H10835

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey	HYDROGRAPHIC MULTIBEAM/SIDE SCAN SONAR
Field No.	SHEET Q
Registry No.	H10835

LOCALITY

State	TEXAS
General Locality	GULF OF MEXICO
Locality	15 MILES ESE OF GALVESTON

1998-1999

CHIEF OF PARTY
WALTER S. SIMMONS

LIBRARY & ARCHIVES

DATE January 4, 2002

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

REGISTRY NO. **H10835**

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 NO. **Q**

State TEXAS

General locality GULF OF MEXICO

Locality 15 MILES ESE OF GALVESTON

Scale 1:20,000 Date of survey 18 August 1998 – 25 Jan 1999

Instructions dated October 23, 1997 as amended Project No. OPR-K171-KR

Vessel M/V NEPTUNE

Chief of party WALTER S. SIMMONS

Surveyed by S. Lemke, D. Walker, R. Fischman, G. Ghiorse, R. Nadeau, J. Squadrito, T.Snyder, L. Gates, A. Quintal, S. Ferguson, M. Estaphan, B. Andrews

Soundings taken by (**echo sounder**), hand lead, pole MULTIBEAM RESON SEABAT 8101

Graphic record scaled by survey personnel

Graphic record checked by survey personnel

Protracted by HP DESIGNJET 2500P (OFFICE) Automated plot by HP750C (FIELD)

Verification by ATLANTIC HYDROGRAPHIC BRANCH PERSONNEL

Soundings in fathoms (**feet**) meters at MLW (**MLLW**)

REMARKS: Contract # 50-DGNC-8-90025/SAIC
Contractor Name: Science Applications International Corp.
221 Third Street; Newport, RI 02840
HAND WRITTEN NOTES IN DESCRIPTIVE REPORT WERE MADE DURING OFFICE PROCESSING.

AWOIS ✓ & SURF ✓ 9-13-01 by MRH

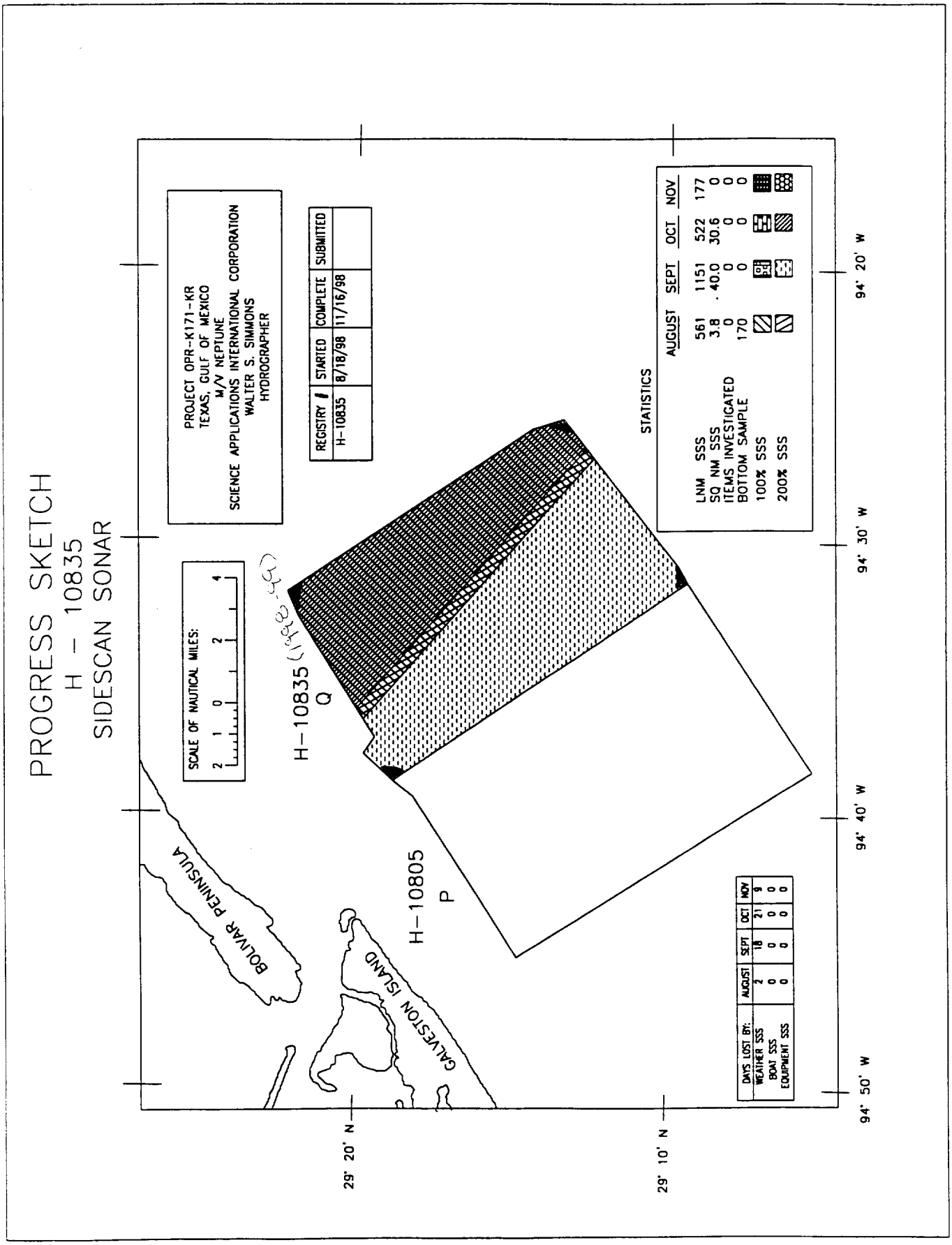
NOAA FORM 77-28 SUPERSEDES FORM C&GS-537. ☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—665-661/1222 REGION NO. 6

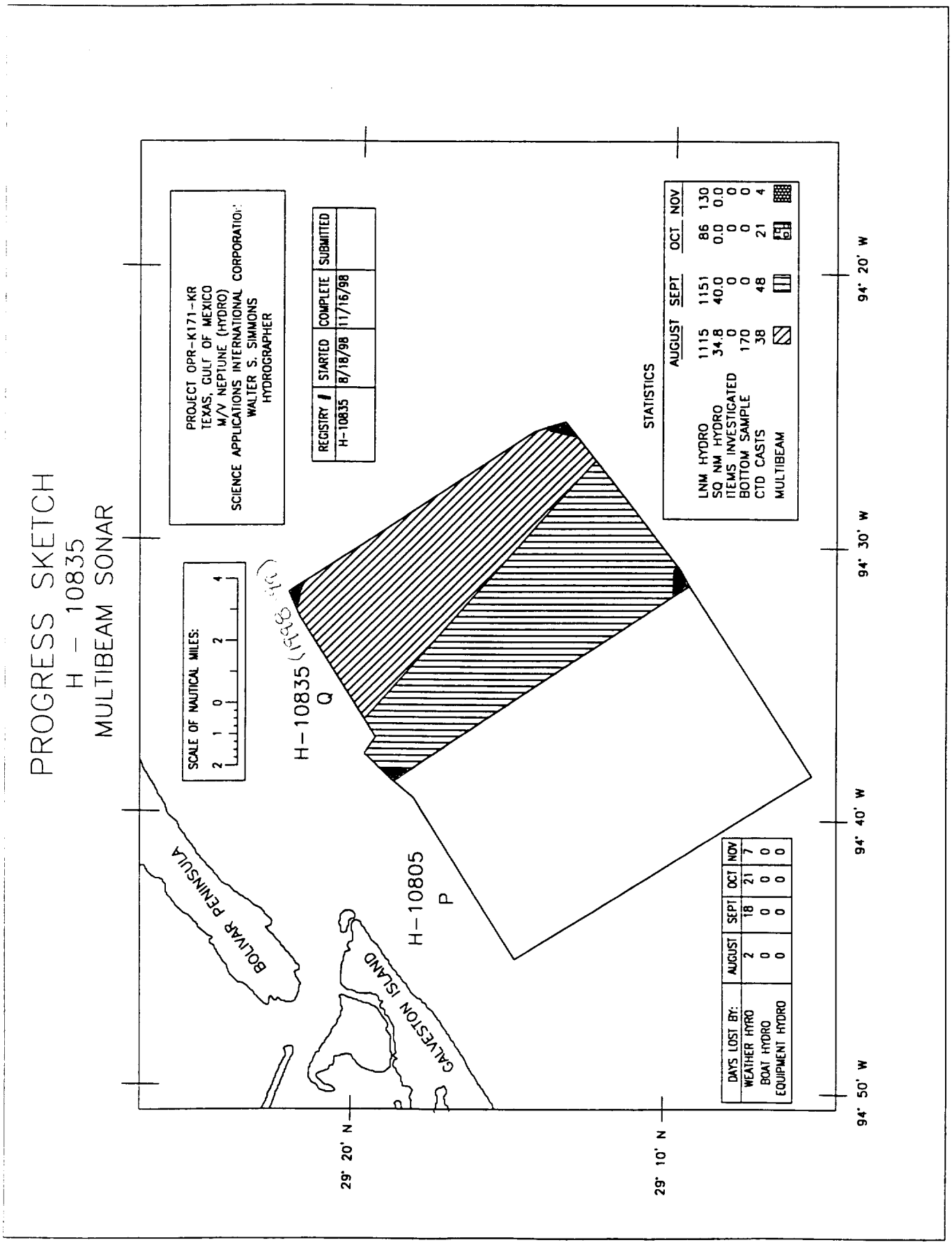
INDEX OF SHEETS

The Progress Sketches on the following pages indicate:

1. Survey Outlines
2. Field Survey Letters and Survey Registry Numbers
3. Work Accomplished by Month

Progress for multibeam and for sidescan are shown on separate Sketches.


PROGRESS SKETCH
H - 10835
SIDESCAN SONAR
PROJECT OPR-K171-KR
TEXAS, GULF OF MEXICO
M/V NEPTUNE
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
WALTER S. SIMMONS
HYDROGRAPHER
REGISTRY # | STARTED | COMPLETE | SUBMITTED
H-10835 | 8/18/98 | 11/16/98 |
SCALE OF NAUTICAL MILES:
2 1 0 1 2 4
H-10835 (1998-3)
Q
H-10805
P
BOLIVAR PENINSULA
GALVESTON ISLAND
STATISTICS
AUGUST SEPT OCT NOV
LNM SSS 561 1151 522 177
SQ NM SSS 3.8 40.0 30.6 0
ITEMS INVESTIGATED 0 0 0 0
BOTTOM SAMPLE 170 0 0 0
100% SSS
200% SSS
DAYS LOST BY: AUGUST SEPT OCT NOV
WEATHER SSS 2 18 21 9
BOAT SSS 0 0 0 0
EQUIPMENT SSS 0 0 0 0
94° 50' W
94° 40' W
94° 30' W
94° 20' W
29° 20' N
29° 10' N


PROGRESS SKETCH
H - 10835
MULTIBEAM SONAR
PROJECT OPR-K171-KR
TEXAS, GULF OF MEXICO
M/V NEPTUNE (HYDRO)
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
WALTER S. SIMMONS
HYDROGRAPHER
REGISTRY # | STARTED | COMPLETE | SUBMITTED
H-10835 | 8/18/98 | 11/16/98 |
SCALE OF NAUTICAL MILES:
2 1 0 2 4
H-10835 (1998)
Q
H-10805
P
BOLIVAR PENINSULA
GALVESTON ISLAND
STATISTICS
AUGUST SEPT OCT NOV
LNM HYDRO 1115 1151 86 130
SQ NM HYDRO 34.8 40.0 0.0 0.0
ITEMS INVESTIGATED 0 0 0 0
BOTTOM SAMPLE 170 0 0 0
CTD CASTS 38 48 21 4
MULTIBEAM
DAYS LOST BY: AUGUST SEPT OCT NOV
WEATHER HYDRO 2 18 21 7
BOAT HYDRO 0 0 0 0
EQUIPMENT HYDRO 0 0 0 0
94° 50' W
94° 40' W
94° 30' W
94° 20' W
29° 20' N
29° 10' N

Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract 50-DGNC-8-90025/SAIC reflect the state of the sea floor in existence on the day and at the time the survey was conducted.

		Page
A	PROJECT	1
B	AREA SURVEYED	1
C	SURVEY VESSELS	2
D	AUTOMATED DATA ACQUISITION AND PROCESSING	6
E	SONAR EQUIPMENT (Sidescan sonar operations)	7
F	SOUNDING EQUIPMENT	10
G	CORRECTIONS TO SOUNDINGS	11
H	CONTROL STATIONS	14
I	HYDROGRAPHIC POSITION CONTROL	14
J	SHORELINE	15
K	CROSSLINES	15
L	JUNCTIONS	16
M	COMPARISON WITH PRIOR SURVEYS	17
N	COMPARISON WITH THE CHART	17
O	ADEQUACY OF SURVEY	19
P	AIDS TO NAVIGATION	19
Q	STATISTICS	19
R	MISCELLANEOUS	20
S	RECOMMENDATIONS	21
T	REFERRAL TO REPORTS	22

APPENDIX A	-	DANGER TO NAVIGATION REPORTS	23
*APPENDIX B	-	LANDMARKS AND NON-FLOATING AIDS TO NAVIGATION LISTS	28
*APPENDIX C	-	LIST OF HORIZONTAL CONTROL STATIONS	29
*APPENDIX D	-	LIST OF GEOGRAPHIC NAMES	30
*APPENDIX E	-	TIDE NOTES	31
*APPENDIX F	-	SUPPLEMENTAL CORRESPONDENCE	36
*APPENDIX G	-	CALIBRATION DATA	45

* DATA FILED WITH FIELD RECORDS.

* APPENDIX H - DGPS VERIFICATION DATA 66
* APPENDIX I - DATA PROCESSING ROUTINE 68
* APPENDIX J - SOUND VELOCITY PROFILE DATA 69
* APPENDIX K - AUTOMATED DATA ACQUISITION AND PROCESSING SOFTWARE 73

* DATA FILED WITH FIELD RECORDS.

List of Figures

		Page
	Progress Sketch, Sidescan Sonar	iv
	Progress Sketch, Multibeam Sonar	v
C-1	M/V NEPTUNE Antenna and Transducer Locations Relative to the POS/MV IMU Vessel Reference Point	3
C-2	M/V NEPTUNE Draft Determination Through Day 260	5
C-3	M/V NEPTUNE Draft Determination on and After Day 261	5
R-1	Histogram of Selected Soundings by Beam Number	20

List of Tables

		Page
C-1	Survey Vessel Characteristics	2
C-2	M/V NEPTUNE Antenna and Transducer Locations Relative to the POS/MV IMU Vessel Reference Point	4
E-1	Sidescan Coverage Gaps	10
E-2	Sidescan Coverage and Tack Problems	10
G-2	Roll, Pitch, and Heading Bias for the M/V NEPTUNE	14
K-1	Junction Analysis Mainscheme (A) vs Crosslines (A)	16
L-1	Junction Analysis, H10835, Sheet Q to H10805, Sheet P	16
L-2	Preliminary Junction Analysis, H10835, Sheet Q to H10805, Sheet R	17
N-1	New Features Discovered	18
P-1	U.S. Coast Guard Buoys	19
P-2	Oil Platforms, Lighted	19
S-1	H10835 Items for Investigation	21

Descriptive Report to Accompany
Hydrographic Survey H10835
Scale 1:20,000, Surveyed 1998
M/V NEPTUNE
Science Applications International Corporation (SAIC)
Walter S. Simmons, Hydrographer

A. PROJECT

Project number: OPR-K171-KR
Dates of instructions: 23 October 1997 **Original:** 50-DGNC-8-90025/SAIC
5 January 1998 Modification #1 50-DGNC-8-24001
07 August 1998 Modification #2 50-DGNC-8-24002
Dates of supplemental instructions: 04 August 1998
Sheet letter: Q
Registry number: H10835
Purpose: To provide NOAA with modern, accurate hydrographic survey data acquired using shallow water multibeam and sidescan sonar technology with which to update the nautical charts of the assigned area.

B. AREA SURVEYED

The area surveyed was the Approach to Galveston, Texas, Shipping Safety Fairway, and the Fairway Anchorage to the east of the Fairway including a portion of the Precautionary Area at the entrance to the Galveston Channel. The following coordinates approximately bound the area surveyed:

29.313198 N	094.646537 W
29.328982 N	094.630131 W
29.323084 N	094.620029 W
29.364413 N	094.546836 W
29.370318 N	094.531691 W
29.239758 N	094.431470 W
29.223433 N	094.425307 W
29.161523 N	094.514909 W
29.156688 N	094.524570 W

Dates of multibeam data acquisition:

08/18/98 – 08/20/98	JD 230 – 232
08/23/98 – 09/01/98	JD 235 – 244
09/03/98 – 09/06/98	JD 246 – 249
09/19/98 – 09/25/98	JD 262 – 268
09/29/98 – 10/02/98	JD 272 – 275
10/09/98 – 10/10/98	JD 282 – 283
11/16/98	JD 320
01/10/99 – 01/11/99	JD 010 – 011

Dates of Sidescan data acquisition:

08/26/98 – 09/01/98	JD 238 – 244
09/04/98 – 09/06/98	JD 247 – 249
09/19/98 – 09/25/98	JD 262 – 268
09/29/98 – 10/02/98	JD 272 – 275
10/09/98 – 10/11/98	JD 282 – 284
10/13/98 – 10/16/98	JD 286 – 289
11/08/98 – 11/10/98	JD 312 – 314
11/15/98 – 11/16/98	JD 319 – 320
12/14/98	JD 348
01/10/99 – 01/11/99	JD 010 – 011
01/25/99	JD 025

C. SURVEY VESSELS

M/V NEPTUNE was the platform for multibeam sonar, sidescan sonar, sound velocity, and bottom samples. Multibeam and sidescan data acquisition systems were mounted in the main cabin of the NEPTUNE and post processing systems in a CONEX container welded in place on the aft deck of the NEPTUNE. The POS/MV IMU was mounted on the vessel centerline just forward and above the RESON 8101 transducer, below the main deck. Multibeam sounder transducer was mounted on the keel. Table C-1 is a list of vessel characteristics for the vessel employed on this survey.

Table C-1. Survey Vessel Characteristics

Vessel Name	LOA (Ft)	Beam (Ft)	Draft (Ft)	Gross Tonnage	Power (Hp)	Registration Number
M/V NEPTUNE	106.9	26	8	90	1200	D595478

The M/V NEPTUNE layout is depicted in Figure C-1 and the vessel offsets are shown in Table C-2. Figures C-2 and C-3 show the M/V NEPTUNE's draft calculations. The Reference Point for the entire system was located at the top centerline of the POS/MV IMU. The ping position recorded in the gsf multibeam file is the IMU position. The position of the sounding from each beam of the echo sounder is determined by applying the recorded x and y offsets to the IMU position.

