H10888

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey SIDE SCAN SONAR/MULTIBEAM

Field No. SHEET G

Registry No. H10888

LOCALITY

State LOUISIANA

General Locality GULF OF MEXICO

Locality 60 NM SSE OF CALCASIEU PASS

1999

CHIEF OF PARTY
ART KLEINER

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
	HYDROGRAPHIC TITLE SHEET	H10888
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 G

State: Louisiana

General Locality: Gulf of Mexico

Locality: 60 Miles SSE of Calcasieu Pass

Scale: 1:20,000 Date of Survey: June, 1999

Instructions Dated: March 23, 1999 Project Number: OPR-K171-KR

Vessel: *M/V Inez McCall*

Chief of Party: Art Kleiner

Surveyed by: P. Melancon, H. Langill, T. MacEwen, D. Albright, D. Warren, B. West, M. Andrews, S. Reichel

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

Graphic record scaled by: N/A

Graphic record checked by: N/A

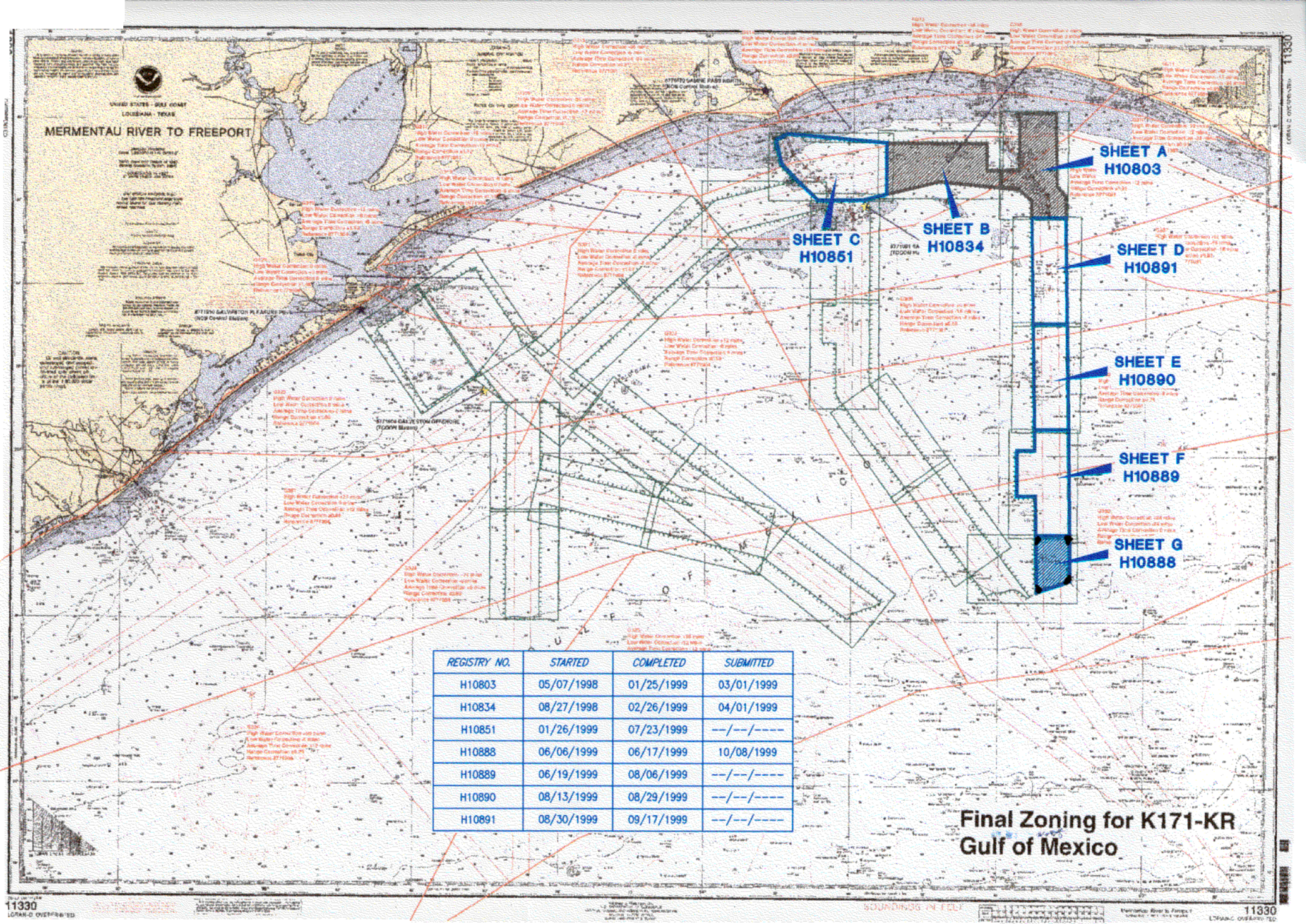
Protracted by: ~~N/A~~ Atlantic Hydrographic Branch Personnel Automated plot by: HP2500CP - Office HP 755 Plotter - Field

Verification by: C&C Technologies Personnel

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

Remarks: Multibeam Hydrographic Survey of Sheet G
Data collection in meters, later converted into feet, referenced to MLLW
200% side scan sonar coverage
UTC time was used exclusively
Tidal Zone: G302
Tidal Stations: 877-1081
Handwritten Notes in the Descriptive Report were made during office processing.

AWOIS ✓ & SURF ✓ by MBH on 7/12/01



REGISTRY NO.	STARTED	COMPLETED	SUBMITTED
H10803	05/07/1998	01/25/1999	03/01/1999
H10834	08/27/1998	02/26/1999	04/01/1999
H10851	01/26/1999	07/23/1999	--/--/----
H10888	06/06/1999	06/17/1999	10/08/1999
H10889	06/19/1999	08/06/1999	--/--/----
H10890	08/13/1999	08/29/1999	--/--/----
H10891	08/30/1999	09/17/1999	--/--/----

TABLE OF CONTENTS

A. PROJECT
B. AREA SURVEYED
C. SURVEY VESSELS
D. AUTOMATED DATA ACQUISITION
E. SIDE SCAN SONAR
F. SOUNDING EQUIPMENT
G. CORRECTIONS TO SOUNDINGS
H. CONTROL STATIONS
I. HYDROGRAPHIC POSITION CONTROL
J. SHORELINE
K. CROSS LINES
L. JUNCTIONS
M. COMPARISON WITH PRIOR SURVEYS
N. COMPARISON WITH THE CHART
O. <NOT USED BY CONTRACTOR>
P. AIDS TO NAVIGATION
Q. STATISTICS
R. MISCELLANEOUS
S. RECOMMENDATIONS
T. REFERRAL TO REPORTS

APPENDICES

A. DANGER TO NAVIGATION REPORTS
* B. LANDMARKS AND NONFLOATING AIDS TO NAVIGATION
C. LIST OF HORIZONTAL CONTROL STATIONS
D. LIST OF GEOGRAPHIC NAMES
E. TIDE NOTES
F. SUPPLEMENTAL CORRESPONDANCE
G. CALIBRATION DATA
H. DGPS VERIFICATION DATA
I. DATA PROCESSING ROUTINE
J. SOUND VELOCITY PROFILE DATA
K. AUTOMATED DATA ACQUISITION AND PROCESSING SOFTWARE
L. LETTER OF APPROVAL

SEPARATES

I. SURVEY LOG
II. CROSS LINE STATISTICS
* III. SONAR CONTACT TABLE

*Data filed with original Field records.

