROCESSING *SEE ALSO THE EVALUATION REPORT***

D.1. A detailed list of data acquisition and processing software used for this survey can be found in Appendix H. \*

Vertical beam echosounder (VBES) data acquisition was accomplished using Coastal Oceanographics **HYPACK** software. VBES data processing was accomplished using **HPS** (HYDROGRAPHIC PROCESSING SYSTEM) software and assorted utility programs contained on the **HYDROSOFT** version 9.4 compact disk provided by the Systems Support Branch (N/CS32).

All side scan data was acquired digitally using Triton Elics International (TEI) ISIS version 4.31 software. Digital side scan data was processed using Universal Systems Limited (USL) CARIS/SIPS version 4.3 (UNIX) software.

The Sea-Bird SBE-19 SEACAT CTD instrument was utilized with **SEASOFT 3.3M** and **SEACAT 2.0** software. The program **VELOCIWIN** (Version 4.0, March 1999) was used to process CTD data and calculate sound velocity corrections.

*\* DATA FILED WITH ORIGINAL FIELD RECORDS*



**E. SONAR EQUIPMENT**

E.1. Except for the period between DN 236 and DN 251, WHITING conducted all side scan sonar operations using a 500kHz Klein T-5500 multibeam digital high speed, high resolution side scan sonar (HSHRSSH) system. Between DN 236 and DN 251, WHITING conducted side scan sonar operations using a 100kHz Edgetech Model 272-T side scan sonar (SSS) configured with an AU32 A/D converter.

Both WHITING launches used the 100kHz Edgetech Model 272-T towfish, configured with an AU32 A/D converter throughout this survey.

E.2. The Klein and Edgetech towfish are configured with a standard 20° below-horizontal beam angle depression.

E.3. The frequencies of 500kHz for the Klein and 100kHz for the Edgetech were used throughout the survey.

E.4(a) During survey operations, it was determined that the depth of water in the survey area would require two range scales to cover the field examinations. A range scale of 100 meters was used with a line spacing of 80 meters for deeper areas of the survey. A range scale of 75 meters was used with a line spacing of 60 meters for the shoaler areas of the survey to obtain adequate fish height. These range scales were used to obtain complete (200%) area coverage and provide optimal contact resolution. The line spacing is in accordance with section 6.4 of the Field Procedures Manual (FPM, dated March 1999). Data collected with an HDOP of 4.0 or greater was rejected or smoothed during post-processing. Maximum line spacing was never exceeded.

E.4(b) Periodic (usually daily) confidence checks were conducted during data acquisition by observing bottom features such as sand waves, scours, and naturally-occurring contrast of sea floor characteristics in the side scan imagery.

E.4(c) Two hundred percent side scan sonar coverage was completed for this survey. Side scan lines were assembled into mosaics using **CARIS/SIPS**. Mosaic rasters were viewed in **MapInfo** to assess sonar coverage after exporting them from **CARIS/SIPS** using the "mosaic2tiff" program developed by SSB. A holiday line plan was compiled over apparent gaps in the mosaic rasters using a **MapBasic** utility program; and then exported as **HYPACK** line files for acquisition. Any holidays with a length of 200 meters or less not covered with 200% side scan sonar were covered with 100% side scan sonar. All relevant and questionable contacts were investigated using a reduced side scan range scale.

E.4(d) Occasional thermocline problems were observed in the sonar imagery. Affected data was rejected and re-acquired at a later date after the thermocline dissipated.

E.4(e) Aboard WHITING, the Klein towfish was deployed using a SEA-MAC winch and armored coaxial cable from the stern A-frame. The EdgeTech SSS towfish was similarly deployed from WHITING's stern A-frame using armored cable. On launch 1014 and 1015, the EdgeTech SSS towfish was deployed on a Kevlar-jacketed cable using a Superwinch and J-arm.

E.4(f) Cable-out aboard WHITING was determined using an MD-TOTCO digital sheave meter installed on the stern A-frame block. The MD-TOTCO digitized cable-out values were acquired in real-time into **HYPACK** via an RS-232 serial cable. Cable-out aboard the launches was determined manually and entered into **HYPACK** during acquisition.

E.5. Contact investigations were conducted using VBES, reduced-range SSS, or diver methods. Line spacing for VBES or SSS investigations was reduced to ensure 100% ensonification coverage for the particular sensor. Detailed descriptions of all investigated contacts are addressed in the Item Investigation Reports found in Section M.

E.6. Sonar coverage determination is described in E.4.c above. Sonar targets were initially evaluated during data acquisition. After ISIS data conversion, sonar targets were evaluated in **CARIS/SIPS**. Imagery analysis for targets during **SIPS** processing resulted in contact files and images for each line. These data were then exported into **HPS** for contact correlation and to rank contact significance using the **CORRELATOR** program. Positions of significant contacts were then exported into **HYPACK** target tables and further investigated using methods discussed in Section E.5.

**F. SOUNDING EQUIPMENT**

F.1. All hydrographic soundings were acquired using an ODOM ECHOTRAC DF3200 MKII precision survey echosounder. The following ECHOTRAC sounders were used:

<b>Vessel</b>	<b>EDP Number</b>	<b>ECHOTRACK S/N</b>
NOAA Ship WHITING	2930	9656
NOAA Launch 1014	2932	9644
NOAA Launch 1015	2931	9655

F.2. Not Applicable for this survey.

F.3. There were no faults in sounding equipment that affected data accuracy or quality.

F.4. Both high (100kHz) and low (24kHz) frequency depths were recorded during data acquisition. The high frequency digitized depths are used throughout this survey.

F.5. Not applicable for this survey

**G. CORRECTIONS TO SOUNDINGS**

G.1(a) Velocity of sound through water was determined using SeaBird SBE 19 SeaCat Sound Velocity Profilers (SVP s/n 196093-1060 and SVP s/n 192472-286). SeaCat Data Quality Assurance Tests were conducted IAW with the FPM after each cast. The SeaCat SVP units were calibrated January 14, 1999, by SEA-BIRD ELECTRONICS, INC.

All sound velocity data were processed using **VELOCIWIN** version 4.0. Computed velocity correctors were entered into HPS sound velocity tables and re-applied during post-processing to both high and low frequency depths.

