H10803

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 A

Registry No.: H10803

LOCALITY

State: Louisiana

General Locality: Gulf of Mexico

Locality: 11 NM SSE of Calcasieu Pass

1998

CHIEF OF PARTY
Art Kleiner, Hydrographer in Charge

NOAA FORM 77-28 (11-72)

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

HYDROGRAPHIC TITLE SHEET

REGISTRY NUMBER: H-10803

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

FIELD NUMBER: Sheet A

State: Louisiana

General Locality: Gulf of Mexico

Locality: 11 miles S-SE of Calcasieu Pass

Scale: 1:20,000 Date of Survey: May 7 - August 5, 1998

Instructions Dated: October 23, 1997 Project Number: OPR-K171-KR

Vessel: *M/V Inez McCall*

Chief of Party: Art Kleiner, ~~ACSM Certified~~ Hydrographer ~~#180~~ IN Charge

Surveyed by: T. Richards, S. Croft, P. Melancon, W. Bourque, J. Parsons, T. Creswell, D.Fitts, T. Patro, T. George, J. McCullogh, D. Warren, H. Langill, J. Lynch, S. Alleman, K. Buffitt, S. Melancon, M. Legros, P. Alleman

Soundings taken by echosounder, hand lead line, or pole: Simrad EM3000 Dual Head Multibeam Echosounder

Graphic record scaled by: N/A

Graphic record checked by: N/A

Protracted by: N/A Automated plot by: HP 755 Plotter (Field) Hewlett Packard Design Jet 2500CP (Office)

Verification by: ~~C&C Technologies Inc. Personnel~~ Atlantic Hydrographic Branch Personnel

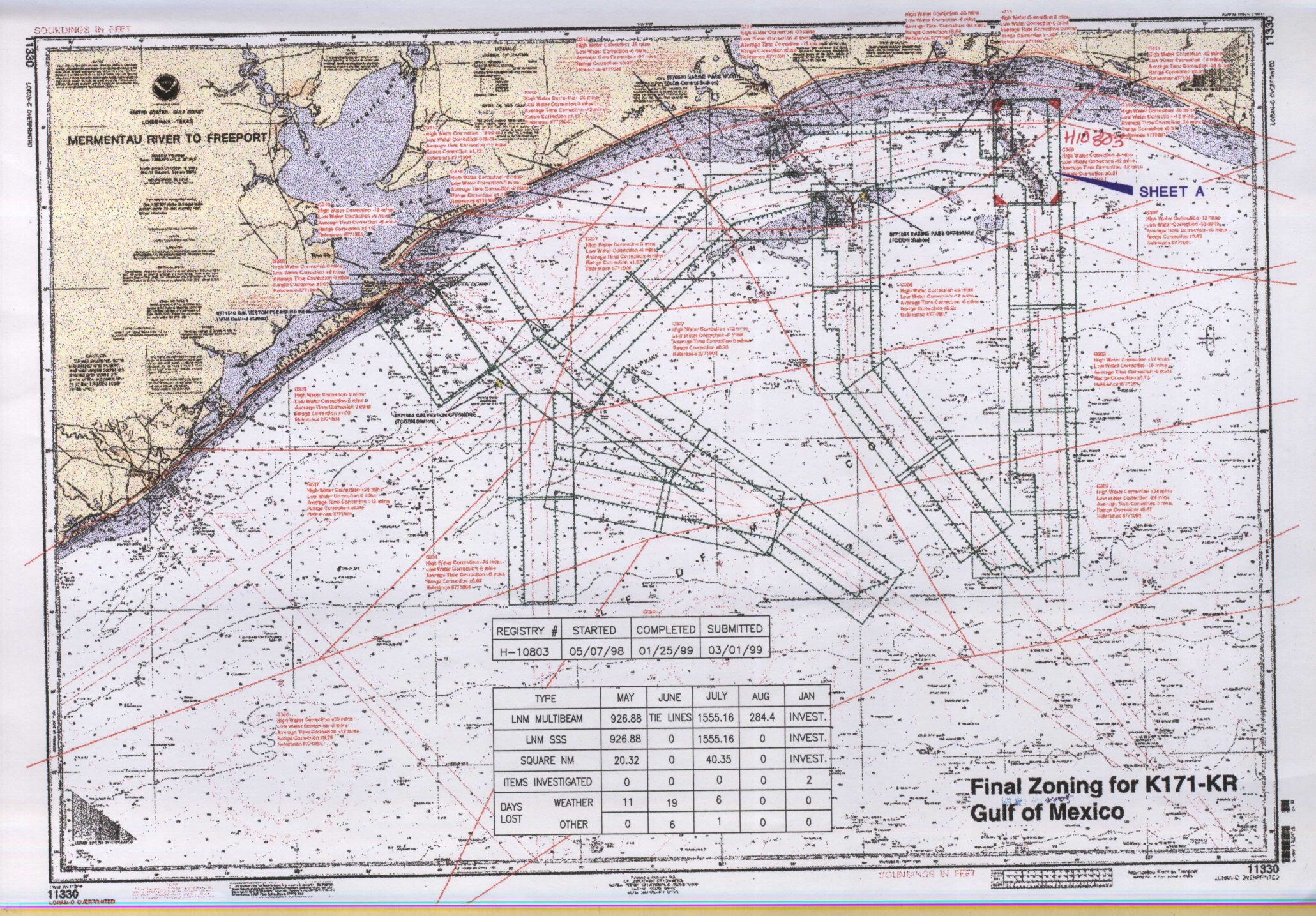
Soundings in: Feet: X Fathoms: _____ Meters: _____ at MLW: _____ MLLW: X

Remarks: 100% Multibeam Hydrographic Survey of Sheet A. Data Collection in meters, later converted into feet, referenced to MLLW.
200% Side Scan Sonar coverage. UTC time was used exclusively.
Tidal Zones: 309, 314 and 315 were used
Tidal Station: Sabine Pass Offshore (877-1081)
Bottom sediment samples were taken

* Hand written Notes in Descriptive Report were made during Office Processing.

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

AWOIS ✓ & SURF ✓ By MBH ON 10/13/99



REGISTRY #	STARTED	COMPLETED	SUBMITTED
H-10803	05/07/98	01/25/99	03/01/99

TYPE		MAY	JUNE	JULY	AUG	JAN
LNM MULTIBEAM		926.88	TIE LINES	1555.16	284.4	INVEST.
LNM SSS		926.88	0	1555.16	0	INVEST.
SQUARE NM		20.32	0	40.35	0	INVEST.
ITEMS INVESTIGATED		0	0	0	0	2
DAYS LOST	WEATHER	11	19	6	0	0
	OTHER	0	6	1	0	0

Final Zoning for K171-KR
Gulf of Mexico

TABLE OF CONTENTS

APPENDICES

SEPARATES

* DATA filed with Field Records.

A. PROJECT

A.1 Project Number: OPR-K171-KR
Sheet A
Date: March 13, 1998
Contract No.:50-DGNC-8-90024
Task Order: 56-DGNC-8-23001 May 27, 1998
Date of Changes: Amendment 0001 August 31, 1998
Amendment 0002 January 22,1999

A.2 The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data acquired using shallow water multibeam and side scan sonar technology with which to update the nautical charts of the assigned area. Numerous obstructions have been reported in this area. Side scan sonar was used to investigate these obstructions and a shallow water multibeam sonar system was used to determine the least depth over obstructions as well as determine the depths over the entire project area.

B. AREA SURVEYED

B.1 Sheet A, shown on the INDEX OF SHEETS, is located 11 miles south-southeast of Calcasieu Pass, Louisiana in the Gulf of Mexico.

B.2 The area was bounded by the following survey limits.

Latitude	Longitude
29°41'13.1"N	93°17'51.7"W
29°41'13.2"N	93°12'30.5"W
29°32'21.9"N	93°12'19.1"W
29°31'12.3"N	93°11'11.3"W
29°28'31.1"N	93°11'06.7"W
29°28'31.0"N	93°15'47.4"W
29°30'39.2"N	93°15'48.7"W
29°31'58.9"N	93°17'33.0"W
29°32'10.6"N	93°20'00.4"W
29°34'15.0"N	93°20'00.5"W
29°34'15.0"N	93°20'00.5"W
29°34'15.6"N	93°17'31.5"W
29°40'48.1"N	93°17'31.1"W
29°40'48.1"N	93°17'53.7"W
29°41'13.1"N	93°17'51.7"W

B.3 Data collection was performed between May 7, 1998 (J.D. 127) and August 5, 1998 (J.D. 217) and on January 25 (J.D. 25) and 26 (J.D. 26), 1999. An Abstract of Times of Hydrography is included in Appendix E. *

C. SURVEY VESSELS

C.1 The *M/V Inez McCall* was leased from Cameron Offshore Boats, Inc. by C & C Technologies for the duration of the survey. A vessel diagram is included as part of Appendix G. *

C.2 The *M/V Inez McCall* was used for all survey operations including multibeam soundings, side scan sonar operations, velocity casts, positioning, on-board processing, grab sampling, and interim deliverable production.

C.3 Vessel Description

Registration Number	638285
Length (feet)	110
Beam (feet)	25
Tonnage	
Gross	92
Net	62
Propulsion	2-12V71 rated @ 400 HP each
Props	56x48
Shafts	4 ½" Stainless
Speed	10 knots
Steering	Hydraulic
Clutches	TD MG514C 5.16x1
Electronics	
Radar	Furuno
VHF	Raytheon
Loran	Texas Instruments
Auto Pilot	Sperry
SSB	Mariconi
Depth Finder	Kodiak
Auxiliary Equipment	
2 Spotlights	
200# Anchor	
2 40 KW Gensets	
110/220 Volts	
Washing Machine, Dryer	

* Data Filed with Field Records.