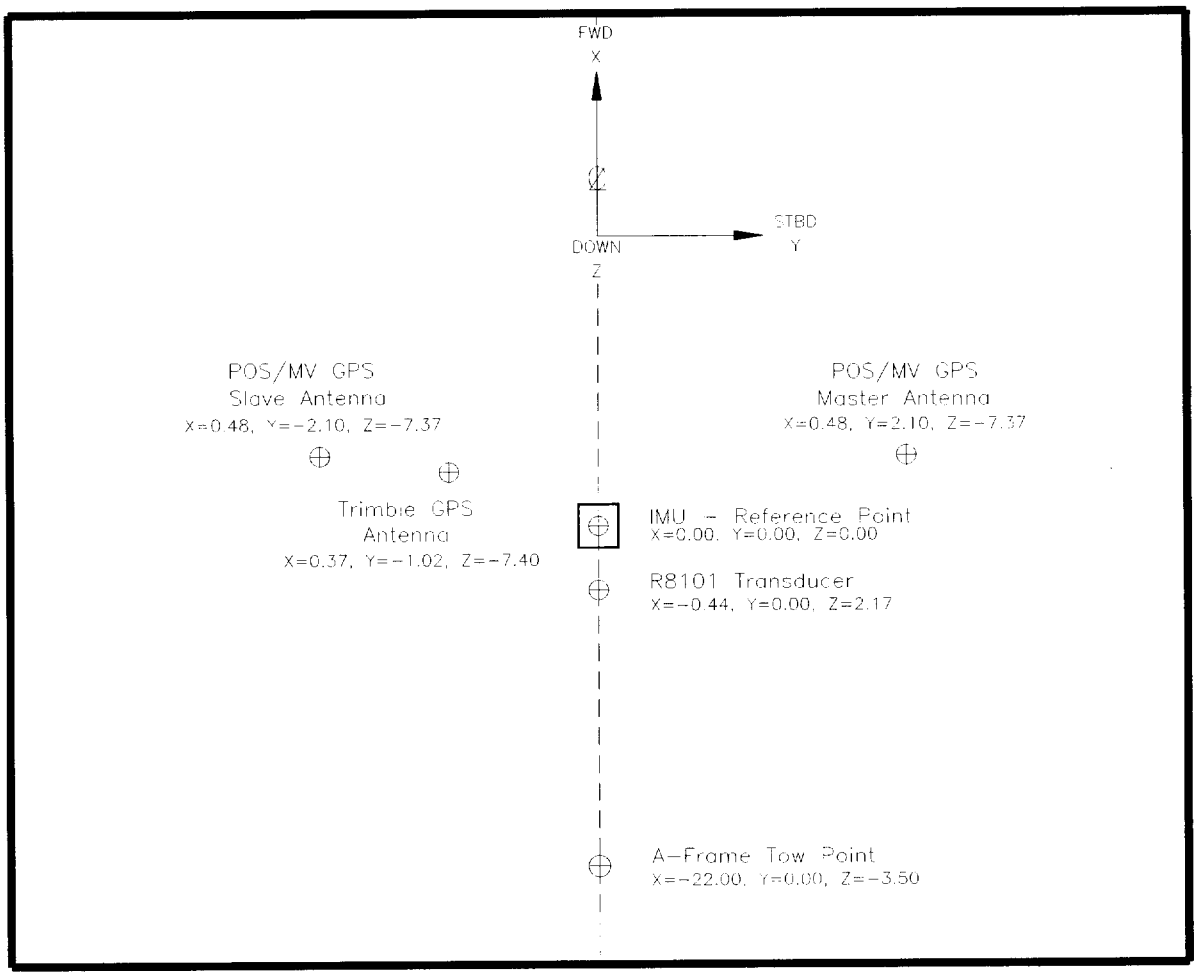


Figure C-1. M/V NEPTUNE Antenna and Transducer Locations Relative To the POS/MV IMU Vessel Reference Point

Table C-2. M/V NEPTUNE Antenna and Transducer Locations Relative To the POS/MV IMU Vessel Reference Point

Sensor	Offset in iss2000		POS/MV IMU	
Multibeam			X	-0.44
Reson Coordinate			Y	0
			Z	2.17
Trimble 7400	X	0.37		
	Y	-1.02		
	Z	-7.40		
GPS Differential Master Antenna			X	0.48
			Y	2.10
			Z	-7.37
Sidescan Tow PT	X	-22.0		
"A" frame aft	Y	0		
M/V NEPTUNE	Z	-3.5		

The transducer depth was recorded as 3.46 meters to the boat deck. The boat deck to waterline height was measured and subtracted from the transducer hull depth to determine the draft of the electronic center of the transducer. Measurements were made on each side of the vessel before departure from port and upon return to port to prorate the draft for fuel and water consumption. Lead-line comparisons to the corresponding echo sounder beam confirmed the 3.46 meters as the correct transducer depth below deck. On and before day 260 the transducer draft was determined in accordance with *Figure C-2*.

Upon installation of the RESON R8101 sounder, the processor control unit would not operate. The unit was changed and the system operated. Later it was discovered that the firmware in use was for the E/R projector transducer instead of being matched to the stick projector that was in use. RESON advised that this combination would cause a draft change of 0.04 to 0.05 meter, and that there might be a slight additional depth change across the swath. Draft determination and leadline comparisons had accounted for the shift in draft of the transducer. The accuracy test had demonstrated that depths across the swath met the accuracy standards. On day 261 the firmware in the RESON R8101 was upgraded to match the stick transmitter transducer which was being used. This resulted in a change in the electronic draft of the transducer of –0.04 meter as predicted by RESON and confirmed by leadline comparisons. On and after day 261 the transducer draft was determined in accordance with *Figure C-3*.

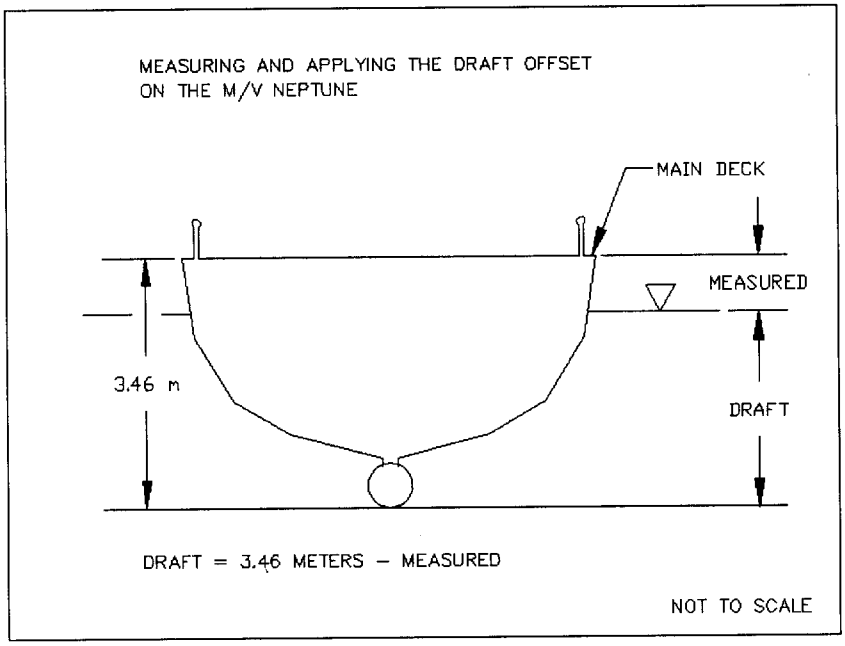


Figure C-2. M/V NEPTUNE Draft Determination Through Day 260

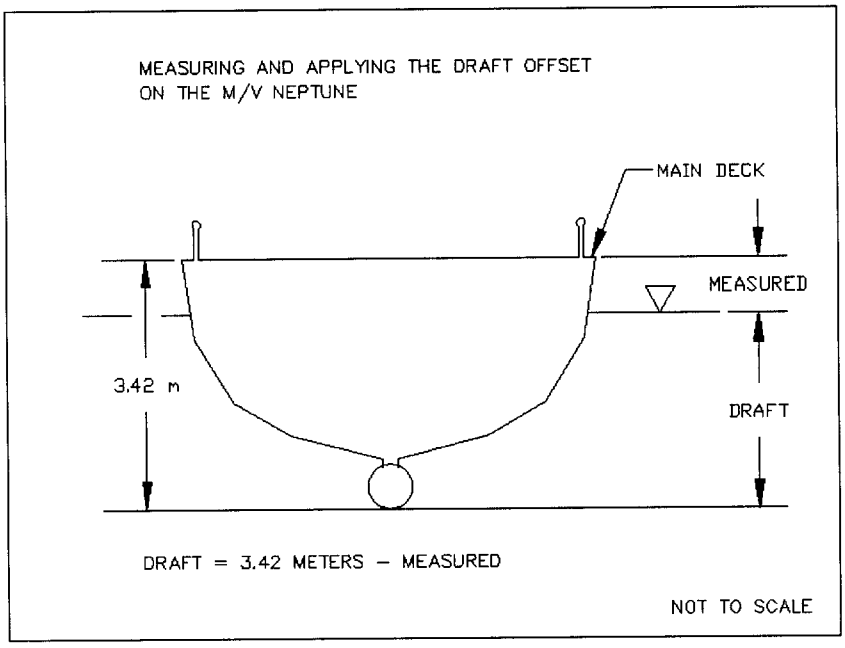


Figure C-3. M/V NEPTUNE Draft Determination on and After Day 261

The SAIC Integrated Survey System (**iss2000**) and the RESON R8101 multibeam system have different coordinate systems, and therefore care must be taken when inputting correctors to the system. The **iss2000** considers "z" to be positive down, while both the RESON and POS/MV consider "z" positive up. Both the **iss2000** and POS/MV consider "x" positive forward, the RESON considers "x" as positive athwart ships to starboard. The **iss2000** considers "y" positive athwart ships to starboard, the POS/MV considers "y" positive athwart ships to port and the RESON considers "y" as positive forward.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

SEE ALSO THE EVALUATION REPORT.

Data acquisition was through the **SAIC iss2000** system. Survey planning, real-time navigation, and data logging were controlled by the **iss2000**. On the M/V NEPTUNE, the **iss2000** was run on a HP UNIX machine, with navigation and data time tagging running on an OS/2 machine. The **iss2000** also provided navigation data to the sidescan sonar systems for merging with the sonar data.

Navigation was recorded from the POS/MV system and from the Trimble 7400. Positioning confidence checks were performed alongside survey control stations in port. Daily positioning confidence checks were performed by comparing data recorded from the POS/MV to data recorded from the Trimble DGPS.

The RESON R8101 range scale was set to 50 meters. The data acquisition rate for the R8101 was set at 8 pings per second for vessel speeds above 6 knots, and at 5 pings per second for vessel speeds of 6 knots or less. This means that the specified on average 3.2 pings per 3 meters could be obtained at up to 14.5 knots with the 8 pings per second data rate, and at up to 9 knots at the 5 pings per second data rate. At the most common speeds the results were: 10 knots, 8 pings per second, on average 4.6 pings per 3 meters; 6 knots, 5 pings per second, on average 4.9 pings per 3 meters. In all cases, the specified on average 3.2 pings per 3 meters was met.

The sidescan sonar equipment used throughout the H10835 survey was the Klein 2000 System. This system recorded data on 8mm Exabyte data tapes as well as sidescan thermal paper rolls. Both channels were set at a range scale of 75 meters. The vessel speed was maintained at 6.0 knots or less, so that there were three or more sidescan sonar pings per meter along track. Once collected, the sidescan paper rolls and data tapes were reviewed by a sidescan processor. The processor, with the assistance of the hydrographer, would find and verify targets. The processor would also note data gaps due to weather, system problems, fish altitude out of range, data masking, or any other events that would cause the data to be rejected. The digital data were converted into .xtf format where contact list files (*.cnv) could be generated using ISIS. These files are used for sidescan contact to multibeam feature correlation analysis in the **iss2000** system.

Cleaning of the R8101 multibeam data began with a real time filter which was used to flag data with depths of less than 3-5 meters (depending on which part of the survey) or greater than 20 meters. The next step was for tracklines to be created and analyzed in order to determine if it was necessary to turn on or off any data because of events such as turns or improper start/end of line. After the track was determined to be acceptable, another filter was applied to the data. This filter looked for a particular Quality flag placed in the data by the R8101, and flagged each beam that failed the quality test. After filtering, interactive editing was performed to remove noise, fish, etc. using the **geoswath** geo-referenced editor. The **geoswath** editing process allowed both plan and profile views with each beam represented in its true geographic position and depth.

Tidal height correctors were not applied in real-time. In post-processing verified tide data from the Sabine Pass Offshore tide station (877-1081) was then applied to the data from the beginning of the survey

(JD230) until JD 249. This data came from the NOAA OPSD web page for verified tide data. After Julian Day 249 the applied verified tide correctors were obtained for the Galveston Pleasure Pier tide station (877-1510) because of failure of the Sabine Pass Offshore station (877-1081). On day 010 and 011, the corrected tides were obtained from the Sabine Pass Offshore station (877-1081).

Depth data were then gridded to 1-meter cells for quality evaluation and for comparing to sidescan sonar contacts. When anomalies were seen in the 1-meter grids, the edited multibeam files were re-examined and re-edited as needed. When the multibeam files were all determined to be satisfactory, the data were binned to a 10-meter cell size, populating the bin with the shoalest sounding in the bin and maintaining its true position and depth with tracking to the gsf data file.

Examination of the gridded depth layer and the junction analysis of main scheme to crossline data revealed a problem in the correctors obtained for the Galveston Pleasure Pier tide station (877-1510) using the NOAA specified zoning in the NOAA Memorandum of August 4, 1998. The storm that knocked out the Sabine Pass Offshore station (877-1081) also reversed the prevailing wind patterns over the survey area. Hydrographer's analysis determined that the correction factors on the Galveston Pleasure Pier tide station (877-1510) after day 249 should have been: Zone 320, time –6 minutes, ratio 1.31; Zone 323, time 0.00, ratio 1.25. These values were verified by comparison of data to crossline data run earlier, comparison to data using Sabine Pass Offshore station before the storm, and comparison to H10805 data. NO TIDAL CORRECTORS WERE APPLIED IN THE OFFICE. ALL TIDE CORRECTORS APPLIED IN THE FIELD.
Soundings were selected from the 10-meter binned layer using the **sel_sound** sounding selection software. This routine starts with the shoalest sounding in the survey, flags out soundings that would overlap it on the plot, proceeds to the shoalest remaining sounding and repeats the above process until all soundings in the 10-meter bin layer have been evaluated. The Set_Sounding, **setsound,** program was run to flag all selected soundings in the gsf multibeam file. The selected sounding file, the platform and navigation aids file, and the feature file were combined to produce the smooth sheet in **AutoCAD**. Contours were manually drawn from the selected soundings on the smooth sheet.

Processing of sidescan sonar data is discussed in Section E.

Throughout this descriptive report wherever software is mentioned, it is inferred that the most current version of the software available was used. A complete list of all software versions and dates is provided in Appendix K. DATA FILED WITH FIELD RECORDS.

E. SIDESCAN SONAR

The following sidescan sonar equipment was used for the H10835 survey:

KVH Fluxgate Compass Serial Number 20 2003

Klein 2000 Sidescan Sonar System towfish leased from RentMAR
Serial Number 122
Vertical beam width 40°, 10° depression, 100/500kHz. (100 kHz data recorded)

A Klein 2000 Sidescan Sonar with no depressor, recording the 100 kHz data, was used for the entire survey.

Sidescan operations were conducted in water depths ranging from 33 to 56 feet. The sidescan range scale was maintained at 75 meters, and the sidescan altitude off the bottom was maintained between six and 15

meters. The amount of cable deployed was determined by using tape markings on the cable. As the cable length was adjusted to maintain the proper fish altitude, the operator would note the markings on the cable and enter the amount of cable deployed into the **iss2000**, which calculated layback and fish position.

To verify that the sidescan signal reached the full extent of the slant range setting, records were checked for location of known objects at the far edge of the slant range. Daily confidence checks for both channels were conducted using trawl marks and anchor scours while on line.

1. Sidescan Sonar Survey Data Acquisition Procedure

Survey lines were run at an azimuth of 131° and 311°. Both navigation and sidescan sonar data were logged continuously throughout the day. Navigation file names were manually changed after each survey line was completed. Due to the generally flat nature of the bottom in the survey area, maintaining the sidescan towfish height above the bottom was relatively easy. Typically, only one or two adjustments to the length of cable deployed were necessary during each survey line.

2. Problems Encountered During Sidescan Sonar Survey Acquisition

The presence of numerous porpoises at times caused problems with the sidescan sonar records. The porpoises would sometimes bump the sidescan sonar towfish, and completely wash out the records. Chatter or noise from the porpoises would produce black specks on the records. These areas were all considered gap areas and were rerun as gap fill survey lines. During the running of the gap fill survey lines, no porpoise interference was encountered.

Very large schools of fish and shrimp caused problems by producing large black areas on the sidescan sonar records and sometimes large shadows as well. These areas were all considered gap areas and were rerun as gap fill survey lines.

There was a great deal of vessel traffic within the survey area, including shrimp boats, supply boats, and cargo vessels. The wake from these vessels would sometimes be all that was discernible on the sidescan sonar record. These areas were all considered gap areas and were rerun as gap fill survey lines. A second problem involved aborting the survey line because of vessels located on the line and not moving out of the way, even when radioed. Most of the shrimp boats that were encountered would never answer their VHF radios after numerous attempts to contact them. When this occurred, the survey line was reacquired where it was aborted, with some overlap to ensure there was no data gap. As many as 25 cargo vessels were anchored within the survey area. Many gap fills were necessary to cover the area after the anchored vessels had moved.

Filling gaps around oil platforms and drilling rigs required running a series of line orthogonal to the main scheme lines.

3. Sidescan Target and Feature Processing

The Senior Hydrographer reviewed each hardcopy record for quality and to make corrections or annotations if necessary. He analyzed the records for data gaps, sonar contacts, amount of cable out, record quality, biotics in the water column, etc. Time, paper roll number, survey line, digital tape number, start/end of line, and the cause of any data gaps were all logged. Data gaps were commonly caused by vessel wakes, fish and porpoises, anchored vessel hulls masking bottom, and noise in the water column. All digital records were reviewed and compared with hardcopy records. The Lead Hydrographer spot

checked the sidescan records, reviewed all sonar contacts in the sidescan records, and compared them to the multibeam records.

The digital sidescan records from the Klein2000 system were converted from the Klein proprietary format to Extended Triton Format (XTF) using a program called Tape2000 purchased from Klein. These XTF files were copied to 8mm tape in tar format for delivery to be used with CARIS SIPS. The XTF data also allowed data review and target analysis in Triton Isis.

Catenary files to be used for tracklines and coverage plots were extracted from the XTF files using a SAIC proprietary program called NAVXTF. This was beneficial for two reasons. First, that the catenary files, relatively small in size in terms of the amount of disk storage space they require, summarize the time and position for the XTF formatted data. Thus, they were a good quality check on the XTF formatted data. Second, that catenary files have the same format as tracklines in **iss2000** and were also used to generate coverage plots.

From Julian Day 238 to 247, the catenary data were not logged in real-time but were created in post-processing using the same program that runs in real-time. The logged ship position, cable out, and other catenary parameters were used as input to insure an exact replica of the real-time calculations.

A time window file was created for each 100% of coverage in order to create both tracklines and coverage plots. The **iss2000** uses the catenary (towfish navigation) files to create plots using only good data as defined by time in the time window file. By viewing the coverage plots in the **iss2000** survey planning tool, a user can easily build survey lines to fill in any data gaps found in the coverage grids.

Targets were correlated with multibeam features using the **iss2000/Survey Analysis/Sonar Contact Analysis** software to view the sidescan contacts as an overlay to the multibeam gridded depth layer. This routine allows the hydrographer to designate features to be plotted on the smooth sheet as wreck, rock, or obstruction, and to designate which sonar contacts were correlated to each feature. The software produces the *q_feature.cnt* file and modifies the *q_ss_cons_new.ctv* file to indicate the results of the hydrographer's evaluation. The **feature to gsf** program was used to add tracking of the features to the gsf multibeam data records, and to create the *q_feature_att.cnt* with multibeam attributes of file, ping, beam, and depth. Since the multibeam gridded depths contain only the data that met standards, the hydrographer also used **geoswath** to look at the unprocessed reconnaissance multibeam to determine multibeam coverage of sidescan contacts. This enabled him to make better recommendations for item investigations.

4. Problems with Sidescan Coverage

The 100% sidescan coverage plot and digital data has six known time gaps ranging from 6 to 15 seconds in size. All are covered fully by the 200% sidescan data as well as multibeam data. The NOAA standards portion of the multibeam swath fills in approximately half of each gap area and the remainder of each gap area is completely covered by full swath multibeam data. No features or targets are found in the area. ***Table E-1*** shows details of these time gaps in sidescan data.

Table E-1. Sidescan Coverage Gaps

Digital File	Latitude	Longitude	Julian Day	Start Time	End Time
98240_7A.XTF	29 18 20 N	094 30 35 W	240	07 29 14	07 29 20
98240_7A.XTF	29 17 58 N	094 30 37 W	240	09 11 05	09 11 21
98263_34A.XTF	29 14 32 N	094 32 06 W	264	01 42 33	01 42 48
98266_43A.XTF	29 12 13 N	094 30 55 W	266	20 25 02	20 25 16
98266_43A.XTF	29 12 13 N	094 30 55 W	266	20 25 17	20 25 27
98320_85C.XTF	29 13 01 N	094 30 20 W	320	03 31 28	03 31 36

The sidescan coverage and trackline plots have eight locations where an apparent navigation error appears. These navigation errors do not occur in the actual data but are a result of navigation extraction routines and plotting programs. The errors are described as "loops" caused by a heading reversal approximately one to two minutes after the start of a line. They show up as small circular loops on the trackline plots and as small circles of 200% coverage (yellow color fill) on the coverage plots. See ***Table E-2*** below for a list of the loop areas.

Table E-2. Sidescan Coverage and Track Problems

Sidescan Coverage (%)	Latitude	Longitude	Julian Day	Time
100	29 22.18 N	094 31.96 W	238	17 34 30
100	29 22.08 N	094 32.26 W	238	17 46 20
100	29 21.22 N	094 34.24 W	239	14 44 00
100	29 16.79 N	094 27.80 W	239	16 22 00
100	29 21.11 N	094 34.09 W	239	21 19 00
100	29 20.68 N	094 34.87 W	240	12 35 00
100	29 14.10 N	094 25.86 W	240	14 43 00
100	29 12.88 N	094 26.43 W	242	16 45 00
200	29 19.78 N	094 36.41 W	243	14 02 00

F. SOUNDING EQUIPMENT

The following components were used for acquisition of multibeam bathymetric data:

- RESON SeaBat 8101 multibeam system installed July 08, 1998 consisting of:
  - One SeaBat Transducer, Serial Number 019704,
  - One SeaBat 8101 Processor, Serial Number 6597
  - SeaBat 6042 Controller and Processing Unit, Serial Number 590 P0 794-387

A lead line made of Kevlar line with a 10-lb. mushroom anchor as a weight was used for checking the multibeam echo sounder. The line was marked in feet and was calibrated against a steel tape.