A. PROJECT

A.1 Project Number: OPR-K171-KR
Sheet G
Contract No.: 50-DGNC-8-90024 October 27, 1997
Task Order: 56-DGNC-9-23004 March 23, 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 shall be used to locate these obstructions and a shallow water multibeam sonar system shall be used to determine the least depth over the obstructions as well as determine the depths over the entire project area.

B. AREA SURVEYED

B.1 Sheet G, shown on the INDEX OF SHEETS, is located 60 miles south-southeast of Calcasieu Pass, Louisiana in the Gulf of Mexico.

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

Latitude (°N)	Longitude (°W)
28.837883	93.250978
28.837790	93.174196
28.746198	93.172876
28.724651	93.248932
28.837883	93.250978

B.3 Data collection was performed between June 6 (J.D. 157) and June 17 (J.D. 168), 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.

* Data Filed with field records.

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

C.3 Vessel Description:

Registration Number	638285
Length (feet)	110
Beam (feet)	25
Tonnage	
Gross	92
Net	62

C.4 Unusual vessel configuration: None

* 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, Satloc DGPS, Endeco YSI Sound Velocity Probe, Seabird CTD sensor, and Echotrac single beam 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 EM3000D 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. Details of the processing steps are provided in* Appendix I.

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

* Data Filed with Field records.

d) Data editing

2) Merging of data

3) Generation of smooth sheet

4) Generation of back-trace data

D.4 EG&G 260 side scan sonar data were collected and processed using the Triton Elics Isis software, run on a Windows 95 PC. Side scan data were recorded digitally together with time and position data, fed from HydroMap, and saved in extended triton format (.xtf) to 8mm AIT tapes.

D.5 The ISIS software was used to process the side scan data. Sonar targets and positions were recorded using this software.

D.6 A list of software and version numbers used for data collection and processing is given in Appendix K.*

E. SIDE SCAN SONAR

E.1 Side scan sonar data were collected using an EG&G 260 towfish, S/N 24534. Data were recorded using Isis software. Digital data were saved to Magneto Optical Disks and to 8-mm AIT tapes. Analog data were 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 all water depths. A range of 75 meters per channel was used throughout the survey. The towfish was configured with 20° depression angles. The towfish altitude was maintained between 6 and 7 meters. A 65-meter line spacing was used to adequately provide 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 lines. All shot points were annotated with line name, date, time, position (easting and northing), event number, and layback.

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, dredged channels, or platforms were used as the target for the confidence checks. On several occasions, it was necessary to break line and find

*Data filed with field records.

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 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 ISIS software. 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.6 Fix files extracted from the HydroMap digital data were used to establish proof of coverage. 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 either 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.7 Due to the presence of an oil field platform in the survey area, a gap in 200% side scan sonar coverage exists. One hundred percent coverage was achieved at this location. The side scan coverage plots are included as *Separates.

E.8 One significant contact was observed in the survey area. The details and data reproductions are presented in Section N and the contact is depicted on the smooth sheet.

Other targets, which were tagged and are listed in the sonar contact list, consist of insignificant debris and gas and oil field platforms. Targets were measured online using the 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 so that correlation could be made between contacts seen on adjacent lines. A sonar contact list was made of all tagged targets and is included as a *Separate with the side scan sonar data.

F. SOUNDING EQUIPMENT

F.1 A Simrad EM3000D dual-head multibeam sonar system, S/N 138, was used for all hydrographic operations. Head 1 (port side) was S/N 605 and head 2 (starboard side) was S/N 604. This system operates at a frequency of 300 kHz with 127 receive beams for each transducer.

*Data filed with field records

F.2 A 200 kHz Echotrac 3200 MK II single beam echosounder, S/N 9555, was used as a continuous real-time check of the multibeam echosounder depth readings. Heave compensation was accomplished by corrections provided by the POS/MV motion sensor.

F.3 A draft tube was installed to measure changes in the vessel 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 Periodic 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 each depth value.

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

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 EM3000D 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)
06/06/99	28.735479	93.240382	06/09/99	28.824175	93.239192
06/06/99	28.731664	93.183016	06/10/99	28.811028	93.241206
06/06/99	28.737858	93.140223	06/11/99	28.800600	93.239933
06/07/99	28.821024	93.179573	06/12/99	28.789130	93.244014

*Data filed with field records.

06/07/99	28.803637	93.219503	06/12/99	28.788001	93.248073
06/07/99	28.836830	93.249467	06/12/99	28.741312	93.209857
06/07/99	28.833399	93.202422	06/12/99	28.784081	93.171840
06/08/99	28.831338	93.179701	06/13/99	28.772376	93.173099
06/08/99	28.832809	93.251043	06/14/99	28.761226	93.245537
06/08/99	28.827402	93.248238	06/15/99	28.750228	93.243250
06/08/99	28.823001	93.183838	06/16/99	28.738754	93.246770

Two Seabird sound velocity profilers, S/N 1730 and S/N 1174, were used for the survey. Following, are the calibration dates for each of the Seabirds used during the survey. The calibration records are included in Appendix G.

Seabird Serial Number	Date of Calibration
1730	March 26, 1999
1174	March 25, 1999

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 the POS/MV motion sensor. The mean sound velocity of each sound velocity profile acquired 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 settlement 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 settlement was measured for eight different RPM values for each line. The results of the settlement test revealed that the greatest change over the entire RPM range was less than 20 centimeters. The settlement test log and results are included in *Appendix G.

The multibeam data were corrected for settlement 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

*Data filed with field records.

processed in groups based upon the survey speed and the corresponding settlement 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 an internal GPS receiver, 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). SATLOC computes 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). 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. Procedures for a standard patch test are outlined below and patch test results are included in Appendix G.*

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 EM3000. 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 EM3000. 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. The following formula is used for this calculation: cy = atan (dt

* Data Filed with field records.

/ (2 x offset from track line)), where cy = yaw corrector value and dt = target distance offset.

G.8 The tidal datum used for the survey was Mean Lower Low Water (MLLW). During post-processing, tidal data from the Sabine Pass offshore tidal station (877-1081) were used with correction offsets for tide zone 302. The tidal zone, station, and offsets used during post-processing are given in the table below.

Tidal Zone	Tide Station	Time Correction			Height Correction
		HW	LW	Ave	
G302	877-1081	+24	-24	0	0.67

H. CONTROL STATIONS - See also Evaluation Report

H.1 The horizontal datum used for the survey was NAD83 (North American Datum of 1983).

H.2 No horizontal control stations were established for this survey. Existing land based stations used for SATLOC and Coast Guard beacon are listed in *Appendix C.

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 real-time coverage 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 in the Statement of Work were met:

- 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 that 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, as specified in the Statement of Work, were met. Both DGPS systems used for this survey met 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) 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 that would have degraded the expected positional accuracy were encountered.

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.*

While computing the comparisons between each of the positioning systems it was discovered that the Version 3 upgrade to the POS/MV was not incrementing the date correctly each day at midnight UTC. This error resulted in the first two digits of the year incrementing instead of the two-digit day of the month.

This problem did not affect the data processing. The Simrad EM3000 time synchronizes once on startup and then again every second unless the time difference between itself and the POS vary by greater than five seconds. Consequently, at midnight on the first night the Simrad did not synchronize to the POS. However, the Simrad date and time remained correct and accurate because it continues to set the second on the one pulse per second.