Electric Galley
Central Air and Heat

C.4 Unusual vessel configuration: None

C.5 During a period of downtime due to weather the *M/V Inez McCall*, while at McCall's Offshore Dock in Cameron, Louisiana, was hit by the Aries Marine Corp. Jack-Up Vessel RAM IX. The *M/V Inez McCall* was struck twice, once on June 18 and once on June 19. The vessel was struck at the bow, in the vicinity of the EM3000 transducers. Initially divers determined that no damage had been done to the transducers or the mount. The vessel was tied up at the dock for a few days for legal reasons. As an attempt was made to resume surveying it was apparent that some damage had been done either to the transducers or the mount. The mount was removed at that time to assess the damage. The mount had to be repaired. Once back in place a patch test was run to ensure that the proper offsets were accounted for. There were twelve days of downtime between the time the boat was hit and the time the patch test was performed and surveying resumed.

D. AUTOMATED DATA ACQUISITION AND PROCESSING *See also Evaluation Report.*

D.1 Hydrographic data were collected and processed using C & C Technologies' proprietary HydroMap software run on a SUN Sparc Ultra2/2170 workstation. HydroMap was used to collect data from the survey instruments and record it on high speed AIT tape drives. All data were time tagged and recorded to file in their raw form. No subsampling was performed. Data collected by HydroMap include Simrad EM3000D, POS/MV, Trimble GPS, Endeco YSI Sound Velocity Probe, Seabird CTD sensor, and Echotrac echosounder.

D.2 Two Endeco/YSI conductivity-temperature probes were mounted at the multibeam echosounder transducers to provide real-time sound velocity measurements at the transducer location. The sensor data were integrated with the EM3000 to provide corrections for beam pointing angles during data collection.

Two Seabird SEACAT SBE 19 Profilers were used simultaneously to measure the water column sound velocity during hydrographic operations. The profilers were deployed to a minimum of 95% of the maximum water depth in the survey area to be covered. The sound velocity data from the casts were applied to the multibeam data at the time of collection.

D.3 Processing was performed in the following manner. Expanded processing steps are provided in Appendix I. *DATA filed with Field Records.*

1) For each survey line, processing involved the following steps:

a) Extraction of generic vessel navigation data
b) Performance of time correlation and georeferencing
c) Data binning
d) Data editing

2) For each tide zone, processing involved the following steps:
a) Application of tide correctors
b) Merging of survey lines
c) Cropping of data to the zone boundary

3) Merging of data from all tidal zones

4) Generation of smooth sheet

5) Generation of back-trace data

D.4 EG&G 260 side scan sonar data were collected and processed using CODA Technologies software run on a UNIX-based PC. Side scan data were digitally recorded in CODA (Caris SIPS readable) format on 4mm tapes along with time and position data provided by HydroMap.

For the investigation work in January of 1999, the Triton Elics Isis software, run on a Windows 95 PC, was used for side scan sonar data collection. This data were recorded digitally, together with time and position, and saved in QMIPS format to Magneto Optical disks and 8mm AIT tapes.

D.5 CODA software was used to process the side scan data. Sonar targets and positions were recorded using this software. Trackplots derived from CODA fix files were used to produce coverage maps showing side scan coverage.

Sonar targets recorded during the investigation work were positioned and measured using the Isis software from Triton Elics.

D.6 A list of software and version numbers used for data collection and processing are given in Appendix K. DATA Filed with Field Records.

E. SIDE SCAN SONAR

E.1 Side scan sonar data were collected using two EG&G 260 towfish, S/N 018400 and S/N 022162. Data were recorded using CODA Technologies software. Digital data was saved to 4mm tapes and analog data was printed in real-time on an EPC 1086 recorder.

Side scan data were recorded using Isis software for the investigation work performed in January of 1999. Digital data were saved to Magneto Optical Disks and to 8 mm AIT tapes and analog data was printed in real-time on an EPC 1086 recorder.

The side scan sonar towfish was towed from the stern of the survey vessel. The towpoint was 16.14 meters astern of the navigation center. The dual frequency fish was operated at a frequency of 100 kHz for the duration of the survey.

E.2 Side scan data were collected across the survey area in water depths of 9 to 12 meters. A range of 75 meters per channel was used throughout the survey. The towfish were configured with a 20° depression angle. The towfish altitude was maintained between 6 and 7 meters. Line spacing was based upon multibeam requirements and the 40-meter and 50-meter line spacing that was used adequately provided the required 200 % coverage with the side scan sonar.

E.3 Fix marks (shot points) were recorded and annotated at an interval of 150 meters for all main scheme and rerun lines. All shot points were annotated with an event number, date, time, and fish position (easting and northing). Although the layback or cable out values are annotated on each of the side scan sonar analog records the positions shown on all records have already been corrected for layback and are actual fish positions.

E.4 Side scan sonar confidence checks were performed daily during survey operations. When possible, features seen during normal survey operations such as drag scars, canholes, or platforms were used as the target for the confidence checks. On a few occasions, it was necessary to break line and find a known target to use for the confidence check. Each time a confidence check was performed it was annotated as such on the analog records and was noted in the survey log. The survey logs are included with the data and are submitted as separates.*

E.5 During the first two months of survey operations, side scan quality was affected greatly by dolphins in the area. Portions of the majority of the lines in the northern third of the survey area had to be rerun at a later date due to the amount of interference caused by the dolphins. Data that were ruled to be unacceptable due to this interference were marked as rejected on the analog record. The lines were then rerun at a later date and the analog records of the rerun lines are stored with the original line of data. Many lines had to be rerun two or more times, due to the continuous dolphin interference. The CODA system provided no mechanism to tag the portions of the lines that were rejected as such on the digital data. A table of affected files and the names of the corresponding rerun file is provided below. A table of digital files and corresponding line names is included as a separate* with the side scan sonar data.

* DATA Filed with Field Records.

Original Line	Shot Points Affected	Rerun Line	Original Line	Shot Points Affected	Rerun Line
60	66-68	319	196	35-38	259
83	73-79	311	197	52-55	261
84	73-79	311	199	48-50	255
85	29-38	317	199	66-68	251
85	49-53	325	201	46-48	253
86	30-38	314,316,326	201	58-62	256
86	60-67	312	202	68-71	264
87	67-74	318	204	49-51	258
87	80-84	318,322,324,329	204	81-83	263
89	67-68	323,328	205	40-43,50-53	243
95	5-58	309	206	63-73	262,265
100	42-44	310,315,327	207	63-73	262
100	61-77	310,315,327	208	36-46	248
101	76-83	301,302	208	74-76	250
102	67-69	308	210	66-69	233,236
105	64-66	299	210	73-77	233
107	67-79	300	211	60-65	249
109	73-86	307	212	63-71	234,342
110	50-52	305	217	27-34	238
110	78-85	304	218	37-85 (parts)	244,247
111	55-57,66-75	306	219	42-52	237
112	73-82	302	219	66-70	235
113	38-84 (parts)	296	220	44-86 (parts)	240
114	50-85 (parts)	291	221	56-60	232
116	76-84	293	222	28-30	239
117	66-86 (parts)	292	222	78-80	241
118	68-84	298	228	46-55	231
119	54-85	290	230	44-47	246
120	56-85	294	230	69-70	245
122	35-73 (parts)	289	359	28-38	573
123	28-53	295	387	33-28	570
123	80-85	297	428	38-40	567
124	30-32	288	464	84-85	560
134	67-80	285	475	9-11	541
137	50-55	287	480	3-5	542
141	58-72 (parts)	285	487	30-33	538
143	67-69	283	493	21-24	531
144	65-70	284	493	37-39	532
147	50-52	282	519	66-67	529
157	58-60	281	519	87-90	526
164	30-48	278	523	87-90	528
165	29-55	280	524	87-90	527
166	Entire line	275,330	576	22-37	746
167	Entire line	277	609	69-71	747
168	Entire line	169	612	37-76	745
173	30-36	279	619	98-96	744
188	71-73	268	636	45-49	740
189	31-36	273	655	70-72	667
190	28-38	272,274	657	47-48	737

190	59-62	269	664	47-62	736
191	31-37	270,271	667	74-70	668
191	41-43	270	684	47-48	735
191	72-76	266	688	89-91	730
192	69-74,77-79	267	695	47-65	732
193	36-49	260	700	68-76	726
194	37-44,47-49	260	702	65-74	725
195	31-35	254	719	47-60	727
195	61-65	257			

E.6 The side scan records do not appear in a one-to-one ratio, along track to across track, due to the way that the CODA system records the data. All measurements were taken from the georeferenced digital data to ensure correct positions and dimensions.

On many of the analog records there are pauses in the record where the printer paper needed to be changed or adjusted. Although there are blank spaces on the record, no data were lost. The CODA system has a built in buffer, which allows for the output to the printer to be paused temporarily for paper adjustments. When printing is resumed, the data on the record continues where it left off prior to the pause.

E.7 Both the analog and digital copies of the side scan data were reviewed in the field. All measurements and positions were taken from the digital records using the CODA Technologies software during the main survey and the ISIS software during the investigation work. The digital data were reviewed first and then the analog data were reviewed to make sure that all of the proper annotations had been made. All features and targets that were tagged on the digital records were also annotated appropriately on the analog records.

E.8 Fix files extracted from the digital data were used to establish proof of coverage. These fix files contain towfish positions during data collection. The fix files were edited to exclude any areas for which the data were rejected. A hatching subroutine in AutoCAD was then used to show the swath width on each side of the trackline. Alternate lines were chosen for the first 100% coverage and the remaining lines were used to make up the second 100% coverage.