It was found that the RESON R8101/R6042 produced a nearly constant "frown" profile when viewing the data along track. Careful analysis showed that the data met the depth accuracy criteria. Discussions with RESON have not yet resolved the cause.

G. CORRECTIONS TO SOUNDINGS

1. Speed of sound

The following systems were used to determine sound velocity profiles for corrections to multibeam sonar soundings:

- Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 193607-0565, Calibration Date 23 March 1998.
- Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 1919165-1911, Calibration Date 15 June 1998.

Speed of sound profiles were computed from casts taken with Sea-Bird Electronics, Inc. model 19 CTDs. The primary unit was SBE19 #0565. Daily confidence checks were obtained from simultaneous casts with the primary CTD and with SBE19 #1911. All profiles were computed using **SBE Term19** and **DATCNV**, which applied the calibration correctors for the CTD being processed. Calibration forms are located in Appendix G.* Computed profiles were copied to the **iss2000** for comparison on the screen. A selected profile was applied to the system, recorded, and sent to the RESON 6042 where a refraction lookup table was computed for application of depth, angle and range correctors to the multibeam sounding data. If sounding depths exceeded the cast depth, the 6042 used the most probable slope of the profile to extend correctors beyond the table.

Many factors were considered in determining the frequency of CTD casts. Before the survey had begun, items such as shape and proximity of the coastline, sources and proximity of freshwater, sunshine or overcast skies, wind velocity, wave height, and seasonal changes were taken into consideration. After downloading each CTD cast, each was converted to the proper format and compared to the previously applied cast. Over time, this comparison allowed detection of patterns that indicated when CTD casts should be taken. The result was to take a CTD cast once per watch, every six hours, unless the cast results showed a thermocline, in which case, the CTD casts would be taken more frequently.

Quality control tools, including real-time displays and a multibeam swath editor, were used to monitor how the sound velocity was effecting the multibeam data. Due to the gentle slope topography of the survey area, severe effects due to improper sound velocity could be viewed easily in the multibeam data profile, in an along-track direction. Constant monitoring of weather conditions also influenced the frequency of CTD casts. On bright, sunny days with glassy sea conditions, the thermocline fluctuated much more rapidly than on days that were either overcast or the water surface was rippled by wind.

A table including all CTD casts, dates and times of each cast and maximum depths of each cast can be found Appendix J.*

2. Instrument Corrections

No Instrument corrections were necessary after the initial installation and calibration was complete.

3. Corrections determined from vertical casts

Leadline comparisons to multibeam soundings were made at least once every two weeks to verify the transducer draft and echo sounder instrument correctors. For each comparison, a CTD cast was taken and the sound velocity profile loaded into the **iss2000** and the RESON 6042. Ten leadline readings were taken

* DATA FILED WITH FIELD RECORDS.

on either side of the vessel with the UTC time of observation while the **iss2000** recorded the multibeam readings. **Exammb** was used to find the appropriate port and starboard beam depth readings for the time and position of each leadline reading.

The results of these readings were entered into a spreadsheet along with the observed draft, the draft recorded in the gsf multibeam file, and any squat corrector which may have been entered in the **iss2000**. The spreadsheet applied a calibration corrector to the leadline readings and converted the readings from feet to meters. It also applied correctors to the port and starboard multibeam depths for the difference between the observed draft and the draft entered in the **iss2000,** and for any settlement and squat inadvertently left in the **iss2000**.

The comparisons were averaged for each side of the vessel, and the standard deviations were computed. The mean of the results from 15 sets of comparisons was 0.023 meter on the port side and 0.039 meter on the starboard side. The lead-line cumulative results are included in Appendix G. *

4. **Static draft**

Depth of the transducer below the deck was determined from measurements made while the boat was on the marine railway, and was verified by lead-line comparisons. The static draft was observed by measuring from the deck to the waterline before getting underway from Galveston and subtracting that measurement from the transducer distance below the deck. If the static draft value changed from the previously noted value, the new value was entered into the RESON system. The static draft was again determined upon return to port and the change in draft was prorated on a daily basis, and applied to the gsf multibeam data in post processing. The prorated draft results are reported in Appendix G. *

5. **Settlement and squat**

Measurements of settlement and squat were conducted near 29 20.24N 094 38.10W on day 193, July 12, 1998, in 10 meters of water. The following procedures were used:

- Selected an area of flat bottom at a depth similar to the survey area.
- Planned a survey line across the flat bottom.
  1. Considered the current and wind in planning the line.
  2. Used NOAA Galveston Pleasure Pier (877-1510) station for the water level during the test.
  3. Calibrated the echo sounder, and applied sound velocity profile for the test area. (Timing latency and pitch, roll and heading biases had been determined and applied.)
  4. Approached the line at a slow to moderate speed, brought the RPM's to zero and drifted down the line while recording soundings over the flat bottom.
  5. Ran the line at each of the predetermined RPM settings while recording soundings over the flat bottom.
  6. Applied water level correctors to the soundings.
  7. Subtracted the depth determined from each of the RPM passes from the depth determined on the drifting, zero RPM pass. These differences are the settlement and squat correctors to be applied when operating at the corresponding RPM.
  8. Constructed a lookup table of RPM and settlement and squat correctors in the configuration file so that the computer could interpolate a corrector based upon the RPM entered into the system

Geoswath was used to measure the depth for each pass. The results were compiled into a lookup table of vessel's engine RPM vs. settlement and squat. When on survey line, engine RPM's were entered into the

* DATA FILED WITH FIELD RECORDS.

iss2000 system by the real-time system operator. The computer applied settlement and squat correctors interpolated from the lookup table, and recorded it in the "Depth Corrector" field of the GSF data file for each ping.

All results are reported in Appendix G - Settlement and Squat Test. *

6. **Roll, Pitch and Heading**

The following sensor was used for acquisition of Heave, Roll, Pitch and Heading data:

- TSS POS/MV Inertial Navigation System, Serial Number 001615

The POS/MV was used for heave, roll, and pitch. The accuracy of the sensor was 5 percent of 1 m or 5 cm for heave; ± 0.10° dynamic accuracy for roll and pitch, and ± 0.05° static accuracy for roll and pitch. The POS/MV was used for heading. The dynamic heading accuracy of the unit was better than 0.05°.

Heading, roll, and pitch biases were determined in a series of tests performed in the survey area prior to the start of the survey. Prior to conducting any of the tests, a CTD cast was taken to determine the sound velocity profile and entered into the RESON system. The roll bias was initially set to 0°, heading bias was initially set to 0°, and pitch bias was set to 0°.

A position timing latency test was conducted on day 193 over a feature in the near flat bottom near 29 19.2N 094 39.2W, running the same line in the same direction at slow speed and fast speed. This test confirmed the laboratory timing test with the result of no position timing latency.

The roll bias test was run first on days 192 and 193 in an area of flat bottom near 29 20.22N 094 38.14W in 10 meters water depth. The range scale of the RESON was set to 50 meters. Three lines were run spaced 40 meters apart and each line was run in both directions. The data from parallel lines in the same direction were used for roll bias calculations so that the depths from the center beams from one line were compared against the depths of the mid-swath beams. Tidal corrections were applied to all data before roll corrections were calculated using routines in the **iss2000/Survey Analysis** software. A second roll bias test was run on day 196 near 29 15.2N 094 36.6W in 15 meters water depth, resulting in a final roll bias corrector of +0.216 degrees. Roll bias results are shown in Appendix G. *

The pitch test was conducted by surveying multiple reciprocal passes on a line perpendicular to an anchor scour. During the pitch test, ship speed was maintained as consistent as possible. Roll bias was mistakenly set at +0.24 for the pitch test, while both pitch and heading were set to zero. This was later determined to have had no discernable impact on the pitch bias test. Tidal corrections were applied to all data before the pitch bias was calculated. Pitch biases were computed by comparing runs in opposite directions. The test revealed no discernable pitch bias. A pitch bias of 0.0 was kept in the system.

Following the roll and pitch bias tests, the roll bias was corrected to +0.216 in the system, and a heading bias test was conducted. For the heading bias test, five parallel lines were run in opposing directions so that the inner beams from the transducer overlay the intermediate to outer beams of adjacent swaths. The heading bias was then determined by measuring the distance between equal depths and calculating the angle subtended by that distance. Tidal corrections were applied to all data before heading corrections were calculated using routines in the **iss2000/Survey Analysis** software. After repeated inconclusive test results, it was deemed that the heading bias was zero. The shallow water depths of the survey area combined with the accuracy of the navigation makes it extremely difficult to measure small degrees of

* DATA FILED WITH FIELD RECORDS.

heading bias. Further proof of a heading bias of zero lies in trawl marks traversing numerous swaths with perfect alignment.

Roll, pitch, and heading biases applied in H10835 are shown in Table G-2.

Table G-2. Roll, Pitch, and Heading Bias for the M/V NEPTUNE

Roll	0.216
Pitch	0.0
Heading	0.0

H. CONTROL STATIONS SEE ALSO EVALUATION REPORT.

The horizontal datum used for the survey was the North American Datum (NAD) 1983.

Horizontal control station CG-20 1974 was used for independent checks of the positioning systems on the survey vessel. Data for this station was downloaded from the NOAA/NGS web page.

I. HYDROGRAPHIC POSITION CONTROL

The following equipment was used for positioning on the M/V NEPTUNE:

- TSS POS/MV Serial Number 001615
- Trimble 7400 GPS Receiver, Serial Number 3713A18839
- Magnavox MX50R Differential Beacon Receiver, Serial Number 154
- 41R Differential Beacon Receiver, Serial Number 3508-102-18550

The primary hydrographic positioning equipment was the POS/MV on the M/V NEPTUNE using correctors from the USCG differential station at Galveston, TX. By setting real-time system thresholds, HDOP, number of satellites, elevation of satellites, and age of correctors were monitored to insure that the resulting hydrographic positioning errors, at the 95% confidence level, did not exceed 10 meters.

When leaving or returning to port M/V NEPTUNE would tie up to pier 15 where measurements were made to calculate the offset between the hydrographic navigation position and horizontal control station CG-20, 1974. While measurements were being made, navigation data were being logged. Comparison of the navigation center position computed from the control station and the average position based on navigation resulted in confidence checks that were well within specifications of inverse distance of less than 15 meters, and were no more than 3 meters inverse distance from the check position. Daily position confidence checks were established using a Trimble DGPS with correctors from the U.S. Coast Guard DGPS station at Port Aransas, TX. A real-time monitor raised an alarm when the two DGPS positions differed by more than 10 meters horizontally. Positioning confidence checks were well below the allowable inverse distance of less than 15 meters.

In the beginning of the survey, the POS/MV would lose GAMS (GPS Azimuth Measurement System) once per day for about one hour. The time of day was extremely predictable to within 5 minutes of the start time. Loss of GAMS caused the heading data to slowly degrade. Survey operations were continued until the heading accuracy decreased to .8 degrees. Surveying was then stopped until the GAMS heading

accuracy returned so that positioning of the outer beam soundings would not be compromised. The problem was in the POS/MV software and seemed to be related to our geographic location and the number of satellites in view. The POS/MV manufacturer fixed the problem after several iterations of e-prom replacement.

On the M/V NEPTUNE, all antenna, transducer, towpoint, and towfish offsets were measured relative to the POS/MV IMU. Two separate teams of two people measured and calculated all offsets using a measuring tape. The final offsets from both teams were then compared and agreed very well.

The **iss2000** software calculates the towfish position using an operator input cable out value and the towpoint configuration or offsets previously measured.

J. SHORELINE

Not applicable.

K. CROSSLINES

There were 282 linear km of crossline surveyed and 5222 linear km of mainscheme lines surveyed resulting in 5.4% coverage by crossline. Comparisons of all crossing data in the portion of the swaths which meet the standards, (A), show that more than 98 percent of comparisons were within 30 centimeters and 99.98 percent of comparisons were within 50 centimeters. Only 104 of 473765 comparisons exceed 50 centimeters, and all were less than 90 centimeters. Of these 104 comparisons, 72 are traceable to one crossline and one mainscheme line that crossed on the slope of the Galveston channel. All other large comparisons are traceable to anchor scours where deep soundings were left in the data. Positive differences comprised 54.7%, and negative differences 42.1% of the comparisons. Zero differences comprised 3.2% of comparisons. See *Table K-1* for the listing of the Junction Analysis, Main Scheme Standards Data (A) to Crossline Standards Data (A).

Table K-1. Junction Analysis Mainscheme (A) vs. Crossline (A)

Junction Analysis, Main Scheme Standards Data (A) to Crossline Standards Data (A)								
Depth Difference Range		All Differences		Positive Differences		Negative Differences		Zero Differences
		Count	Percent	Count	Percent	Count	Percent	Count
00.0 to	10.0cm	260090	54.9	126849	48.95	118249	59.24	14992
10.1 to	20.0cm	148721	86.29	94779	85.52	53942	86.26	
20.1 to	30.0cm	56889	98.3	33477	98.44	23412	97.99	
30.1 to	40.0cm	7529	99.89	3668	99.85	3861	99.92	
40.1 to	50.0cm	432	99.98	292	99.97	140	99.99	
50.1 to	60.0cm	53	99.99	40	99.98	13	100	
60.1 to	70.0cm	43	100	40	100	3	100	
70.1 to	80.0cm	7	100	6	100	1	100	
80.1 to	90.0cm	1	100	1	100	0	100	
Total counts and %		473765	100.0%	259152	54.7%	199621	42.1%	3.2%

L. JUNCTIONS SEE ALSO THE EVALUATION REPORT.

This survey junctions with H10805 on the west and H10850 on the south. . See *Table L-1* for the listing of the Junction Analysis, H10835, Sheet Q to H10805, Sheet P. Of the 105080 comparisons, 98.88% were within 50 centimeters. The greater percentage of positive differences indicates that the H10835 soundings tend to be deeper than the H10805 soundings in the common area.

Table L-1. Junction Analysis, H10835, Sheet Q to H10805, Sheet P

Junction Analysis, H10835, Sheet Q to H10805, Sheet P								
Depth Difference Range		All Differences		Positive Differences		Negative Differences		Zero Differences
		Count	Percent	Count	Percent	Count	Percent	Count
00.0 to	10.0cm	21923	20.86	15153	15.64	5711	80.13	1059
10.1 to	20.0cm	30125	49.53	28837	45.4	1288	98.2	
20.1 to	30.0cm	30790	78.83	30662	77.05	128	100	
30.1 to	40.0cm	14395	92.53	14395	91.9	0	100	
40.1 to	50.0cm	6673	98.88	6673	98.79	0	100	
50.1 to	60.0cm	1098	99.93	1098	99.92	0	100	
60.1 to	70.0cm	73	100	73	100	0	100	
70.1 to	80.0cm	2	100	2	100	0	100	
80.1 to	90.0cm	1	100	1	100	0	100	
Total counts and %		105080	100.0%	96894	92.2%	7127	6.8%	1.0%

See *Table L-2* for the listing of the Preliminary Junction Analysis, H10835, Sheet Q to H10850, Sheet R. Of the 36102 comparisons, 98.82% were within 50 centimeters. The greater percentage of negative differences indicates that the H10850 soundings tend to be deeper than the H10835 soundings in the common area. This analysis is preliminary because final processing of H10850 is not complete. Final analysis will be included in the Descriptive Report for H10850.

Table L-2. Preliminary Junction Analysis, H10835, Sheet Q to H10850, Sheet R

Preliminary Junction Analysis, H10835, Sheet Q to H10850, Sheet R								
Depth Difference Range		All Differences		Positive Differences		Negative Differences		Zero Differences
		Count	Percent	Count	Percent	Count	Percent	Count
00.0 to	10.0cm	11067	30.65	2863	71.15	7594	24.13	610
10.1 to	20.0cm	10035	58.45	986	95.65	9049	52.89	
20.1 to	30.0cm	8045	80.74	171	99.9	7874	77.91	
30.1 to	40.0cm	4561	93.37	4	100	4557	92.39	
40.1 to	50.0cm	1967	98.82	0	100	1967	98.64	
50.1 to	60.0cm	419	99.98	0	100	419	99.97	
60.1 to	70.0cm	8	100	0	100	8	100	
70.1 to	80.0cm	0	100	0	100	0	100	
80.1 to	90.0cm	0	100	0	100	0	100	
Total counts and %		36102	100.0%	4024	11.1%	31468	87.2%	1.7%

M. COMPARISON WITH PRIOR SURVEYS SEE ALSO EVALUATION REPORT.

Comparison with prior surveys was not required under this contract. See Section N for comparison to the nautical chart.

N. COMPARISON WITH THE CHART SEE ALSO EVALUATION REPORT

H10835 was compared to Chart 11323, 56th ed., 28 March 1998 at scale 1:80,000 in lieu of the specified 55th edition.

Charted obstruction cleared to 40 feet (AWOIS #366) at 29 16 50N 094 32 51W is a tower section on its side as reported by RU/HE with a hang at 42 feet and cleared at 41 feet. H10835 preliminary least depth is 44 feet.* Sidescan reveals an apparent lattice tower section. The multibeam swath that meets standards covers a portion of the tower, the remainder of the tower is in the reconnaissance data area. Recommend this item remain as charted until an item investigation verifies the least depth. CONCUR **
* IN LAT 29-16-51.72N, LON 94-32-50.90W

Charted obstruction cleared to 39 feet (AWOIS #371) at 29 17 49N 094 31 58W, reported by RU/HE as a solid I-beam with a 12-inch flange driven vertically into the bottom, and protruding 6 feet in 46 feet, was not seen in the multibeam or in the 200% sidescan data.. The multibeam swath that meets standards did not cover the position of AWOIS #371. Recommend this item remain as charted until an item investigation verifies the least depth or disproves the item. CONCUR **

Charted obstruction cleared to 34 feet (AWOIS #~~347~~ 88) at 29 22 00N 094 32 00W was not seen in the multibeam or in the 200% sidescan data. NM23/65 reported this to be a tank 20 feet long and 10 feet high. Recommend this obstruction be removed from the chart. CONCUR SEE ADDENDUM, P.28, AWOIS 388 FOR ADDITIONAL INFORMATION.

Charted obstruction PA (AWOIS #8920) at 29 14 48N 094 29 18W was not seen in the multibeam or in the 200% sidescan data. LNM51/85 reported this to be the legs from a capsized jack up rig that were being salvaged by a barge anchored over them at the time of the report. Recommend this obstruction be removed from the chart. CONCUR DELETE OBSTN, PA
SEE ADDENDUM P.16 ITEM #10, FOR ADDITIONAL INFORMATION.

Charted obstruction PA (AWOIS #8970) at 29 16 30N 094 32 12W was not seen in the multibeam or in the 200% Sidescan data. LNM6/94 reported this to be a lost anchor. Recommend this obstruction be removed from the chart. CONCUR

Table N-1 lists 14 new features discovered in H10835. Recommend these features be charted as determined in this survey.

Table N-1. New Features Discovered

* SEE DTON, PAGES 21-22 FOR ADDITIONAL INFORMATION

EVAL REPORT	Feature #	Latitude	Longitude	Depth Feet		1 = Standards	Multibeam File Name	Ping	Beam	Depth Meters	* DTON #
N.1	1	29 21.81700N	094 32.06940W	35.53	OBSTR	1	mba98230.d07	3873	85	10.83	
	3	29 16.86201N	094 32.84830W	44.75	OBSTR	1	mba98247.d06	16682	80	13.64	AWOIS 8970
	4	29 14.52590N	094 30.37080W	48.52	OBSTR	1	mba98248.d12	29276	36	14.79	21
N.1	5	29 11.66930N	094 28.81170W	49.80	OBSTR	1	mba98264.d16	41543	17	15.18	
N.2	6	29 15.46620N	094 33.92930W	45.44	OBSTR	1	mba98265.d06	23541	74	13.85	
N.11	7	29 17.39459N	094 36.89185W	40.75	OBSTR	1	mba98265.d19	31613	82	12.42	
	8	29 16.78105N	094 35.59757W	45.51	OBSTR	1	mba98265.d15	27246	76	13.87	29
	9	29 18.30707N	094 37.68093W	41.21	OBSTR	1	mba98274.d05	5585	25	12.56	6,7
N.1	10	29 14.45573N	094 26.86407W	47.80	OBSTR	1	mba98240.d13	32780	72	14.57	
N.5	11	29 18.43909N	094 33.92898W	42.91	OBSTR	1	mba98243.d03	32813	50	13.08	
N.11	12	29 18.82529N	094 33.77109W	42.52	OBSTR	1	mba98232.d10	10238	81	12.96	
	13	29 14.93139N	094 27.20726W	47.70	OBSTR	1	mba98231.d21	33888	88	14.54	40
N.11	14	29 16.76050N	094 29.48033W	47.31	OBSTR	1	mba98241.d01	10863	58	14.42	
N.9	15	29 15.95547N	094 31.45953W	42.62	OBSTR	1	mba98320.d05	1505	67	12.99	
N.11	16	29 15.49440N	094 33.95810W	48.33	OBSTR	1	mba98265.d06	23659	87	14.73	

29.66 094 57.49

Additional targets were detected in the sidescan data only, or in both sidescan and reconnaissance multibeam data. See Section S for recommendations for additional investigation of these targets.