The following is a list of sound velocity casts which apply to this survey, F-00453:

Table	DN	Vessel	Position Of Cast		DN Period	Cast Depth (M)
			Latitude	Longitude		
11	230	2931/2932	38°54'48"N	075°06'53"W	230-236	22.7
13	237	2931/2932	39°00'54"N	075°02'24"W	237-253	17.9
12	230	2931/2932	39°12'15"N	075°16'58"W	230-236	19.4
14	239	2931/2932	38°59'42"N	075°06'06"W	239-258	14.0
33	277	2931/2932	39°10'24"N	075°16'24"W	277-281	11.5
34	277	2931/2932	38°56'42"N	075°09'24"W	277-281	15.0
41	300	2930	38°30'01"N	074°43'56"W	300-304	35.8
45	304	2931/2932	38°36'13"N	074°39'21"W	304	37.7

G.1(b) The following dual leadline comparisons with the ECHOTRAC DF 3200 MKII were conducted for WHITING, launch 1014, and launch 1015 for this project and apply to this survey, F-00453:

Vessel	Area	Latitude	Longitude	DN
2930	Delaware Bay	38°55'24"N	075°07'30"W	230
2931	Harbor of Refuge	38°48'37"N	075°07'51"W	223
2931	Harbor of Refuge	38°48'37"N	075°07'24"W	224
2932	Delaware Bay	38°48'48"N	075°05'30"W	224

Weather and sea conditions were calm and proved ideal for the leadline comparisons. No corrections to soundings were needed. Leadlines were calibrated on May 17, 1999; and the calibrations confirmed that leadline errors were negligible. Refer to the echogram records for the above listed day numbers.

G.1(c) Static draft corrections for launch 1014 and 1015 (0.55 meters) were measured on July 28, 1993 (HPS Offset Tables 1 and 2). The static draft correction for WHITING (3.2 meters) was measured on May 3, 1999 at Mayport Naval Station, Florida (HPS Offset Table 9). Static draft correctors were applied during data post-processing for each survey vessel.

G.1(d) Settlement and squat values for WHITING were determined on April 19, 1999 (HPS Offset Table 9). Settlement and squat values for both launches were determined March 16, 1998 (HPS Offset Tables 1 for launch 1015, and HPS Offset Table 2 for launch 1014). The settlement and squat correctors were applied during data processing. Refer to Appendix E.\*

G.1(e) WHITING and each launch are equipped with a TSS DMS-05 Dynamic Motion Sensor. Heave correctors determined by the DMS-05 sensors were acquired in **HYPACK** during data acquisition and applied to raw data during processing. Serial numbers for these sensors are as follows:

Vessel	EDP Number	DMS-05 S/N
NOAA Ship WHITING	2930	2066
NOAA Launch 1014	2932	2062
NOAA Launch 1015	2931	2068

G.4. No DLDG correctors were used. DLDG gauges were calibrated on February 9, 1999 by PTC Electronics Incorporated. See Appendix E\* for calibration information.

G.5. No other factors were determined to affect corrections to soundings.

G.6(a) The tidal datum for this project is Mean Lower Low Water (MLLW). The operating tide station at Lewes, Delaware (855-7380) served as control for datum determination.

G.6(b) Zoning for this survey is consistent with the project instructions. HPTools was used for Tide table creation and was used for the application of Preliminary Water Level Data during data processing. See Appendix D.1(i) for zoning information.

Approved tides for F00453 were requested by letter to N/OPS1 dated November 22, 1999. See Appendix D.\* *APPROVED TIDES AND ZONING HAVE BEEN APPLIED DURING OFFICE PROCESSING*

**H. Hydrographic Position Control *SEE ALSO THE EVALUATION REPORT***

H.1 The horizontal datum for this survey is North American Datum of 1983 (NAD 83). No horizontal control stations were established for this survey.

H.2. This survey was conducted using the Global Positioning System (GPS) corrected by U.S. Coast Guard (USCG) Differential GPS reference stations.

H.3. USCG DGPS stations used were Cape Henry and Cape Henlopen.

H.4. Not applicable.

H.5. The Horizontal Dilution of Precision (HDOP) specified by the Draft NOAA Hydrographic Project Instructions were monitored during on-line data collection. If the positioning degraded beyond the acceptable limits while on-line, the data was either smoothed or rejected.

Performance checks for WHITING and both launches were conducted with launches secured in davits using the program **Pcheck** (from the Hydrosoft 9.4 CD-ROM). Differential correctors from the Cape Henry or Cape Henlopen USCG DGPS stations were used to correct GPS signals. Simultaneous **HYPACK** positions on all three platforms were acquired and an offset distance and azimuth computed between the ship and each launch system. The computed offset distances and azimuths were compared to measured values. A summary of the DGPS performance checks is included in Appendix F.\* All DGPS performance checks confirmed that the equipment was working properly.

H.6. Serial numbers for the Trimble DSM212L receivers are as follows:

Vessel	EDP Number	DSM212L S/N
NOAA Ship WHITING	2930	System 1: 0220159721 System 2: 0220159722
NOAA Launch 1014	2932	0220159716
NOAA Launch 1015	2931	0220159723

Trimble receivers were initialized to the appropriate station and frequency using the **Trimble TSIP Talker** software.

H.7(a) There were no unusual methods used to operate or calibrate electronic positioning equipment.

H.7(b) No equipment malfunctions affected the quality of survey data collected.

H.7(c) No unusual atmospheric conditions affected data quality.

H.7(d) The maximum allowed HDOP value of 4.0 was never exceeded. Weak differential signals or satellite problems did not affect the survey data quality.

H.7(e) No systematic errors were detected which required adjustments.

H.7(f) DGPS antenna offsets were measured on April 15, 1999 for WHITING. For VBES data, offsets and laybacks were measured using the high-frequency echosounder transducer as the reference point. Correctors were entered into Offset Table 9. The DGPS antennae were installed on launches 1014 and 1015 on April 2, 1996, directly over the echosounder transducer. Antenna height was also measured on the same respective dates shown above, using the water line as the reference. Correctors were entered into Offset Table 1 for launch 1015 and Table 2 for launch 1014. A minimum of four satellites were used throughout this survey providing altitude-unconstrained positioning.

H.7(g) The SSS offset and layback distances for the launch J-arms were measured on July 28, 1993, and verified on April 15, 1999. The SSS offset and layback distances for WHITING's A-frame was measured on April 15, 1999. The offset and layback values were entered into the appropriate CARIS Vessel Configuration Files (VCF) and applied during CARIS/SIPS data processing.