E.9 The locations of AWOIS items were plotted on the trackline plots in the field so that those locations could be easily correlated with the appropriate side scan sonar lines and shot points. Following, is a table of AWOIS items that lie within the survey bounds and a list of side scan sonar lines that were traversed over the reported locations.

AWOIS Item	Position		Side Scan Lines	Shot Points
	Latitude (N)	Longitude (W)		
410	29.580000	93.280000	400,402,398	67
6987	29.646213	93.538511	501-503	57-58
6988	29.552500	93.325000	473,476,478	7-8
6989	29.565000	93.290000	442-444	30-31
6990	29.573888	93.219166	422,418,424	76-77
6992	29.607008	93.286714	334,336	32-33
6993	29.650000	93.216667	102,104	77-78
7040	29.533644	93.291786	520-523,746	29-30
8966	29.596528	93.268917	365,363,359	44
8967	29.665000	93.286667	62,53	32-33

E.10 One significant contact was observed in the survey area. It is depicted on the Smooth Sheet and is described in Section N.5 and Appendix A. DATA Filed with Field Records.

Other targets, which were tagged and are listed in the sonar contact list, consist mainly of canholes, navigation markers, and gas and oil field platforms. Several contacts interpreted to be insignificant debris were also tagged. Targets were measured online using the CODA software with the exception of the targets seen during the investigation work, which were processed using Triton Elics Isis software. Each time a target was tagged, a file was created containing the target type, position, measurements, time, and other relevant information. These target locations and types were then plotted in AutoCAD and correlations were made between contacts seen on adjacent lines. A sonar contact list was made of all tagged targets. The sonar contact list is included as a separate* with the side scan sonar data. * DATA Filed with Field Records

F. SOUNDING EQUIPMENT

F.1 A Simrad EM3000 dual head multibeam sonar system, S/N 138, was used for all hydrographic operations. This system operates at a frequency of 300 kHz with 127 receive beams for each transducer.

F.2 A 200 kHz Echotrac 3200 MK II single beam echosounder, S/N 9555, integrated with a TSS 335B vertical reference unit for heave compensation, S/N 348, was used as a continuous real-time check of the multibeam echosounder depth readings.

F.3 A draft tube was installed to measure changes in the vessels static draft. A valve was installed in the vessel hull and a clear plastic tube was attached to the valve. The tube was calibrated with a relative scale and daily measurements of the static

draft were taken and entered into the multibeam echosounder as the "water level down" (draft) value.

F.4 Daily lead line measurements were taken as an additional check of the single beam and multibeam echosounder depth readings. The lead line was marked off at 10 centimeter intervals using a cloth metric tape measure. An average of several readings was taken as the depth value.

F.5 All of the above mentioned equipment were used during the entire survey and in all water depths.

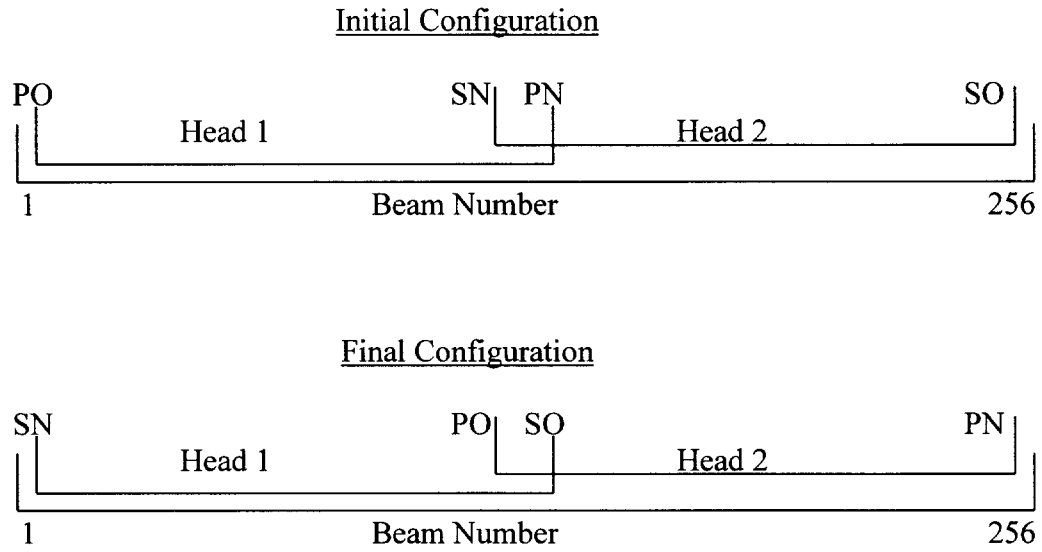
F.6 The EM-3000D (dual-headed) system was originally configured with the transducer heads mounted at +/- 45 degrees with respect to horizontal (90 degrees apart). In this mounting configuration, a multipath artifact caused by surface reflections appeared in the multibeam data. This artifact was characterized as an alongtrack "trenching effect" of various random amplitudes ranging from 0 to 3 meters, at 8 to 10 meters from both sides of nadir. This effect was filtered out during post processing.

To eliminate this artifact, the transducer mounting angle was altered to +/- 30 degrees with respect to horizontal (120 degrees apart). In this configuration, the transducers were aimed more downward thereby reducing surface interference. This adjustment eliminated the artifact.

Mounting Angle	Dates	Lines
45 degrees	05/07/98 to 05/13/98	1-68
30 degrees	05/16/98 to 01/26/99	69-1111, investigation lines

F.7 At the end of June, frequent dropouts in the multibeam data began to occur. These dropouts averaged from less than 5 meters to near 50 meters in the along track direction and in all cases the areas of dropouts were rerun at a later date. On June 30, upon suggestion from an onboard Simrad representative, the cables from the heads to the topside unit were swapped in an effort to eliminate the multibeam dropouts. The dropouts became dramatically less frequent after the cables were switched and the remainder of the job, which encompassed lines 331-1111, was run in this configuration.

As far as the Simrad topside unit was concerned, swapping the transducer cables also effectively swapped the transducer heads. Adjusting the Simrad software configuration in the topside unit accommodated the port-to-starboard swap. This change affected the beam number versus cross-track distance because internal beam numbering is independent of transducer configuration. The results of this change are detailed in the following diagram.



Where: PO = Outer beams on the port side
PN = Nadir beams on the port side
SO = Outer beams on the starboard side
SN = Nadir beams on the starboard side

This change is also evident in the appearance of the cross line statistics. With the heads in the initial configuration, a plot of beam number against cross-track distance places the outer port beams at the extreme left (beam #1) and the outer starboard beams at the extreme right (beam #256). After the cables were swapped, the starboard nadir beams show up at the extreme left (beam #1) and the port nadir beams show up at the extreme right (beam #256).

G. CORRECTIONS TO SOUNDINGS

G.1 Two Endeco/YSI conductivity-temperature probes, model number 600R, were mounted at the multibeam echosounder transducers to provide real-time sound velocity measurements at the transducer location. The sensor data were integrated with the EM3000 to provide corrections for beam pointing angles during data collection.

Two Seabird SEACAT SBE 19 Profilers were used simultaneously to measure the water column sound velocity during hydrographic operations. The profilers were deployed to a minimum of 95% of the maximum water depth in the survey area to be covered. The sound velocity data from the casts were applied to the multibeam data at the time of collection prior to the commencement of the next survey line. Appendix J contains a list of sound velocity profiles, dates, times, positions, and

the survey lines to which each profile was applied. Below is a table of dates and locations of all casts used for sound speed corrections.

Date	Latitude (N)	Longitude (W)	Date	Latitude (N)	Longitude (W)
05/07/98	29.677867	-93.286675	07/10/98	29.565416	-93.266660
05/07/98	29.614726	-93.190116	07/10/98	29.564204	-93.335569
05/07/98	29.605067	-93.270919	07/11/98	29.564204	-93.335569
05/07/98	29.691609	-93.250083	07/12/98	29.553225	-93.214199
05/07/98	29.607337	-93.229445	07/14/98	29.552013	-93.207457
05/08/98	29.687440	-93.297487	07/15/98	29.545795	-93.207167
05/08/98	29.676418	-93.282778	07/16/98	29.541303	-93.209214
05/11/98	29.675021	-93.256197	07/17/98	29.534559	-93.212591
05/11/98	29.666780	-93. 25592	07/17/98	29.534728	-93.207636
05/12/98	29.665680	-93.245130	07/17/98	29.538119	-93.226023
05/17/98	29.677191	-93.299822	07/17/98	29.535791	-93.233959
05/17/98	29.686108	-93.285300	07/18/98	29.544676	-93.296790
05/18/98	29.655814	-93.202528	07/19/98	29.559190	-93.280489
05/18/98	29.647441	-93.265698	07/19/98	29.559196	-93.242469
05/19/98	29.645420	-93.274951	07/19/98	29.563727	-93.208573
05/20/98	29.643056	-93.202807	07/19/98	29.503171	-93.200104
05/20/98	29.630497	-93.287827	07/20/98	29.499823	-93.201210
05/21/98	29.628172	-93.303648	07/20/98	29.499650	-93.216877
05/21/98	29.628683	-93.297171	07/20/98	29.501044	-93.231558
05/26/98	29.794649	-93.324498	07/20/98	29.502068	-93.247322
05/27/98	29.624283	-93.287657	07/20/98	29.500954	-93.262753
05/27/98	29.624673	-93.299880	07/20/98	29.535201	-93.240498
05/28/98	29.614926	-93.297434	07/20/98	29.526363	-93.201720
05/28/98	29.619830	-93.199435	07/21/98	29.530344	-93.197360
05/29/98	29.611193	-93.295813	07/21/98	29.523868	-93.199797
05/29/98	29.613326	-93.204276	07/21/98	29.525693	-93.262387
05/29/98	29.611117	-93.198477	07/22/98	29.521942	-93.195727
05/30/98	29.620431	-93.303326	07/22/98	29.522884	-93.196629
05/30/98	29.642113	-93.217089	07/22/98	29.521748	-93.196470
06/03/98	29.531830	-93.331960	07/22/98	29.521323	-93.194624
06/03/98	29.573802	-93.290926	07/22/98	29.520622	-93.189134
06/23/98	29.558909	-93.336010	07/22/98	29.515775	-93.194014
06/24/98	29.697439	-93.297832	07/22/98	29.516524	-93.188772
06/30/98	29.683823	-93.290118	07/22/98	29.515899	-93.186660
07/01/98	29.552406	-93.333274	07/23/98	29.516616	-93.189483
07/01/98	29.558719	-93.313379	07/23/98	29.513615	-93.190940
07/01/98	29.614358	-93.269170	07/23/98	29.512744	-93.193343
07/01/98	29.583795	-93.243833	07/23/98	29.506114	-93.189169