See Section P for discussion of charted and uncharted oil platforms.

Traces of the trench for the charted pipeline from the platform at 29 13 32N 094 34 43W to 29 13 36N 094 34 12W and from 29 15 18N 094 36 04W through the above point, to 29 11 01N 094 31 24W to the platform at 29 10 51N 094 31 15W were seen in both the multibeam and the sidescan data.

Traces of the trench for the charted pipeline from the platform at 29 10 51N 094 31 15W to 29 10 53N 094 31 29W to 29 10 28N 094 32 21W were seen in both the multibeam and the sidescan data.

Traces of the trench for an apparent uncharted pipeline from the platform at 29 10 51N 094 31 15W, to 29 10 50N 094 31 28W, to 29 10 45N 094 31 37W, to 29 09 52N 094 31 52W were seen in both the multibeam and the sidescan data. PIPELINE IS SHOWN ON CHART 11323, 58TH EDITION, JUNE 24, 2000.

Traces of the trench for an apparent uncharted pipeline from the platform at 29 13 44N 094 27 52W, to 29 13 34N 094 27 51W, to 29 13 22N 094 27 30W, to 29 13 04N 094 26 58W (sidescan and reconnaissance multibeam contact, possible exposed pipeline) to the platform at 29 12 49N 094 26 24W were seen in both the multibeam and the sidescan data.

O. NOT USED BY CONTRACTOR SEE EVALUATION REPORT.

P. AIDS TO NAVIGATION

See Section N for discussion of charted pipelines and possible new pipelines. These pipelines are all buried and are not useful as aids to navigation. U.S. Coast Guard buoys were found on station as listed in ***Table P-1.*** These buoys adequately serve their apparent purpose. CONCUR

Table P-1. – U.S. Coast Guard Buoys

Latitude	Longitude	Buoy Descriptor
29 18 23N	094 37 42W	RW "GB" Mo (A) Fl 2.5s RACON (—•••)
29 16 47N	094 35 36W	Y "K" Fl Y 6s
29 15 30N	094 33 54W	Y "I" Fl Y 4s
29 14 13N	094 32 14W	Y "G" Fl Y 2.5s
29 12 55N	094 30 31W	Y "E" Fl Y 6s
29 11 41N	094 28 47W	Y "C" Fl Y 4s

Oil Platforms were found at the positions listed in ***Table P-2.*** The Platform at 29 12 30N 094 33 24W * is a stored semi-submersible that is not on the chart. Recommend that this platform be charted. The other platforms are near their charted positions. √ CONCUR

Table P-2. – Oil Platforms, Lighted

	Latitude				Longitude					
	29	13	32	N	094	34	43	W	Platform Lighted	*
*	29	12	30	N	094	33	24	W	Platform Lighted	
	29	10	50	N	094	31	17	W	Platform Lighted	*
	29	15	57	N	094	31	28	W	Platform Lighted	*
	29	13	44	N	094	27	52	W	Platform Lighted	*
	29	12	49	N	094	26	24	W	Platform Lighted	**

* SHOWN ON CHART 11323 58TH ED., JUNE 24, 2000. NO CHANGE IN CHARTING IS RECOMMENDED.

Q. STATISTICS

** SEE SECTION N.4. OF THE EVALUATION REPORT FOR CHARTING RECOMMENDATION.

Survey statistics were as follows:

2411	Lineal nautical miles of sounding lines multibeam and sidescan
75	Square nautical miles of multibeam and sidescan
105	Number of sound velocity casts
0	Number of items investigated
170	Number of bottom samples

R. MISCELLANEOUS SEE ALSO EVALUATION REPORT.

Figure R-1 shows the distribution by beam number of the 57,511 soundings selected for the smooth sheet. The majority of soundings appear to be in the area where the bottom detection algorithm changes from phase to amplitude. All of the soundings selected meet the positioning and depth accuracy specifications (position error not exceeding 10 meters at 95% confidence, depth error not exceeding 0.3 meter at 90% confidence).

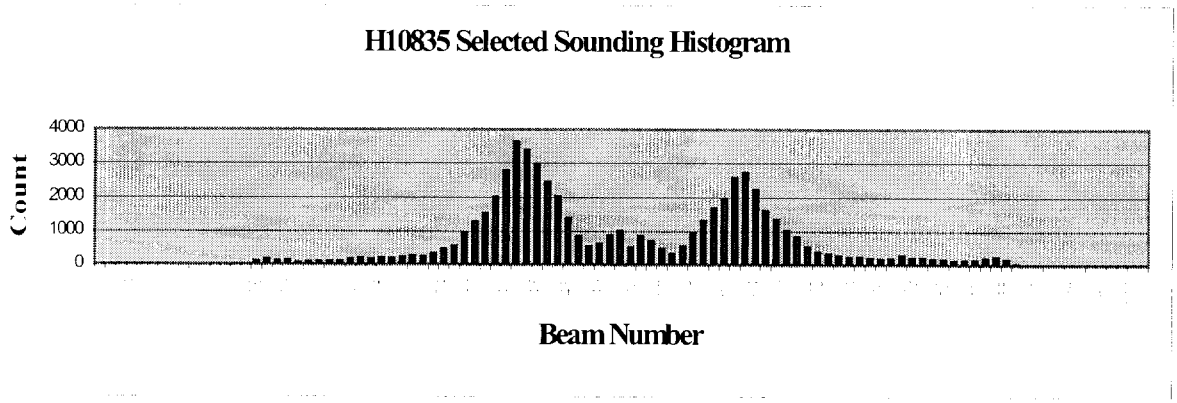


Figure R-1. Histogram of Selected Soundings by Beam Number.

S. RECOMMENDATIONS

Recommend reconstruction of the entire common area of chart 11323 and chart 11330 with data from this survey.

The following items are recommended for further investigation under separate instructions. Table S-1 lists items that were previously recommended to NOAA, and are the subject of a separate task order for investigation.

Table S-1. H10835 Items for Investigation

* SEE ADDENDUM PAGES FOR CHARTING RECOMMENDATIONS

EVAL REPORT	Item	Latitude North	Longitude West	Multibeam			Sidescan	Description	Danger Reported	*ADDENDUM PAGE
				Depth Feet	Swath	Height Feet	Height Feet		To Coast Guard	
	AWOIS #366	29 16.856 51.36	094 32.854 51.24	44	Partial Std.	3.4	3.3	Tower section		27-28
	AWOIS #371	29 17.816 48.96	094 31.966 57.96		No Detect		No Detect	12" I-beam		28
	I-1	29 17.339 20.34	094 36.874 52.44	44	Recon	4.5	3.3		10-23-98	13-14
N.11	I-2	29 17.395 23.10	094 36.892 53.52	41	Std.	5.4	5.6		10-23-98	
	I-3	29 17.386 23.16	094 36.915 54.90	40	Recon	7.5	5.9		10-23-98	14
N.11	I-4	29 17.387 23.22	094 36.938 56.28	44	Recon	2.4	2.6		10-23-98	
	I-6	29 18.322 19.32	094 37.660 39.60	39	Recon	4.7	3.9		10-23-98	15
N.11	I-7	29 18.334 20.04	094 37.673 40.38	39	Recon	4.5	2.6		10-23-98	
N.11	I-8	29 17.370 22.20	094 36.962 57.72	45	Recon	2.3	2.0		10-23-98	
	I-9	29 18.425 25.50	094 35.598 35.88	35	Recon	9.5	11.8		10-06-98	16
	I-10	29 14.913 54.78	094 29.437 26.22	44	Recon	7.1	6.2		10-23-98	16-17
	I-11	29 13.976 04.56	094 26.973 58.38	48	Recon	4.7	2.6	possible exposed pipe	10-23-98	17
	I-12	29 14.495 29.70	094 30.908 54.48	46	Recon	5.4	6.6		10-23-98	18
	I-15	29 21.780 46.80	094 31.790 47.40	32	Recon	6.8	4.6		10-23-98	18-19
	I-17	29 17.843 50.58	094 29.620 37.20	35	Recon	13.1	10.2		10-23-98	19
	I-19	29 18.396 23.76	094 31.128 01.68	38	Recon	9.0	9.5		10-23-98	19-20
	I-20	29 15.267 16.02	094 28.837 50.22	44	Recon	5.7	3.9		10-23-98	20
N.11	I-21	29 14.536 32.16	094 30.384 23.04	48	Recon	3.2	0		10-23-98	
N.11	I-22	29 11.689 41.34	094 28.791 47.46	53	Std.	3.5	0	Possible old buoy sinker	10-23-98	
	I-23	29 18.392 23.52	094 37.703 42.18	39	Recon	5.0	3.9	Possible old buoy sinker	10-23-98	I-46
N.2	I-25	29 15.466 27.96	094 33.929 55.76	46	Recon	4.9	2.6		10-23-98	
N.10	I-26	29 15.485 29.10	094 33.915 54.90	45	Recon	1.8	3.9			
N.11	I-27	29 15.498 29.88	094 33.942 56.52	46	Recon	5.2	1.3		10-23-98	
N.12	I-29	29 16.778 46.68	094 35.591 35.46	46	Recon	1.9	3.3		10-23-98	
	I-31	29 15.901 54.06	094 35.271 16.26	46	Recon	3.8	1.0		10-23-98	21-22
	I-32	29 13.309 18.54	094 34.263 15.78	42	Recon	9.8	1.3		10-23-98	22
	I-33	29 12.181 10.86	094 32.831 49.86	49	Recon	4.1	3.0		10-23-98	22-23
N.11	I-34	29 10.819 49.14	094 31.229 13.74	54	Recon	2.0	1.6			
	I-39	29 19.876 52.56	094 34.180 10.80	39	Recon	2.2	1.6			23
N.1	I-40	29 14.937 56.22	094 27.211 12.66	47	Recon	3.1	3.3		10-23-98	

* SEE ADDENDUM PAGES FOR CHARTING RECOMMENDATION *ADDENDUM

EVAL REPORT N.11

Item	Latitude North	Longitude West	Multibeam			Sidescan	Description	Danger Reported	PAGE
			Depth Feet	Swath	Height Feet	Height Feet		To Coast Guard	
I-41	29 15.248	094 27.815	50	Recon	0.8	2.6			
I-42	29 16.447	094 29.379	44	Recon	5.1	1.3		10-23-98	24
I-43	29 18.262	094 30.782	42	Recon	4.5	1.0		10-23-98	24-25
I-44	29 16.897	094 34.618	41	Recon	6.6	1.6		10-23-98	25
I-45	29 15.825	094 29.527	44	Recon	6.3			10-23-98	25-26
I-46	29 18.408	094 37.689	38	Recon	4.8			10-23-98	26
I-47	29 18.351	094 37.597	39	Recon	5.3	3.9		10-23-98	27

The Houston – Galveston Navigation Channel Project by the U.S. Army Corps of Engineers will affect the soundings in this survey. See the Separates Notebook accompanying this report for a print out of the Galveston District project description. MicroStation drawings of the project may be obtained from the Galveston District. Extension of the Entrance Channel to Station 76+000 will reach almost to the charted buoy Y "I" Fl Y 4s. Authorized depth will be 45 feet with a minimum bottom width of 800 feet. Recommend channel data be obtained from the U.S. Army Corps of Engineers. CONCUR

T. REFERRAL TO REPORTS

None.

APPENDIX A: DANGER TO NAVIGATION REPORT

October 06, 1998

Commander (OAN)
Eighth Coast Guard District
Hale Boggs Federal Building
New Orleans, LA 70130-3396

REPORT OF DANGER TO NAVIGATION

Dear Sir:

While conducting hydrographic survey operations in the approaches to Galveston, Texas, Science Applications International Corporation discovered an uncharted obstruction. Attached are the Report of Danger to Navigation and a section of chart 11323 indicating the position of this danger.

Differential GPS, sidescan sonar, and multibeam sonar were used to determine the position and depth. These data are preliminary and subject to office review.

Sincerely,
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Walter S. Simmons
Lead Hydrographer

Enclosures

Cc: Lt. David Neander, NOAA
Contracting Officer's Technical Representative

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H10835

State: Texas

General Locality: Gulf of Mexico

Sublocality: Approach to Galveston (15 Miles ESE of Galveston)

Project Number: OPR-K171-KR

The following object was found during hydrographic survey operations:

Object Discovered: Obstruction

Covered 35 feet corrected to Mean Lower Low Water using observed tide correctors.

Affected nautical charts:

Chart Number	Edition		Reported Depth	Charted Horizontal Datum	Geographic Position	
	No.	Date			Latitude	Longitude
11323	56	03/28/98	35 ft	NAD 83	29° 18.~~425'~~ N 25.50	094° 35.~~597'~~ W 35.88

October 23, 1998

Commander (OAN)
Eighth Coast Guard District
Hale Boggs Federal Building
New Orleans, LA 70130-3396

REPORT OF DANGER TO NAVIGATION

Dear Sir:

While conducting hydrographic survey operations in the approaches to Galveston, Texas, Science Applications International Corporation discovered several uncharted obstructions. Attached are the Reports of Danger to Navigation and a section of chart 11323 indicating the positions of these dangers.

Differential GPS, sidescan sonar, and multibeam sonar were used to determine the position and depth. These data are preliminary and subject to office review.

Sincerely,
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Walter S. Simmons
Lead Hydrographer

Enclosures

Cc: Lieutenant Commander David Neander, NOAA
Contracting Officer's Technical Representative

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H10835

State: Texas

General Locality: Gulf of Mexico

Sublocality: Approach to Galveston (15 Miles ESE of Galveston)

Project Number: OPR-K171-KR

The following objects were found during hydrographic survey operations:

Affected nautical charts:

Chart Number	Edition		Class	Reported Depth MLLW	Charted Horizontal Datum	Geographic Position	
	No	Date		Observed		Latitude	Longitude
11323	56	03/28/98	OBSTN	44 ft	NAD 83	29° 17.~~339'~~ N 20.34	094° 36.~~874'~~ W 52.14
11323	56	03/28/98	OBSTN	41 ft	NAD 83	29° 17.~~393'~~ N 23.70	094° 36.~~892'~~ W 53.52
11323	56	03/28/98	OBSTN	40 ft	NAD 83	29° 17.~~386'~~ N 23.16	094° 36.~~915'~~ W 54.90
11323	56	03/28/98	OBSTN	44 ft	NAD 83	29° 17.~~387'~~ N 23.22	094° 36.~~938'~~ W 56.28
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 15.~~466'~~ N 27.96	094° 33.~~929'~~ W 55.74
11323	56	03/28/98	OBSTN	39 ft	NAD 83	29° 18.~~322'~~ N 19.32	094° 37.~~660'~~ W 39.60
11323	56	03/28/98	OBSTN	39 ft	NAD 83	29° 18.~~334'~~ N 20.04	094° 37.~~673'~~ W 40.38
11323	56	03/28/98	OBSTN	45 ft	NAD 83	29° 17.~~370'~~ N 22.20	094° 36.~~962'~~ W 57.72
11323	56	03/28/98	OBSTN	44 ft	NAD 83	29° 14.~~913'~~ N 54.78	094° 29.~~437'~~ W 26.22
11323	56	03/28/98	OBSTN possible exposed pipeline	48 ft	NAD 83	29° 13.~~076'~~ N 04.56 29.70	094° 26.~~973'~~ W 58.38 54.48
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 14.~~495'~~ N	094° 30.~~908'~~ W
11323	56	03/28/98	OBSTN	50 ft	NAD 83	29° 11.~~669'~~ N 40.14	094° 28.~~812'~~ W 48.72
11323	56	03/28/98	OBSTN	32 ft	NAD 83	29° 21.~~780'~~ N 46.80	094° 31.~~790'~~ W 47.40
11323	56	03/28/98	OBSTN	35 ft	NAD 83	29° 21.~~811'~~ N 48.66	094° 32.~~070'~~ W 01.20
11323	56	03/28/98	OBSTN	35 ft	NAD 83	29° 17.~~843'~~ N 50.58	094° 29.~~620'~~ W 37.20
11323	56	03/28/98	OBSTN	38 ft	NAD 83	29° 18.~~396'~~ N 23.76	094° 31.~~128'~~ W 07.68
11323	56	03/28/98	OBSTN	44 ft	NAD 83	29° 15.~~267'~~ N 16.02	094° 28.~~837'~~ W 50.22
11323	56	03/28/98	OBSTN	48 ft	NAD 83	29° 14.~~536'~~ N 32.16	094° 30.~~384'~~ W 23.04
11323	56	03/28/98	OBSTN possible old buoy sinker	53 ft	NAD 83	29° 11.~~689'~~ N 41.34	094° 28.~~791'~~ W 47.46
11323	56	03/28/98	OBSTN possible old buoy	39 ft	NAD 83	29° 18.~~392'~~ N 23.52	094° 37.~~703'~~ W 42.18

Chart Number	Edition		Class	Reported Depth MLLW	Charted Horizontal Datum	Geographic Position		
	No	Date		Observed		Latitude	Longitude	
			sinker					
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 16.~~819'~~ N49	14 094° 35.~~614'~~ W	36.84
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 15.~~466'~~ N27	96 094° 33.~~929'~~ W	55.74
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 15.~~498'~~ N29	88 094° 33.~~942'~~ W	56.52
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 16.~~778'~~ N46	68 094° 35.~~591'~~ W	35.46
11323	56	03/28/98	OBSTN	39 ft	NAD 83	29° 18.~~388'~~ N23	28 094° 37.~~698'~~ W	44.88
11323	56	03/28/98	OBSTN	46 ft	NAD 83	29° 15.~~901'~~ N54	06 094° 35.~~271'~~ W	16.26
11323	56	03/28/98	OBSTN	42 ft	NAD 83	29° 13.~~309'~~ N18	54 094° 34.~~263'~~ W	15.78
11323	56	03/28/98	OBSTN	49 ft	NAD 83	29° 12.~~181'~~ N10	86 094° 32.~~831'~~ W	49.86
11323	56	03/28/98	OBSTN	41 ft	NAD 83	29° 18.~~299'~~ N17	94 094° 37.~~678'~~ W	40.68
11323	56	03/28/98	OBSTN	48 ft	NAD 83	29° 14.~~455'~~ N27	30 094° 26.~~862'~~ W	51.72
11323	56	03/28/98	OBSTN	43 ft	NAD 83	29° 18.~~439'~~ N26	34 094° 33.~~929'~~ W	53.74
11323	56	03/28/98	OBSTN	47 ft	NAD 83	29° 14.~~937'~~ N56	22 094° 27.~~211'~~ W	12.66
11323	56	03/28/98	OBSTN	44 ft	NAD 83	29° 16.~~447'~~ N26	82 094° 29.~~379'~~ W	22.74
11323	56	03/28/98	OBSTN	42 ft	NAD 83	29° 18.~~262'~~ N15	72 094° 30.~~782'~~ W	46.92
11323	56	03/28/98	OBSTN	41 ft	NAD 83	29° 16.~~897'~~ N53	82 094° 34.~~618'~~ W	37.08
11323	56	03/28/98	OBSTN	44 ft	NAD 83	29° 15.~~825'~~ N49	50 094° 29.~~527'~~ W	31.62
11323	56	03/28/98	OBSTN	38 ft	NAD 83	29° 18.~~408'~~ N24	48 094° 37.~~689'~~ W	41.34
11323	56	03/28/98	OBSTN	39 ft	NAD 83	29° 18.~~351'~~ N	094° 37.~~597'~~ W	
						21.06	35.82	

Science Applications International Corporation
An Employee-Owned Company

February 25, 1999

LETTER OF APPROVAL

REGISTRY NUMBER H10835

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of survey H10835 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and smooth sheet have been closely reviewed and are considered complete and adequate as per the Statement of Work.