**I. SHORELINE**

No shoreline is contained within the boundaries of this survey.

**J. CROSSLINES**

J.1.-.4. Not applicable for this survey.

**K. JUNCTIONS SEE ALSO THE EVALUATION REPORT**

K.1.-.4. Not applicable for this survey.

**L. COMPARISON WITH PRIOR SURVEYS SEE ALSO THE EVALUATION REPORT**

A comparison with prior surveys is not required due to the completion of 200% side scan sonar coverage.

M. ITEM INVESTIGATION REPORTS SEE ALSO THE EVALUATION REPORT

AWOIS NO: 2723, 2724

Item Description: Theresa I, Walter Graze

Source:

AWOIS Position: Lat. 39°12'37.8"N Long. 075°15'15.1"W

Required Investigation: SD, S2, ES Radius: 1150m

Charts Affected: 12304

---

INVESTIGATION

Date(s): October 4, 1999 (DN 277)

Position Numbers: 25026.8, 25011.2, 25019.6

Investigation Used: ES

Surveyed Position: Lat. 39°12'38.52"N Long. 075°15'15.10"W

Position Determined By: Differential GPS

Investigation Summary: During SSS investigation of AWOIS 2723 and 2724 contact 238\_047\_1923\_1 was found. On day 277 using VBES at 10m line spacing this contact was confirmed with least depth of 19ft.

---

CHARTING RECOMMENDATION

Recommendation: The Hydrographer recommends removal of the "Wrecks" at Lat. 39°12'38.6"N Long. 075°15'02.0"W. The Hydrographer also recommends charting "Obstruction, least depth known by sounding only," with a least depth of 19ft (5.9 meters), based on preliminary water levels at the surveyed position. *DO NOT CONCUR*

*SEE SHEET 1 OF 6*



**AWOIS NO:** 2723, 2724

**Item Description:** Theresa I, Walter Graze

**Source:**

**AWOIS Position:** Lat. 39°12'37.86"N Long. 075°15'15.10"W

**Required Investigation:** SD, S2, DI **Radius:** 1150m

**Charts Affected:** 12304

---

**INVESTIGATION**

**Date(s):** October 4 1999 (DN 277)

**Position Numbers:** 25081.2, 25113.5, 22933.3, 22946.4, 22939.6

**Investigation Used:** ES

**Surveyed Position:** Lat. 39°12'53.34"N Long. 075°15'17.07"W

**Position Determined By:** Differential GPS

**Investigation Summary:** During SSS investigation of AWOIS 2723, 2724 contact 230\_019\_1824 was found. On day 277 using VBES at 10m line spacing, this contact was confirmed, with a least depth of 15ft.

---

**CHARTING RECOMMENDATION**

**Recommendation:** The Hydrographer recommends charting "Obstruction, least depth known by sounding only," with a least depth of 15ft (4.7<sup>9</sup> meters), based on ~~preliminary water levels~~ at the surveyed position. *CONCUR APPROVED TIDES*

*CHART 16 OBSTR*

*SEE SHEET 1 OF 6*

AWOIS NO: 9992

Item Description: Obstruction

Source: CL653/37; ~~H 9202 WH 71~~ *Red*

AWOIS Position: Lat. 39°02'40.50"N Long. 075°10'09.00"W

Required Investigation: S2, ES, BD, DI, SD      Radius: 600m

Charts Affected: 12304

---

INVESTIGATION

Date(s): October 17, 1999 (DN 290)

Position Numbers: <sup>1639</sup>~~20211.6~~

Investigation Used: ES

Surveyed Position: Lat. 39°02'40.90<sup>7</sup>"N Long. 075°09'<sup>10'06.52"</sup>~~10.64~~"W

Position Determined By: Differential GPS

Investigation Summary: On day 236 during main scheme SSS investigation for AWOIS 9992, contact 236\_011\_2105\_1 was found. On day 290 least depth of 35ft was found utilizing VBES at reduced line spacing.

---

CHARTING RECOMMENDATION

Recommendation: The Hydrographer recommends removing the 30ft charted "Rock, least depth known by diver or sounding only" and charting "Obstruction, least depth known by sounding only," with a least depth of 35ft (10.7<sup>8</sup> meters), based on preliminary water levels at the surveyed position. *DO NOT CONCUR APPROVED TIDES*

*SEE SHEET 2 OF 6*

Contact No: 230\_008\_1555\_1

Item Description: Obstruction

Source: H-10926

AWOIS Position: N/A

Required Investigation: N/A                      Radius: N/A

Charts Affected: 12304

---

**INVESTIGATION**

Date(s): October 17, 1999 (DN 290)

Position Numbers: 1525, 1

Investigation Used: ES

Surveyed Position: Lat. 39°02'19.23"N    Long. 075°09'59.07"W

Position Determined By: Differential GPS

**Investigation Summary:** During SSS investigation for AWOIS 9992 on day 230 contacts 230\_008\_1551\_1, 230\_005\_1406\_1, 230\_006\_1416\_1, 230\_006\_1413\_1 and shoal soundings were found near the surveyed position. On day 290 using VBES at 10m line spacing contacts were investigated and a least depth found. Side scan imagery indicate possible rocks.

---

**CHARTING RECOMMENDATION**

**Recommendation:** The Hydrographer recommends charting "Obstructions, least depth known by sounding only," with a least depth of 3<sup>3</sup>/<sub>4</sub>ft (10.4 meters), based on preliminary water levels at the surveyed position.

*APPROVED TIDES  
CONCUR WITH CLARIFICATION:*

*CHART 33 RKS*

*SEE SHEET 2 OF 6*

**AWOIS NO:** 1095

**Item Description:** Wreckage of Steam Tug Cherokee

**Source:** USCG GENTAIN 44, Gary Gentle-90

**AWOIS Position:** Lat. 38°35'54.<sup>4</sup>00"N Long. 074°39'<sup>28.58</sup>30.00"W

**Required Investigation:** SD, S2, DI

**Radius:** 500m

**Charts Affected:** 12214

---

**INVESTIGATION**

**Date(s):** October 30 1999 (DN 303)

**Position Numbers:** 25780.0

**Investigation Used:** S2

**Surveyed Position:** Lat. 38°35'53.17"N Long. 074°39'29.23"W

**Position Determined By:** Differential GPS

**Investigation Summary:** On DN 303 WHITING investigated AWOIS 1095 and found contact 303\_102\_2142\_1, the remains of a wreck within 40 meters of AWOIS 1095. Contact height was 13.8ft (based on scaled side scan sonar image) compared to the reported height of 15ft (USCG GENTAIN, 1944).