07/02/98	29.557455	-93.229945	07/23/98	29.511111	-93.186242
07/02/98	29.560048	-93.211211	07/24/98	29.508748	-93.190510
07/02/98	29.450048	-93.211211	07/24/98	29.507447	-93.194090
07/02/98	29.550730	-93.185304	07/24/98	29.514094	-93.260396
07/02/98	29.611555	-93.281359	07/24/98	29.507806	-93.190608
07/03/98	29.613994	-93.266222	07/24/98	29.506739	-93.189898
07/06/98	29.601679	-93.242273	07/25/98	29.500081	-93.236701
07/06/98	29.599239	-93.207295	07/25/98	29.497161	-93.190186
07/06/98	29.596801	-93.251301	07/25/98	29.492809	-93.242828
07/06/98	29.595618	-93.222657	07/26/98	29.488610	-93.245028
07/07/98	29.595818	-93.222909	07/27/98	29.483955	-93.234600
07/07/98	29.594138	-93.203549	07/28/98	29.482921	-93.212085
07/07/98	29.585709	-93.214420	07/28/98	29.532238	-93.242990
07/08/98	29.585702	-93.214040	07/30/98	29.611867	-93.273055
07/08/98	29.575095	-93.221968	08/02/98	29.532238	-93.532238
07/09/98	29.578634	-93.211085	08/03/98	29.614514	93.200160
07/09/98	29.574593	-93.275535	08/04/98	29.674782	-93.296143
07/10/98	29.570641	-93.271882			

Following, are the dates and locations of all casts used for sound speed corrections during the investigation work.

Date	Latitude (N)	Longitude (W)	Date	Latitude (N)	Longitude (W)
01/25/99	29.610078	-93.240612	01/25/99	29.474498	-93.227126
01/25/99	29.589763	-93.290437			

Three different Seabirds were used for the survey. From May 7 to May 13, S/N 1730 was the primary and S/N 1174 was the secondary Seabird. Between May 13 and June 3 the primary profiler was S/N 1266. The original Seabirds were used from June 3 until the end of the survey. Following, are the calibration dates of the three Seabirds that were used. The calibration records of all three profilers are included in Appendix G. DATA Filed with Field Records.

Seabird Serial Number	Date of Calibration
1730	April 10, 1998
1266	April 10, 1998
1174	April 22, 1998

G.2 No instrument corrections were necessary for the multibeam or single beam echosounders.

G.3 An Echotrac 3200MK II single beam echosounder, S/N 9555, was run continuously throughout the survey for validation of the multibeam depth data.

Heave compensation for the single beam echosounder was accomplished using a TSS 320B Vertical Reference Unit, S/N 348. The mean sound velocity taken from each sound velocity profile was entered into the single beam echosounder to correct for water column sound speed. A lead line reading was performed once a day as an additional check of depth readings. Readings from the draft tube were used to determine static draft.

G.4 Readings of the draft tube were taken daily to ensure that the proper static draft value was entered into the multibeam and single beam echosounders. In addition to the daily measurements, readings were also taken each time the vessel departed the dock and anytime changes in fuel and water loads were made.

G.5 A squat test was performed aboard the M/V Inez McCall on April 27, 1998. Three lines were run at RPM values ranging from 0 to 1800. The amount of squat was measured for eight different RPM values for each line. The results of the squat test revealed that the greatest change over the entire RPM range was less than 20 cm. The squat test log and results are included in Appendix G. Data filed with Field Records.

The multibeam data were corrected for squat during post processing. Three survey speeds were used during data collection: 4.5 knots for main scheme lines, 6.5 knots for cross lines, and 8 knots for multibeam-only reruns. The lines were processed in groups according to survey speed and the corresponding squat was added to the depth readings as an elevation offset.

G.6 An Applied Analytics, Inc. POS/MV 320 motion sensor was integrated with the multibeam echosounder to provide real-time heave, pitch, and roll corrections. This system, which has two internal GPS receivers, was used in conjunction with SATLOC differential corrections for primary navigation throughout the survey and was used to determine heave, pitch, and roll offsets during the patch tests. SATLOC is based upon technology developed by NASA for space docking, which requires accuracy and reliability at a great distance from the Reference Site (RS). With other DGPS systems the corrections are computed at the RS then broadcast out to the user, which degrades the accuracy at the rate of 1 meter for every 100 kilometers as you move away from the RS. SATLOC eliminates this problem by computing a unique correction for each receiver based upon a variety of GPS conditions from horizon to horizon. This technique is referred to as a State Space Model (SSM). The SSM is recognized as the best way to produce differential corrections. From a cold start-up, SATLOC determines its location using its integral GPS then calculates a line of sight to each satellite in view. Next it receives the SSM and applies the ionosphere model to correct for GPS signal delays, orbital correctors, and clock correctors. The output solution is a differential correction message unique to your exact location.

G.7 Prior to the survey, a standard patch test procedure was performed at the work site to determine correctors for roll, pitch, yaw, and system latency. "Can hole"

depressions created by a jack-up rig were used as targets for determining and verifying alignment correctors in the following manner. Patch test results are included in Appendix G. DATA filed with Field Records.

Roll:
Iterations of linear regression were performed upon the mean differences from eight pairs of collinear reciprocal lines to verify the roll mounting angles for each transducer head and to compute the roll corrector value applied by the POS/MV.

Pitch:
Two pairs of collinear reciprocal lines were run at the lowest practical survey speed over the calibration target to calculate the offsetting pitch corrector value applied by the EM-3000. The following formula was used: cp = atan (dt / (2 x water depth)), where cp = pitch corrector value and dt = target offset distance.

Latency:
Two pairs of collinear reciprocal lines were run at the highest practical survey speed over the calibration target to calculate the offsetting latency corrector value applied by the EM-3000. The following formula was used: dl = dt / (2 x velocity), where dl = latency corrector value and dt = target offset distance.

Yaw:
One pair of reciprocal lines with approximately 25% overlap was run over the calibration target. No offset was required, so a zero (0) misalignment value was entered into the POS/MV. The following formula was used for this calculation: cy = atan (dt / (2 x offset from track line)), where cy = yaw corrector value and dt = target distance offset.

G.8 Between July 17 and July 23, the YSI sound velocity probes used to measure changes in the sound velocity at the multibeam transducer were not functioning properly. During this time, the transducer sound speed was either taken from the probe with an offset applied or entered manually. For each of these two methods, the sound speed at the depth of the transducer was also recorded from the sound velocity cast. Each time a cast was taken, the value was compared to the value that the YSI was providing. The EM3000 echosounder controller allows for an offset to be applied to the YSI before the sound speed is applied to the beam forming process. The difference between the reading from the YSI probe and the Seabird cast was calculated and entered as the offset. It was observed that the YSI readings were steadily decreasing. At this time, the sound speed at the transducer was entered manually as being the sound speed at the level of the transducer taken from the Seabird cast. During the five days that the YSI was not functioning properly sound velocity profiles were taken much more frequently than during normal survey operations to ensure that a valid sound speed was being used to determine the beam pointing angles.

G.9 The tidal datum used for the survey was Mean Lower Low Water (MLLW). Tidal corrections were applied in real-time using the predicted tides derived from MicroNautics WorldTide software. During post-processing, tidal data from the Sabine Pass offshore tidal station (877-1081) were used with the appropriate offsets entered for each of the three tidal zones in the survey area. The tidal zones, station, and offsets used during post-processing are given in the table below. Approved Tides And Zones were Applied during Field Processing. See Appendix E, Section 2.0

Tidal Zone	Tide Station	Time Correction			Height Correction
		HW	LW	Ave	
G309	877-1081	-6	-12	-12	.91
G314	877-1081	-30	-6	-18	.99
G315	877-1081	0	0	0	1.00

H. CONTROL STATIONS See Also Evaluation Report.

H.1 The horizontal datum used for the survey was WGS84 (World Geodetic System of 1984).

H.2 No horizontal control stations were established for this survey.