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Walter S. Simmons
Hydrographer
February 25, 1999

Admiral's Gate, 221 Third Street, Newport, Rhode Island 02840 • Office: (401) 847-4210 • Fax: (401) 849-1585
Other SAIC Offices: Albuquerque, Colorado Springs, Dayton, Falls Church, Huntsville, Las Vegas, Los Altos, Los Angeles, McLean, Oak Ridge, Orlando, San Diego, Seattle, Tucson

ADDENDUM

TO

H10835 (1998-99)

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NO.
	HYDROGRAPHIC TITLE SHEET	**ADDENDUM TO H10835**
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 NO. **Q**

State TEXAS

General locality GULF OF MEXICO

Locality 15 MILES ESE OF GALVESTON

Scale 1:20,000 Date of survey 13 July 1999 – 16 July 1999

Instructions dated 23 October 1997 as amended Project No. OPR-K171-KR

Vessel R/V Neptune

Chief of party WALTER S. SIMMONS

Surveyed by W. Simmons, G. Ghiorse, D. Walker, L. Gates, L. McAuliffe, E. Tobey, M. Estaphan, B. Ramaswamy

Soundings taken by (**echo sounder**,) hand lead, pole MULTIBEAM RESON SEABAT 8101

Graphic record scaled by survey personnel

Graphic record checked by survey personnel

Protracted by HP DESIGNSET 2500CP (OFFICE) Automated plot by HP1055CM (FIELD

Verification by ATLANTIC HYDROGRAPHIC BRANCH PERSONNEL

Soundings in fathoms (**feet.**) meters at MLW, (**MLLW**)

REMARKS: Contract # 50-DGNC-8-90025/SAIC
Contractor Name: Science Applications International Corp.
221 Third Street; Newport, RI 02840
HAND WRITTEN NOTES IN DESCRIPTIVE REPORT WERE MADE DURING OFFICE PROCESSING

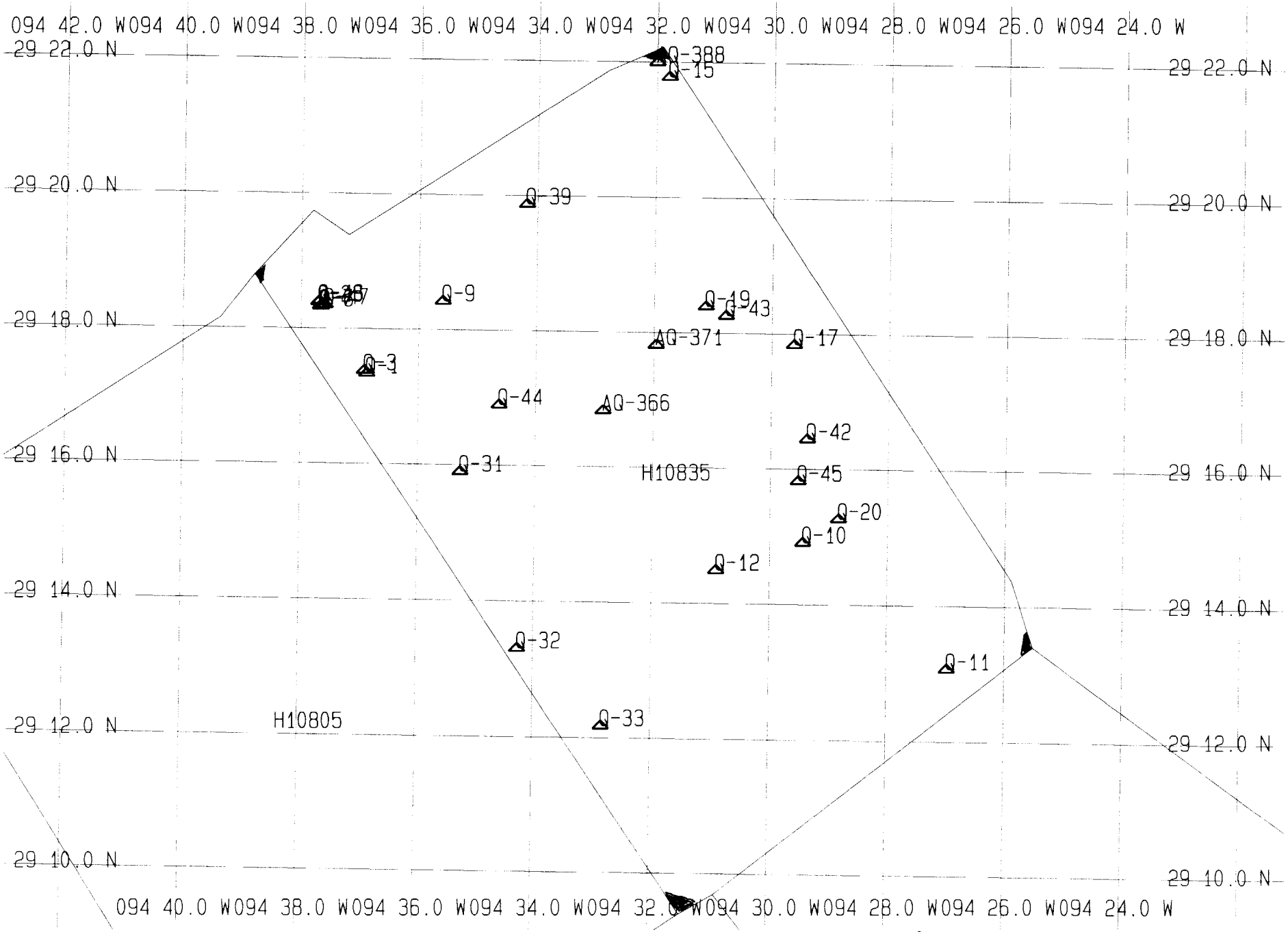
NOAA FORM 77-28 SUPERSEDES FORM C&GS-537.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—665-661/1222 REGION NO. 6

INDEX OF SHEETS

The Index of Sheets on the following page indicates:

1. Survey Outlines
2. Survey Registry Numbers
3. Location of Items Investigated


094 42.0 W094 40.0 W094 38.0 W094 36.0 W094 34.0 W094 32.0 W094 30.0 W094 28.0 W094 26.0 W094 24.0 W
29 22.0 N
29 20.0 N
29 18.0 N
29 16.0 N
29 14.0 N
29 12.0 N
29 10.0 N
AQ-388
AQ-15
AQ-39
AQ-9
AQ-19
AQ-43
AQ-371
AQ-17
AQ-3
AQ-44
AQ-366
AQ-42
AQ-31
H10835
AQ-45
AQ-20
AQ-10
AQ-12
AQ-32
AQ-11
H10805
AQ-33
H10835 (1998-99)

Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract 50-DGNC-8-90025/SAIC reflects the state of the sea floor in existence on the day and at the time the survey was conducted.

		Page
A	PROJECT	1
B	AREA SURVEYED	1
C	SURVEY VESSEL	2
D	AUTOMATED DATA ACQUISITION AND PROCESSING	4
E	SONAR EQUIPMENT (Side scan sonar operations)	6
F	SOUNDING EQUIPMENT	9
G	CORRECTIONS TO SOUNDINGS	9
H	CONTROL STATIONS	12
I	HYDROGRAPHIC POSITION CONTROL	12
J	SHORELINE	13
K	CROSSLINES	13
L	JUNCTIONS	13
M	COMPARISON WITH PRIOR SURVEYS	13
N	COMPARISON WITH THE CHART	13
O	ADEQUACY OF SURVEY	29
P	AIDS TO NAVIGATION	29
Q	STATISTICS	29
R	MISCELLANEOUS	29
S	RECOMMENDATIONS	29
T	REFERRAL TO REPORTS	30

APPENDIX A	-	DANGER TO NAVIGATION REPORTS	31
* APPENDIX B	-	LANDMARKS AND NON-FLOATING AIDS TO NAVIGATION LISTS	31
* APPENDIX C	-	LIST OF HORIZONTAL CONTROL STATIONS	31
* APPENDIX D	-	LIST OF GEOGRAPHIC NAMES	31
* APPENDIX E	-	TIDE NOTES	31
* APPENDIX F	-	SUPPLEMENTAL CORRESPONDENCE	33

* DATA FILED WITH FIELD DATA.

* APPENDIX G - CALIBRATION DATA 42
* APPENDIX H - DGPS VERIFICATION DATA 46
* APPENDIX I - DATA PROCESSING ROUTINE 47
* APPENDIX J - SOUND VELOCITY PROFILE DATA 48
* APPENDIX K - AUTOMATED DATA ACQUISITION AND PROCESSING SOFTWARE 60

* DATA FILED WITH FIELD RECORDS.

List of Figures

		Page
	Index of Sheets	iv
C-1	Configuration of R/V Neptune during Survey Operations	3
C-2	R/V Neptune Draft Determination	4

List of Tables

		Page
C-1	Survey Vessel Characteristics	2
C-2	R/V Neptune Antenna and Transducer Locations Relative to the POS/MV IMU Vessel Reference Point	3
G-1	Roll, Pitch, and Heading Bias for the R/V Neptune	12

Descriptive Report Addendum to Accompany
Hydrographic Survey H10835
Scale 1:20,000 Surveyed 1999
R/V NEPTUNE
Science Applications International Corporation (SAIC)
Walter S. Simmons, Hydrographer

A. PROJECT

Project Number: OPR-K171-KR
Dates of Instructions: 23 October 1997 **Original:** 50-DGNC-8-90025/SAIC
5 January 1998 Modification #1:56-DGNC-8-24001/SAIC
7 August 1998 Modification #2:56-DGNC-8-24002/SAIC
9 November 1998 Modification #3:56-DGNC-9-24003/SAIC
9 April 1999 Modification #4:56-DGNC-9-24004/SAIC
12 July 1999 Modification #5:56-DGNC-9-24005/SAIC
Dates of Supplemental Instructions: 4 August 1998, 25 May 1999
Sheet Letter: Q
Registry Number: H10835
Purpose: Additional Item Investigations to Accompany Hydrographic Survey H10850.

B. AREA SURVEYED

Description:

The area surveyed was the Approach to Galveston, Texas, Shipping Safety Fairway, and the Fairway Anchorage to the east of the Fairway including a portion of the Precautionary Area at the entrance to the Galveston Channel. The following coordinates bound the survey approximately:

29.313198 N	094.646537 W
29.328982 N	094.630131 W
29.323084 N	094.620029 W
29.364413 N	094.546836 W
29.370318 N	094.531691 W
29.239758 N	094.431470 W
29.223433 N	094.425307 W
29.161523 N	094.514909 W
29.156688 N	094.524570 W

Dates of multibeam data acquisition (UTC):

07/13/99 – 07/14/99	JD 194 –195
07/16/99	JD 197

Dates of side scan data acquisition (UTC):

07/14/99	JD 195
07/16/99	JD 197

C. SURVEY VESSEL

The R/V Neptune was the platform for multibeam sonar, side scan sonar, and sound velocity data collection. Two CONEX containers were welded in place on the aft deck of the R/V Neptune. One container was used for multibeam and side scan data collection, the other for data processing. The POS/MV IMU was mounted on the vessel centerline just forward and above the RESON 8101 transducer, below the main deck. The multibeam sounder transducer was mounted on the keel. The side scan sonar tow position was located at the "A" frame aft center. A double-armored co-ax conductor cable on a SeaMac winch was used for towing the side scan. Table C-1 is a list of vessel characteristics for the R/V Neptune.

Table C-1. Survey Vessel Characteristics

Vessel Name	LOA (Ft)	Beam (Ft)	Draft (Ft)	Gross Tonnage	Power (Hp)	Registration Number
R/V Neptune	106.9	26	8	90	1200	D595478

The R/V Neptune sensor configuration is depicted in Figure C-1 and the vessel offsets are shown in Table C-2. Figure C-2 shows the R/V Neptune's draft calculations. All measurements are in meters. The Reference Point for the entire multibeam system is located at the top centerline of the POS/MV IMU. The transducer depth was recorded as 3.42 meters below the boat's main deck. The distance below the boat deck to the water surface was measured and subtracted from the transducer hull depth to determine the draft of the electronic center of the transducer. Lead line comparisons to the corresponding beam confirmed the 3.42 meters as the correct transducer depth below deck. Measurements were made on each side of the vessel before departure from port and upon return to port in order to prorate the daily draft for fuel and water consumption.

Figure C-1. Configuration of R/V Neptune during Survey Operations, measurements in meters

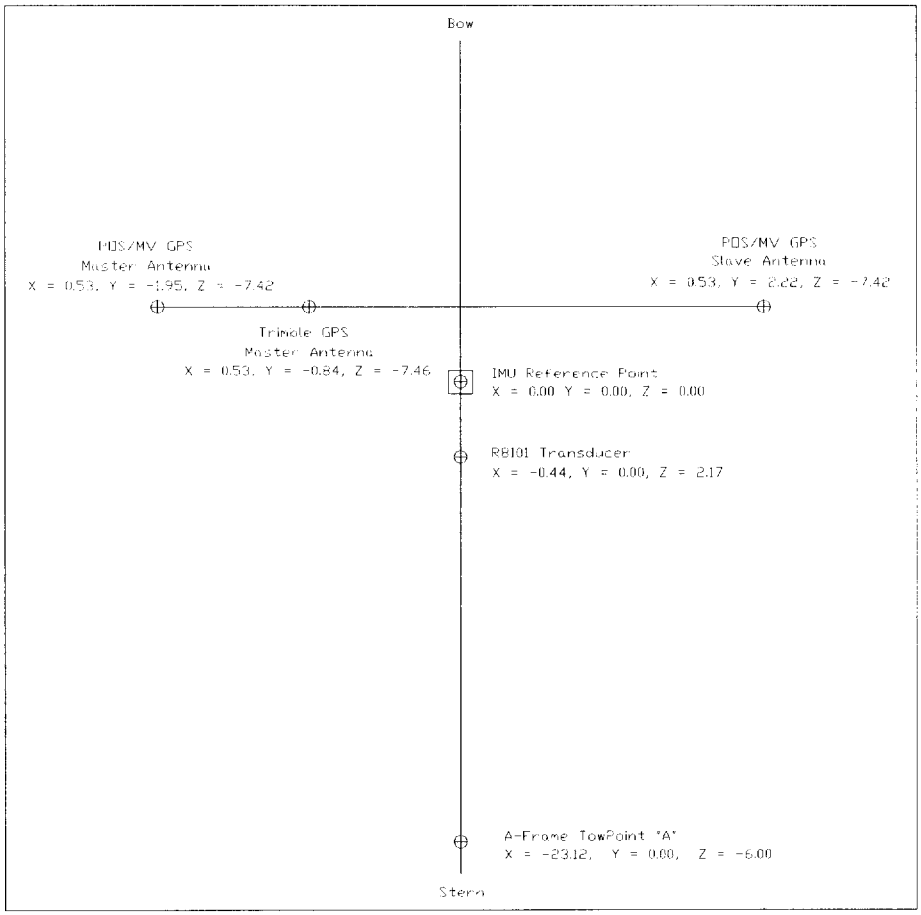
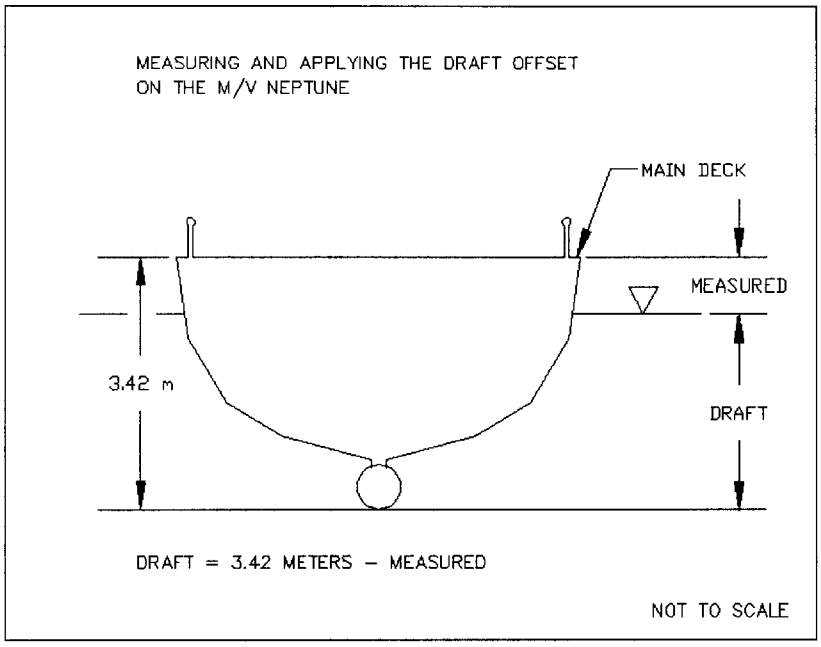


Table C-2. R/V Neptune Antenna and Transducer Locations Relative To the POS/MV IMU Vessel Reference Point, measurements in meters

Sensor	Offset in ISS2000		POS/MV IMU	
Multibeam Reson 8101 Transducer	X		X	-0.44
	Y		Y	0
	Z		Z	2.17
Trimble 7400 Antenna	X	0.53		
	Y	-0.84		
	Z	-7.46		
POS/MV GPS Master Antenna			X	0.53
			Y	-1.95
			Z	-7.42
Side Scan Tow Point "A" frame aft	X	-23.12		
	Y	0		
	Z	-6.00		

Figure C-2. R/V Neptune Draft Determination



The SAIC Integrated Survey System (**iss2000**) and the RESON 8101 multibeam system utilize different coordinate systems, and therefore care must be taken when inputting correctors to the system. The **iss2000** considers "z" to be positive down, while both the RESON and POS/MV consider "z" positive up. Both the **iss2000** and POS/MV consider "x" positive forward, the RESON considers "x" as positive athwart ships to starboard. The SAIC **iss2000** considers "y" positive athwart ships to starboard, the POS/MV considers "y" positive athwart ships to port and the RESON considers "y" as positive forward.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

SEE ALSO EVALUATION REPORT

Data acquisition was accomplished using the SAIC **iss2000** system. Survey planning, real-time navigation, and data logging were controlled by the **iss2000** on a HP UNIX machine, with navigation and data time tagging running on an OS/2 machine. The **iss2000** provided navigation data to the Klein 5500 sonar system for merging with the side scan sonar data.

Navigation was recorded from both the POS/MV system and the Trimble 7400. Data from the POS/MV was used as the primary navigation merged with both multibeam and side scan data. Positioning confidence checks were performed alongside survey control stations in port. Daily positioning confidence checks for the R/V Neptune were done by comparing data recorded from the POS/MV to data recorded from the Trimble DGPS.

The RESON 8101 range scale was set to 35 meters in the shallower areas, and was set to 50 meters for the remainder of the sheet. The data acquisition rate for the R8101 was set at maximum for the range scale selected. This means that the specified on average 3.2 pings per 3 meters could be obtained at up to 14.5 knots with the 8 pings per second data rate. At an average speed of 8.5 knots the specified average of 3.2 pings per 3 meters was met.

The side scan sonar equipment used throughout the H10835 survey was the Klein 5500 System. This Transceiver/Processor Unit (TPU) was networked to a personal computer that logged data to hard disk. On a watch-by-watch basis, these raw Klein formatted data were transferred to a side scan sonar-processing computer where they were archived to 4mm tape. Both channels were set at a range scale of 100-meters throughout the survey, except for some gap fills where the hydrographer decided to set the range scale to 75-meters each side to reduce the occurrence of additional gaps caused by surface wave interference. Vessel speed averaged 8 to 9 knots and never exceeded 10 knots. This ensured three or more side scan sonar pings per meter along track.

Once collected and archived to tape, the side scan data were converted to eXtended Triton Format (XTF). A side scan processor then reviewed the side scan data using Triton ISIS software. The processor would note data gaps due to weather, system problems, the fish altitude out of range, data masking, or any other events that would cause the data to be rejected. With the assistance of the hydrographer, the processor would locate and verify contacts and create a contact list using ISIS. This contact list was later imported into the **iss2000** system for side scan contact to multibeam feature correlation.

Cleaning of the R8101 multibeam data began with an evaluation of the navigation track line. An automated filter was then applied for minimum and maximum depths of 4 and 30 meters. Then the interactive editing was performed to remove noise, fish, etc. The editing process used the GEOSWATH geo-referenced editor which allows for both plan and profile views with each beam in its true geographic position and depth. Tidal correctors were not applied in real-time. Observed tides were down loaded from the NOAA/CO-OPS web page. Preliminary and verified data from the Sabine Offshore Station (877-1081) were applied to the multibeam data using the zoning provided August 4, 1998. NOAA memorandum, "Final Water Level Data for Application to Hydrographic Survey OPR-K171-KR-1998", which is in Appendix F.* All H10835 multibeam data were reprocessed with verified tide data from the Sabine Pass Offshore (877-1081) station as downloaded from the NOAA/CO-OPS web page. NO TIDAL CORRECTORS WERE APPLIED IN THE OFFICE. ALL TIDE CORRECTORS WERE APPLIED IN THE FIELD.
Depth data were then gridded to 1-meter cells for quality evaluation and for comparing to side scan sonar contacts. When anomalies were seen in the 1-meter grids, the edited multibeam files were re-examined and re-edited as needed. When all multibeam files were determined to be satisfactory, the data were binned to a 10-meter cell size, populating the bin with the shoalest sounding in the bin and maintaining its true position and depth with tracking to the GSF data file.