In Hydromap processing, the time in the Simrad datagrams is used to apply all corrections, in particular the tide corrections.

In order to correlate the dates prior to performing the positioning system comparisons, the correct dates were extracted from the Trimble data by matching up the times (time of day) in the GGA strings. We have included the corrected POS/MV navigation files as part of the deliverables.

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, which were used as the corrections for the secondary positioning system, 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 are 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 Statement of Work.

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

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

*Data filed with field records

I.12 Antenna offset and layback corrections were measured using conventional methods by two different procedures. These conventional methods involved the employment of tape measures, a hand level, and a plum bob.

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 were referenced to the navigation center, which was 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 that compares data from a main line with data from cross lines. The comparison calculates the mean difference and noise level as a function of across-track position. The measurements are used for quantitative quality assurance, system accuracy, and ray-bending analysis. All cross line statistical results are included as Separates II.

K.1 Reference Data

In general, cross lines, which consisted of a minimum of 5 percent of the main scheme lines, were used to produce reference data. The reference data were considered to be an accurate representation of the bottom. Since the data were collected from an orthogonal direction, the errors were independent.

The cross lines were processed to produce the best possible data. Frequent sound velocity profiles were taken to minimize any possible ray-bending. The swath was restricted to an angular sector of 10 degrees, resulting in a swath width of less than 2 meters to ensure that there were no measurable ray-bending or roll errors. The data were binned and thinned using a median filter. The data were then carefully edited to ensure that there were no remaining outliers.

K.2 Test line

The line to be evaluated, the test line, was processed to produce a trace file. Trace files were comprised of binned soundings that had not been thinned. Processing parameters were set to include all beams.

Data filed with field records

K.3 Cross Analysis

To perform the cross analysis, all lines of the reference data set were utilized and the results were "stacked" to produce more significant statistics.

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

Optionally remove tidal effects:

Residual tidal effects were removed by eliminating the difference between the reference line data and the near-nadir beams of the test line. The beams of the test line that fell within a small (operator settable) angular sector from nadir were subtracted from the corresponding soundings of the reference data. The average difference was 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 was subtracted from the sounding in the corresponding bin of the reference line. The resulting differences were used to accumulate statistics based on an operator settable across-track binning criteria. The across-track binning was based upon across-track distance, beam number, and angle from nadir. The bin size was also settable by the operator.

K.4 Results From All Reference Lines Stacked

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

K.5 Interpretation

Ray-bending:

The effects of ray-bending were measured by observing the values of the mean difference curve. 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 does not match the real world. The errors will normally be

* Data filed with field records

reduced if a new sound velocity profile is recorded and loaded into the sonar unit.

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

Evaluation Procedure:

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

When the ray-bending appeared to be variable along the line, the survey was segmented into smaller sub-areas.

When the sound velocity changed so quickly in time and space that the specified accuracy could not be met, a narrower swath was used in that area.

Vertical accuracy:

The RMS difference and the confidence interval reflect the vertical accuracy of the system. 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.

K.6 Each test line was compared to all the reference lines that had overlapping data. A graph was produced for each test line showing the mean difference, RMS difference, and confidence interval for each beam. The graphs show the multibeam data to be repeatable with 90% of the soundings within 10 centimeters across the entire swath.

L. JUNCTIONS - See also Evaluation Report

This survey junctions with Gulf of Mexico hydrographic survey H10889, Sheet F, which lies 50 miles SSE of Calcasieu Pass. The survey of Sheet F is currently ongoing. Comparisons will be made in the H10889 (Sheet F, 1999) 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 chart was used for comparison for this survey. It should be noted that the current edition of the chart was released after the Work Order was effected. Therefore, a later chart edition than that indicated in Attachment #3 of the Statement of Work is reflected.

Chart Number	Scale	Edition	Edition Date
11330	1:250,000	12	August 8, 1998

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

N.2 A comparison with the chart revealed only three charted soundings that fall within the survey limits of Sheet G.

The charted sounding of 78 feet, located at approximately 28^0 50' 00"N, 93^0 11' 48" W, is 5 feet shoaler than the survey depth. Concur

The charted sounding of 90 feet, located at approximately 28^0 45' 48"N, 93^0 14' 12" W, is 5 feet shoaler than the survey depth. Concur

The charted sounding of 90 feet, located at approximately 28^0 46' 12"N, 93^0 10' 36" W, is 2 feet shoaler than the survey depth. Concur

N.3 One charted item lies within the survey area. This table identifies each of the charted items. A description and chart comparison follows.

Charted Item	Description	Position		Charted Depth (feet)	Survey Depth (feet)
		Latitude (N)	Longitude (W)		
1	Wreck PA Santa Fez (AWOIS 277)	28° 48' 12"	93° 14' 00"	-	87

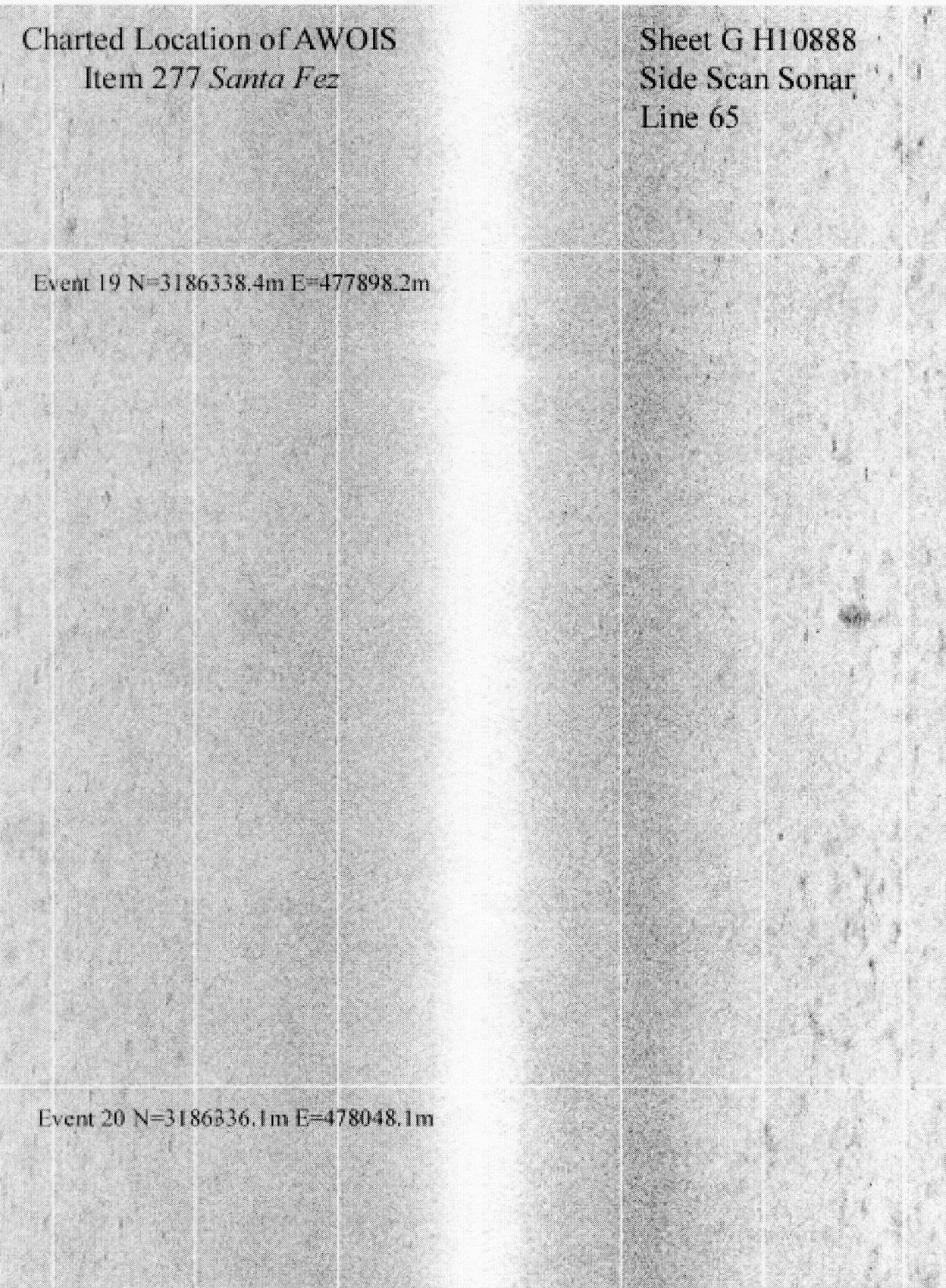
N.4 The location of the AWOIS item was plotted on the trackline plots in the field so it could be easily correlated with the appropriate side scan sonar lines and shot points. The following table lists side scan sonar lines and the corresponding shot points that were run over the reported AWOIS location.