---

**CHARTING RECOMMENDATION**

**Recommendation:** The Hydrographer recommends retaining the charted "Wreck, least depth by wire drag, 71ft" and returning next season for a detached position and diver least depth determination. See Section S. *CONCUR*

*SEE SHEET 4 OF 6*

AWOIS NO: 1092

**Item Description:** Sunken Barge Marie Beasly

**Source:** NM 3/28/27; unknown

**AWOIS Position:** Lat. 38°34'24.00"N Long. 074°41'30.00"W

**Required Investigation:** SD, S2, DI

**Radius:** <sup>5</sup>00m

**Charts Affected:** 12214

---

**INVESTIGATION**

**Date(s):** 31 October 1999 (DN 304)

**Position Numbers:** N/A

**Investigation Used:** S2

**Surveyed Position:** N/A

**Position Determined By:** Differential GPS

**Investigation Summary:** The assigned radius of <sup>5</sup>200m was covered with 200% side scan sonar, no significant contacts were found.

---

**CHARTING RECOMMENDATION**

**Recommendation:** The Hydrographer recommends deleting "Wreck, least depth known by wire drag or diver of 57ft" charted at position of Lat. 38°34'<sup>28.0</sup>~~30.4~~"N Long. 074°41'<sup>30.0</sup>~~28.6~~"W. CONCUR

SEE SHEET 5 OF 6

**AWOIS NO:** 1084

**Item Description:** Salvage Tug "Nina"

**Source:** Capt. Potter, Delbay & River Pilots; Gary Gentile-90

**AWOIS Position:** Lat. 38°30'30.00"N Long. 074°50'30.00"W

**Required Investigation:** SD, S2, DI

**Radius:** 1000m

**Charts Affected:** 12214

---

**INVESTIGATION**

**Date(s):** 31 October 1999 (DN 304)

**Position Numbers:** N/A

**Investigation Used:** S2

**Surveyed Position:** Lat. 38°30'31.56"N Long. 074°50'32.56"W

**Position Determined By:** Differential GPS

**Investigation Summary:** On DN 304 contact 304\_300\_1645\_1, the remains of a wreck, was found within 100 meters of AWOIS 1084.

---

**CHARTING RECOMMENDATION**

**Recommendation:** The Hydrographer recommends changing charted "Wreck, position approximate" to "Wreck, least depth unknown" at the surveyed side scan sonar position and returning next season for a detached position and a least depth determination. *CONCUR*

*SEE SHEET 6 OF 6*

Contact No: N/A

Item Description: Deadman Shoal

Source: H-10926

AWOIS Position: N/A

Required Investigation: N/A

Radius: N/A

Charts Affected: 12304

---

**INVESTIGATION**

Date(s): August 18, 25, 27, 29, 1999 (DN 230, 237, 239, 241)

Position Numbers: 1-1418, 21252-22148, 22942-24284

Investigation Used: ES

Surveyed Position: Lat. 39°06'00.0"N Long. 074°57'57.0"W  
Lat. 39°06'00.0"N Long. 075°00'40.8"W  
Lat. 39°04'40.0"N Long. 075°00'40.8"W  
Lat. 39°04'40.0"N Long. 074°57'57.0"W

Position Determined By: Differential GPS

Investigation Summary: On DN 230, 237, 239, and 241, a VBES investigation at 50m line spacing was conducted at Deadman Shoal in a 2 x 1.3 nmi area around G "IDS" buoy.

---

**CHARTING RECOMMENDATION**

Recommendation: The Hydrographer recommends charting representative soundings and to re-define depth curves for Deadman Shoal. *CONCUR*

*SEE SHEET 3 OF 6*

**N. COMPARISON WITH THE CHART**

*SEE ALSO THE EVALUATION REPORT*

N.1. Four charts are affected by this survey:

Chart No. 12214  
Cape May to Fenwick Island  
42<sup>nd</sup> Ed., September 25, 1999  
1:80,000

Chart No. 12200  
Cape May to Cape Hatteras  
45<sup>th</sup> Ed., December 12, 1998  
1:419,706

Chart No. 12304  
Delaware Bay  
40<sup>th</sup> Ed., February 20, 1999  
1:80,000

Chart No. 13003  
Cape Sable to Cape Hatteras  
44<sup>th</sup> Ed., October 9, 1999  
1:1,200,000

N.2. No Danger to Navigation Reports were issued as a result of this survey.

N.3(a) Not applicable for this survey.

N.3(b) No significant shoaling or deepening trends were observed within the limits of this survey.

N.3(c) No hydrographic findings of special note are reported.

N.3(d) No maintained channels occur within the limits of this survey.

N.3(e) Not applicable for this survey.

N.4(a) thru N.6(k) These sections not applicable to this survey.



**O. ADEQUACY OF SURVEY** *SEE ALSO THE EVALUATION REPORT*

This survey is sufficiently complete and fully adequate to supersede prior survey data within common areas.

**P. AIDS TO NAVIGATION**

P.1. Not applicable to this survey.

P.2. Two floating aids to navigation are within the survey boundaries of F-00453. Both aids to navigation serve their intended purposes. See Section M, ITEM INVESTIGATIONS.

Name	Light List No.	Latitude	Longitude
GR "WR"	1610	39°12'32.89"N	074°15'16.69"W
G "IDS"	1685	39°05'12.10"N	074°59'50.74"W

P.3. Not applicable to this survey.

P.4. Not applicable to this survey.

P.5. Not applicable to this survey.

P.6. There were no non-floating aids to navigation included within the limits of this survey.

**Q. STATISTICS**

Total number of Non-Rejected Positions . . . . .	.51144
Q.1.a. Linear Nautical Miles of SSS . . . . .	.177.84
Q.1.b. Linear Nautical Miles of VBES-only . . . . .	.110.1
Q.1.c. Square Nautical Miles of VBES . . . . .	.3.705
Q.1.d. Square Nautical Miles of SSS . . . . .	.3.172
Q.2.a. Days of Data Acquisition . . . . .	.10
Q.2.b. Total Number of Soundings . . . . .	.7137
Q.2.c. Number of Soundings on Final Field Sheet . . . . .	.NA
Q.2.d. Number of Detached Positions . . . . .	.0
Q.2.d. Number of Bottom Samples . . . . .	.0
Q.2.e. Number of Velocity Casts . . . . .	.7
Q.2.f. Number of Tide Stations Installed . . . . .	.1

R. **MISCELLANEOUS** *SEE ALSO THE EVALUATION REPORT*

Not applicable for this survey.