H.3 Results of the 24-hour monitoring of the SATLOC differential signal are shown in Appendix H.* Results of the test are as follows:

A fix was taken every second totaling 94,682 position values (26.3 hours).
The average PDOP value was 1.20.
The difference between control point LCG25 and average DGPS position:
Northing = 0.12 meters
Easting = 0.87 meters

A scatter-plot of the mean radial position error, with the mean HDOP annotated on the plot, is included in Appendix H.*

I. HYDROGRAPHIC POSITION CONTROL

I.1 This survey was conducted using a Trimble 4000SSi 9-channel GPS receiver, a SATLOC Trimble DSM 12 channel GPS receiver, and a POS/MV inertial navigation unit, embedded with two NovAtel GPS receivers. All units were integrated with differential GPS (DGPS) corrections. Data were continuously recorded from all three GPS units throughout the survey. The real-time positional solutions were projected on the coverage chart display during survey operations.

* Data filed with Field Records.

I.2 The DGPS integration included the following checks and settings to ensure that all requirements as specified by the Scope of Work were met, which included:

- All GPS receivers were set to have at least an 8-degree elevation mask; typically an 11-degree elevation mask was used.
- The audio alarm was set to sound each time a GPS position, which was not differentially corrected, was received.
- A PDOP value of 7 was used to ensure that at least 4 satellites were being received at all times.

I.3 The accuracy requirements were met as specified by the Scope of Work. Both DGPS systems used for this survey meet the 95% confidence level and did not exceed the 10-meter limit as specified in the Statement of Work. The Horizontal Dilution of Precision (HDOP) as specified by the Scope of Work was monitored by HydroMap data collection software during data collection. When the HDOP value exceeded the allowable limit of 2.5, survey operations were suspended until DGPS performance improved. If positioning quality degraded beyond acceptable limits while on line, the data were automatically rejected by HydroMap software.

I.4 No difficulties were encountered that would have degraded the expected positional accuracy.

I.5 Positioning equipment utilized during this project, identified by manufacturer, model, and serial number are:

Unit 1:
Trimble 4000-SSi
S/N 3507A09641
Firmware Version: 7.22v
MBX2 USCG DGPS Receiver
Unit # 212

Unit 2:
Trimble DSM
S/N not available (board)
Satloc Receiver (C&C)
Unit # 0047

Unit 3:
POS/MV unit # 011
(2) NovAtel 3151ROEM
S/N not available (board)
Firmware Version: 3.33
Satloc Receiver (C&C)
Unit # 0047

I.6 The DGPS positioning system does not require calibrations. A comparison of each of the three positioning systems was performed for each line of data and can be found in Appendix H. *

I.7 There were no unusual methods used to calibrate or operate the electronic positioning equipment.

I.8 There were no equipment malfunctions or substandard operations that would have affected the positioning equipment.

I.9 The USCG DGPS Receivers can be affected by atmospheric conditions such as thunderstorms. The Radio link from the tower site can be cut off temporarily by this atmospheric condition, but in no way is the data quality damaged. The HydroMap software was configured to provide an audio warning and automatically reject the data if a DGPS signal was not received within 20-second timeframes as specified in the Scope of Work. These were uncommon events and both USCG DGPS sites were rarely affected at the same time.

I.10 No poor geometric configurations were encountered during this survey.

I.11 No systematic errors were detected that required adjustments.

I.12 Antenna offset and layback corrections were measured using conventional methods. These conventional methods consisted of the use of tape measures, a hand level, and plum bob. Each measurement was checked in two ways. The first method was to take the measurements twice by two different personnel. The second method was to measure incrementally such that the sums and differences of the measures could be used to check the overall dimensions. All distances are referenced to the navigation center or the POS/MV IMU. A list and diagram of the determined measurements are provided in Appendix G. *

J. SHORELINE

"Not Applicable"

K. CROSS LINES

HydroMap contains a tool which is used to compare data from a main line with data from cross lines. The comparison calculates the mean difference and noise level as a function of cross-track position. The measurements are used for quantative quality assurance system accuracy and ray-bending analysis.

* Data filed with Field Records.

K.1 Reference Data

In general, cross lines are used to produce reference data. The reference data are considered to be an accurate representation of the bottom. Since the data are collected from an orthogonal direction, the errors should be independent.

The cross lines are processed to produce the best possible data. Frequent sound velocity profiles are taken to minimize any possible raybending. Further, the swath is restricted to a width that ensures that there is no measurable raybending or roll errors. In this case, the swath is restricted to an angular sector of 10 degrees, producing a swath width of less than 2 meters. The data are binned and thinned using a median filter. The data are then edited carefully to ensure that there are no remaining outliers. The cross line data are maintained in files for each line.

K.2 Test line

The line to be evaluated, the test line, is processed to produce a trace file. Trace files are comprised of binned soundings that have not been thinned. They contain extra data in addition to x, y, and z that are used for analysis. Processing parameters are set to include all beams.

K.3 Cross Analysis

To perform the cross analysis, each line of the reference data set is analyzed and the results are "stacked" to produce more significant statistics.

The following operations are performed for each line of the reference data:

Optionally remove tidal effects:

Residual tidal effects can be removed by removing the difference between the reference line data and the near-nadir beams of the test line. The beams of the test line which fall within a small (operator settable) angular sector from nadir are subtracted from the corresponding soundings of the reference data. The average difference is used to temporarily offset all of the test line soundings for comparison to this reference line.

Difference all soundings and Bin the results:

Each sounding of the test is subtracted from the sounding in the corresponding bin of the reference line. The resulting differences are used to accumulate statistics based on an operator settable across-track binning criteria. The across-track binning may be based upon across-track

distance, beam number, or angle from nadir. The bin size is also settable by the operator.

K.4 Results From All Reference Lines Stacked

The accumulated statistics of all test line soundings compared to all reference lines are processed to produce four across-track profiles. The profiles represent the mean difference, standard deviation, root-mean-square difference, and percentile confidence interval. The data are provided in graphical form.

K.5 Interpretation

Raybending:

The effects of ray-bending are measured by observing the values of the mean difference curve. Ray-bending produces a mean difference that curves upward or downward at the outer edges of the swath in a symmetric pattern around nadir. The value of the difference at a given across-track distance indicates the amount of vertical error being introduced by incorrect ray-bending corrections.

Residual ray-bending errors occur when the sound velocity profile loaded into the sonar do not match the real world. The errors will normally be reduced if a new sound profile is recorded and loaded into the sonar unit.

Errors in sound velocity at the sonar head cause the sonar to miscalculate the beam pointing angles and result in a symmetric mean difference curve that closely resembles the error due to incorrect sound velocity profiles.

Procedure

At the end of each line, beam analysis is run to measure the ray-bending at the outer edge of the intended usable swath. If the ray-bending exceeds the allowable tolerance, another sound velocity cast is taken.

If the ray-bending appears to be variable along the line, it may be necessary to break the survey into smaller sub-areas.

If the sound velocity is changing so quickly in time and space that the specified accuracy cannot be met, then a narrower swath is used in that area.

Vertical accuracy:

The vertical accuracy of the system is reflected by the RMS difference and the confidence interval.

The 90% confidence interval must be below 0.25 meters when measured beam-by-beam.

Roll Error:

Residual roll error was measured by determining the slope of the mean difference curve with the data being analyzed in terms of cross-track distance. With cross lines, the slope directly indicates the roll bias. With reciprocal lines, the slope will indicate approximately twice the roll bias.

L. JUNCTIONS See Also Evaluation Report.

This survey junctions to the west with Gulf of Mexico hydrographic surveying project H-10834 Sheet B, which is 12 miles SW of Calcasieu Pass. The survey in the Sheet B is currently ongoing. A preliminary review reveals a close general agreement of soundings in the junctioning area. Further comparisons will be made in the H-10834 (Sheet B) Descriptive Report.

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 charts.

N. COMPARISON WITH THE CHART See Also Evaluation Report.

N.1 The following nautical charts were used for comparison for this survey. It should be noted that the majority of the charts were released after the Work Order was effected. Therefore, later chart editions than those indicated in Attachment #3 of the Statement of Work are reflected.

Chart Number	Scale	Edition	Edition Date
11330	1:250,000	12	August 8, 1998
11344	1:80,000	33	July 11, 1998
11345	1:175,000	29	July 19, 1997
11347 SC	1:50,000	30	May 30, 1998

All Local Notices to Mariners that applied to the survey area were taken into consideration for the chart comparison.

N.2 A comparison with the chart revealed a close agreement with the survey depths, which are generally deeper than the charted soundings by 1 to 3 feet.

N.3 The maintained channel has a controlling depth of 42.5 feet. Survey depths within the maintained channel generally agree with the controlling depth. Exceptions exist primarily at the edges of the channel, but shoal soundings of 40 feet exist near the center of the channel at a few locations.* Shoal soundings within the channel may be attributed to a variety of factors. Grab samples taken during the survey reveal the bottom to be composed of soft silt and mud. Slumping of this soft bottom material into the channel make the edges of the channel difficult to delineate and may contribute to the existence of shoal soundings within the channel. "Fluff layers", created by the suspension of low-density mud in the water column, also produce shoal depths when sounded with high-frequency echosounders, such as the 300 kHz Simrad EM-3000S that was utilized for this survey. The Calcasieu River discharges directly into this channel, which may also contribute to the occurrence of suspended sediment layers. No grab samples were taken within the channel. No dual-frequency echosounder was used to prove or disprove the existence of suspended sediment.

* See Also Evaluation Report.

N.4 Twelve* charted items lie within the survey area. This table identifies each of the charted items for which a description and chart comparison follows. All of the following charted items appear on nautical chart 11347 (1:50,000).