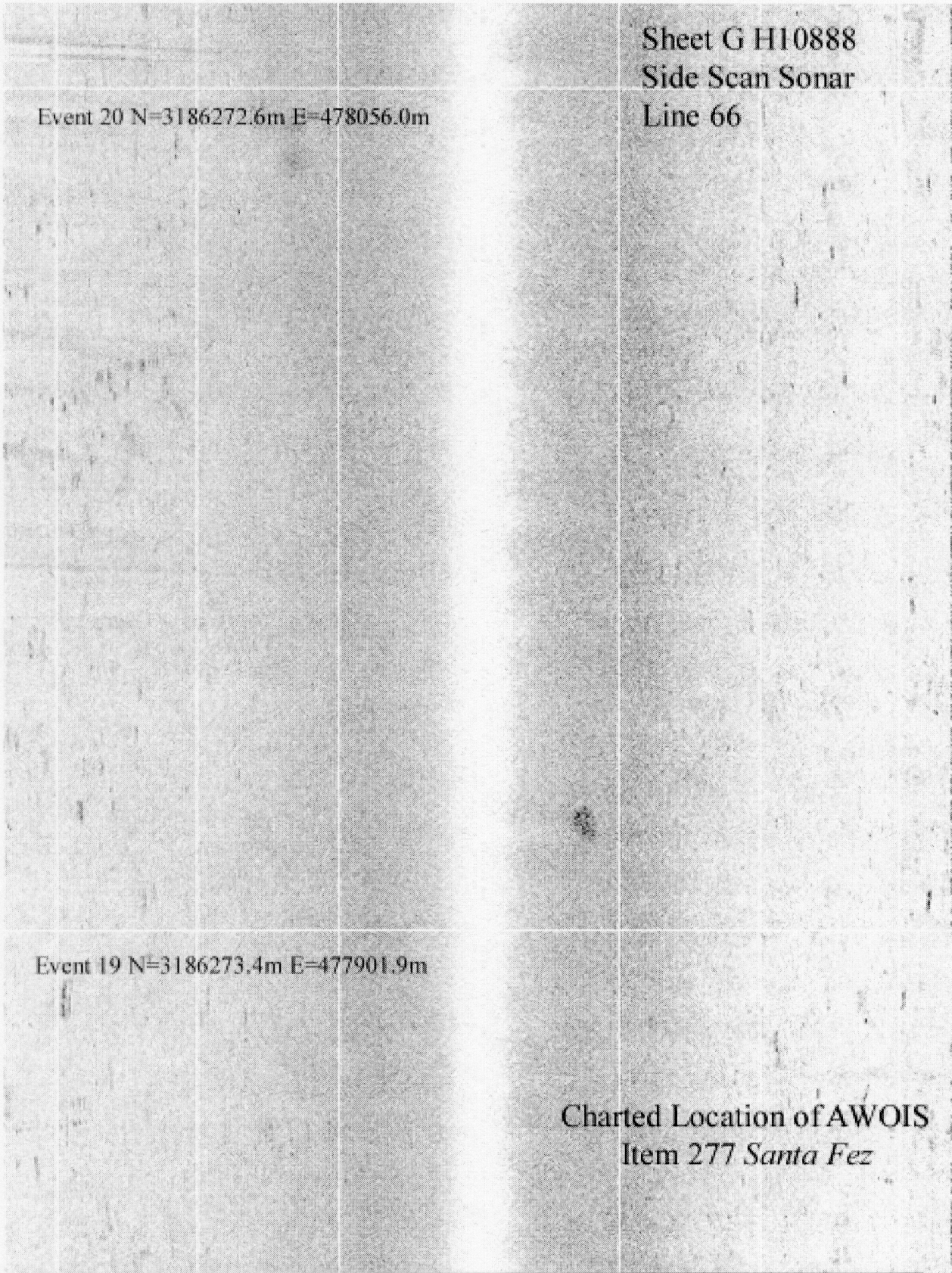
AWOIS Item	Position		Side Scan Lines	Shot Points
	Latitude (N)	Longitude (W)		
277	28° 48' 12"	93° 14' 00"	65, 66, 68, 69	19 - 20

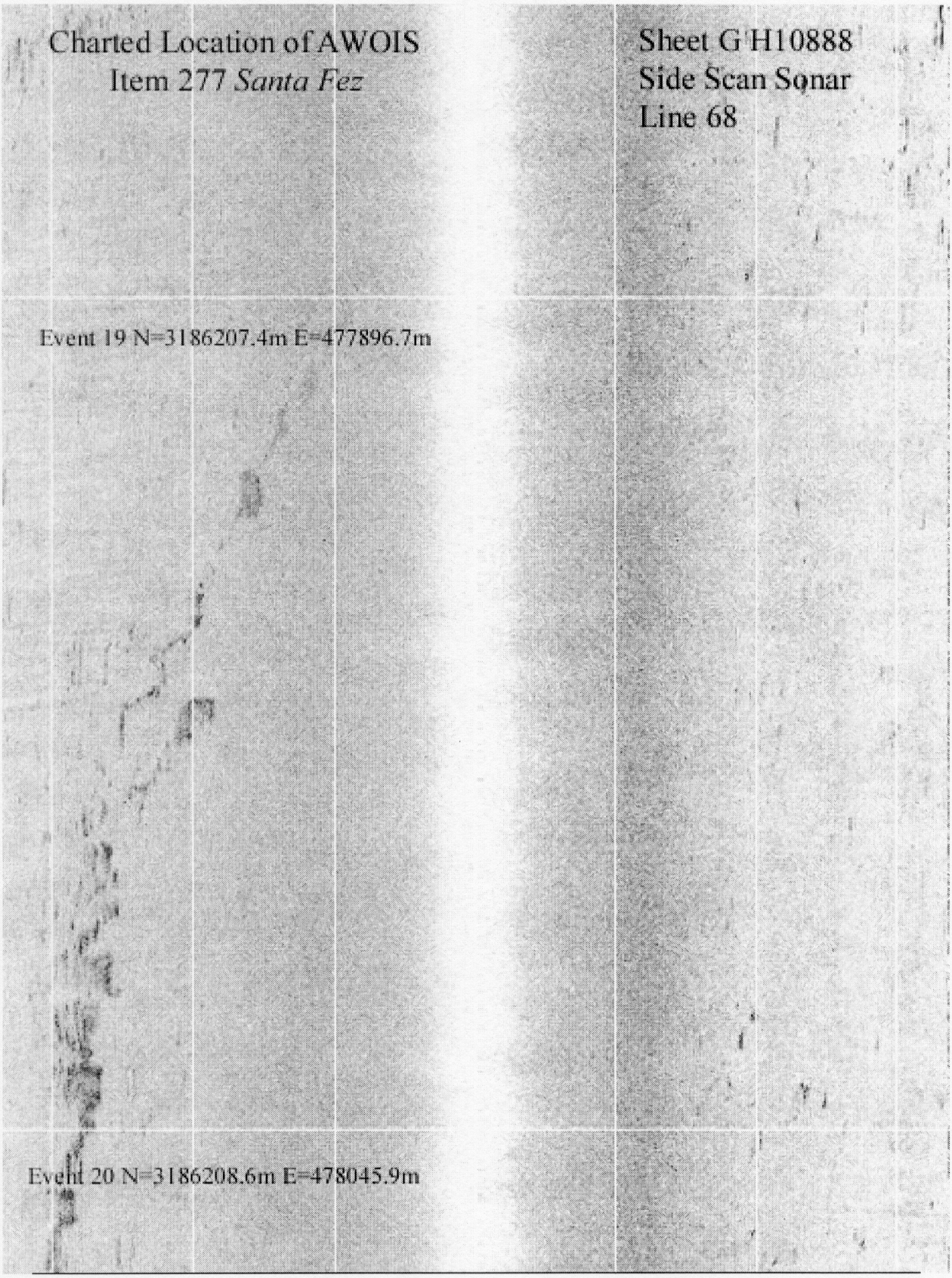
Charted Item 1

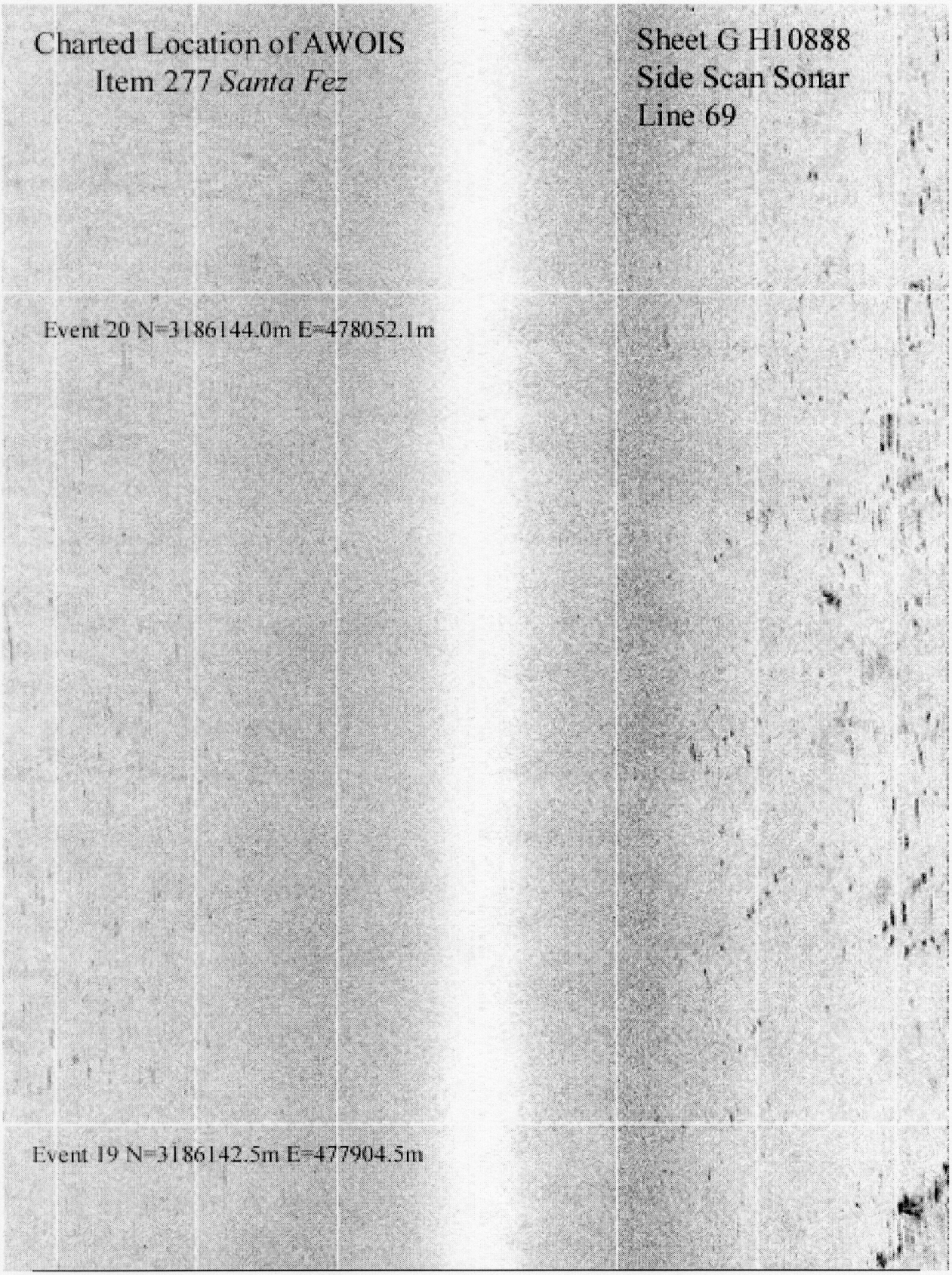
Item Type: **Wreck PA**
AWOIS Number: 277
Description: *Santa Fez*
Charted Position: 28° 48' 12" N, 93° 14' 00" W
Charted Depth: -
Method of Investigation: 200% side scan and multibeam
Survey Results: No evidence of the wreck was found during the survey.
Recommendation: Remove from chart. Concur

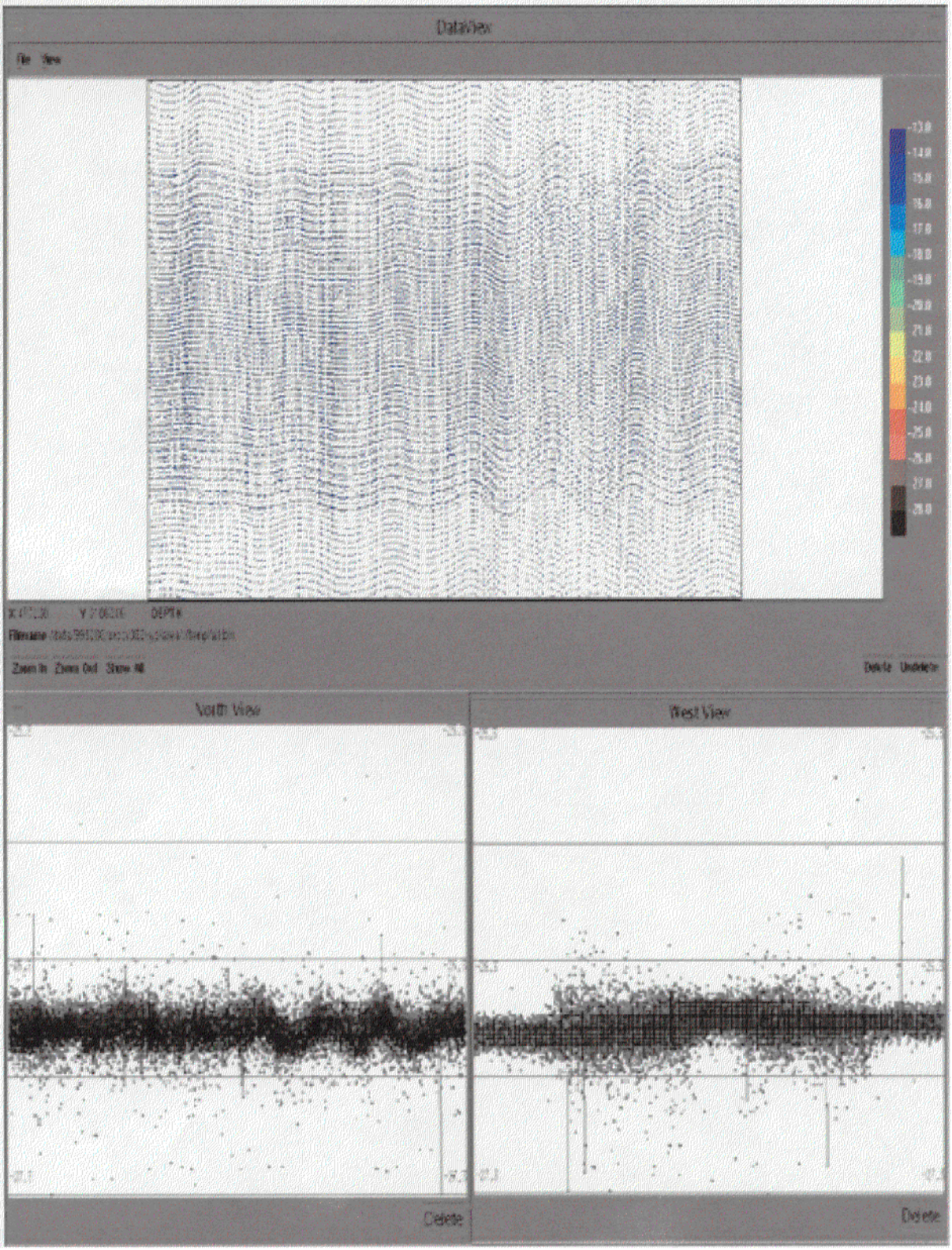
Remove HH PA from chart.


Charted Location of AWOIS
Item 277 *Santa Fez*
Sheet G H10888
Side Scan Sonar
Line 65
Event 19 N=3186338.4m E=477898.2m
Event 20 N=3186336.1m E=478048.1m


Sheet G H10888
Side Scan Sonar
Line 66
Event 20 N=3186272.6m E=478056.0m
Event 19 N=3186273.4m E=477901.9m
Charted Location of AWOIS
Item 277 *Santa Fez*


Charted Location of AWOIS
Item 277 *Santa Fez*
Sheet G H10888
Side Scan Sonar
Line 68
Event 19 N=3186207.4m E=477896.7m
Event 20 N=3186208.6m E=478045.9m

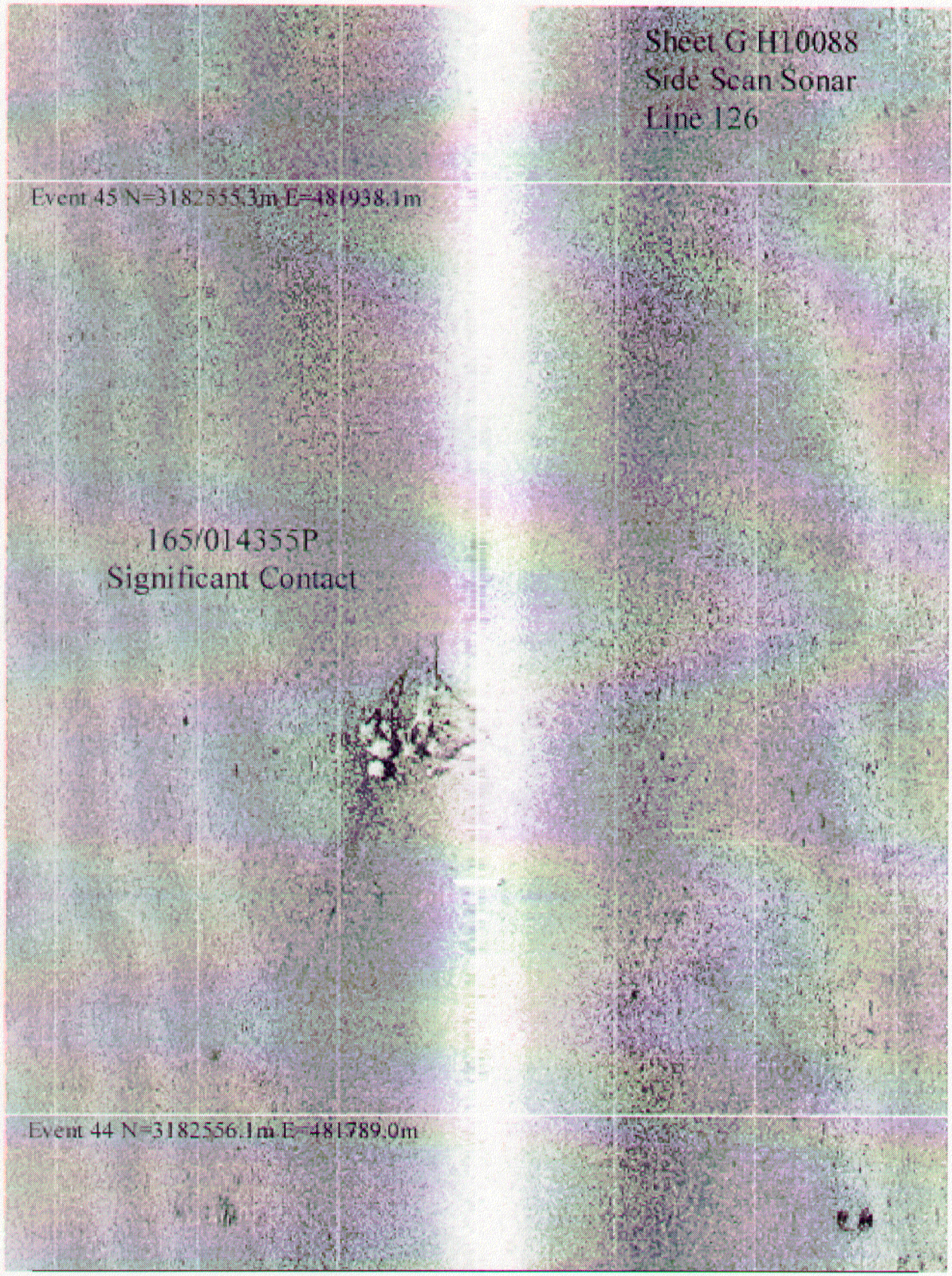

Charted Location of AWOIS
Item 277 *Santa Fez*
Sheet G H10888
Side Scan Sonar
Line 69
Event 20 N=3186144.0m E=478052.1m
Event 19 N=3186142.5m E=477904.5m

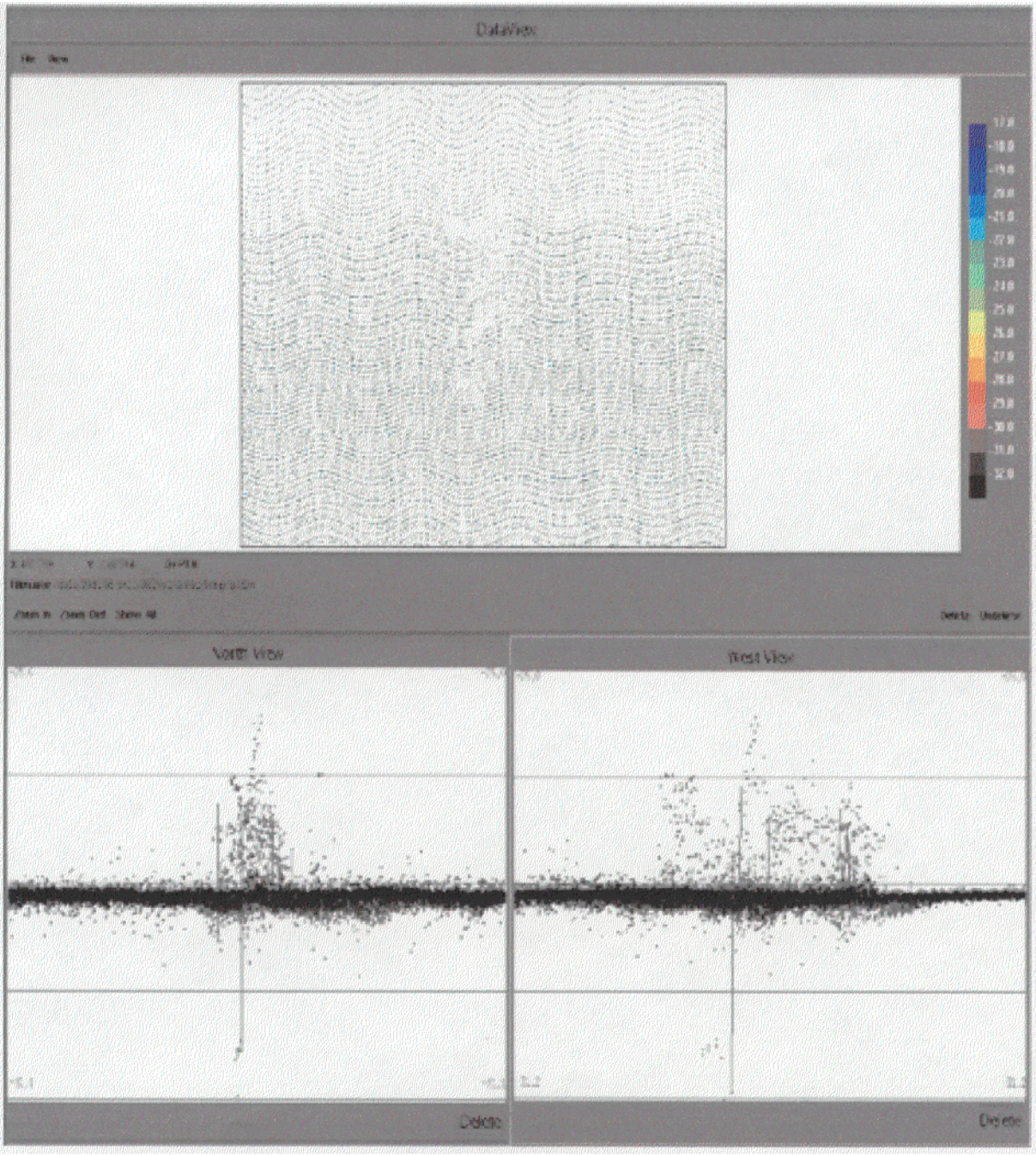

DataView
North View
West View
Delete
Delete

N.5 One significant contact was seen in the survey area. The target that is depicted on the smooth sheet is included in the sonar contact table as contacts 165/000307P and 165/014355P. Data reproductions from both the side scan sonar and the multibeam are included here. The object appears to be man-made debris resulting from oil and gas operations. The least depth over the target, as established from the raw multibeam data, is 24.88 m (81.62 feet). Concur

Chart 81 obstn (non-dangerous) in
Lat 28-46-13.45N
Lon 93-11-11.60 W


Sheet G H10888
Side Scan Sonar
Line 125
Event 43 N=312620.4m E=481637.8m
165/000307P
Significant Contact
Event 44 N=3182621.9m E=481787.6m


Sheet G H10088
Side Scan Sonar
Line 126
Event 45 N=3182555.3m E=481938.1m
165/014355P
Significant Contact
Event 44 N=3182556.1m E=481789.0m


DataView
North View
West View

N.6 Two charted pipelines lie within the survey area. The positions of these pipelines were confirmed by side scan and multibeam sonar data. Positions along the pipelines were tagged and are listed in the sonar contact table. It is recommended that these pipeline locations be maintained as charted. Concur

A third pipeline also lies within the survey area. Positions along this pipeline are listed in the sonar contact table. It is recommended that this pipeline be added to the chart. - See below

N.7 One charted platform and one uncharted platform lie within the survey area. Both platforms are shown on the smooth sheet and described in the sonar contact table. It is recommended that the platforms be charted as depicted on the smooth sheet. Concur

N.8 No evidence of the charted buoy labeled G Q G HORN Priv Well was found during the survey. It is recommend that the buoy be removed from the chart. Concur

O. <NOT USED BY CONTRACTOR>

P. AIDS TO NAVIGATION - See also Evaluation Report

P.1 Two charted pipelines lie within the survey area. The positions of these pipelines were confirmed by side scan and multibeam sonar data. Positions along the pipelines were tagged and are listed in the sonar contact table. It is recommended that these pipeline locations be maintained as charted. Concur

A third pipeline also lies within the survey area. Positions along this pipeline are also listed in the sonar contact table. It is recommended that this pipeline be added to the chart. Concur w/ condition: When an accurate position is obtained on this pipeline, it should be charted.

P.2 One charted platform and one uncharted platform lie within the survey area. Both platforms are shown on the smooth sheet and described in the sonar contact table. It is recommended that the platforms be charted as depicted on the smooth sheet. Concur

P.3 No evidence of the charted buoy labeled G Q G HORN Priv Well was found during the survey. It is recommend that the buoy be removed from the chart. Concur

Q. STATISTICS

Lineal nautical miles of sounding lines (Side scan and multibeam)	819.45

Lineal nautical miles of sounding lines (Multibeam only)	50.05
Square nautical miles (Multibeam and 200% side scan coverage)	24.73
Number of velocity casts (applied to data)	22
Number of supplemental tide stations	0
Number of horizontal control stations occupied/established	0
Number of items investigated	0

R. MISCELLANEOUS- See also Evaluation Report

R.1 The "Histogram of Selected Soundings by Beam Number" is dominated by peaks at the outer edges of the swath and humps near nadir. The outer swath peaks are centered on beams 40 and 210. The nadir humps are centered near beams 95 and 165. There is also a peak near beam 138.

The selected soundings are shoal selected. Therefore, beams that tend to have the most residual noise or shoal bias after processing are over-represented.

An examination of the cross line comparisons shows consistent systematic biases of +/-5 cm varying over the swath. Shoal-biased peaks occur near beams 40, 95, 138, and 165. These peaks correspond with peaks in the histogram, indicating that the representation in the selected soundings is strongly correlated with small biases on the order of 5 cm.

In addition to biases and noise, representation in the selected soundings is also a result of data thinning. Specifically, outer beams are favored in the histogram due to the EM3000D's characteristically reduced data density and an "edge effect", which is created when bins do not fall completely within the multibeam swath.

Because the beam distribution of the EM3000-D is FFT and the heads overlap, the data density in the outer part of the swath is only about 5% of the data density near nadir. This results in less data thinning in the outer beams and thus over-representation of the outer beams by a factor of approximately 20.

Due to an "edge effect", bins that fall on the edge of the swath may contain as few as fifteen soundings. Data thinning exacerbates the over-representation of these beams.

The gap at the center of the histogram does not represent an absence of data. It is the result of the Simrad EM3000D's internal beam numbering and reflects overlap between the two transducer heads. Extremely dense data exists at nadir, which is centered at beams 110 to 120 and 140 to 150.

R.2 A multibeam coverage map is included as part of the Separates. An along track gap in multibeam coverage is present near the location of the ANG WC 405A platform. Due to the orientation and size of the platform it was impossible to achieve full coverage at this location.

S. RECOMMENDATIONS

None

T. REFERRAL TO REPORTS

LETTER OF APPROVAL

REGISRY NO. H10888

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of survey H10888 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.

Art Kleiner
Hydrographer
C & C Technologies, Inc.
October, 1999

06/20/2001

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NUMBER: H10888

NUMBER OF CONTROL STATIONS	2
NUMBER OF POSITIONS	14944
NUMBER OF SOUNDINGS	14944

	TIME-HOURS	DATE COMPLETED
PREPROCESSING EXAMINATION	50.0	09/14/2000
VERIFICATION OF FIELD DATA	241.0	01/26/2001
QUALITY CONTROL CHECKS	0.0	
EVALUATION AND ANALYSIS	200.0	
FINAL INSPECTION	23.0	06/20/2001
COMPILATION	17.0	06/20/2001
TOTAL TIME	531.0	

ATLANTIC HYDROGRAPHIC BRANCH APPROVAL 06/20/2001

NOAA FORM 76-155
(11-72)

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

SURVEY NUMBER

H-10888

GEOGRAPHIC NAMES

Name on Survey	A ON CHART NO. 11330	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
GULF OF MEXICO (title)	X		X							3
LOUISIANA (title)	X		X							4
										5
										6
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										24
										25

Approved

Chief Cartographer

JAN 23 2001

NOAA FORM 76-155 SUPERSEDES C&GS 197

NOAA FORM 61-29
(12-71)

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

REFERENCE NO.
N/CS33-27-01

LETTER TRANSMITTING DATA

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

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

DATE FORWARDED 06/22/2001

NUMBER OF PACKAGES 1

TO:

CHIEF, DATA CONTROL GROUP, N/CS3x1
NOAA / NATIONAL OCEAN SERVICE
STATION 6815, SSMC3
1315 EAST-WEST HIGHWAY
SILVER SPRING, MARYLAND 20910-3282

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.

H10888

LOUISIANA, GULF OF MEXICO, 60 NM SSE OF CALCASIEU PASS

ONE TUBE CONTAINING THE FOLLOWING:

1 SMOOTH SHEET FOR SURVEY H10888
1 ORIGINAL DESCRIPTIVE REPORT
1 DRAWING HISTORY FORM (NOAA FORM #76-71) FOR NOS CHART 11330
1 RECORD OF APPLICATION TO CHART FORM (NOAA FORM #75-96)
1 H-DRAWING ON MYLAR FOR NOS CHART 11330
1 COMPOSITE DRAWING ON PAPER FOR NOS CHART 11330

FROM: (Signature)
Deborah A. Blair

RECEIVED THE ABOVE
(Name, Division, Date)

Return receipted copy to:

NOAA \ NATIONAL OCEAN SERVICE
ATLANTIC HYDROGRAPHIC BRANCH N/CS33
439 WEST YORK STREET
NORFOLK, VA. 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

ATLANTIC HYDROGRAPHIC BRANCH
EVALUATION REPORT FOR H10888 (1999)

This Evaluation Report has been written to supplement and/or clarify the original Descriptive Report. Sections in this report refer to the corresponding sections of the Descriptive Report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

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

NADCON, version 2.10
MicroStation 95, version 5.05
I/RAS B, version 5.01
Caris HIPS/SIPS
AutoCAD, Release 14

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 0.899 seconds (27.68 meters or 1.38 mm at the scale of the survey) north in latitude, and 0.545 seconds (14.77 meters or 0.74 mm at the scale of the survey) west in longitude.

L. JUNCTIONS

H10889 (1999) 1:20,000 to the north

A standard junction was effected between the present survey and survey H10889 (1999). There are no junctional surveys to the south, east, or west. Present survey depths are in harmony with the charted hydrography to the south, east and west.

← Depth contour 90' curve departs to the north
9-4-01

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 11330 (12th Edition, Aug 08/98)

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. A charted lighted platform in Latitude 28°47'18"N, Longitude 93°14'23"W originates with an unknown source. This platform was found to be in its charted location by the present survey. No change in charting is recommended.

2. An uncharted lighted platform in Latitude 28°47'40"N, Longitude 93°13'52"W was found by the present survey. It is recommended that a Platform be added to the chart in the present survey location.

3. An uncharted obstruction with a depth of 93 feet (28[3] m), in Latitude 28°44'02.66"N, Longitude 93°14'20.36"W, was located by the field unit. This feature was not charted because shoaler depths are in the immediate area.

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

P. AIDS TO NAVIGATION

There were no aids to navigation located within the limits of the present survey. The following should be noted:

1. The privately maintained lighted buoy G charted in Latitude 28°47'40"N, Longitude 93°13'52"W was not found by the present survey. It appears that this buoy was marking the location of a charted note well (cov 79 ft). A lighted platform now exists where the buoy and covered well were charted. It is recommended that the covered well note be removed from the chart. It is further recommended that the fate of the buoy and its associated notes be determined by Marine Chart Division personnel upon the arrival of this data in Silver Spring, Maryland. The buoy has been displaced on the chart to allow for the charting of the platform.

R. MISCELLANEOUS

Chart compilation was done by Atlantic Hydrographic Branch personnel, in Norfolk, Virginia. Compilation data will

be forwarded to the Marine Chart Division, Silver Spring, Maryland. The following NOS Chart was used for compilation of the present survey:

11330 (12th Edition, AUG 08, 1999) 1: 250,000

Reginald L. Keene Sr.

Reginald L. Keene Sr.
Cartographic Technician
Verification of Field Data
Evaluation and Analysis

APPROVAL SHEET
H10888

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.

Deborah A. Bland Date: 3/01/01
Deborah A. Bland
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.

for Robert A. Robertson Date: 6/20/2001
James S. Verlaque
Lieutenant Commander, NOAA
Chief, Atlantic Hydrographic Branch

****

Final Approval:

Approved: Samuel P. De Bow, Jr. Date: August 24, 2001
Samuel P. De Bow, 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. H 10888

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
11330	3/5/01	D.A. Blake	Full [redacted] 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
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			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.