S. **RECOMMENDATIONS**

The Hydrographer recommends WHITING return to items mentioned in Section M ITEM INVESTIGATIONS for further development during 2000 field season.

T. **REFERRAL TO REPORTS**

A Coast Pilot Report will be submitted to N/CS26 at the conclusion of project OPR-D392-WH.

A Tide Station Report for station 855-4399 (Mahon River Entrance) will be submitted to N/OPS1 at the conclusion of project OPR-D392-WH.

This is a multi-year project for WHITING and is expected to be complete in September 2000.

Respectfully Submitted,

*Marc Moser*

Marc S. Moser  
Ensign, NOAA  
Junior Officer  
NOAA Ship Whiting

MARCH 30, 2000

Date

APPENDIX K

APPROVAL SHEET

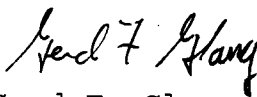
OPR-D392-WH-99  
Delaware Bay and Approaches  
New Jersey - Delaware

In Proximity to Cape Henlopen, Delaware  
**Survey Registry No. F-00453**

Field operations for this basic hydrographic survey were conducted under my daily supervision with frequent checks of progress and adequacy. All field sheets, this Descriptive Report, and all accompanying records and data are approved.

This survey is adequate to supersede all prior surveys in common areas, and for application to the relevant NOS nautical charts.

Respectfully,



Gerd F. Glang  
Lieutenant Commander, NOAA  
Commanding Officer  
NOAA Ship WHITING

MARCH 30, 2000

Date



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL OCEAN SERVICE  
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: March 8, 2000

HYDROGRAPHIC BRANCH: Atlantic  
HYDROGRAPHIC PROJECT: OPR-D392-WH-99  
HYDROGRAPHIC SHEET: F00453

LOCALITY: Approaches to Delaware Bay, NJ/DE

TIME PERIOD: August 18 - October 31, 1999

TIDE STATION USED: 855-7380 Lewes, DE  
Lat.  $38^{\circ} 46.9'N$  Lon.  $75^{\circ} 07.2'W$   
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters  
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.314 meters


TIDE STATION USED: 855-4399 Mahon River Entrance, DE  
Lat.  $39^{\circ} 11.1'N$  Lon.  $75^{\circ} 24.0'W$   
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters  
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.746 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: DB14, DB15, DB39, ATL526 & ATL527.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time.

For 

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

GEOGRAPHIC NAMES

F00453

Name on Survey	Source of Information										
	A	B	C	D	E	F	G	H	K		
CROSS LEDGE	X										1
DEADMAN SHOAL	X										2
DELAWARE (title)	X		X								3
DELAWARE BAY	X		X								4
FOURTEEN FOOT BANK	X										5
NEW JERSEY (title)	X		X								6
NORTH ATLANTIC OCEAN	X		X								7
											8
											9
											10
											11
											12
											13
											14
											15
											16
											17
											18
											19
											20
											21
											22
											23
											24
											25

APPROVED  
*Dennis J. Roseburg*  
 APR 27 2000

N/CS33-47-00

LETTER TRANSMITTING DATA

DATA AS LISTED BELOW WERE FORWARDED TO YOU BY  
(Check):

- ORDINARY MAIL
- AIR MAIL
- REGISTERED MAIL
- EXPRESS
- GBL (Give number) \_\_\_\_\_

TO:

Chief, Data Control Group, N/CS3x1  
 NOAA/National Ocean Service  
 Station 6815, SSMC3  
 1315 East-West Highway  
 Silver Spring, MD 20910-3282

DATE FORWARDED

14 July 2000

NUMBER OF PACKAGES

One Tube

NOTE: A separate transmittal letter is to be used for each type of data, as tidal data, seismology, geomagnetism, etc. State the number of packages and include an executed copy of the transmittal letter in each package. In addition the original and one copy of the letter should be sent under separate cover. The copy will be returned as a receipt. This form should not be used for correspondence or transmitting accounting documents.

F00453

Delaware/ New Jersey, North Atlantic Ocean/ Delaware Bay and Approaches

(One) Tube Containing The Following:

- 1 Original Descriptive Report
- 6 Page size smooth sheet plots
- 2 Drawing History Forms (NOAA Form #76-71) 1 each for NOS Charts 12214, 12304
- 1 Record of Application To Charts Form (NOAA FORM #75-96) for survey F00450
- 1 H-Drawing for NOS Charts 12214
- 1 H-Drawing for NOS Chart 12304
- 2 Composite Drawings for NOS Chart 12214
- 3 Composite Drawings for NOS Chart 12304

FROM: (Signature)

*Richard Blevins*  
 Richard Blevins

RECEIVED THE ABOVE  
(Name, Division, Date)

Return receipted copy to:

Richard Blevins  
 Atlantic Hydrographic Branc  
 N/CS33  
 439 West York Street  
 Norfolk, VA 23510-1114

07/14/2000

HYDROGRAPHIC SURVEY STATISTICS  
REGISTRY NUMBER: F00453

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	7134
NUMBER OF SOUNDINGS	7134

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	8.0	04/17/2000
VERIFICATION OF FIELD DATA	50.0	06/07/2000
QUALITY CONTROL CHECKS	20.0	
EVALUATION AND ANALYSIS	2.0	
FINAL INSPECTION	26.0	05/19/2000
COMPILATION	48.0	06/23/2000
TOTAL TIME	154.0	
ATLANTIC HYDROGRAPHIC BRANCH APPROVAL		05/26/2000

**ATLANTIC HYDROGRAPHIC BRANCH  
EVALUATION REPORT FOR F00453 (1999)**

This Evaluation 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.

**D. AUTOMATED DATA ACQUISITION AND PROCESSING**

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

Hydrographic Processing System  
NADCON, version 2.10  
MicroStation 95, version 5.05  
I/RAS B, version 5.01

The smooth sheet was plotted using a Hewlett Packard DesignJet 2500CP plotter.