* Eighteen

Item	Description	Position		Charted Least Depth (feet)	Survey Least Depth (feet)
		Latitude (N)	Longitude (W)		
1	Pipe PA (AWOIS 6993)	29° 39' 00"	93° 13' 00"	-	32
2	Obstructions (Rep 1990)	29° 37' 13"	93° 16' 34"	32 & 31	34 – 35
3	Obstruction (Rep 1990)	29° 36' 55"	93° 16' 04"	33	35
4	Obstruction (Rep 1990)	29° 36' 38"	93° 16' 10"	33	35 – 36
5	Obstruction (Rep 1990)	29° 36' 28"	93° 17' 13"	31	35
6	Wreck PA (AWOIS 6992)	29° 36' 25"	93° 17' 12"	-	35 – 36
7	Obstruction (Rep 1990)	29° 35' 50"	93° 17' 07"	35	37
8	Obstruction (AWOIS 8966)	29° 35' 48"	93° 16' 08"	31	37
9	Obstruction Pipe (AWOIS 7040)	29° 32' 01"	93° 17' 30"	35	39 – 40
10	Obstruction	29° 32' 10"	93° 17' 24"	35	39 – 40

11	Obstruction (AWOIS 6987)	29° 32' 27"	93° 14' 50"	35	39
12	Obstruction (Rep 1994)	29° 30' 50"	93° 12' 33"	36	41

Item 1

Item Type: Pipe PA
AWOIS Number: 6993
Charted Position: 29° 39' 00" N, 93° 13' 00" W
Charted Depth: --
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the pipe was found during the survey.
Recommendation: Remove from chart. Concur Delete o Pipe PA

Item 2

Item Type: (2) Obstructions Rep 1990
Charted Position: 29° 37' 15" N, 93° 16' 34" W and 29° 37' 13"N, 93° 16' 27" W
Charted Depth: 32 feet and 31 feet (9.45 meters and 9.75 meters)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstructions were seen during the survey and survey depths at the location are 2 to 4 feet deeper than the charted least depth.
Recommendation: Remove from chart. Concur Delete (32) Obstns (31) (Rep 1990) Chart Present Survey Soundings

Item 3

Item Type: Obstruction Rep 1990
Charted Position: 29° 36' 55" N, 93° 16' 04" W
Charted Depth: 33 feet (10.06 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was observed during the survey. Survey depths are two feet deeper than the charted least depth.
Recommendation: Remove from chart. Concur Delete (33) Obstn (Rep 1990) Chart Present Survey Soundings.

Item 4

Item Type: Obstruction Rep 1990
Charted Position: 29° 36' 38" N, 93° 16' 10" W
Charted Depth: 33 feet (10.06 m)

Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was seen during the survey.
Depths at the location of the charted obstruction are 2 to 3 feet deeper than the charted least depth.
Recommendation: Remove from chart. Concur Delete (33) obstn (rep 1990) Chart Present Survey Soundings
Shown on chart 11344, 33rd. ED as 34 obstn (rep 1990) / Delete (34) obstn (Rep 1990)

Item 5

Item Type: Obstruction Rep 1990
Charted Position: 29° 36' 28" N, 93° 17' 13" W
Charted Depth: 31 feet (9.45 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was observed during the survey.
Survey depths are 4 to 5 feet deeper than the charted least depth at the charted location of the obstruction.
Recommendation: Remove from chart. Concur Delete (31) obstn (rep 1990) Chart Present Survey Soundings.

Item 6

Item Type: Wreck PA *M/V Altier*
AWOIS Number: 6992
Charted Position: 29° 36' 25" N, 93° 17' 12" W
Charted Depth: --
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the ~~reported~~ charted wreck was seen during the survey.
Recommendation: Remove from chart. Concur Delete (++) PA

Item 7

Item Type: Obstruction Rep 1990
Charted Position: 29° 35' 50" N, 93° 17' 07" W
Charted Depth: 35 feet (10.69 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was observed during the survey.
Survey depths are 2 feet deeper than the charted least depth.
Recommendation: Remove from chart. Concur Delete (35) obstn (rep 1990) Chart Present Survey Soundings

Item 8

Item Type: Obstruction
AWOIS Number: 8966
Charted Position: 29° 35' 48" N, 93° 16' 08" W
Charted Depth: 31 feet (9.45 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was seen during the survey.
Survey depths in the area are 6 feet deeper than the charted least depth.
Recommendation: Remove from chart. Concur
Delete (31) obstn Chart Present Survey Soundings.

Item 9

Item Type: Obstruction Pipe
AWOIS Number: 7040
Charted Position: 29° 32' 01" N, 93° 17' 30" W
Charted Depth: 35 feet (10.67 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the pipe was observed during the survey.
Survey depths are 4 to 5 feet deeper than the charted least depth.
Recommendation: Remove from chart. ~~Concur~~
~~Delete (35) obstn (pipe)~~ ~~chart Present Survey Soundings~~
Do not concur See Eval. Rept.

Item 10

EKM 12/15/99

Item Type: Obstruction
Charted Position: 29° 32' 10" N, 93° 17' 24" W
Charted Depth: 35 ~~feet~~ 38 feet (~~10.67~~ 11.58 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was observed during the survey.
Survey depths are 4 to 5 feet deeper than the charted least depth at the charted location of the obstruction.
Recommendation: Remove from chart. Concur
Delete (38) obstn Chart Present Survey Soundings.

Item 11

Item Type: Obstruction
AWOIS Number: 6987
Charted Position: 29° 32' 27" N, 93° 14' 50" W
Charted Depth: 35 feet (10.67 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was observed during the survey.

Survey depths in the area are 4 feet deeper than the charted least depth.

Recommendation: Remove from chart. ~~Concur~~ Delete '35' obstn ~~Chart Present Survey Soundings.~~

Do not concur See Eval. Rept. GKM 12/15/99

Item 12

Item Type: Obstruction Rep 1994
Charted Position: 29° 30' 50" N, 93° 12' 33" W
Charted Depth: 36 feet (10.97 m)
Method of Investigation: 200% side scan and 100% multibeam
Survey Results: No evidence of the obstruction was seen during the survey and water depths from the survey are 5 feet deeper than the charted least depth.
Recommendation: Remove from chart. Concur ... Obstn Chart Present Survey Soundings. Delete '36' (rep 1994)

N.5 One danger to navigation was discovered on May 31, 1998 and reported at a location of 29° 36' 32.00" N and 93° 14' 19.00" W with a corrected least depth of 32 feet (9.75 meters). The danger to navigation report and letter are included in Appendix A.* The Local Notice to Mariners in which this obstruction was reported is included in Appendix F. ** Concur See N.8 for Charting Recommendation

A further investigation, performed on January 25, 1999, revealed that the item of investigation was no longer in its original position. Its new position was 29° 36' 31.88" N and 93° 14' 28.30" W with a corrected least depth of 33.0 feet (~~10.06~~ 9.7 meters). The danger to navigation report and letter are included in Appendix A.* The Local Notice to Mariners in which this obstruction will be reported is not in publication yet. After office review of All Data Chart '32' obstn

O. <NOT USED BY CONTRACTOR>

P. AIDS TO NAVIGATION

P.1 All aids to navigation within the survey area were recorded by description and position. The positions were determined by positioning the vessel bow as close as possible to the aid and taking a fix. The fixes were taken using HydroMap software which was set to take the average of three positions to give the position of the aid. A comparison of the charted positions, light list descriptions, and survey results are given in the table below.

* Data Attached To This Report
** Data Filed with Field Records. 25

Description	Scaled Chart Position		Survey Results		Difference		
	Lat (N)	Lon (W)	Lat (N)	Lon (W)	Lat (sec)	Lon (sec)	m
Lighted Buoy 20 (Red)	29.58667	93.28389	29.58630	93.28400	-1.32	-0.38	42.36
Lighted Buoy 19 (Green)	29.58500	93.28611	29.58425	93.28658	-2.7	1.69	94.79
Lighted Buoy 18 (Red)	29.57306	93.27194	29.57327	93.27173	0.78	0.79	30.90
Lighted Buoy 16 (Red)	29.56000	93.25972	29.56002	93.25987	0.06	-0.54	14.70
Lighted Buoy 15 (Green)	29.55806	93.26194	29.55804	93.26198	-0.05	-0.13	0.65
Lighted Buoy 14 (Red)	29.54639	93.28060	29.54667	93.24809	1.03	-0.13	31.16
Lighted Buoy 12 (Red)	29.53306	93.23556	29.53315	93.23548	0.34	0.27	12.63
Lighted Gong Buoy 11 (Green)	29.53111	93.23806	29.53131	93.23781	0.72	0.90	32.83
Lighted Buoy 9 (Green)	29.52083	93.22861	29.52099	93.22876	0.57	-0.54	0.33
Lighted Bell Buoy 8 (Red)	29.51889	93.22389	29.51913	93.22466	0.85	-2.77	79.22
Lighted Buoy 7 (Green)	29.51472	93.22639	29.51487	93.22613	0.54	0.92	30.18
Lighted Buoy 6 (Red)	29.50028	93.22278	29.50052	93.22289	0.87	-0.41	28.65
Lighted Gong Buoy 5 (Green)	29.50028	93.22583	29.50025	93.22573	-0.11	0.39	10.25
Lighted Buoy 4 (Red)	29.48333	93.22220	29.48335	93.22256	0.07	-1.23	33.04
Lighted Buoy 3 (Green)	29.48333	93.22528	29.48329	93.22560	-0.14	-1.17	31.34

P.2 The aids to navigation observed in the survey area appear to serve their purpose. No aids to navigation that were not on the charts and in the light list were observed during the survey. Concur

P.3 Two charted pipelines lie within the survey area. However, the positions were not confirmed or disproved by the side scan sonar or multibeam echosounder data. It is recommended that the pipelines be retained as charted.