Soundings were selected from the 10-meter binned layer using the **sel_sound** sounding selection software. This routine starts with the shoalest sounding in the survey, flags out soundings that would overlap it on the plot, proceeds to the shoalest remaining sounding and repeats the above process until all soundings in the 10-meter bin layer have been evaluated. The **set_sound** program was run to flag all selected soundings in the gsf multibeam file. The selected sounding file, the platform and navigation aids file, and the feature file were combined to produce the smooth sheet in **AutoCAD**.

Throughout this descriptive report wherever software is mentioned, it is inferred that the most current version of the software available was used. A complete list of all software versions and dates is provided in Appendix K.*

Processing of side scan sonar data is discussed in Section E.

The real time multibeam acquisition system used for the H10835 survey included:

One UNIX workstation – Used for system control, survey operations, real-time quality control.

*DATA FILED WITH FIELD RECORDS.

One personal computer – Used for running POS M/V and Trimble software and for downloading and conversion of sound velocity data from CTD's.
One personal computer – Used for navigation and time syncing on the O/S-2 operating system.
A custom computer from RESON was used to operate the 8101 system.
A custom computer from RESON was used to operate the R6042 system.

Uninterrupted power supplies (UPS) protected the entire system.

Multibeam Data Processing

Multibeam data processing was done in two stages. Initial data cleaning and validation was done shortly after the data were collected, usually by the same watchstander who had collected the data. To maintain a high degree of continuity between data collection and data processing it was convenient to split a watchstander's work into two phases, one to collect data and the next to process that same data.

On a watch by watch basis, tracklines were made, verified, and corrected to ensure data coverage and also check for navigation errors. Next, outer beams of the multibeam data, exceeding accuracy standards calculated by the Hydrographer, were flagged as invalid using the **iss2000** software. Multibeam data were manually edited and the preliminary multibeam coverage grid was then updated. Each watchstander would perform a backup of all data on the processing system at the end of each processing watch. After the watchstander had completed the initial data cleaning, a different watchstander, a data manager, or the hydrographer verified the data. Any questionable possible obstructions were written down and later evaluated by the hydrographer. A data manager on the survey vessel would later correct the data for draft and tides, make updated coverage grids, tracklines, sounding grids, selected sounding plots and preliminary data products. The data manager's duties also included routine system backups on all computers and quality control on all data.

In the processing lab in Newport, RI, further quality assurance reviews were done, and corrections were made to all data. Contact analysis was performed correlating side scan contacts with multibeam features. Multibeam coverage and sounding grids were updated following changes found during the contact analysis. The **iss2000** system used proprietary algorithms to create the grids and selected soundings. Final plots were produced exporting data to a DXF format using the **iss2000** software. These data were then imported into **AutoCAD** for final map production.

E. SIDE SCAN SONAR

The following side scan sonar equipment was used for the H10835 survey:

Klein 5500 Side Scan Sonar System towfish
    Serial Number 250
    Vertical beam width 40 , 0 depression, 455kHz.
    K-Wing Depressor, serial number 435
Transceiver/Processing Unit (TPU), serial number 109
Display/Control/Data logging computer

1. Side Scan Sonar Data Acquisition Procedure

The watchstander would always have the assistance of the previous watchstander who was located close by processing data. This assistance was necessary for conducting CTD casts as well as towfish deployment and retrieval. A minimum of four people were used during towfish deployment and retrieval.

Side scan operations were conducted in water depths ranging from 38 to 68 feet. The side scan towfish altitude off the bottom was maintained between eight and fifteen meters. The MacArtney Sheave used had a cable counter with a read out in meters. The cable out data was broadcast from the cable counter to the **iss2000** system where layback and fish position was calculated. The cable length was adjusted to maintain the proper fish altitude using a remote controller for the SeaMac winch. The watchstander appended to a side scan annotation file when changes were made to the cable out length. These annotation files were later merged with the XTF data using proprietary software.

Maintaining towfish height above the bottom was relatively easy due to the remote controller for the winch. Adjustments to the length of cable deployed were required several times during each survey line. These primarily occurred in the Heald Bank area and an area of shallower water in the southern portion of the sheet. A proprietary software program, which displays the towfish and water depths, made monitoring the towfish altitude easy.

The depressor allowed the amount of cable out to be less than the water depth. This permitted turns to be tighter and thus faster than surveys previously conducted without the use of a depressor. There was also no need to worry about the towfish hitting the seafloor while conducting CTD casts. In addition, the depressor kept the towfish below the propwash even at higher survey speeds of 9 knots.

Navigation and multibeam file names were manually changed after each survey line, or item investigation, was completed. The Klein 5500 data logging software automatically changes the file name every ten minutes. The side scan range scale was set to 50-meters where specified, and to 75-meters where the range scale was not specified.

Watchstanders used proprietary software to create digital annotation files that were later merged with XTF side scan data.

Daily confidence checks were conducted using trawl marks, anchor scours, and geologic features (sand waves) that ran through both channels while on line.

2. Problems Encountered During Side Scan Sonar Survey Acquisition

Sargasso weed floating on the water surface was a continual detriment to acquisition of good side scan data. The Klein 5500 locks on to the strongest signal. In water depths less than 60 feet, this usually means the water surface if Sargasso or wind waves are present.

Weather also had a negative impact on the quality of the side scan data. When operating in 3 to 4 foot seas, it was frequently impossible to avoid surface wave noise and the subsequent large number of data gaps.

Use of the 50-meter and 75-meter range scales reduced the impact of these problems.

3. Side Scan Sonar Processing

After being archived to 4mm tape, digital side scan data from the Klein 5500 system were converted from the Klein proprietary format to eXtended Triton Format (XTF) using a SAIC proprietary program called xtf_io. These XTF files were copied to 4mm tape in tar format and are the deliverables to be used with CARIS SIPS. The XTF data also allowed data review and target analysis in Triton ISIS.

A side scan processor looked at each record using Triton ISIS to review the data. A spreadsheet was used to log times where data gaps were caused by seaweed interference, biota in the water column, or other reasons. The time, survey line, corresponding multibeam file, start/end of line, side scan file name, watch id number, line azimuth, and data gaps information were all logged in the spreadsheet. This information was used to set the bad data off line so that they were ignored in processing and in coverage analysis.

Annotation files logged in real-time by the watchstanders were later corrected for errors and additional annotations were added. Additional annotations include contacts, confidence checks, and comments on the records. The corrected annotations were merged into the XTF data using the xtf_io program. Trackline data were extracted from the XTF files for each Julian day.

A time window file, which lists the times of all valid data, was created for each 100% of coverage in order to create both trackline and coverage plots in the **iss2000** system. By viewing the coverage plots in the **iss2000** survey-planning tool, a user can easily plan survey lines to fill in any data gaps.

Side Scan Contact Analysis

ISIS and Contact Post Processing Software (Triton/Elics Inc.) were used to select and process contact information from the XTF sonar files. Contact information includes the following:

1. Year and Julian Day contact was acquired.
2. Time contact was acquired.
3. Contact position - Latitude and Longitude.
4. Contact identifier (i.e. OBST for Obstruction).
5. Slant range to contact (Note: Negative number if contact was detected on port side).
6. Fish altitude when contact was acquired.
7. Contact height, based on length of shadow and geometric calculation using steps 5 & 6.

Contact information was stored in .CON files that were converted into a .CTV file using a SAIC proprietary program called ISIS2ctv. During the conversion, a postscript image file was made of each contact. This .CTV file can be directly loaded into **iss2000** as a separate data layer. Once in the **iss2000** system, contacts were correlated by position and height with the one-meter grid of the multibeam data displayed with side scan contacts overlaid. Bathymetric features in the multibeam data were then compared with the side scan contact data, and features were selected for the smooth sheet.

F. SOUNDING EQUIPMENT

The following components were used for acquisition of multibeam sounding data using the RESON SeaBat 8101 multibeam system:

- Transducer, Serial Number 099707
- 8101 Processor, Serial Number 13819
- R6042 Controller and Processing Unit, Serial Number 590 P0 794-387

A lead line made of Kevlar line with an 8 pound mushroom anchor as a weight was used for checking the multibeam echo sounder. The line was marked in feet and was calibrated against a steel tape. Lead line comparisons are summarized in Appendix G.* Numerous comparisons, at least one per watch, were made between the R8101 center beam depth verses the side scan fish depth plus the fish altitude height. These values were almost always identical. This method of confidence checks was implemented to replace the single beam Echotrak that was not working during the site investigations.

G. CORRECTIONS TO SOUNDINGS

1. Speed of Sound

The following systems were used to determine sound velocity profiles for corrections to multibeam sonar soundings.

- "A" - Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 193607-0565, Calibration Date 23 February 1999.
- "B" - Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 2710, Calibration Date 15 October 1998.
- "C" - Sea-Bird Electronics, Inc., Model 19 CTD, Serial Number 1915869-2389, Calibration Date, 02 September 1998.

The primary unit was SBE19 #0565. Daily confidence checks were obtained from simultaneous casts with the primary CTD and one of the other two CTD's. After downloading CTD casts, both were converted to the proper format and compared to each other and to the previously applied cast. All profiles were computed using **SBE Term19** and converted using the **SBE DatCnv** software. Computed profiles were copied to the **iss2000** for comparison on the screen. A selected profile was applied to the system, recorded, and sent to the RESON 6042, where a refraction lookup table was computed for application of speed of sound and ray tracing correctors to the multibeam sounding data. If sounding depths exceeded the cast depth, the 6042 used the bottom of the table to extend correctors below the table.

Factors considered in determining how often a CTD cast was needed included: shape and proximity of the coastline, sources and proximity of freshwater, seasonal changes, wind, sea state, cloud cover, and changes from the previous profile. A cast was taken at least once during each 6-hour watch. Normally there were two casts per 6 hour watch during daylight, and one cast per 6 hour watch during darkness, when running multibeam.

Quality control tools, including real-time displays and a multibeam swath editor, were used to monitor how the sound velocity was affecting the multibeam data. Severe effects due to improper sound velocity could easily be seen by viewing multibeam data in an along track direction.

* DATA FILED WITH FIELD RECORDS.

A table including all CTD casts, dates of each cast, the location of the cast, and the maximum depth of each cast is located in Appendix J. ✱

2. Instrument Corrections

No instrument corrections were necessary after the initial installation and calibration was complete.

3. Corrections Determined from Vertical Casts

Lead line comparisons to multibeam center beam soundings were made at least every two weeks to verify the transducer draft and echo sounder instrument correctors. For each comparison, a CTD cast was taken and the sound velocity profile loaded into the **iss2000** and the RESON 6042. Twenty lead line readings, ten from the port side and ten from starboard, were recorded along with the UTC time of observation while the **iss2000** recorded the multibeam readings. **Exammb** was used to determine the appropriate port and starboard beam depth readings for the time and position of each lead line reading.

The results of these readings were entered into a spreadsheet along with the draft readings and any squat correctors that may have been entered into the **iss2000**. The spreadsheet applied a calibration corrector to the lead line readings and converted the readings from feet to meters. It also applied correctors for any settlement and squat inadvertently left in the **iss2000** to the port and starboard multibeam readings.

Each corrected lead line cast depth was compared to the simultaneous multibeam. The ten comparisons were averaged and the standard deviations were computed. The lead line cumulative results are included in Appendix G. ✱

4. Static draft

Depth of the transducer below the deck was determined from measurements made while the boat was on the marine railway in 1998, and was verified by lead line comparisons. The static draft was observed by measuring from the main deck to the waterline before getting underway from Galveston and subtracting that measurement from the transducer distance below the deck. If the static draft value changed from the previously noted value, the new value was entered into the RESON system. The static draft was again determined upon return to port and the change in draft was prorated on a daily basis. The measured and prorated draft results are reported in Appendix G, Table App. G-4. ✱

5. Settlement and Squat

Measurements of settlement were conducted near 29°11.7'N, 094°28.8'W on day 138, May 19, 1999, in fifteen meters of water. The following procedures were used to determine the settlement correctors:

- Selected an area of flat bottom at a depth similar to the survey area.
- Planned a survey line across the flat bottom.
  1. Considered the current and wind in planning the line.
  2. Used Sabine Offshore (877-1081) station for the water level during the test.
  3. Calibrated the echo sounder, and applied sound velocity profile for the test area. (Timing latency and pitch, roll and heading biases had been determined and applied.)
  4. Approached the line at a slow to moderate speed, brought the Rpm's to zero and drifted down the line while recording soundings over the flat bottom.
  5. Ran the line at each of the predetermined RPM settings while recording soundings over the flat bottom.

✱ DATA FILED WITH FIELD RECORDS.

6. Applied water level correctors to the soundings.
7. Subtracted the depth determined from each of the RPM passes from the depth determined on the drifting, zero RPM pass. These differences are the settlement and squat correctors to be applied when operating at the corresponding RPM.
8. Constructed a lookup table of RPM and settlement and squat correctors in the configuration file so that the computer could interpolate a corrector based upon the RPM entered into the system

Geoswath was used to measure the depth for each pass. The results were compiled into a lookup table of vessel's engine RPM vs. settlement and squat. When on survey line, the engine's RPM was entered into the **iss2000** system by the real-time system operator. The computer applied settlement and squat correctors interpolated from the lookup table, and recorded them in the "Depth Corrector" field of the GSF data file for each ping.

All results are reported in Appendix G, Table App. G-5. ✱

6. Roll, Pitch and Heading Biases

The following sensor was used for acquisition of Heave, Roll, Pitch and Heading data:

- TSS POS/MV Inertial Navigation System, Serial Number 024

The POS/MV was used for heave, roll, and pitch. The accuracy of the sensor was five percent of one meter or five centimeter for heave $\pm$ 0.10 dynamic accuracy for roll and pitch, and $\pm$ 0.05 static accuracy for roll and pitch. The POS/MV was used for heading. The dynamic heading accuracy of the unit is better than 0.05.

Heading, roll, and pitch biases were determined in a series of tests performed in the survey area prior to the start of the survey. Prior to conducting any of the tests, a CTD cast was taken to determine the sound velocity profile and entered into the RESON system. Initially, the roll, pitch, and heading biases were set to 0 in the RESON system.

The roll bias test was run first in an area with relatively flat bottom. The range scale of the RESON was set to 50-meters. Three lines were run spaced 40-meters apart and each line was run in both directions. The data from parallel lines in the same direction were used for roll bias calculations so that the depths from the center beams from one line were compared against the depths of the mid-swath beams. Tidal corrections were applied to all data before roll corrections were calculated using routines in the **Survey Analysis** software. Roll bias results are shown in Appendix G, Table App.G-3. ✱

After the roll biases were calculated and entered into the RESON system, a pitch bias test was conducted. The pitch test was conducted by surveying multiple reciprocal lines perpendicular to an anchor scour. During the pitch test, ship speed was maintained at as constant a rate as possible. Tidal corrections were applied to all data before the pitch bias was calculated. Pitch biases were computed by comparing runs in opposite directions. There was no discernable pitch bias as a result of these tests. A bias of 0.0 was kept in the system for the survey.

Following the roll and pitch bias tests, a heading bias test was conducted. For the heading bias test, five parallel lines were run in opposing directions so that the inner beams from the transducer overlay the intermediate or outer beams of adjacent swaths. The heading bias was then determined by measuring the distance between equal depths and calculating the angle subtended by that distance. Tidal corrections were applied to all data before heading corrections were calculated using routines in the **Survey Analysis** software. After repeated inconclusive test results, it was deemed that the

✱ DATA FILED WITH FIELD RECORDS.

heading bias was zero. It is believed that the shallow water depths of the survey area combined with the accuracy of the navigation makes it extremely difficult to measure small degrees of heading bias. Further proof of a heading bias of zero lies in trawl marks crossing through numerous swaths with perfect alignment.

Table App. G-6 contains the results of the Accuracy test conducted on JD 197. The Accuracy Test for data collected after the transducer change was derived from two lines run along the northwest sheet limit and compared to the north ends of the mainscheme lines run in the common area.

Roll, pitch, and heading biases applied in H10835 are shown in Table G-1.

Table G-1. Roll, Pitch, and Heading Bias for the R/V Neptune

Julian Days	139-209
Roll	0.40
Pitch	0.00
Heading	0.00

H. CONTROL STATIONS SEE ALSO EVALUATION REPORT.

The horizontal datum used for the survey was the North American Datum (NAD) 1983.

Horizontal control stations CG-20 1974 and CG-21 1974 were used for independent checks of the positioning system on the survey vessel. Data for these stations were downloaded from the NOAA/NGS web page.

I. HYDROGRAPHIC POSITION CONTROL

The following equipment was used for positioning on the R/V Neptune:

- TSS POS/MV, Serial Number 024
- Trimble 7400 GPS Receiver, Serial Number 3713A18839
- Trimble Differential Beacon Receiver
- 41R Differential Beacon Receiver, Serial Number 3508-102-18550

The primary hydrographic positioning equipment was the POS/MV, which used correctors from the USCG differential station at Galveston, TX. The **iss2000** monitored HDOP, number of satellites, elevation of satellites, and age of correctors to ensure the resulting hydrographic positioning errors did not exceed ten meters at the 95% confidence level.

When in port, the R/V Neptune tied up to Pier 15 where measurements were made to calculate the offset between the hydrographic navigation position and horizontal control station CG-20, 1974. While measurements were being made, navigation data were being logged. Comparison of the navigation center position computed from the control station and the average position based on navigation resulted in confidence checks that were well within specifications, with no more than 3 meters inverse distance from the check position. Daily position confidence checks were established using a Trimble DGPS with correctors from the U.S. Coast Guard station at Port Aransas, TX. A real-time monitor raised an alarm when the two DGPS positions differed by more than 10 meters

horizontally. Positioning confidence checks were well below the allowable inverse distance of less than 15 meters.

The USCG Galveston DGPS station was used as the primary positioning corrector source. The USCG Port Aransas, TX DGPS station was used for daily positioning confidence checks. The primary DGPS receiver automatically locks onto the strongest DGPS signal; therefore, when the USCG Galveston DGPS station was off the air for upgrades, primary navigation used the USCG Port Aransas, TX DGPS station. The system resumed utilizing the Galveston DGPS station when it came back online.

All antenna, transducer, towpoint, and towfish offsets were measured relative to the POS/MV's IMU. Two separate teams of two people measured and calculated all offsets using a measuring tape. The final offsets from both teams were compared and were found to agree.

The **iss2000** software calculates the towfish position using an automatic cable out value and the towpoint configuration or offsets previously measured.

J. SHORELINE

Not applicable.

K. CROSSLINES

Not applicable.

L. JUNCTIONS SEE ALSO EVALUATION REPORT.

Not applicable.

M. COMPARISON WITH PRIOR SURVEYS SEE ALSO EVALUATION REPORT.

Not applicable.

N. COMPARISON WITH THE CHART SEE ALSO EVALUATION REPORT.

H10835 was compared to Chart 11323, 57th edition, 27 March 1999 at scale 1:80,000 in lieu of the specified 55th edition.

Item 1:

I-1 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-1 is located at 29°17.~~339~~20.34'N, 094°36.~~874~~52.44'W, and is the correlation of side scan targets 54 (height 3.3') and 60 (height 3.3'). Reconnaissance multibeam heights were 3.8'and 4.5', respectively. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	41 feet
Latitude:	29 17.~~3370~~ N 20.22
Longitude:	094 36.~~8742~~ W 52.45
File:	hbmba99194.d05
Time:	12:34:17

Comparison with the Chart and Charting Recommendations: Item 1 is charted as a dotted circle, blue tint based on SAIC's Report of Danger to Navigation with the least depth 44 feet determined from reconnaissance multibeam data. The chart symbol overlaps a charted 40 Obstn, dotted circle, blue tint. See Item 3 for charting recommendations. CONCUR CHART 41: OBSTN 29-17-20.22N 94-36-52.45W

Comparison with the Smooth Sheet: This item is in an area of 45-foot soundings on the smooth sheet. Recommend addition of 41 Obstr to the smooth sheet. CONCUR

Item 3:

I-3 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-3 is located at 29°17.~~386~~23.16'N, 094°36.~~915~~54.90'W, and is the correlation of side scan targets 56 (height 4.9') and 62 (height 5.9'). Reconnaissance multibeam heights were 6.6' and 7.5', respectively. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. In addition, the charted 40 Obstn from the smooth sheet was verified in one of the swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	39 feet 23.11
Latitude:	29 17.~~3851~~ N
Longitude:	094 36.~~9145~~ W 54.87
File:	hbmba99194.d04
Time:	12:24:55

Comparison with the Chart and Charting Recommendations: Item 3 is within the charted 40 Obstn, dotted circle, blue tint which was based on SAIC's Report of Danger to Navigation with the least depth 40 feet determined from reconnaissance multibeam data. Recommend that 39 replace the 40, and that the two overlapping dotted circles, blue tint remain as charted. CONCUR WITH CLARIFICATION DELETE 40: OBSTN CHART 39: OBSTN

Comparison with the Smooth Sheet: Recommend addition of 39 Obstr to the smooth sheet. CONCUR

29-17-23.16N 94-36-54.90W

29-17-23.11N 94-36-54.87W

Item 6:

I-6 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-6 is located at 29°18.~~322'~~ N, 094°37.~~660'~~ W, and is the correlation of side scan targets 51 (height 1.6') and 93 (height 3.9'). Reconnaissance multibeam heights were 3.3' and 4.7', respectively. I-6 is located in the vicinity of Buoy "GB". Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. . In addition, the 41 Obstn on the smooth sheet was verified in one of the swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	41 feet
Latitude:	29 18.~~3225~~ N
Longitude:	094 37.~~6594~~ W
File:	hbmba99194.d06
Time:	12:54:17

Comparison with the Chart and Charting Recommendations: Item 6 is charted as a 39 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend that the charted 39 Obstn be replaced by 41 Obstn, and that the dotted circle, blue tint be retained. CONCUR WITH CLARIFICATION DELETE 39. OBSTN CHART 41. OBSTN

Comparison with the Smooth Sheet: This item is within an area of 43-foot soundings on the smooth sheet. Recommend addition of 41 Obstr to the smooth sheet, and removal of 43-foot soundings as required. CONCUR

29-18-19.32
94-37-39.60
29-18-19.35
94-37-39.56

Item 7:

I-7 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-7 is located at 29°18.~~334'~~ N, 094°37.~~673'~~ W, and is the correlation of side scan targets 52 (height 2.6') and 95 (height 2.6'). Reconnaissance multibeam heights were 0.2' and 4.5', respectively. I-6 is located in the vicinity of Buoy "GB". Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	41feet
Latitude:	29 18.~~4326~~ N
Longitude:	094 37.~~6719~~ W
File:	hbmba99194.d09
Time:	13:37:23

Comparison with the Chart and Charting Recommendations: See Item 6, FOR CHARTING RECOMMENDATION.

Comparison with the Smooth Sheet: This item is within an area of 43-foot soundings on the smooth sheet. Recommend addition of 41 Obstr to the smooth sheet, and removal of 43-foot soundings as required. DO NOT CONCUR
IN THE VICINITY OF ITEM 6 41 OBSTR. DO NOT SHOW ON SMOOTH SHEET.

Item 9:

I-9 originates in SAIC's table S-1 (25.50 / 35.88) and is recommended by SAIC for an additional investigation. I-9 is located at 29°18.~~425~~'N, 094°35.~~598~~'W, and is the correlation of side scan targets 18 (height 9.5') and 17 (height 11.8'). Reconnaissance multibeam heights were 9.5'and 9.4', respectively. I-9 is located on the east edge of the Galveston Ship Channel Inbound Lane. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 06, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	32 feet 25.33
Latitude:	29 18.~~4221~~N
Longitude:	094 35.~~5971~~W 35.83
File:	hbmba99194.d19
Time:	17:04:55

Comparison with the Chart and Charting Recommendations: Item 9 is charted as a 35 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 35 Obstn with 32 Obstn, and retention of the dotted circle, blue tint. CONCUR WITH CLARIFICATION
32. OBSTN IS SHOWN ON CHART 11323, 58TH ED., JUNE, 24/00. NO CHANGE IN CHARTING.
The charted 35 Obstn PA at 29 18 42N 094 36 00W appears to be a miss plot using degrees, minutes, seconds instead of SAIC's reported position in degrees and minutes of 29 18.425N 094 35.597W. Recommend that this charted 35 Obstn PA, dotted circle, blue tint, be removed. CONCUR
INCORRECTLY CHARTED THRU LOCAL NOTICE TO MARINERS 41 (LNM 41/98).
ITEM REMOVED AND NOT SHOWN ON CHART 11323, 31ST. ED., JUNE 13, 2001.
Comparison with the Smooth Sheet: Recommend addition of 32 Obstr to the smooth sheet. CONCUR

Item 10: SEE ALSO P. 17, SECTION N. OF DESCRIPTIVE REPORT FOR ADDITIONAL INFORMATION.

I-10 originates in SAIC's table S-1 (54.78 / 26.22) and is recommended by SAIC for an additional investigation. I-10 is located at 29°14.~~913~~'N, 094°29.~~437~~'W, and did not correlate with another target from the 2nd 100% side scan sonar. The corresponding side scan target 8 had a height of 6.2'. Reconnaissance multibeam height was 7.1'. I-10 is located approximately 300m north-northwest of a charted OBSTN PA (AWOIS # 8920). Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	45 feet 54.79	49 feet 55.16
Latitude:	29 14.~~9132~~ N	29 14.~~9193~~ N
Longitude:	094 29.~~4374~~ W26.24	094 29.~~4282~~ W25.69
File:	hbmba99194.d38	hbmba99194.d38
Time:	21:18:57	21:19:02

Comparison with the Chart and Charting Recommendations: Item 10 is charted as a 44 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 44 Obstn with 45 Obstn, and retention of the dotted circle, blue tint. The second obstruction, 49 feet, is about 20 meters distant to the northeast and is covered by the above symbol. Recommend removal of the charted Obstn PA (AWOIS # 8920) from the chart. CONCUR

Comparison with the Smooth Sheet: This item is within an area of 50-foot soundings on the smooth sheet. Recommend addition of 45 Obstr to the smooth sheet. CONCUR

DELETE 44: OBSTN 29-14-54.78N 94-29-26.22W 45: OBSTN 29-14-54.79N 94-29-26.24W

Item 11:

I-11 originates in SAIC's table S-1 (04.56 / 58.35) and is recommended by SAIC for an additional investigation. I-11 is located at 29°13.~~076'~~N, 094°26.~~973'~~W, and is the correlation of side scan targets 10 (height 2.0') and 99 (height 2.6'). Only target 10 was detected in the reconnaissance multibeam, with a respective height of 4.7'. I-11 is located on the east edge of the Galveston Ship Channel Inbound Lane, at the southeast end of the survey area. SAIC noted that this feature could be an exposed pipeline. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	50 feet 04.47
Latitude:	29 13.~~0745~~ N 58.22
Longitude:	094 26.~~9704~~ W
File:	hbmba99194.d34
Time:	20:24:33

Comparison with the Chart and Charting Recommendations: Item 11 is charted as a 48 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 48 Obstn with 50 Obstn, and retention of the dotted circle, blue tint. This item still appears to be an exposed section of pipeline. DO NOT CONCUR DURING OFFICE PROCESSING ITEM WAS DEEMED EXPOSE PIPELINE. *IT IS RECOMMENDED THAT THE 50 OBSTN BE SHOWN AS A 50 SOUNDING, NO OBSTN

Comparison with the Smooth Sheet: This item is within an area of 51-foot soundings on the smooth sheet. Recommend addition of 50 Obstr to the smooth sheet because it may be an exposed pipeline.

DELETE 48: OBSTN DO NOT CONCUR *

Item 12:

I-12 originates in SAIC's table S-1 (29.70) and (54.48) and is recommended by SAIC for an additional investigation. I-12 is located at 29°14.~~495~~'N, 094°30.~~908~~'W, and did not correlate with another target from the 2nd 100% side scan sonar. The corresponding side scan target 21 had a height of 6.6'. Reconnaissance multibeam height was 5.4'. I-12 is located in the center of the Galveston Ship Channel Inbound Lane. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	46 feet 29.69
Latitude:	29 14.~~4949~~ N
Longitude:	094 30.~~9093~~ W 54.56
File:	hbmba99194.d35
Time:	20:54:05

Comparison with the Chart and Charting Recommendations: Item 12 is charted as a 46 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend retention of the charted 46 Obstn as charted. CONCUR RETAIN CHARTED 46' OBSTN

Comparison with the Smooth Sheet: This item is within an area of 50-foot soundings on the smooth sheet. Recommend addition of 46 Obstr to the smooth sheet. CONCUR

Item 15:

I-15 originates in SAIC's table S-1 (46.80) and (47.40) and is recommended by SAIC for an additional investigation. I-15 is located at 29°21.~~780~~'N, 094°31.~~790~~'W, and is the correlation of side scan targets 125 (height 3.3') and 1 (height 4.6'). Reconnaissance multibeam heights were 6.2' and 6.8', respectively. I-15 is located in the northeast comer of the survey area, approximately 600m south-southeast from a charted OBSTN cleared to 34'(AWOIS #388). Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23,1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	36 feet 46.68
Latitude:	29 21.~~7780~~ N
Longitude:	094 31.~~7901~~ W 47.41
File:	hbmba99194.d51
Time:	23:18:08

Comparison with the Chart and Charting Recommendations: Item 15 is charted as a 32 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 32 Obstn with ~~35~~ 36 Obstn, and retention of the dotted circle, blue tint. CONCUR

DELETE 32; OBSTN CHART 36; OBSTN

Charted Obstn cleared to 34 with dotted circle and blue tint (AWOIS #388) should be removed from the chart. Item 15, the charted 35 Obstn just to the west, and the 35 Obstr found under item AWOIS #388 were the only features found within a 1500 meter radius around the charted position of the Obstn cleared to 34-feet. CONCUR WITH CLARIFICATION SEE AWOIS 388 P. 29 OF THIS REPORT FOR CHARTING RECOMMENDATION.

Comparison with the Smooth Sheet: This item is within an area of 39-foot soundings on the smooth sheet. Recommend addition of 36 Obstr to the smooth sheet. CONCUR

Item 17:

I-17 originates in SAIC's table S-1 (50.58 / 37.20) and is recommended by SAIC for an additional investigation. I-17 is located at 29°17.~~843'~~N, 094°29.~~620'~~W, and did not correlate with another target from the 2nd 100% side scan sonar. The corresponding side scan target 4 had a height of 10.2'. Reconnaissance multibeam height was 13.1'. I-17 is located within the Fairway Anchorage Area, in the eastern portion of the survey area. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. There was no obstruction detected in this investigation. The area is a flat bottom of 46 and 47-foot depths.

Least depth:	46 feet 50.58
Latitude:	29 17.~~843~~ N 37.14
Longitude:	094 29.~~619~~ W
File:	hbmba99194.d45
Time:	22:09:40

Comparison with the Chart and Charting Recommendations: Item 17 is charted as a 35 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend removal of the charted 35 Obstn, dotted circle, blue tint. CONCUR

DELETE 35; OBSTN

Comparison with the Smooth Sheet: This item is within an area of 46 to 47-foot soundings on the smooth sheet. Recommend no changes to the smooth sheet. CONCUR

Item 19:

I-19 originates in SAIC's table S-1 (23.76 / 07.68) and is recommended by SAIC for an additional investigation. I-19 is located at 29°18.~~396'~~N, 094°31.~~128'~~W, and is the correlation of side scan targets 123 (height 9.5') and 7 (height 6.9'). Reconnaissance multibeam heights were 9.0' and 3.1, respectively. I-19 is located in the Fairway Anchorage Area. Upon inspection of the side scan image, NOAA has determined that

this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23,1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	39 feet 23.53
Latitude:	29 18.~~3922~~ N
Longitude:	094 31.~~1308~~ W 07.85
File:	hbmba99194.d48
Time:	22:28:47

Comparison with the Chart and Charting Recommendations: Item 19 is charted as a 38 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 38 Obstn with 39 Obstn, and retention of the dotted circle, blue tint. CONCUR WITH CLARIFICATION
DELETE 38 OBSTN CHART 39 OBSTN
Comparison with the Smooth Sheet: This item is within an area of 45 to 46-foot soundings on the smooth sheet. Recommend addition of 39 Obstr to the smooth sheet. CONCUR

Item 20:

I-20 originates in SAIC's table S-1 (16.02 / 50.22) and is recommended by SAIC for an additional investigation. I-20 is located at 29°15.~~267~~'N, 094°28.~~837~~'W. Corresponding side scan target 8 has a height of 3.9'. Reconnaissance multibeam height is 5.7'. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	46feet 16.05
Latitude:	29 15.~~2675~~ N 50.36
Longitude:	094 28.~~8393~~ W
File:	hbmba99194.d39
Time:	21:24:00

Comparison with the Chart and Charting Recommendations: Item 20 is charted as a 44 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 44 Obstn with 46 Obstn, and retention of the dotted circle, blue tint. CONCUR WITH CLARIFICATION
DELETE 44 OBSTN CHART 46 OBSTN
Comparison with the Smooth Sheet: This item is within an area of 40 to 50-foot soundings on the smooth sheet. Recommend addition of 46 Obstr to the smooth sheet.

Item 23:

I-23 originates in SAIC's table S-1 (23.52 / 42.18) and is recommended by SAIC for an additional investigation. I-23 is located at 29°18.~~392~~'N, 094°37.~~703~~'W, and is the correlation of side scan targets 97 (height 3.9'), 28 (height 3.0') and 53 (height 3.6'). Reconnaissance multibeam heights for targets 28 and 53 were 5.0' and 5.0', respectively. I-23 is located near Buoy "GB". NOAA has determined that this item justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998 (as possible old buoy sinker).

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. This investigation revealed no obstruction in the area. It is likely that the old buoy sinker was removed after the Danger to Navigation Report was submitted.

Least depth:	42 feet 23.40
Latitude:	29 18.~~39~~N 42.00
Longitude:	094 37.~~70~~W
File:	hbmba99194.d10
Time:	14:00:13

Comparison with the Chart and Charting Recommendations: Item 23 is within the area covered by the charted 38 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Obstruction appears to have been removed. Recommend removal of the charted 38 Obstn, dotted circle, blue tint. See also Item 46, FOR CHARTING RECOMMENDATION

Comparison with the Smooth Sheet: This item is within an area of 42 to 43-foot soundings on the smooth sheet. Recommend no changes. CONCUR

Item 31:

I-31 originates in SAIC's table S-1 (54.06 / 16.26) and is recommended by SAIC for an additional investigation. I-31 is located at 29°15.~~901~~'N, 094°35.~~271~~'W, and is the correlation of side scan targets 65 (height 0.0') and 58 (height 1.0'). Reconnaissance multibeam heights were 3.8' and 3.5', respectively. I-31 is located in the Galveston Ship Channel Outbound Lane. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the item was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. There was no obstruction detected in this investigation. The area is a flat bottom of 48-foot depths.

Least depth:	48 feet 54.06
Latitude:	29 15.~~901~~N
Longitude:	094 35.~~271~~ W 16.26
File:	hbmba99194.d27
Time:	18:31:23

Comparison with the Chart and Charting Recommendations: Item 31 is charted as a 46 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend removal of the charted 46 Obstn, dotted circle, blue tint. CONCUR DELETE 46' OBSTN

Comparison with the Smooth Sheet: This item is within an area of 48 foot soundings on the smooth sheet. Recommend no changes. CONCUR

Item 32: 18.54 15.78

I-32 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-32 is located' at 29°13.~~309'~~ N, 094°34.~~263'~~ W. I-32 corresponds to side scan target 77 (height 1.3'), with a reconnaissance multibeam height of 9.8'. I-32 was not detected in the 2nd 100% side scan coverage. I-32 is located 350m southwest of the Galveston Ship Channel Outbound Lane. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. There was no obstruction detected in this investigation. The area is a flat bottom of 51-foot depths.

Least depth:	51 feet 18.54
Latitude:	29 13.~~309~~N 15.78
Longitude:	094 34.~~263~~ W
File:	hbmba99194.d30
Time:	19:12:31

Comparison with the Chart and Charting Recommendations: Item 32 is charted as a 42 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend removal of the charted 42 Obstn, dotted circle, blue tint. CONCUR DELETE 42' OBSTN

Comparison with the Smooth Sheet: This item is within an area of 51-foot soundings on the smooth sheet. Recommend no changes. CONCUR

Item 33: 10.86 49.86

I-33 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-33 is located at 29°12.~~181~~'N, 094°32.~~831~~'W. I-33 corresponds to side scan target 80 (height 3.0'), with a reconnaissance multibeam height of 4.1'. I-33 was not detected in the 2nd 100% side scan coverage. I-33 is located 150m southwest of the Galveston Ship Channel Outbound Lane. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	50 feet 1787 – 10.72
Latitude:	29 12.~~7190~~ N
Longitude:	094 32.~~8259~~ W 49.55
File:	hbmba99194.d32
Time:	19:31:57

Comparison with the Chart and Charting Recommendations: Item 33 is charted as a 49 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 49 Obstn with 50 Obstn, and retention of the dotted circle, blue tint. CONCUR DELETE 49: OBSTN ADD 50: OBSTN

Comparison with the Smooth Sheet: This item is within an area of 52-foot soundings on the smooth sheet. Recommend addition of 50 Obstr to the smooth sheet. CONCUR

Item 39:

52.56 10.80

I-39 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-39 is located at 29°19.~~876~~'N, 094°34.~~180~~'W. I-39 corresponds to side scan target 112 (height 1.6'), with a reconnaissance multibeam height of 2.2'. I-39 was not detected in the 2nd 100% side scan coverage. I-39 is located within the Fairway Anchorage Area. Upon inspection of the side scan image (noting the "man-made" appearance), NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. There was no obstruction detected in this investigation. The area is a flat bottom of 40 to 41-foot depths. A depression (about one foot deep) was found at 29 19.8824N 094 34.1850W.

Least depth:	40 feet 52.56
Latitude:	29 19.~~876~~ N 10.80
Longitude:	094 34.~~180~~ W
File:	hbmba99194.d22
Time:	17:30:01

Comparison with the Chart and Charting Recommendations: Item 39 was not charted. Recommend application of soundings from the smooth sheet. CONCUR

Comparison with the Smooth Sheet: This item is within an area of 40 to 41-foot soundings on the smooth sheet. Recommend no changes. CONCUR

Item 42:

I-42 originates in SAIC's table S-1 (26.82 / 22.74) and is recommended by SAIC for an additional investigation. I-42 is located- at 29°16.~~447~~'N, 094°29.~~379~~'W. I-42cbrresponds to side scan target 118 (height 1.3'), with a reconnaissance multibeam height of 5.1'. I-42 was not detected in the 2nd 100% side scan coverage. I-42 is located within the Fairway Anchorage Area. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	47 feet 26.94
Latitude:	29 16.~~4498~~ N 23.18
Longitude:	094 29.~~3864~~ W
File:	hbmba99194.d43
Time:	21:49:16

Comparison with the Chart and Charting Recommendations: Item 42 is charted as a 44 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 44 Obstn with 47 Obstn, and retention of the dotted circle, blue tint. DO NOT CONCUR DELETE 44 OBSTN SURROUNDING DEPTHS ARE 47 AND 48 FEET. IT IS RECOMMENDED THAT THE 47 OBSTN NOT BE CHARTED

Comparison with the Smooth Sheet: This item is within an area of 48-foot soundings on the smooth sheet. Recommend addition of 47 Obstr to the smooth sheet~~*~~ 47 AND

* DO NOT CONCUR SHOW ON SMOOTH SHEET AS 47 FOOT SOUNDING.