**H. CONTROL STATIONS**

Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD 83). Office processing of this survey is based on these values. Six page size plots have been annotated with ticks showing the computed mean shift between NAD 83 and the North American Datum of 1927 (NAD 27). All sheets are plotted at 1:10,000 scale with the exception of sheet three which is plotted at 1:20,000.

(1) To place sheet 1 of 6 on NAD 27, move the projection lines 0.410 seconds (12.643 meters or 1.26 mm at the scale of the sheet) north in latitude, and 1.314 seconds (31.536 meters or 3.15 mm at the scale of the sheet) east in longitude.

(2) To place sheet 2 of 6 on NAD 27, move the projection lines 0.406 seconds (12.517 meters or 1.25 mm at the scale of the sheet) north in latitude, and 1.334 seconds (32.071 meters or 3.21 mm at the scale of the sheet) east in longitude.

(3) To place sheet 3 of 6 on NAD 27, move the projection lines 0.407 seconds (12.563 meters or 0.63 mm at the scale of the sheet) north in latitude, and 1.368 seconds (32.869 meters or 1.65 mm at the scale of the sheet) east in longitude.

(4) To place sheet 4 of 6 on NAD 27, move the projection



lines 0.409 seconds (12.627 meters or 1.26 mm at the scale of the sheet) north in latitude, and 1.418 seconds (34.305 meters or 3.41 mm at the scale of the sheet) east in longitude.

(5) To place sheet 5 of 6 on NAD 27, move the projection lines 0.409 seconds (12.597 meters or 1.26 mm at the scale of the sheet) north in latitude, and 1.411 seconds (34.149 meters or 3.41 mm at the scale of the sheet) east in longitude.

(6) To place sheet 6 of 6 on NAD 27, move the projection lines 0.405 seconds (12.485 meters or 1.25 mm at the scale of the sheet) north in latitude, and 1.384 seconds (33.544 meters or 3.35 mm at the scale of the sheet) east in longitude.

#### **K. JUNCTIONS**

This survey does not junction with any contemporary surveys. Present survey depths are in harmony with the charted hydrography to the north, south, east, and west.

#### **L. COMPARISON WITH PRIOR SURVEYS**

A comparison with prior surveys was not done during office processing in accordance with section 4. of the memorandum titled "Changes to Hydrographic Survey Processing", dated May 24, 1995.

#### **M. ITEM INVESTIGATION**

1) AWOIS Item #2723, a sunken wreck, "THERESA I", in Latitude 39°12'37.86"N, Longitude 75°15'15.10"W, originates with Notice to Mariners 27 of 1967 (NM27/67). This item was investigated during survey operations for H10255 (1987) and was found to be two wrecks with a least depth of 15 feet (4<sup>6</sup> m), lying side by side. This item was not adequately investigated by the field unit. This wreck has been brought forward from the prior survey to supplement the present survey. No change in charting status is recommended. See also AWOIS item number 2724 and sheet 1 of ~~7.6~~

2) AWOIS Item #2724, a sunken wreck, "WALTER GRAZE", in Latitude 39°12'37.86"N, Longitude 75°15'15.10"W, originates with NM27/67. This item was investigated during survey operations for H10255 (1987) and found to be two wrecks with a least depth of 15 feet (4<sup>6</sup> m), lying side by side. This item was not adequately investigated by the field unit. This

wreck has been brought forward from the prior survey to supplement the present survey. No change in charting status is recommended. See also AWOIS item number 2723 and sheet 1 of 8.6

3) AWOIS Item #9992, a rock, with a least depth of 30 feet (9<sup>1</sup> m), in Latitude 39°02'40.50"N, Longitude 75°10'09.00"W, originates with CL653/37. This item is not considered disproved by the present survey. It is recommended that this item be retained as charted.

**N. COMPARISON WITH CHART 12200 (45<sup>th</sup> Edition, Dec 12/98)**  
12214 (42<sup>nd</sup> Edition, Sep 25/99)  
12304 (40<sup>th</sup> Edition, Feb 20/99)  
13003 (44<sup>th</sup> Edition, Oct 9/99)

### **Hydrography**

The charted hydrography originates with the prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in sections M., N., and O. of the Descriptive Report.

Except as noted in this report, the present survey is adequate to supersede the charted hydrography within the common area.

### **O. ADEQUACY OF SURVEY**

This is an adequate hydrographic/side scan sonar survey. Addition work is recommended to obtain least depths on items discussed on pages 12 and 18 of the Descriptive Report.

### **R. 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. The following NOS Charts were used for compilation of the present survey:

12214 (42<sup>nd</sup> Edition, Sep 25/99)  
 12304 (40<sup>th</sup> Edition, Feb 20/99)

*Robert Snow*

**Robert Snow**

Cartographic Technician  
Verification of Field Data  
Evaluation and Analysis

APPROVAL SHEET  
F00453

**Initial Approvals:**

The completed survey has been inspected with regard to survey coverage, delineation of depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data. The digital data have been completed and all revisions and additions made to the smooth sheet during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Richard W. Blevins Date: 22 MAY 2000  
Richard W. Blevins  
Cartographer  
Atlantic Hydrographic Branch

I have reviewed the smooth sheet, accompanying data, and reports. This survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Evaluation Report.

Andrew L. Beaver Date: 26 MAY 00  
Andrew L. Beaver  
Lieutenant Commander, NOAA  
Chief, Atlantic Hydrographic Branch

\*\*\*\*\*

**Final Approval:**

Approved: Samuel P. De Bow, Jr. Date: August 9, 2001  
Samuel P. De Bow, Jr.  
Captain, NOAA  
Chief, Hydrographic Surveys Division

75° 16' 00"

75° 15' 30"

75° 15' 00"

75° 14' 30"

75° 14' 00"

75° 16' 00"

75° 15' 30"

75° 15' 00"

75° 14' 30"

75° 14' 00"



75° 14' 30" W  
 NAD 27 — 39° 13' 00" N

CHECKED BY: RS  
 4/19/00

*DELAWARE BAY*

39° 13' 00"

39° 12' 30"

F00453  
 DELAWARE  
 DELAWARE BAY  
 IN THE VICINITY OF CROSS LEDGE  
 SCALE: 1:10,000  
 AUG - OCT 1999  
 SOUNDINGS IN FEET AT MLLW  
 SHEET 1 OF 6  
 AWOIS ITEM 2723 and 2724  
*Soundings and Features: in orange from  
 survey H10255 (1987)*