Q. STATISTICS

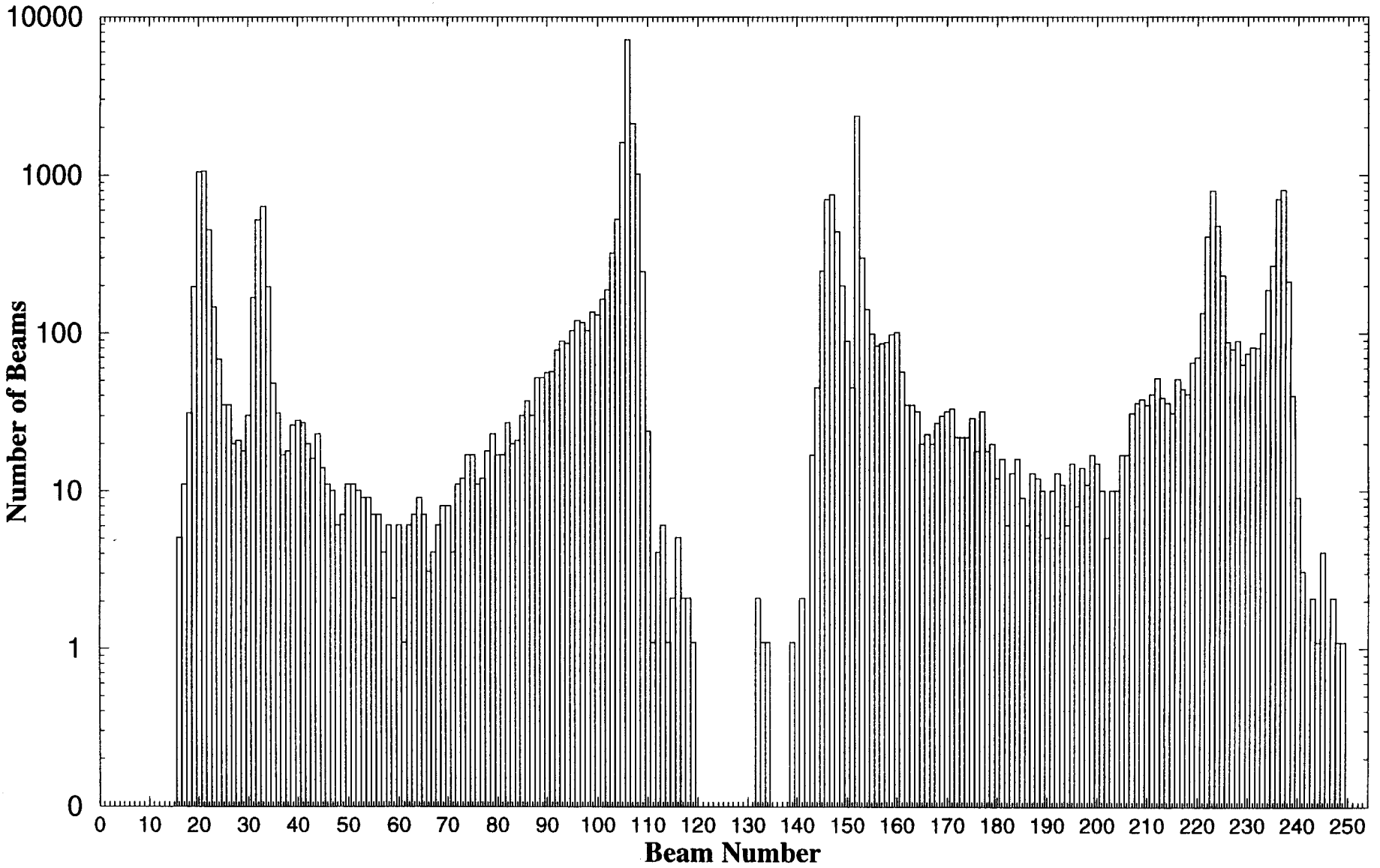
Lineal nautical miles of sounding lines (Side scan and multibeam)	2597.52 nm
Lineal nautical miles of sounding lines (Multibeam only)	402.7 nm
Square nautical miles (100% multibeam and 200% side scan coverage)	60.1 nm^2
Number of velocity casts (applied to data)	82
Number of supplemental tide stations	0
Number of horizontal control stations occupied/established	1 (For Squat Test)
Number of items investigated	2

R. MISCELLANEOUS

In the northern portion of the survey area, the main features seen on the seafloor were canholes. These canholes are created when an idled jackup rig is removed from a location. They are characterized by depressions surrounded by rings of mud, which rise above the surrounding seafloor. Due to the design of the jackup rigs, the canholes usually appear in groups of three and are on the magnitude of about 10 meters in diameter. They rarely display a relief of greater than 1 meter. The result of these canholes are shoal soundings that are not considered to pose a danger to navigation. Concur

Grab samples taken within the survey area reveal the bottom to be composed of soft mud and silt, a factor conducive to the prevalence of "fluff layers" within the channel. The slumping of channel slopes, as revealed by this survey, is also precipitated by the soft bottom material.

Histogram of Selected Soundings By Beam Number



S. RECOMMENDATIONS See also Evaluation Report.

The performance of a Class II Project Condition Survey, as outlined in the US Army Corps of Engineers Hydrographic Surveying Manual EM-1110-2-1003, is recommended within the channel limits. The incorporation of a dual-frequency (200 / 24 – 40 kHz) echosounder is further recommended to delineate the suspended sediment layer.

T. REFERRAL TO REPORTS

DANGER TO NAVIGATION REPORT

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

Dear Sir:

While conducting hydrographic survey operations in the approaches to Calcasieu Pass, Louisiana, C & C Technologies, Inc. discovered an uncharted shoal. Attached are the Danger to Navigation Report and a section of chart number 11347 indicating the position of this danger.

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

Sincerely,
C & C Technologies, Inc.

Frank Lipari, PE, PLS

Enclosures: report
Copy: COTR

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H -10803

State: Louisiana

General Locality: Gulf of Mexico

Sublocality: 11 miles SSE of Calcasieu Pass

Project Number: OPR-K171-KR

The following item was found during hydrographic survey operations:

Object Discovered: unknown

Covered 33.78 feet corrected to Mean Lower Low Water using predicted tide correctors.

Chart Number	U. Edition		Reported Depth	Charted Horiz. Datum	Geographic Position	
	No.	Date			Latitude	Longitude
11344	32	Aug 17/96	33.78 ft.	NAD 83	29-36-32	93-14-19
11345	29	July 19/97				
11347	28	Apr 27/96				
11330	11	Sept 30/95				
11340	57	Sept 24/94				

DANGER TO NAVIGATION REPORT

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

Dear Sir:

Reference my letter reporting a danger to navigation located in chart number 11347 and your response of 24 September 1998.

The final depth computed after application of final tide information is 32.0 feet in lieu of the previously reported depth of 33.78 feet.

Please issue a revised Notice to Mariners.

Sincerely,
C & C Technologies, Inc.

Frank Lipari, PE, PLS

Enclosures: previous correspondence
Copy: COTR

DANGER TO NAVIGATION REPORT

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

February 26, 1999

Dear Sir:

Reference my letter reporting a danger to navigation located in chart number 11347 and your response of 24 September 1998.

After further investigation, the least depth computed after application of final tide information is 33.0 and the obstruction appears to have migrated to the west with final coordinates of 29° 36' 31.88" N and 93° 14' 28.30" W.

Please issue a revised Notice to Mariners.

Sincerely,
C & C Technologies, Inc.

Frank Lipari, PE, PLS

Enclosures: previous correspondence
Copy: COTR

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H -10803

State: Louisiana

General Locality: Gulf of Mexico

Sublocality: 11 miles SSE of Calcasieu Pass

Project Number: OPR-K171-KR

The following item was found during hydrographic survey operations:

Object Discovered: unknown

Covered 33 feet corrected to Mean Lower Low Water using predicted tide correctors.

Chart Number	V. Edition		Reported Depth	Charted Horiz. Datum	Geographic Position	
	No.	Date			Latitude	Longitude
11344	32	Aug 17/96	33ft.	NAD 83	29-36-32	93-14-28
11345	29	July 19/97				
11347	28	Apr 27/96				
11330	11	Sept 30/95				
11340	57	Sept 24/94				

U.S. Department of Transportation
United States Coast Guard

Commander
Eighth Coast Guard District
Hale Boggs Federal Building

501 Magazine Street
New Orleans, LA 70130-3396
Staff Symbol: oan
Phone: 504 589-6277
FAX: 504 589-6654

16600
24 September 1998

C&C Technologies
Survey Services
Attn: Mr. Frank Lipari, PE, PLS
730 E. Kaliste Saloom Road
Lafayette, LA 70508

Dear Mr. Lipari:

Thank you for your recent letter concerning an uncharted shoal. We have updated this information in the Gulf of Mexico Local Notice to Mariners 39/98.

Again, thank you for your interest in ensuring the Local Notice to Mariners publication contains accurate and up to date information. We welcome any future comments or questions.

Sincerely,

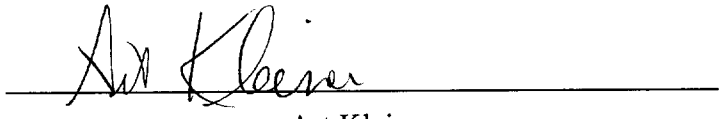
D. P. LEDET, SR.
Chief, Marine Information Section
Aids to Navigation Branch
U.S. Coast Guard
By direction of the District Commander

LETTER OF APPROVAL

REGISRY NO. H-10803

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of survey H-10803 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report and smooth sheets have been closely reviewed and are considered complete and adequate as per the Statement of Work.