Item 43:

I-43 originates in SAIC's table S-1 (15.72 / 46.92) and is recommended by SAIC for an additional investigation. I-43 is located at 29°18.~~262~~'N, 094°30.~~782~~'W. I-43 corresponds to side scan target 120 (height 1.0'), with a reconnaissance multibeam height of 4.5'. I-43 was not detected in the 2nd 100% side scan coverage. I-43 is located within the Fairway Anchorage Area. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	44 feet 15.78
Latitude:	29 18.~~2630~~ N 47.38
Longitude:	094 30.~~7896~~ W
File:	hbmba99194.d47
Time:	22:33:18

Comparison with the Chart and Charting Recommendations: Item 43 is charted as a 42 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 42 Obstn with 44 Obstn, and retention of the dotted circle, blue tint. CONCUR DELETE 42 OBSTN CHART 44 OBSTN

Comparison with the Smooth Sheet: This item is within an area of 46-foot soundings on the smooth sheet. Recommend addition of 44 Obstr to the smooth sheet. CONCUR

Item 44:

I-44 originates in SAIC's table S-1 (53.82 / 37.08) and is recommended by SAIC for an additional investigation. I-44 is located at 29°16.~~897'~~N, 094°34.~~618'~~W. I-44 corresponds to side scan target 127 (height 1.6'), with a reconnaissance multibeam height of 6.6'. I-44 was not detected in the 2nd 100% side scan coverage. I-44 is located within the Galveston Ship Channel Inbound Lane. Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	46 feet 53.82
Latitude:	29 16.~~897~~ N 37.08
Longitude:	094 34.~~618~~ W
File:	hbmba99194.d24
Time:	18:16:09

Comparison with the Chart and Charting Recommendations: Item 44 is charted as a 41 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend removal of the charted 41 Obstn, dotted circle, blue tint. CONCUR DELETE 41 OBSTN

Comparison with the Smooth Sheet: This item is within an area of 46-foot soundings on the smooth sheet. Recommend no changes. CONCUR

Item 45:

I-45 originates in SAIC's table S-1 (49.50 / 31.62) and is recommended by SAIC for an additional investigation. I-45 is located at 29°15.~~825'~~N, 094°29.~~527'~~W. I-45 was not detected in the 200% side scan coverage, however, a contact with a height of 6.3' was noted within the reconnaissance multibeam. I-45 is located within the Fairway Anchorage Area. NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two sets of orthogonal lines with the contact's position near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	46 feet 48.62
Latitude:	29 ~~18.8104~~25N
Longitude:	094 29.~~5276~~ W31.66
File:	hbmba99194.d42
Time:	21:42:51

Comparison with the Chart and Charting Recommendations: Item 45 is charted as a 44 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Recommend replacement of the charted 44 Obstn with 46 Obstn, and retention of the dotted circle, blue tint. CONCUR DELETE 44: OBSTN CHART 46: OBSTN

Comparison with the Smooth Sheet: This item is within an area of 49foot soundings on the smooth sheet. Recommend addition of 46 Obstr to the smooth sheet. CONCUR

Item 46:

I-46 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-46 is located at 29°18.~~408~~'N, 094°37.~~689~~'W. I-46 was not detected in the 200% side scan coverage, however, a contact with a height of 4.8' was noted within the reconnaissance multibeam. I-45 is located in the vicinity of Buoy "GB". NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two sets of orthogonal lines with the contact's position near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. This investigation revealed no obstruction in the area. It is likely that the old buoy sinker was removed after the Danger to Navigation Report was submitted.

Least depth:	42 feet 24.48
Latitude:	29 18.~~408~~ N 41.34
Longitude:	094 37.~~689~~ W
File:	hbmba99194.d12
Time:	14:00:20

Comparison with the Chart and Charting Recommendations: Item 46 is within the area covered by the charted 38 Obstn, dotted circle, blue tint, based on SAIC's Report of Danger to Navigation with the least depth determined from reconnaissance multibeam data. Obstruction appears to have been removed. Recommend removal of the charted 38 Obstn, dotted circle, blue tint. See also Item 23. CONCUR DELETE 38: OBSTNS

Comparison with the Smooth Sheet: This item is within an area of 42 to 43-foot soundings on the smooth sheet. Recommend no changes. CONCUR

Item 47:

I-47 originates in SAIC's table S-1 and is recommended by SAIC for an additional investigation. I-47 is located at 29°18.~~351~~ 21.06'N, 094°37.~~597~~ 35.82'W, and is the correlation of side scan targets 134 (height 3.3') and 135 (height 3.9'). Reconnaissance multibeam heights were 5.3' and 5.3', respectively. I-47 is located in the vicinity of Buoy "GB". Upon inspection of the side scan image, NOAA has determined that this contact justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir. Note: SAIC reported this item as a danger to navigation on October 23, 1998.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	34 feet 21.02	
Latitude:	29 18.~~3503~~ 35.89 N	
Longitude:	094 37.~~5981~~ W	
File:	hbmba99194.d18	hbmba99194.d15
Time:	16:47:40	15:29:36

Comparison with the Chart and Charting Recommendations: Item 47 was reported by SAIC as a 39 Obstr with the least depth determined from reconnaissance multibeam data. This item was not charted because of its proximity to apparent shoaler obstructions. Because this series of item investigations has resulted in changes to depths, and has revealed that some obstructions have been removed, SAIC now recommends charting this 34 Obstn with dotted circle, blue tint. CONCUR 34 OBSTN SHOWN ON CHART 11323 58TH ED., JUNE 24, 00.

Comparison with the Smooth Sheet: Recommend addition of 34 Obstr to the smooth sheet. CONCUR RETAIN 34' OBSTN

AWOIS Item 366:

AWOIS Item 366 is addressed in Section N of SAIC's Descriptive Report, and is recommended by SAIC for an additional investigation. The item is a charted obstruction cleared to 40', located at 29°16' 50"N, 094°32' 51"W. In 1973 RU/HE reported this as a steel skeleton tower laying on its side with a hang at 42' cleared to 41'. Present survey water depths are 44, and side scan reveals an apparent lattice tower section, which falls between the standard and reconnaissance portions of the multibeam swath. NOAA has determined that this item justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam, specifically two orthogonal lines crossing the contact near nadir.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX.

Least depth:	~~40~~ 43 feet 51.76
Latitude:	29 16.~~8627~~ 50.93 N
Longitude:	094 32.~~8489~~ W
File:	hbmba99194.d23
Time:	17:55:41

Comparison with the Chart and Charting Recommendations: Recommend removal of the charted 40 Obstn cleared to 40 feet, dotted circle, blue tint, and adding the 43 Obstn, dotted circle, blue tint as determined in this investigation. CONCUR CHART 43 OBSTN DELETE 40 OBSTN

Comparison with the Smooth Sheet: Recommend changing the 44 Obstr to 43 Obstr on the smooth sheet. CONCUR

AWOIS Item 371:

AWOIS Item 371 is addressed in Section N of SAIC's Descriptive Report, and is recommended by SAIC for an additional investigation. The item is a charted obstruction cleared to 39', located at 29°17' 49"N, 094°31' 58"W. In 1973 RU/HE reported this to be a solid I-beam with a 12" flange driven vertically into the bottom, and protruding 6' off the bottom in 46'of water. This item was not detected in the 200% side scan or standard portion of the multibeam swath. NOAA has determined that this item justifies additional work by SAIC. Additional investigation shall be conducted using shallow water multibeam and side scan sonar. Side scan coverage shall be 200% using the 50m-range scale, and the search radius shall be 100m around the contact position. Multibeam shall be acquired concurrently with side scan.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. No feature detected in the 200% side scan coverage or in the multibeam coverage.

Least depth:	46 feet 49.02
Latitude:	29 17.~~817~~ N
Longitude:	094 31.~~966~~ W 57.96
File:	hbmba99195.063
Time:	14:40:36

Comparison with the Chart and Charting Recommendations: Recommend removal of the charted 39 Obstn cleared to 39 feet, dotted circle, blue tint, and adding soundings from the smooth sheet. CONCUR DELETE 39 OBSTN

Comparison with the Smooth Sheet: Recommend no changes. CONCUR

AWOIS Item 388:

AWOIS Item 388 is addressed in Section N of SAIC's Descriptive Report (SAIC lists item as "AWOIS 347"), and is recommended by SAIC for the obstruction to be removed from the chart. The item is a charted obstruction cleared to 34', located at 29°22' 00"N, 094°32 00"W. NM23/65 reported this to be an obstruction (tank) 20' long and 10' high. This item was not detected in the 200% side scan and multibeam swath. NOAA has determined that this item justifies additional work by SAIC. Additional investigation shall be conducted using side scan sonar. Side scan coverage shall be 200%, encompassing the area within a 1500m radius around 29°22' 00"N, 094°32 00"W, outside of the original survey area. If the item in question is detected with side scan, multibeam data shall be acquired, specifically two orthogonal lines crossing the contact near nadir. If additional significant side scan contacts are detected within the 1500m radius. SAIC shall identify these items for additional potential investigations.

Method of Investigation: Shallow water multibeam orthogonal lines crossed with the item near nadir.

Results of Investigation: Full coverage of the feature was obtained in both multibeam swaths. Data were fully corrected, including application of verified tides from station 877-1081, Sabine Offshore, TX. There was only one feature discovered during this item investigation. Item 15, the charted 35 Obstn just to its west, and the 35 Obstr found under item AWOIS #388 were the only features found within a 1500 meter radius around the charted position of the charted 34 Obstn cleared to 34-feet.

Least depth:	35feet 18.01
Latitude:	29 22.~~3002~~ N
Longitude:	094 32.~~5706~~ W34.24
File:	hbmba99197.d09
Time:	05:33:37

Comparison with the Chart and Charting Recommendations: Recommend charted 34 Obstn cleared to 34 with dotted circle and blue tint (AWOIS #388) be removed from the chart. Recommend adding 35 Obstn, dotted circle, blue tint at this item position. CONCUR
DELETE 34 OBSTN CHART 35 OBSTN
Comparison with the Smooth Sheet: This new feature is outside the limits of the H10835 survey; however, it could be added to the smooth sheet as a 35 Obstr. Soundings of 37-feet surround the obstruction. CONCUR

O. ADEQUACY OF SURVEY SEE ALSO EVALUATION REPORT.

Not applicable.

P. AIDS TO NAVIGATION

Not applicable.

Q. STATISTICS

Survey statistics are as follows:

40	Linear nautical miles of sounding lines (multibeam and side scan)
5	Linear nautical miles of sounding lines (multibeam only)
4	Number of sound velocity casts
26	Number of items investigated

R. MISCELLANEOUS SEE ALSO EVALUATION REPORT.

Not applicable.

S. RECOMMENDATIONS

See Section N for recommendations.

T. REFERRAL TO REPORTS

Descriptive Report, H10835, 26 February 1999.

Science Applications International Corporation
An Employee-Owned Company
221 Third Street
Newport, RI 02840
(401) 847-4210

September 11, 1999

LETTER OF APPROVAL

REGISTRY NUMBER H10835

This report and data are respectfully submitted.

Field operations contributing to the accomplishment of survey H10835, Item Investigations, were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and data have been closely reviewed and are considered complete and adequate as per the Statement of Work.

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Walter S. Simmons
Hydrographer
September 11, 1999

APPENDIX C: LIST OF HORIZONTAL CONTROL STATIONS

Geodetic station name: CG 20
Year established: 1974
Source of position: Published in National Geodetic Survey database.
Location: Pier 15:
Latitude: 29 18 49.0409
Longitude: 094 47 10.5748
Elevation: 9.0 feet

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

H-10835

Name on Survey	A ON CHART NO. 1325, 1324	B ON PREVIOUS SURVEY NO.	C ON U.S. QUADRANGLE MAPS	D FROM LOCAL INFORMATION	E ON LOCAL MAPS	F P.O. GUIDE OR MAP	G RAND MCNALLY ATLAS	H U.S. LIGHT LIST	K	
GALVESTON (title)	X		X							1
GULF OF MEXICO	X		X							2
TEXAS (title)	X		X							3
										4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
										16
										17
										18
										19
										20
										21
										22
										23
										24
										25

Dennis J. Romesburg

SEP 13 2000

NOAA FORM 76-155 SUPERSEDES C&GS 197

08/21/2001

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10835

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	57384
NUMBER OF SOUNDINGS	57384

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	144.0	10/08/1999
VERIFICATION OF FIELD DATA	649.0	03/16/2001
QUALITY CONTROL CHECKS	16.0	
EVALUATION AND ANALYSIS	284.0	
FINAL INSPECTION	32.0	11/06/2000
COMPILATION	178.0	06/19/2001
TOTAL TIME	1303.0	

ATLANTIC HYDROGRAPHIC BRANCH APPROVAL 08/20/2001

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10835 (1998-99)

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. The smooth sheet has been annotated with ticks showing the computed mean shift between the NAD 83 and the North American Datum of 1927 (NAD 27).

To place this survey on the NAD 27, move the projection lines 0.857 seconds (13.195 meters or 0.66 mm at the scale of the survey) north in latitude, and 0.682 seconds (9.200 meters or 0.46 mm at the scale of the survey) west in longitude.

L. JUNCTIONS

H10805 (1998-99) to the west
H10850 (1998-99) to the southeast

A standard junction was effected between the present survey and surveys H10805 (1998-99) and H10850 (1998-99). There are no junctional surveys to the north or east. Present survey depths are in harmony with the charted hydrography to the north and east.

M. 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.

N. COMPARISON WITH CHARTS 11324 (30th Edition, Mar 28/98)
11323 (56th Edition, Mar 28/98)
11323 (57th Edition, Mar 27/99)
13003 (44th Edition, Oct 9/99)

1. **Hydrography**

The charted hydrography originates with the prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in the Descriptive Report. Attention is directed to the following:

1) The following charted obstructions originate with the present survey:

Depth (ft/m)	Latitude (N)	Longitude (W)
35/10[7]	29°21'49.02"	94°32'04.64"
50/15[2]	29°11'40.15	94°28'48.70
48/15	29°14'27.34"	94°26'51.84"
48/15	29°14'32.16"	94°30'23.04"
47/14[3]	29°14'56.22"	94°27'12.66"
34/10[4]	29°18'21.02"	94°37'35.89"

It is recommended that the features be retained as shown on NOS charts 11323 58th, Ed., June 24, 2000 and 11324 31st, Ed., Jan. 13, 2001.

2) A charted obstruction, with a depth of 46 feet (14 m), in Latitude 29°15'27.97"N, Longitude 94°33'55.76"W, originates with the present survey as a danger to navigation. The depth on the danger to navigation was in error. The correct depth is 45 feet (13[7] m). It is recommended that the feature be deleted. It is also recommended that the feature charted as shown on the present survey.

3) A charted obstruction, with a depth of 50 feet, (15[2] m), in Latitude 29°12'48.5"N, Longitude 94°26'19.0"W, was investigated by subsequent survey H10850 (1998-99). A charting recommendation will be discussed in the Descriptive Report or Evaluation Report for H10850 (1998-1999). No change in charting is recommended.

4) A charted platform, in Latitude 29°12'49"N, Longitude 94°26'24"W, was investigated by subsequent survey H10850 (1998-99). A charting recommendation will be made in the Descriptive Report or Evaluation Report for H10850 (1998-1999). No change in charting is recommended.

5) A charted obstruction, with a depth of 43 feet, (13^1 m) in Latitude 29°18'26.35"N, Longitude 94°33'55.74"W, originates with the present survey. During office processing the feature was examined and deemed insignificant. Surrounding depths are 43 to 44 feet (13^1 to 13^4 m). It is recommended that the charted feature be deleted, and soundings from present survey be charted.

6) A charted unknown obstruction, PA, in Latitude 29°18'24"N, Longitude 94°34'49, originates with Local Notice to Mariners 9 of 2000 (LNM 9/00) and was charted subsequent to the present survey. No change in charting status is recommended.

7) A charted obstruction, PA, in Latitude 29°18'54"N, Longitude 94°38'42, originates with an unknown source and is not considered verified or disproved by the present survey. It is recommended that the charted feature be retained on chart 11323, 58th Edition, 24 June, 2000. It is also recommended that the feature be charted as shown on chart 11324.

8) A charted platform, in Latitude 29°13'18"N, Longitude 94°27'13"W, originates with an unknown source. The feature was charted subsequent to present survey. No change in charting status is recommended.

9) An uncharted obstruction, with a depth of 42 feet (12^8 m), in Latitude 29°15'57.33"N, Longitude 94°31'27.57"W, originates with the present survey. The feature is in the same location as a charted platform, in Latitude 29°15'57"N, Longitude 94°31'28"W. It is recommended that the obstruction not be charted.

10) An uncharted obstruction, with a depth of 45 feet (13^7 m), in Latitude 29°15'29.10"N, Longitude 94°33'54.90"W, originates with the present survey. The feature is in the vicinity of the obstruction discussed in section N.2. of this report. It is recommended that the feature not be charted.

11) The following uncharted obstructions originate with the present survey. During office processing these items were deemed insignificant.

Depth (ft/m)	Latitude (N)	Longitude (W)	Surrounding Depth (ft)
41/12[5]	29°17'23.68"	94°36'53.51"	40 Obstn
42/12[8]	29°18'49.52"	94°33'46.26"	42-43
47/14[3]	29°16'45.63"	94°29'28.82"	47-48
48/15	29°15'29.66"	94°33'57.11"	45 Obstn
41/12[5]	29°17'23.70"	94°36'53.52"	39 Obstn
44/13[4]	29°17'23.22"	94°36'56.28"	39 Obstn
45/13[7]	29°17'22.20"	94°36'57.72"	39 Obstn
53/16[2]	29°11'41.34"	94°28'47.46"	53
46/14	29°15'29.88"	94°33'56.52"	45 Obstn
54/16[2]	29°10'49.14"	94°31'13.74"	54-55
50/15[2]	29°15'14.88"	94°27'48.90"	49-50
39/11[9]	29°18'23.28"	94°37'41.88"	34 Obstn
41/12[5]	29°18'17.94"	94°37'40.68"	34 Obstn
44/13[4]	29°17'20.34"	94°36'52.44"	39 Obstn
39/11[9]	29°18'20.04"	94°37'40.38"	34 Obstn
39/11[9]	29°18'23.52"	94°37'42.18"	34 Obstn
39/11[9]	29°18'21.06"	94°37'35.82"	34 Obstn
44/13[4]	29°16'51.36"	94°32'51.24"	43 Obstn
41/12[5]	29°18'18.42"	94°37'40.86"	34 Obstn
35/10[7]	29°18'25.50"	94°35'35.88"	32 Obstn

No change in charting status is recommended.

12) An uncharted obstruction, with a depth of 45 feet, (13[7] m), in Latitude 29°16'46.86"N, Longitude 94°35'35.85"W, originates with the present survey and was charted as an obstruction, with a depth of 46 feet, (14 m), in Latitude 29°16'46.68"N, Longitude 94°35'35.46"W. During office processing the item was examined and it was determined that the feature was the anchor block for buoy Y "K". Surrounding depths are 46 to 47 (14 to 14[3] m) feet. It is recommended the charted feature be deleted from the chart. It is also recommended that the buoy block not be charted.

2. **Controlling Depths**

1) In the following areas, conflicts exist between the charted controlling depths of 44 ft in Galveston Bay Entrance Channel and present survey soundings:

Present Depth (ft)	Latitude (N)	Longitude (W)
41	29°18'54.0"	94°38'34.5"
41	29°18'47.5"	94°38'22.0"
43	29°18'41.0"	94°38'10.5"
43	29°18'33.5"	94°37'56.0"
43	29°18'29.0"	94°37'47.0"

Except as noted above 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. No additional work is recommended.

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 compiled using the present survey data:

11323 (58th Edition, June 24/00)
11324 (31st Edition, Jan 13/01)

Norris Wike
Cartographer
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H10835

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.

Date: 21 AUGUST 2001

Norris A. Wike
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.

Date: 21 August 2001

James S. Verlaque
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch

****

Final Approval:

Approved: Samuel P. De Bow, Jr. Date: 1/4/02

Samuel P. De Bow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

NOAA FORM 61-29
(12-71)

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

REFERENCE NO.
N/CS33-44-01

LETTER TRANSMITTING DATA

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

- [ ] ORDINARY MAIL
- [ ] AIR MAIL
- [ ] REGISTERED MAIL
- [X] EXPRESS
- [ ] GBL (Give number)_____

TO:

NOAA/National Ocean Service
Chief, Data COntrol GROUP
N/CS3X1, Station 6813, SSMC3
1315 East-West Highway
Silver Spring, MD 20910

DATE FORWARDED
08/30/2001

NUMBER OF PACKAGES
2

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.

H10835 (1998-99)

1 TUBE CONTAINING:	1	MYLAR H-DRAWING FRO CHART #11323
	2	PAPER COMPOSITE DRAWINGS FOR CHART #11323
	1	MYLAR H-DRAWING FRO CHART #11324
	1	PAPER COMPOSITE DRAWING FOR CHART #11324
	1	MYLAR SMOOTH SHEET H10835
1 BOX CONTAINING:	1	ENVELOPE CONTAINING DESCRIPTIVE REPORT H10835
	1	DRAWING HISTORY 11323
	1	DRAWING HISTORY 11324
	1	NOAA FORM 75-96

FROM: (Signature)
NORRIS A. WIKE

RECEIVED THE ABOVE
(Name, Division, Date)

Return receipted copy to:

ATLANTIC HYDROGRAPHIC BRANCH
439 WEST YORK STREET
NORFOLK, VIRGINIA
23510-1114

NOAA FORM 61-29 SUPERCEDES FORM C AND GS 413 WHICH MAY BE USED.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1988 - 554-006-61309

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H10835

INSTRUCTIONS

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.
1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
11324	5/04/01	[signature]	Full ~~Part Before~~ After Marine Center Approval Signed Via FULL APPLICATION
			Drawing No. OF SOUNDINGS AND CURVES FROM SMOOTH
			SHEET
11323	5/21/01	[signature]	Full ~~Part Before~~ After Marine Center Approval Signed Via FULL APPLICATION
			Drawing No. OF SOUNDINGS AND CURVES FROM SMOOTH
			SHEET THRU CHART 11324
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.