39° 12' 00"

75° 10' 30"

75° 10' 00"

75° 09' 30"

FOURTEEN FOOT BANK

75° 10' 00" W

NAD 27

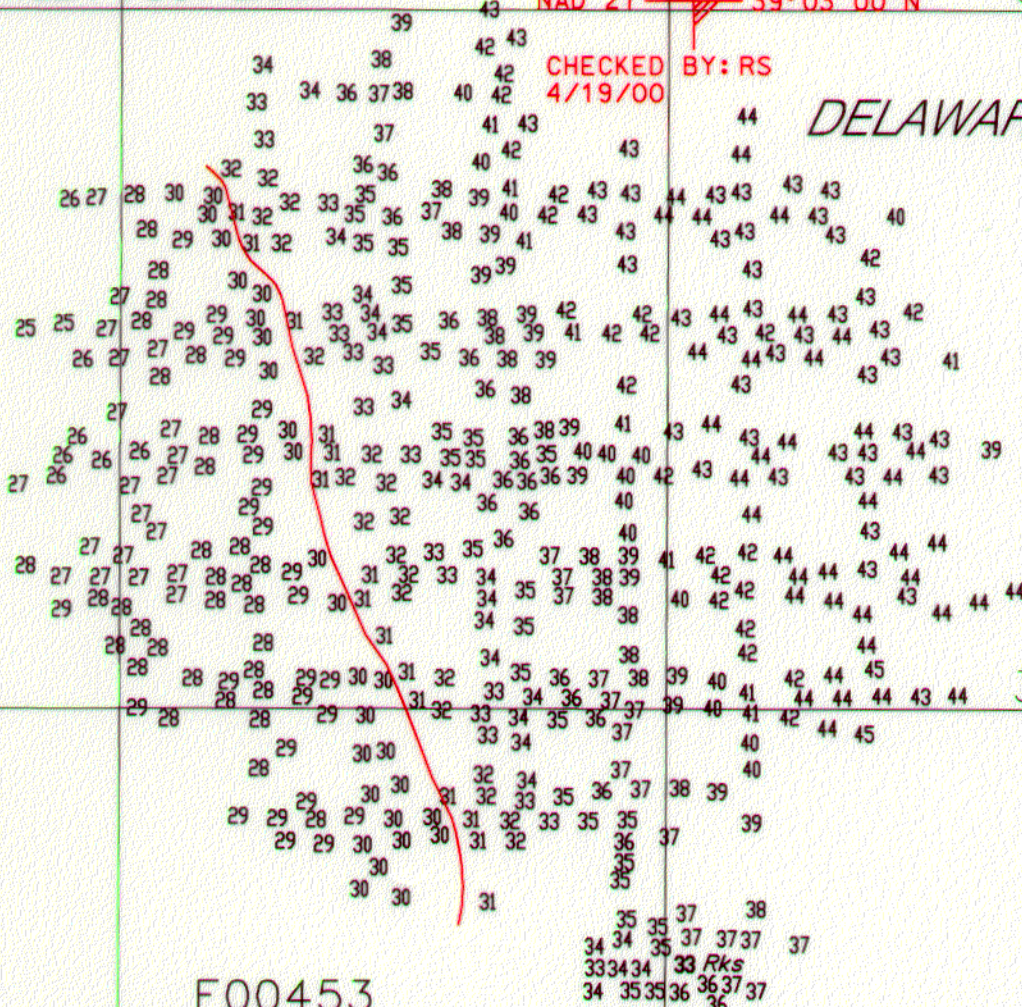


39° 03' 00" N

39° 03' 00"

CHECKED BY: RS  
4/19/00

DELAWARE BAY



F00453  
 DELAWARE  
 DELAWARE BAY  
 IN THE VICINITY OF FOURTEEN FOOT BANK  
 SCALE: 1:10,000  
 AUG - OCT 1999  
 SOUNDINGS IN FEET AT MLLW  
 SHEET 2 OF 6

39° 02' 00"

AWOIS ITEM 9992

75° 10' 30"

75° 10' 00"

75° 09' 30"

75° 01' 00"

75° 00' 00"

74° 59' 00"

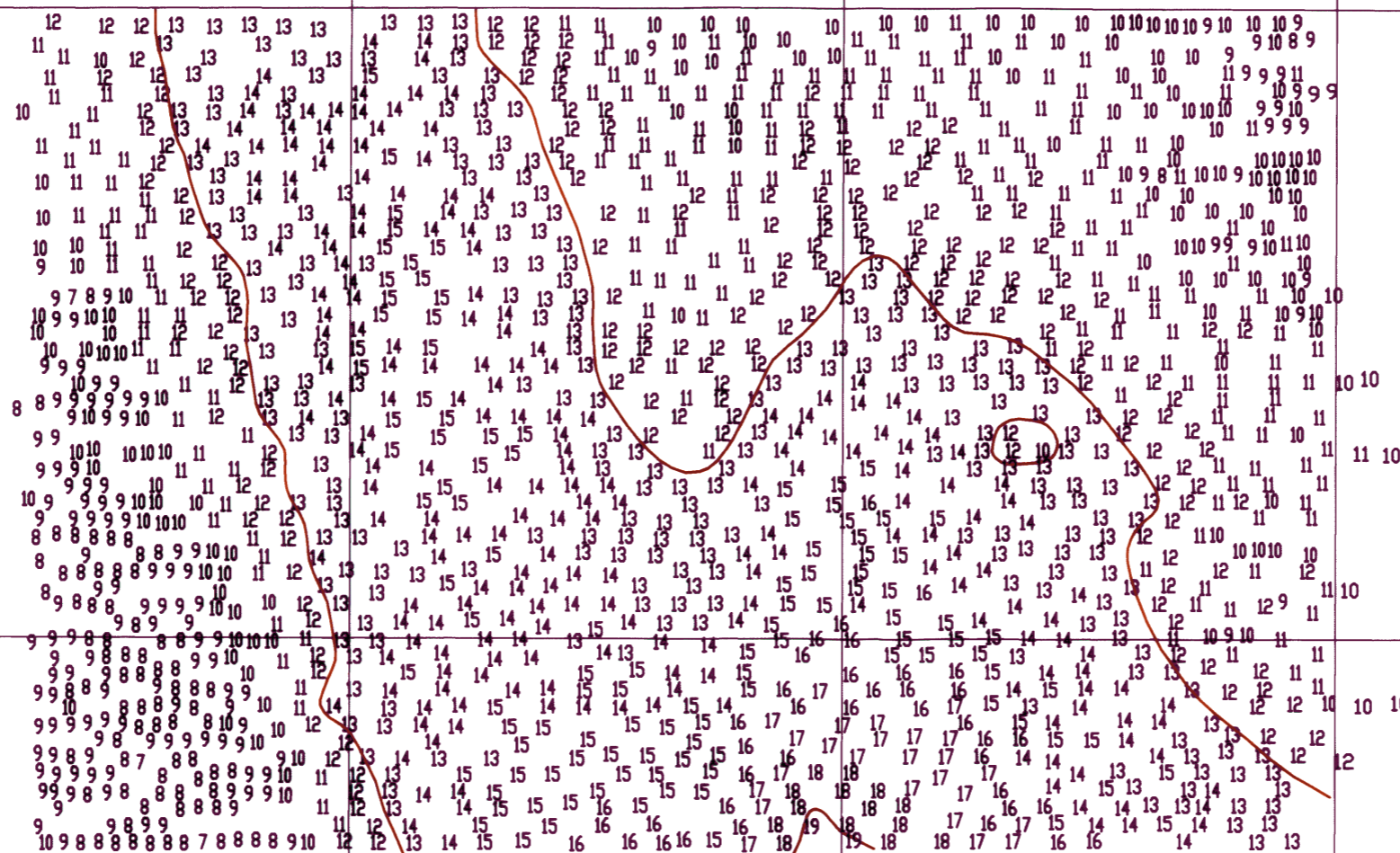
74° 58' 00"

74° 57' 00"

DELAWARE BAY

39° 06' 00"

DEADMAN SHOAL




39° 05' 00"

F00453  
 DELAWARE  
 DELAWARE BAY  
 DEADMAN SHOAL  
 SCALE: 1:20,000  
 AUG - OCT 1999  
 SOUNDINGS IN FEET AT MLLW  
 SHEET 3 OF 6

39° 04' 00"

75° 01' 00"

75° 00' 00" W  
 NAD 27  39° 04' 00" N

CHECKED BY: RS  
 4/19/00

74° 59' 00"

74° 58' 00"

74° 57' 00"

74° 40' 00"

74° 39' 30"

74° 39' 00"

74° 39' 30" W

NAD 27 38° 36' 30" N

38° 36' 30"

CHECKED BY: RS  
4/19/00

*NORTH ATLANTIC OCEAN*

94

94

94

93

93

94

95

95

38° 36' 00"

94

93

91 92 92 92 94 93 93 94

92

91 92 92 92 92 93

93

94

F00453  
DELAWARE  
NORTH ATLANTIC OCEAN  
23 NM SE OF CAPE HENLOPEN  
SCALE: 1:10,000  
AUG - OCT 1999  
SOUNDINGS IN FEET AT MLLW  
SHEET 4 OF 6

38° 35' 30"

AWOIS ITEM 1095

74° 40' 00"

74° 39' 30"

74° 39' 00"

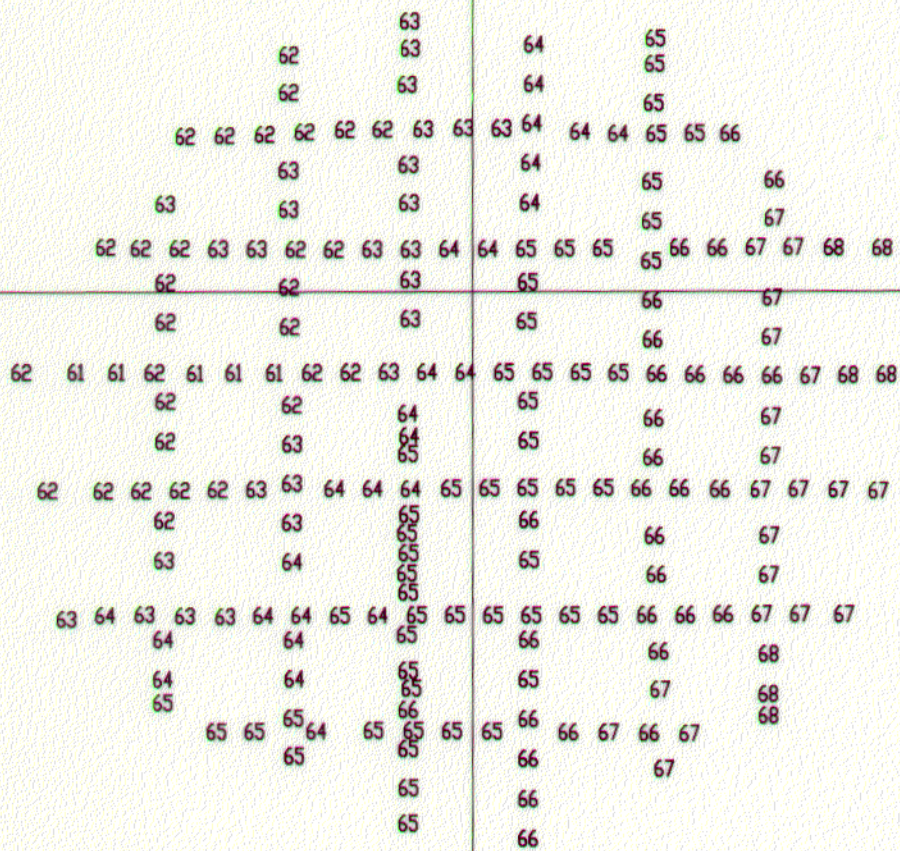


74° 42' 00"

74° 41' 30"

74° 41' 00"


*NORTH ATLANTIC OCEAN*



38° 34' 30"

74° 42' 00" W

38° 34' 00"

NAD 27  38° 34' 00" N

F00453

DELAWARE  
 NORTH ATLANTIC OCEAN  
 23 NM SE OF CAPE HENLOPEN  
 SCALE: 1:10,000  
 AUG - OCT 1999  
 SOUNDINGS IN FEET AT MLLW  
 SHEET 5 OF 6  
 AWOIS ITEM 1092

CHECKED BY: RS  
4/19/00

74° 42' 00"

74° 41' 30"

74° 41' 00"