Art Kleiner
Hydrographer
C & C Technologies, Inc.
December, 1998

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

August 4, 1998

MEMORANDUM FOR: Captain Andrew A. Armstrong
Chief, Hydrographic Surveys Division

FROM: Michael Szabados
Deputy Chief, Oceanographic Products and Services Division

SUBJECT: Final Water Level Data For Application to Hydrographic Survey OPR-K171-KR-1998

This memorandum is to document recommended changes in tidal zoning for OPR-K171-KR-1998 presented to you by Michael Gibson and Stephen Gill in a briefing on Wednesday, July 29, 1998. The original preliminary zoning recommended use of only existing onshore NOS control stations at Galveston Pleasure Pier and Sabine Pass. However, recent analysis as described below shows that offshore gauges better reflect tidal characteristics and water level variations for the hydrographic survey area. Hence, the final reduction of sounding data for this project should be based on data that includes the offshore stations. The new zoning, which reflects the results from the latest analysis, is provided as an attachment with references for all zones with appropriate correctors in a station hierarchy for optimum final reducers.

During the preparation of a refined discrete zoning scheme for offshore Texas, Gulf of Mexico, new analyses using the most up-to-date data sets indicate differences in tidal characteristics and water level variations from off-shore based measurements from those used in the preliminary tidal zoning previously provided. These analyses were facilitated by the availability of data from the Texas Coastal Ocean Observation Network (TCOON). Two of these stations, Galveston offshore (877-1904 @29° 07.4'N,94° 30.5'W) and Sabine Pass offshore (877-1081 @ 29° 29.9'N, 93° 38.4'W), are on platforms within the area being surveyed for NOS hydrographic Survey OPR-K171-KR. Data from these stations are collected using the same sensor and data collection platform as the NOS Next Generation Water Level Measurement System. The data are currently being quality assured and processed by OPSD as part of a memorandum of agreement with Texas General Land Office. Datums have been computed and are approved by OPSD for hydrographic surveying applications.

The provided discrete zoning is based on new determinations of cophase and corange lines of Tropic Higher High and Lower Low Water Time Intervals from harmonic analyses and Diurnal Ranges from standard datum computation algorithms. These are from modern and historical observed data series from shore based and offshore stations and are further adjusted by similar values from the E.W. Schwiderski Gulf of Mexico hydrodynamic model. Tide by tide simultaneous comparisons between area stations also assisted with refinements. Without a more dense network of simultaneously operating offshore gauges. it would not be possible to further

improve the discrete zoning provided.

The two TCOON offshore stations are schedued to be operated at least through this summer. OPSD has been assisting the GLO and the USCOE with operating these stations, however, there is no agreement with GLO or the COE at this time that data acquisition be guaranteed in association with this hydrographic survey. OPSD is notifying GLO of the importance of the stations to upcoming NOAA hydrographic surveys over the next year. Therefore, as long as it is available, OPSD will continue to process it and make it available as verified data relative to MLLW over the OPSD Home Page on the World Wide Web. These two stations will not appear on the Home Page list of stations, however they can be accessed by typing the station numbers in the appropriate field.

Attachments (2)

cc:
N/CS4 R.Barazotto
N/CS41 T. Mero
N/CS42 M. O'Hargan
N/CS41 M.Gibson

NOAA FORM 76-155
(11-72)

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

SURVEY NUMBER

H-10803

GEOGRAPHIC NAMES

Name on Survey	A ON CHART NO. 11330, 11344, 11345, 11347	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	
CALCASIEU PASS (title)	X		X							1
GULF OF MEXICO	X		X							2
LOUISIANA (title)	X		X							3
										4
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Approved:

Chief Geographer

JUN - 7 1999

NOAA FORM 76-155 SUPERSEDES C&GS 197

12/09/99

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10803

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	32028
NUMBER OF SOUNDINGS	32028

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	28.0	07/27/99
VERIFICATION OF FIELD DATA	62.0	08/04/88
QUALITY CONTROL CHECKS	0.0	
EVALUATION AND ANALYSIS	12.0	
FINAL INSPECTION	48.0	07/28/99
COMPILATION	103.0	12/08/99
TOTAL TIME	253.0	

ATLANTIC HYDROGRAPHIC BRANCH APPROVAL 09/02/99

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10803 (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:

NADCON, version 2.10
MicroStation 95, version 5.05
I/RAS B, version 5.01
AutoCAD, release 14
Hydrographic Processing System

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

H. HYDROGRAPHIC POSITION CONTROL

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 0.828 seconds (12.744 meters or 0.64 mm at the scale of the survey) north in latitude, and 0.557 seconds (7.491 meters or 0.37 mm at the scale of the survey) west in longitude.

L. JUNCTIONS

H10834 (1998-99) to the west

A standard junction was effected with survey H10834 (1998). There are no junctional surveys to the north, south, or east. Present survey depths are in harmony with the charted hydrography to the north, south, 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 CHART 11344 (33rd Edition, July 11/98) 11347 (30th Edition, May 30/98)

Hydrography

The charted hydrography originates with the prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section N. of the Descriptive Report. The following should be noted:

1) Automated Wreck and Information System (AWOIS) #6987, a charted obstruction with a depth of 35 feet (10^7m), in Latitude 29°32'18.64"N, Longitude 93°14'50.99"W, originates with prior survey H9627WD (1976), and was subsequently located by prior survey FE346SS (1990). The item was not observed by the field unit. During office processing a side scan contact was determined. The obstruction with a depth of 35 feet was brought forward from prior survey FE346SS (1990) to supplement the present survey. It is recommended that the feature be retained as charted.

2) AWOIS #7040, a charted obstruction, pipe with a depth of 35 feet (10^7m), in Latitude 29°32'01.12"N, Longitude 93°17'30.43"W, originates with prior survey FE326WD (1975), and was subsequently located by prior survey FE346SS (1990). The item was not observed by the field unit. During office processing a side scan contact was determined. The obstruction, pipe with a depth of 35 feet was brought forward from prior survey FE346SS (1990) to supplement the present survey. It is recommended that the feature be retained as charted.

3) The following charted platforms originate with miscellaneous sources and were neither verified nor disproved during field operations:

Latitude (N)	Longitude (W)
29°28'55"	93°14'42"
29°31'47"	93°12'13"
29°33'06"	93°19'46"
29°38'58"	93°14'37"

During office processing of side scan sonar and multibeam data the platforms were not seen. It is recommended that

these features be deleted from the chart unless subsequent information indicates otherwise.

4) A charted obstruction with a depth of 34 feet (10^4 m) and a note rep 1990, in Latitude 29°36'55.21"N, Longitude 93°17'35.26"W, originates with prior survey F00346 (1990) as an obstruction with an estimated depth of 34 feet (10^4 m) from side scan sonar records. The item was not addressed by the field unit in the Descriptive Report. During office processing a review of the side scan sonar and multibeam data determined that there is no obstruction. It is recommended that the feature be deleted from the charted.

5) A charted well, in Latitude 29°32'40"N, Longitude 93°18'20"W, was located by the field unit as a platform, in Latitude 29°32'39.46"N, Longitude 93°18'20.96"W. It is recommended that the charted well be deleted and a platform be charted as shown on the present survey.

6) An uncharted platform, in Latitude 29°40'15.19"N, Longitude 93°16'21.13"W, was located during field operations and positioned during office processing using side scan sonar data. It is recommended that the platform be charted as shown on the present survey.

7) The following uncharted features (can holes) were located by the present survey:

Latitude (N)	Longitude (W)	Depth (ft/m)
29°41'06.91"	93°17'28.34"	$25/7^6$
29°39'55.37"	93°16'30.58"	$28/8^5$
29°39'53.37"	93°16'46.37"	$29/8^8$
29°39'34.14"	93°17'06.17"	$28/8^5$
29°39'48.30"	93°16'22.58"	$29/8^8$
29°39'43.14"	93°15'26.61"	$29/8^8$
29°39'10.55"	93°15'56.73"	$29/8^8$

A can hole is a depression consisting of mud that remains after a platform has been removed. It is recommended that the soundings be charted.

The present survey is adequate to supersede the charted hydrography within the common area.

Dangers to Navigation

One Danger to Navigation report was submitted to Commander (oan), Eighth Coast Guard District, New Orleans, Louisiana for inclusion in the Local Notice to Mariners, and the Marine Chart Division, N/CS3X1, Silver Spring, Maryland. A copy of this report is appended to the Descriptive Report.

R. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will be forwarded to Marine Chart Division, Silver Spring, Maryland. The following NOS Charts were used for compilation of the present survey:

11344 (33rd Edition, July 11/98)
11347 (30th Edition, May 30/98)

S. ADEQUACY OF SURVEY

This is an adequate hydrographic survey; no additional field work is recommended.

Robert Snow

Robert Snow
Cartographic Technician
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H-10803

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: 9/2/99

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: 9/2/99

Andrew L. Beaver
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch

****

Final Approval:

Approved: Samuel P. DeBow, Jr. Date: January 7, 2000

Samuel P. DeBow, Jr.
Captain, NOAA
Chief, Hydrographic Surveys Division

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. 10803

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
11347	9/10/99	M	(Full) Part Before (After) Marine Center Approval Signed Via
			Drawing No. FULL APPLICATION OF SOUNDINGS
			AND CURVES FROM SMOOTH SHEET
11344	9/17/99	M	(Full) Part Before (After) Marine Center Approval Signed Via
			Drawing No. FULL APPLICATION OF SOUNDINGS
			AND CURVES THRU 11347
			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
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SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED