

# 9611

Diag. Cht. 4116-2

NOAA FORM 76-35A	
U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION NATIONAL OCEAN SURVEY	
DESCRIPTIVE REPORT (HYDROGRAPHIC)	
Type of Survey	HYDROGRAPHIC
Field No.	SP-PMC-2-RA-76
Office No.	H-9611
LOCALITY	
State	HAWAII
General Locality	LANAI
Locality	NORTH PORTION OF KEALAIKAHIKI CHANNEL
19 76	
CHIEF OF PARTY C. K. TOWNSEND	
LIBRARY & ARCHIVES	
DATE	9-15-76

1188

4130  
4179  
4180

HYDROGRAPHIC TITLE SHEET

H-9611

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

FIELD NO.

SP-PMC-2-RA-76

State HAWAII

General locality -Island of Lanai

Locality North Portion of Kealaikahiki Channel, South of Lanai

Scale 1:20,000

Date of survey 17 - 20 April 1976

Instructions dated 22 December 1975

Project No. SP-PMC-2-RA-76  
~~SP-411-RA-76~~

Vessel NOAA Ship RAINIER MSS-21

Chief of party Charles K. Townsend, CDR, NOAA

OOD: LT AA Armstrong, LTJG K.A. Andreen, LTJG C.A. Gavin

Surveyed by Hydrographer: LTJG F.L. Kleinschmidt, ENS G.B. Stanke, ENS J.C. Osborn

Soundings taken by echo sounder, ~~XXXXXXXXXX~~ RAYTHEON Universal Graphic Recorder (SN/75)

Graphic record scaled by Ship Personnel

Graphic record checked by Ship Personnel

Positions Verified

~~XXXXXXXXXX~~ by Thelma O. Jones  
Verified

Automated plot by PMC Kynetics Plotter

Soundings ~~XXXXXXXXXX~~ by Thelma O. Jones

Soundings in fathoms ~~feet~~ at MLW MLLW

REMARKS: Survey time was 000° W.

The survey is complete and adequate to supersede prior surveys for the area surveyed.

*Applied to stels 2-9-77*  
*CAB*



DESCRIPTIVE REPORT  
TO ACCOMPANY HYDROGRAPHIC SURVEY

SP-PMC-2-RA-76

H-9611

Scale 1:20,000

1976

NOAA SHIP RAINIER  
CDR. CHARLES K. TOWNSEND  
Commanding

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A. PROJECT

This hydrographic survey was conducted in accordance with PROJECT INSTRUCTIONS, SP-PMC-2-RA-76, South of Lanai, Dated 22 December, 1975; and Change Number 1, dated 8 January, 1976. ✓

B. AREA SURVEYED

The survey was conducted in the Hawaiian Islands south of the island of Lanai and covered forty square nautical miles at a scale of 1:20,000. The survey was conducted over a T-shaped area south of Lanai with corners as follows: ✓

<u>Latitude</u>	<u>Longitude</u>
20° 43.0 <sup>1</sup> ' N.	156° 58.0 <sup>2</sup> ' W.
20° 43.0 <sup>1</sup> ' N.	156° 46.0 <sup>5</sup> 7' W.
20° 40.5' N.	156° 46.0 <sup>5</sup> 7' W.
20° 40.5' N.	156° 52.5' W.
20° 37.0 <sup>6</sup> 8' N.	156° 52.5' W.
20° 37.0 <sup>6</sup> 8' N.	156° 54.7 <sup>9</sup> ' W.
20° 40.5' N.	156° 54.7 <sup>9</sup> ' W.
20° 40.5' N.	156° 58.0 <sup>2</sup> ' W.

The survey began on 17 April and continued through 20 April, 1976.

C. SOUNDING VESSEL

All soundings for the survey were taken by NOAA Ship RAINIER, MSS-21. Main scheme soundings were plotted in black ink, cross-lines were plotted in red ink, and junction soundings were plotted in blue ink. ✓

D. SOUNDING EQUIPMENT

Sounding Equipment used for this survey consisted of an EDO Model 248 transciever (SN 202), a Raytheon Universal Graphic Recorder Model UGR 196B-13 (SN 75), and an EDO Model 261C Digitizer (SN 204). The transducer used was located in the Sound Room #1 of RAINIER, which is located 2.4 meters forward of the electronic positioning equipment.

This equipment was used exclusively by RAINIER during this survey. Velocity, draft, and instrument error will be applied to all soundings obtained with this equipment. ✓

Corrections due to the velocity of sound through the water were determined by means of a Nansen cast. Twelve samples were taken, ranging from the surface to below 200 fathoms. The cast was performed on April 20, 1976 (JD 111) at Latitude  $20^{\circ} 38.7' N$ , Longitude  $156^{\circ} 55.6' W$ . Salinity of the samples was determined by Plessey Model 621 Salinometer SN 1011. The most recent calibration of this instrument was performed 23 December, 1975.

Standard procedures were followed in computing velocity corrections from the cast data in accordance with section 4952

Hydrographic Manual (Provisional). Computer program RK-530 was used to determine layers and corrections at mid-layer depths. A curve was constructed from the computer data, and the velocity correction table was scaled from this curve.

Draft and instrument error corrections during this survey were determined by leadline comparisons. Two leadline comparisons were performed. Visual draft readings on the hull were obtained before and after the survey. These readings established that the draft remained constant during the survey.

As per Order .03-.06, the draft and instrument error was determined to be the average horizontal graphical distance between the leadline data and the velocity correction curve at the same depth. (See graph separate to the text.) By this method, the value of the total correction is 2.4 fathoms. This correction appears as "Draft" on the TC/TI Abstracts and Tapes in the Separate to the Text.

All soundings obtained during this survey were digitized and no abstracts of initial corrections was compiled. Furthermore no initial correction was present. The analog and digital values for the depths were identical and missed digital depths could be scaled directly from the analog record without corrections.

All echo sounding correction tapes were prepared in accordance with the Instruction Manual, Automated Hydrographic Surveys, Sections 9-2 and 9-3. The velocity correction tapes and TC/TI Tapes were logged in single indicator format. Copies of printouts of these tapes are included in the Separate to the Text.

Settlement and squat for RAINIER was determined to be not appreciable during this survey.

E. BOAT SHEET

The Transverse Mercator Projection, soundings and grid were plotted by RAINIER personnel using PDP8/e computer (SN 1015) with a COMPLOT plotter Model DP-3 (SN 5445-7).

The central meridian for the projection was  $156^{\circ} 45' 00''$  W, and the control latitude was 2,156,000 meters north of latitude zero. Rough plots were made during daily operations, and a semi-smooth plot collated at the end of the survey. The final projection was done on 22 February, 1976 and the final sounding plot was done on 20 May, 1976 on Mylar 0.003 inch thick polyester drafting film. No discernable distortion could be detected in the boat sheet during the period of the final plot.

F. STATION CONTROL

Two stations were established on the southern side of Lanai Island for use as MINI-RANGER sites. The following are included in this section of this report.

- A. INTRODUCTION
- ✓ B. PROGRESS SKETCH
- ✓ C. GEOGRAPHIC POSITION SUMMARY
- ✓ = Filed in cahier with the field records

The following supporting documents are included in the Horizontal Control package in Separates Following the Text.

- A. RECOVERY NOTES & DESCRIPTION
- B. HORIZONTAL ANGLE ABSTRACTS
- C. LIST OF DIRECTIONS
- D. ELEVATION ABSTRACT
- E. ABSTRACT OF ZENITH DISTANCES
- F. ELEVATION COMPUTATIONS
- G. DISTANCE ABSTRACT
- H. TELLUROMETER ABSTRACTS
- I. DISTANCE REDUCTIONS
  - i. meteorological correction
  - ii. slope reduction
- J. POSITION COMPUTATIONS



Stations PUU PEHE RM 3 and MINII were established by traverse from existing station PUU PEHE 1914-1962 using Third Order Class 1 procedures.

The positions of RM 3 and MINII were determined by occupying stations PUU PEHE and PUU PEHE RM 3 with T-2 and measuring angles to MINII using PALAOA PT. LIGHT 1962 and KAEA 1914-1962 as initials. Tellurometer distances were measured from RM 3 and PUU PEHE to MINII. The distance between PUU PEHE and RM 3 was taped. Elevations for RM 3 and MINII were determined by measuring vertical angles from PUU PEHE and RM 3 to MINII. These elevations were used to reduce Tellurometer slope distances to sea level. Positions for the stations were computed using a distance and azimuth from PUU PEHE. A check on positions was made by computing the position of MINII from the determined position of RM 3. The position checked within 0.2 meter with the direct computation from PUU PEHE.

RM 3 is a NOS disk set as a reference mark to PUU PEHE stamped PUU PEHE RM 3 1976. It is located 67 meters to the south of the station.

MINII is a NOS disk stamped MINII 1976 and is located on a south-east point,  $3\frac{1}{2}$  miles east of MANELE BAY.

G. POSITION CONTROL

The Motorola Mini-Ranger III, a SHF range-range system was used to provide position control for this survey. During the project, the equipment was almost free from hardware problems and operated continuously for the duration of hydrography. The system consisted of range console SN 720, transceiver SN 727, a signal strength indicator aboard RAINIER, and four reference station transponders ashore. The transceiver was mounted at the top of the foremast, 25 meters above the water line and 2.4 meters abaft the fathometer transducer.

The four reference transponders were placed over three points of known geodetic position. Transponder locations and orientation were unchanged throughout the project.

REFERENCE STATION TRANSPONDER TABLE

<u>Station</u>	<u>Name</u>	<u>Code</u>	<u>SN</u>	<u>Antenna</u>	<u>Orientation</u>
101	Minii	1	774	Hi Gain	195°
102	Minii	2	775	Standard	160°
103	Puu Pehe RM3	3	776	Standard	210°
104	Kaea	4	777	Hi Gain	140°

Code 1 and Code 2 were located over the same point, Code 1 on a four-foot tripod, and Code 2 on a twelve-foot tripod. Both codes were powered by the same 24 volt source (six 12 volt automotive batteries connected in series-parallel). Code 3 was mounted on a twelve-foot

tripod and 24 volt power was supplied by four series-parallel 12 volt batteries. Code 4 was mounted on a four-foot tripod and also powered by four batteries.

With these four transponders, station pairs were selected to provide arc intersection of  $30^{\circ}$  or better throughout the project area. One exception was a small zone in the northeast corner of the project area. This zone covered 0.54 square nautical miles, which is only 1.35% of the project area. The least angle of intersection in this zone was 25 degrees. Applying the formula for position accuracy from Chapter 4 of the PROVISIONAL HYDROGRAPHIC MANUAL  $d_{\text{rms}} = \sqrt{2} \sigma \text{ cosec } \mu$  and setting  $\sigma = 3$  meters and  $\mu = 25$  degrees yields position accuracy of  $\pm 10$  meters (0.5 mm of the survey scale) at the worst intersection. The accuracy is considerably better than this for the other 99% of the project area. ✓

Electronic correctors applied to raw position data for this project were derived from baseline calibration data and supported by daily calibration checks in the working area. A baseline calibration was conducted on 11 April at Kaneohe Bay, Oahu Island, Hawaii, over a Tellurometer measured distance of 717.0 meters across Kaneohe Bay. Daily calibration checks by three-point sextant fix agreed well with the baseline calibration check, generally falling within  $\pm 3$  meters and always within  $\pm 6$  meters. Baseline calibration data is included with the survey data in the cahier. ✓

A small uncorrectable but insignificant error was discovered after completion of the project. A bad circuit card in the range console

created an erroneous BCD output to the computer. Only odd digits were sent from the units place of the right channel. When an even digit was displayed on the console, the BCD output was the next higher odd digit. This resulted in a 1 meter positive error in approximately 50% of the ranges from the right station.

Some "null zones", areas of low signal strength caused by destructive interference from multipath signal propagation, were encountered, but because of signal strength monitoring, unreliable data was not collected, and the validity of the electronic correctors was not <sup>promised</sup> ~~comprised~~. When intolerably low signal strength was encountered, hydrography in that area was temporarily postponed until such a time as conditions in atmospherics or sea conditions eliminated or relocated the null zone.

Also encountered were some "skip zones" in which grossly erroneous ranges characterized by good signal strength, were intermixed with valid ranges. Range errors were consistent and of a magnitude of 1000 to 2000 meters, hence were easily detectable and rejected. In most cases, the proportion of "busts" was small enough that those occurring with a given sounding could be interpolated by time and course. When the proportion became excessive, hydrography in the affected area was accomplished at a later time, when the "skip zone" was less severe or non-existent. At times no more than a three hour wait was required for the problem to go away. It may be that these "skip zones" are caused by multipath constructive interference caused by atmospherics which the Mini-Ranger receiver is unable to filter out. No separate electronic control report for this survey will be submitted.

H. SHORELINE

The shoreline for the boat sheets ~~were~~<sup>is</sup> an approximate transfer by pantograph from H-8833, a 1:40,000 scale prior survey boat sheet done in 1965. This project required no field edit and no shoreline verification.

I. CROSSLINES

Approximately 54.9 nautical miles of the hydrography run was crosslines; which is 10 percent of the total hydrography. Agreement between crosslines and main-scheme lines was very good. Approximately 12% of the crosslines showed a discrepancy of one fathom, this could be attributed to round-off error. Just over 1% of the crossline soundings showed a discrepancy of two fathoms (less than 1% error). These discrepancies are on a sloping bottom and are within the 3% "allowable error" limits described in the Provisional Hydrographic Manual. Thus all crosslines are well within the control limits.

J. JUNCTIONS

This survey did not junction with any other surveys.

K. COMPARISON WITH PRIOR SURVEYS

There were no pre-survey review items issued with this project. Comparison soundings were made with the 1965 survey, H-8833 which was conducted at a scale of 1:40,000. Comparison soundings were plotted on the smooth sheet in carmine. <sup>Most of the</sup> ~~All~~ comparison soundings agree

with the survey soundings within a maximum error of 0.93% with the one exception of the sounding at  $20^{\circ} 37.2'$  N.,  $156^{\circ} 54.8'$  W., which shows a discrepancy of 2.6% (6 fathoms). Since the 227 fathom sounding was confirmed by a crossline sounding and the 221 fathom sounding was transferred from a 1:40,000 sheet; it is recommended that the 227 fathom sounding be considered correct. A 221 fathom sounding is, however, located 200 meters south of the 227 fathom depth. ✓

L. COMPARISON WITH THE CHART

Comparison with chart 19340 (C&GS 4116) showed maximum discrepancies of less than 2% for approximately 7% of the soundings compared. Since chart 19340 is such a small scale (1:250,000) and all scaled soundings fell within an area of comparable depth, the comparison between the smooth boat sheet and this chart is excellent. (See Q.C. Report-item 4) ✓

M. ADEQUACY OF SURVEY

H-9611 is a complete and adequate survey within the area described in section B., and is recommended to supersede all prior surveys in that area for charting purposes. All fathograms were scanned in the field for peaks and deeps and all fathogram notations are clearly marked. ✓

N. AIDS TO NAVIGATION

There are no aids to navigation in the project limits. ✓

O. STATISTICS

554 nautical miles of soundings were run by RAINIER covering 40 square nautical miles and using 1163 positions and 0 detached positions. A total of 0 bottom samples were taken, 0 TDC Casts, 1 Nansen Cast, 0 magnetic stations, 1 tide station, and 0 current observations.

P. MISCELLANEOUS

There were no other significant scientific observations made during this survey and no unusual submarine features nor tidal phenomena were encountered.

Q. RECOMMENDATIONS

No part of this survey is considered inadequate for charting and no additional field work is required. No dredging or construction is planned that will affect the survey results. No special inserts are required in the surveyed area for clarity on either the smooth sheet or on the published chart. The present insert of Manele Bay (not in the surveyed area) should remain on the published chart.

R. DATA PROCESSING PROCEDURES

Data acquisition and processing was accomplished as per instructions in the Provisional Hydrographic Manual and the PMC OORDER. Sounding and position data were obtained by the Hydrolog/Hydroplot System utilizing computer program RK 111.

For each master tape there is a corresponding corrector tape which includes the TRA of the vessel and the Mini-Ranger baseline correctors along with all depth correctors including missed depths, peaks, deeps, and time and course corrections for Mini-Ranger bust (Noted as MRB on Printouts). The semi-smooth and smooth sheets were plotted with these corrector tapes using program RK 211. ✓

Computer programs used during this survey are included in the following list of programs:

<u>Program</u>	<u>Name</u>	<u>Version</u>
RK 111	RANGE-RANGE REAL TIME HYDRO PLOT	1/30/76
RK 201	GRID, SIGNAL & LATTICE PLOT	7/12/75
RK 211	RANGE-RANGE NON REAL TIME PLOT	1/15/76
PM 360	ELECTRONIC CORRECTOR ABSTRACT	2/ 2/76
AM 500	PREDICTED TIDE GENERATOR	11/10/72
AM 602	ELINORE	5/21/75
RK 561	GEODETIC H/R CALIBRATION	2/19/75

S. REFERENCES TO REPORTS

Since this was a special survey of short duration no other reports have been written. All data necessary for complete evaluation and understanding of this survey are included in "Separates Following the Text". ✓

Respectfully submitted:

Stanton M. Ramsey, ENS, NOAA



SEPARATES FOLLOWING THE TEXT

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✓ = Items filed in cahier with field records.

-A-

FIELD TIDE NOTE

FIELD TIDE NOTE

H-9611

SP-PMC-2-RA-76

Kealaikahiki Channel, Lanai Island Hawaii

Field tide reduction of sounding was based on predicted tide tables for Honolulu corrected to KAUMALAPAU, LANAI ISLAND. These predicted tides were converted to GMT tide correctors by PDP 8/e computer using Program AM 500, PREDICTED TIDE GENERATOR, version 10 Nov. 1972. There were no unusual tidal or current observations during the survey.

One station was established to monitor the tides within the project limits:

<u>STATION</u>	<u>LOCATION</u>	<u>OPERATION DATES</u>
T-1, Manele Bay 161-4355	lat: 20° 44.7'N lon: 156° 53.5'W	6 Apr. - 21 Apr. 15 days

T-1 was a Bristol, 0-10 ft. bubbler gage SN. 67A10293, and observations for this gage were done by RAINIER personnel on GMT (000°W).

On 13 April the gage was found to be 2 minutes fast and was reset at 2330Z. All other records from this gage are good. Installation levels were run to 3 temporary marks on 13 April and removal levels were run to 3 temporary marks and 3 (1921 & 1931) C&GS standard disks on 21 April. 2.0 ft. on the staff corresponds to zero on the marigram.

It is recommended that this survey be reduced using Honolulu control gage smooth tides adjusted for Lanai Island and that no zoning is required.

Comments

On 21 April, 18 man-hours were invested in running levels and the ship's sailing was delayed in order to connect the tide gage at Manele Bay to the old C&GS standard disks in the area of 20° 44.6'N, 156° 53.3'W. as directed by PROJECT INSTRUCTIONS.

This time was spent connecting the gage to a "tidal datum" based on 4 high waters and 3 low waters, March 11-13, 1931 reduced to mean values..

-C-

STATION LIST

STATION LIST LANAI ISLAND SP-PMC-2-RA-76

STA 0 LATITUDE LONGITUDE CRT ELEV F KHZ  
 -----  
 101 1 20 45 39836 156 50 41153 250 0010 000000  
 /MINII 1976 M/R CODE 1 HI GAIN ANTENNA  
 STATION ESTABLISHED REFERENCE STATION CONTROL SEC. F

102 4 20 45 39836 156 50 41153 250 0008 000000  
 /MINII 1976 M/R CODE 2  
 STATION ESTABLISHED REFERENCE SECTION F

103 1 20 44 18351 156 53 36714 250 0015 000000  
 /PUU PEHE RM 3 1976 M/R CODE 3  
 STATION ESTABLISHED REFERENCE SECTION F

104 1 20 44 09575 156 57 59512 250 0000 000000  
 /KAEA 1914 M/R CODE 4 HI GAIN ANTENNA  
 EXISTING STATION REFERENCE SECTION F

-----  
 200 1 20 44 07801 156 58 03562 139 0000 000000  
 /PALAOA PT LT 1962  
 EXISTING STATION REFERENCE SECTION F

-----  
 301 3 20 44 44500 156 53 22400 243 0000 000000  
 /MANELE BAY BREAKWATER LT  
 STATION USED ONLY FOR A CALIBRATION CHECK, POSITION  
 FOR THE LIGHT WAS SCALED FROM A 1:10000 SCALE CHART.

-----  
 NOTE: ELEVATIONS ON STATION LIST ARE THE DIFFERENCES  
 BETWEEN M/R ANTENNA HEIGHT ON THE SHIP AND THE  
 ELEVATION OF THE M/R ANTENNAS ON THE SHORE  
 STATIONS.

S= ELEVATION OF SHIPS ANTENNA = 25 METERS  
 E= ACTUAL ELEVATION OF M/R ANTENNAS ON SHORE STATIONS  
 D= DIFFERENCE IN ELEVATIONS = E-S

STATION	E	-	S	=	D(METERS)
-----	----	----	----	----	-----
PUU PEHE RM 3	38.9	-	25.0	=	14.9
MINII CODE 1	14.9	-	25.0	=	-10.1
MINII CODE 2	17.4	-	25.0	=	- 7.6
KAEA	24.5	-	25.0	=	- 0.5

ASCII SIGNAL TAPE

-----

101	1	20	45	39836	156	50	41153	250	0010	000000
102	4	20	45	39836	156	50	41153	250	0008	000000
103	1	20	44	18351	156	53	36714	250	0015	000000
104	1	20	44	09575	156	57	59512	250	0000	000000
200	1	20	44	07801	156	58	03562	139	0000	000000
301	3	20	44	44500	156	53	22400	243	0000	000000

-D-

CORRECTIONS TO  
ECHO SOUNDER DATA

HYTECH SALINOMETER LOG SHEET

CRUISE NO. ... OPR- SP-RMC-2-RA-76 ... DATE 4/23/76  
 STATION NO. ... LONGITUDE 156° 55.6' W ... OPERATOR LTD  
 SHIP NOAA SHIP RAINIER MSS-21 ... AIR TEMP 24.8 ... SALINOMETER No. 1011

1	2	3	4	5	6	7	8	9		10		11		12	13	14
								DRIFT	TEMP	CORRECTIONS (ppt)	CALIB	TOTAL	CORRECTED SALINITY (ppt)			
TIME	NUMBER	TEMP (°C)	TEMP COMP	STAND ARDIZE	CONDUC TIVITY RATIO	NOMINAL SALINITY (ppt)	DRIFT (ppt)	DRIFT	TEMP	CORRECTIONS (ppt)	CALIB	TOTAL	CORRECTED SALINITY (ppt)	REMARKS		
0917	SSW	22.4	74	4941	1.00005	35.002	0	0	0	1.001	1.001	35.003	35.003	C1 = 19.3755		
	32	21.2			.98780	34.561	+0.02	0	0	1.001	1.003	34.564		Calibration sign already reversed.		
	34				.98771	34.518	+0.04	0	0	1.001	1.005	34.523				
	37	20.6			.98772	34.519	+0.06	0	0	1.001	1.007	34.526				
	40	20.8			.98765	34.516	+0.08	0	0	1.001	1.009	34.525				
	236	20.1			.98819	34.537	+0.10	0	0	1.001	1.011	34.548				
	238	20.1			.98828	34.540	+0.12	0	0	1.001	1.013	34.553				
	241	21.1			.99144	34.663	+0.14	0	0	1.001	1.015	34.678				
	243	21.1			1.00049	35.020	+0.17	0	0	1.002	1.019	35.039				
	544	21.2			.99855	34.943	+0.19	0	0	1.001	1.020	34.963				
	546	21.2			.98949	34.588	+0.21	0	0	1.001	1.022	34.610				
	548	21.4			.97952	34.197	+0.23	0	0	1.000	1.023	34.220				
	550	21.2			.97688	34.093	+0.25	0	0	1.000	1.025	34.118				
1037	SSW	22.9			.99938	34.975	-0.027	+0.027	0	1.001	1.028	35.003				



VELOCITY CORRECTIONS COMPUTATIONS

1) CONDUCTIVITY 2) SALINITY  
SPECIFY WHICH OPTION (1,2) 2

VESSEL = 2120

DATE = 4/20/76

TIME = 1955Z

LATITUDE = 20/30/48

LONGITUDE = 156/55/30

TYPE OF OBSERVATION = NANSEN CAST

CAST-DEPTH (SURFACE) (M)	TEMP (DEG C)	SALINITY (0/00)
0000.0	23.62	34.56
0010.0	23.62	34.52
0020.0	23.44	34.53
0050.0	23.34	34.55
0075.0	23.31	34.55
0100.0	23.13	34.68
0150.0	21.97	35.04
0200.0	18.78	34.96
0250.0	15.63	34.61
0300.0	11.26	34.22
0400.0	08.64	34.12
9999999999999999		

DATA BANK INPUT COMPLETED

PUNCH ON? (Y)9? Y

VESSEL =2120

DATE =4/20/76

TIME =1955Z

LATITUDE = 020/30/48.00

LONGITUDE = 156/55/30.00

TYPE OF OBSERVATION =NANSEN CAST

CAST-DEPTH (SURFACE) (M)	TEMP (DEG C)	SALINITY (0/00)	SND VEL (M/SEC)
0000.0	23.62	34.56	1531.01
0010.0	23.62	34.52	1531.13
0020.0	23.44	34.53	1530.86
0050.0	23.34	34.55	1531.13
0075.0	23.31	34.55	1531.46
0100.0	23.13	34.68	1531.57
0150.0	21.97	35.04	1529.86
0200.0	18.73	34.96	1521.95
0250.0	15.63	34.61	1512.97
0300.0	11.26	34.22	1498.80
0400.0	08.64	34.12	1490.75

-----

MID-DEPTH (M)	SND VEL (M/SEC)	LAYER THICKNESS (M)
0000.00	1531.01	0005.00
0010.00	1531.13	0010.00
0020.00	1530.86	0020.00
0050.00	1531.13	0027.50
0075.00	1531.46	0025.00
0100.00	1531.57	0037.50
0150.00	1529.86	0050.00
0200.00	1521.95	0050.00
0250.00	1512.97	0050.00
0300.00	1498.80	0075.00
0400.00	1490.75	0100.00

VELOCITY CORRECTION TABLE OPTIONS:

- 0) NO TABLE
- 1) IN FEET
- 2) IN FATHOMS
- 3) IN METERS

2

DRAFT = 00.0

TRUE DEPTH (SURFACE) (FA)	FATHOMETER DEPTH (FA)	VELOC CORRECTION (FA)
0002.73	0002.61	0000.13
0008.20	0007.82	0000.38
0019.14	0018.25	0000.89
0034.18	0032.59	0001.59
0047.85	0045.62	0002.23
0068.35	0065.16	0003.19
0095.69	0091.25	0004.44
0123.03	0117.49	0005.54
0150.37	0143.90	0006.47
0191.38	0183.91	0007.47
0246.06	0237.56	0008.51

VELOCITY CORRECTION TABLE OPTIONS:

- 0) NO TABLE
- 1) IN FEET
- 2) IN FATHOMS
- 3) IN METERS

2

DRAFT = 02.5

TRUE DEPTH (SURFACE) (FA)	FATHOMETER DEPTH (FA)	VELOC CORRECTION (FA)
0002.73	0000.22	0000.01
0008.20	0005.44	0000.27
0019.14	0015.87	0000.77
0034.18	0030.20	0001.47
0047.85	0043.23	0002.11
0068.35	0062.78	0003.07
0095.69	0088.87	0004.32
0123.03	0115.11	0005.42
0150.37	0141.52	0006.35
0191.38	0181.53	0007.36
0246.06	0235.17	0008.39

-----

SP-PMC-2-RA-76

South of Island of Lanai, Hawaii

RA-20-1-76

Leadline Data

(In Fathoms)

<u>True Depth</u>	<u><sup>ANALOG</sup> <del>Digitized</del> Depth</u>	<u>Correction</u>
5.5	3.0	+2.5
5.5	3.0	+2.5

(Let 1 inch equal 4 fathoms for deep water and 1 inch equal 0.4 fathom for shoal.)

CORRECTIONS IN FATHOMS

Draft and Instrument Error = 2.4 fathoms

FORM CGS-117 (11-62) U.S. DEPARTMENT OF COMMERCE  
COAST AND GEODETIC SURVEY

VELOCITY CORRECTIONS

Ship NOAA Ship RAINIER MSS - 21  
 Charles K. Townsend Comdg.  
 These corrections are to be used  
 between April 17, 1976 and April 21, 1976  
 in the locality South of Island of Lanai,  
Hawaii  
 for hydrographic surveys Nos. H - 9611  
RA - 20 - 1 - 76

(For deep water add a 0 to these figures)

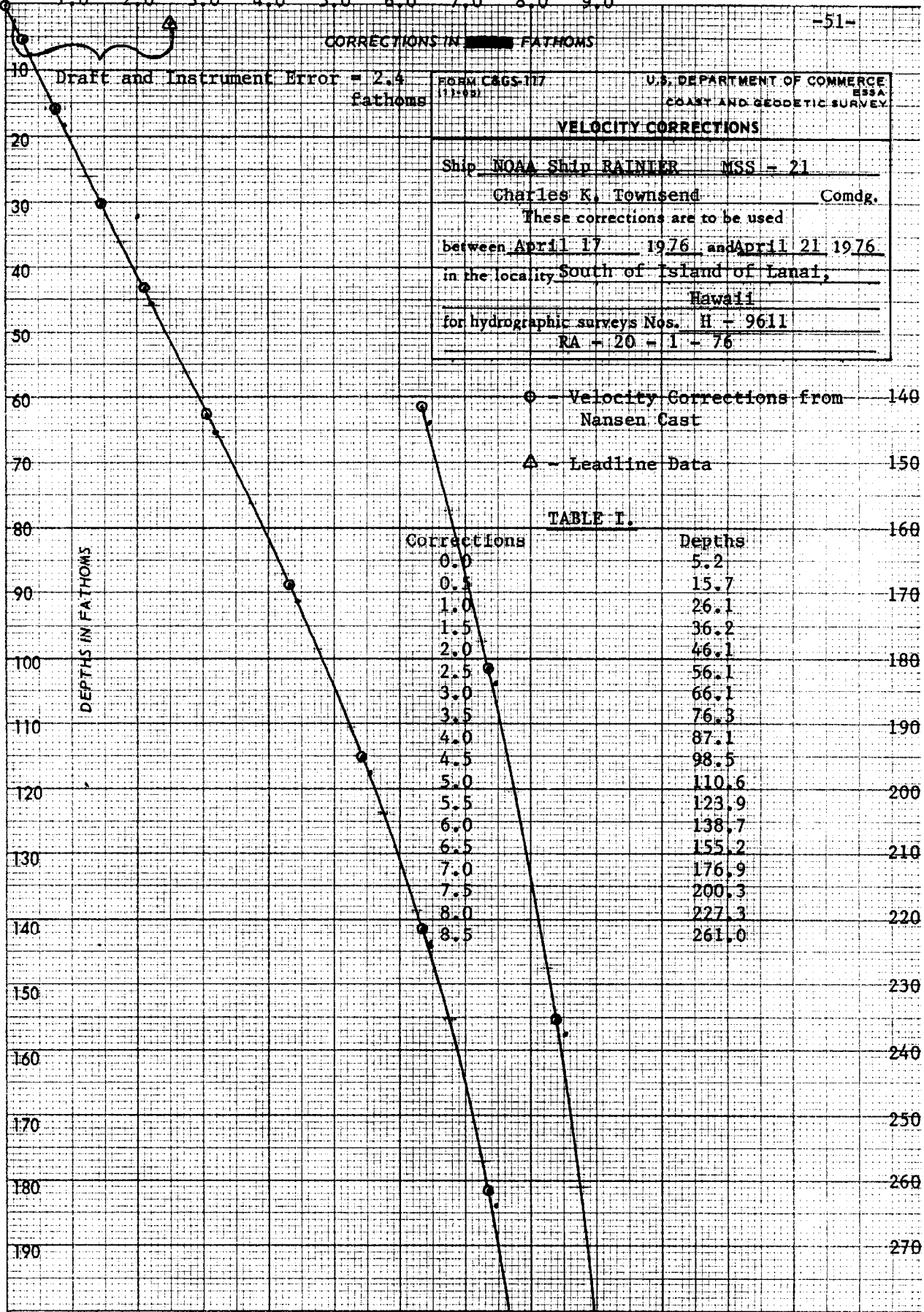


TABLE I.

Corrections	Depths
0.0	5.2
0.5	15.7
1.0	26.1
1.5	36.2
2.0	46.1
2.5	56.1
3.0	66.1
3.5	76.3
4.0	87.1
4.5	98.5
5.0	110.6
5.5	123.9
6.0	138.7
6.5	155.2
7.0	176.9
7.5	200.3
8.0	227.3
8.5	261.0

VELOCITY CORRECTOR TAPE LISTING  
RA-20-1-76(H-9611)

TABLE NO. 1  
VESSEL - 2120(SHIP RAINIER)  
SCALE - FATHOM

000052	0	0000	0001	001	212000	009611
000157	0	0005				
000261	0	0010				
000362	0	0015				
000461	0	0020				
000561	0	0025				
000661	0	0030				
000763	0	0035				
000871	0	0040				
000985	0	0045				
001106	0	0050				
001239	0	0055				
001387	0	0060				
001552	0	0065				
001769	0	0070				
002003	0	0075				
002273	0	0080				
999999	0	0085				





TC/TI CORRECTOR TAPE LISTING  
RA-20-1-76(H-9611)

VESSEL - 2120(SHIP RAINIER)  
FATHOMETER - UGR NO.1 S/N 75

052502 0 0024 0001 109 000000 000000  
000012 0 0024 0001 110 000000 000000  
000002 0 0024 0001 111 000000 000000  
181000 0 0024

APPROVAL SHEET

SP-PMC-2-RA-76

H-9611

KEALAIAHIKI CHANNEL

SOUTH of LANAI

HAWAII

In producing this sheet, standard procedures were observed in accordance with the Provisional Hydrographic Manual, PMC OORDER, and the Instruction Manual for Automated Hydrographic Surveys. The data was examined daily during the execution of the survey.

The boatsheets and accompanying records have been examined by me and are considered complete and adequate for charting purposes and are approved.



Charles K. Townsend  
CDR., NOAA

7/19/76

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

TIDE NOTE FOR HYDROGRAPHIC SHEET

Processing Division: Pacific Marine Center:

Hourly heights are approved for

Tide Station Used (NOAA Form 77-12): Manele Bay

Period: April 6 - 21, 1976

HYDROGRAPHIC SHEET: H-9611

~~ONX~~ SP-PMC-2-RA-76


Locality: Off south coast of Lanai, Hawaiian Islands

Plane of reference (mean lower low water): 1.7 ft.

Height of Mean High Water above Plane of Reference:

1.6 ft.

Remarks: Where tide reducers are required zone direct.

  
\_\_\_\_\_  
Chief, Tides Branch



APPROVAL SHEET

FOR

SURVEY H-9611

- A. All revisions and additions made on the smooth sheet during verification have been entered in the magnetic tape records for this survey. A new final position print-out has been made. A new final sounding print-out has been made.
- B. The verified smooth sheet has been inspected, is complete, and meets the requirements of the Hydrographic Manual. Exceptions are listed in the verifier's report.

Date: 26 Aug 1976

Signed:



Title: Chief, Verification Branch

**HYDROGRAPHIC SURVEY STATISTICS**  
 HYDROGRAPHIC SURVEY NO. H-9611

RECORDS ACCOMPANYING SURVEY: To be completed when survey is registered.

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION		AMOUNT	
SMOOTH SHEET & 2 overlays		1	BOAT SHEETS		1-(2 parts) 2	
DESCRIPTIVE REPORT		1	OVERLAYS (preliminary)		8 2	
DESCRIPTION	DEPTH RECORDS	HORIZ. CONT. RECORDS	PRINTOUTS	TAPE ROLLS	PUNCHED CARDS	ABSTRACTS/SOURCE DOCUMENTS
ENVELOPES	1					
CAHIERS			1			
VOLUMES	0					
BOXES			1-containing raw & smooth Printouts			
T-SHEET PRINTS (List) <i>N/A</i>						
SPECIAL REPORTS (List) <i>N/A</i>						

**OFFICE PROCESSING ACTIVITIES**

The following statistics will be submitted with the cartographer's report on the survey

PROCESSING ACTIVITY	AMOUNTS			
	PRE-VERIFICATION	VERIFICATION	REVIEW	TOTALS
POSITIONS ON SHEET				1163
POSITIONS CHECKED		1155		
POSITIONS REVISED		0		
DEPTH SOUNDINGS REVISED		12		
DEPTH SOUNDINGS ERRONEOUSLY SPACED		0		
SIGNALS ERRONEOUSLY PLOTTED OR TRANSFERRED		0		
	TIME (MANHOURS)			
Verification of Control		1		
Verification of Positions		30		
Verification of Soundings		29		
SMOOTH SHEET		22		
ALL OTHER WORK		20		
<b>TOTALS</b>		102	HIT 7hrs	
PRE-VERIFICATION BY		BEGINNING DATE	ENDING DATE	
James S. Green, Supr. Carto. Tech.		7/2/76	7/13/76	
VERIFICATION BY		BEGINNING DATE	ENDING DATE	
Thelma O. Jones, Cartographic Technician		7/11/76	8/11/76	
REVIEW BY		BEGINNING DATE	ENDING DATE	
G.C. Kenneth W. Wellman		10-12-76	10-14-76	

*Carstens*

15 hrs.

2hr 12/10/76

Bainbridge 4hrs

REGISTRY NO. H-9611

The Computer and Excess Sounding Cards for this survey have not been corrected to reflect the changes made to the Computer Card and Excess Card Printouts at this time of the review.

When the cards have been updated to reflect the final results of the survey, the following shall be completed:

CARDS CORRECTED

DATE \_\_\_\_\_ TIME REQUIRED \_\_\_\_\_ INITIALS \_\_\_\_\_

REMARKS:

REGISTRY NO. H-9611

The magnetic tape containing the data for this survey has not been corrected to reflect the changes made during evaluation and review.

When the magnetic tape has been updated to reflect the final results of the survey, the following shall be completed:

MAGNETIC TAPE CORRECTED

DATE \_\_\_\_\_ TIME REQUIRED \_\_\_\_\_ INITIALS \_\_\_\_\_

REMARKS:

Only one revision was entered in the printout during quality control inspection as follows: The sounding at pos. 86107 (Record #71720) was exceeded.



H-9611

Items for Future Presurvey Reviews

None

<u>Position Index</u>		<u>Bottom Change Index</u>	<u>Use Index</u>	<u>Resurvey Cycle</u>
<u>Lat.</u>	<u>Long.</u>			
204	1570	0	1	50 years
All other areas deeper than 20 fathoms				50 years

## VERIFIER'S REPORT

SP-PMC-2-RA-76

H-9611

This survey was verified and plotted at the Pacific Marine Center, Seattle, Washington. Information relating to this survey is provided as specified in Chapter 6 of the Provisional Hydrographic Manual.

### I. INTRODUCTION

This is a high priority special project designed to satisfy the Defense Mapping Agency's requirements for hydrographic survey data in the area indicated on the attached section of Chart 19340 (C&GS 4116).

Sounding equipment used for this survey consisted of an EDO transceiver, a Raytheon Universal Graphic Recorder and an EDO Digitizer. See paragraph D of ship's report. The Motorola Mini-Ranger III, a SHF range-range system was used to provide position control. See paragraph G of ship's report.

Few problems were encountered during verification of this survey.

### II. CONTROL AND SHORELINE

No shoreline verification was required on this survey. Horizontal control is adequately described in paragraph F of the Descriptive Report. (See Addendum to this report and Q.C. Report-item 1)

### III. HYDROGRAPHY

The basic hydrography incorporated in this survey is adequate to delineate the bottom configuration and to determine least depths. There were no major difficulties encountered in the verification of the main-scheme sounding and crossline agreement was very good. There are no bottom samples in this survey. (See Q.C. Report-item 2)

### IV. CONDITION OF SURVEY

The hydrographic records, overlays, smooth sheet and reports are adequate and conform to the requirements of the Provisional Hydrographic Manual.

### V. JUNCTIONS

There are no contemporary junctional surveys in this area.

## VI. COMPARISON WITH PRIOR SURVEY

Comparison was made with H-8833, 1:40,000 (1965). The comparison was excellent except for the sounding discrepancy described in paragraph K of the Descriptive Report. The verifier concurs with the hydrographer's recommendations. There are no pre-survey review items for this survey. (The above comments are supplemented by item 3 of the Q.C. Report.)

The present survey <sup>is adequate to</sup> ~~should~~ supersede all prior surveys of the area.

## VII. COMPARISON WITH CHART (See Q.C. Report-item 4)

Comparison was made with Chart 19340 (C&GS 4116), 1:250,000, 17th Edition, dated December 6, 1975. The comparison between the charted soundings and present survey soundings is excellent.

There are two navigational aids included in this survey. Palaoa Point Light was used for triangulation and Manele Bay Breakwater Light, used for calibration.

The present survey soundings are adequate to supersede charted soundings.

## VIII. COMPLIANCE WITH INSTRUCTIONS

This is a good basic survey and adequately complies with the project instructions, dated 22 December 1975 and amended 8 January 1976.

## IX. ADDITIONAL FIELD WORK

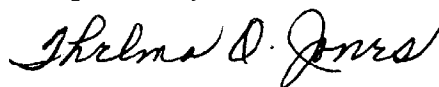
This survey is adequate to supersede charted information in the area. No additional field work is recommended.

## X. NOTES TO COMPILER

The signal list is at the beginning of the Position Printout.

The velocity and TC/TI correctors are at the beginning of the Sounding Printout.

Respectfully submitted,



Thelma O. Jones  
Cartographic Technician  
August 12, 1976

## ADDENDUM

Shoreline was transferred from boatsheet in pencil for orientation purposes only.



**U.S. DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL OCEAN SURVEY  
Pacific Marine Center  
1801 Fairview Avenue East  
Seattle, Washington 98102

DATE: 31 August 1976

TO : Director, Pacific Marine Center

FROM: *Donald E. Nortrup*  
Donald E. Nortrup  
Chief, Processing Division

SUBJ: PMC Hydrographic Survey Inspection Team Report, H-9611

This survey is a Special Investigation Survey of an area south of Lanai Island, Hawaii, accomplished in response to requirements of the Defense Mapping Agency. The survey was conducted by NOAA Ship RAINIER in April 1976 in compliance with Project Instructions SP-PMC-2-RA-76 dated 22 December 1975. Project instructions required complete processing by 01 October 1976.

Inspection of this survey revealed no discrepancies. The survey is a thorough and complete development of the specified area. The Descriptive Report is exceptionally well done. The inspection team has no substantive comments to add to the foregoing reports.

The inspection team finds H-9611 to be an excellent special investigation survey, complete and adequate for charting purposes and to supersede the prior survey. Administrative approval is recommended.

*Donald E. Nortrup*  
Donald E. Nortrup, LCDR, NOAA

*Richard D. Lynn*  
Richard D. Lynn

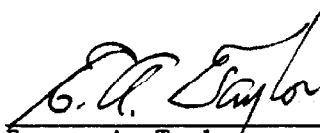
*John C. Albright*  
John C. Albright, LCDR, NOAA

*Alan J. Rebell*  
for Dean R. Seidel, LCDR, NOAA

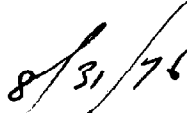


Administrative Approval  
H-9611

The smooth sheet and reports of this survey have been reviewed and the survey is complete and adequate to supersede the prior survey.



\_\_\_\_\_  
Eugene A. Taylor  
Director, Pacific Marine Center



\_\_\_\_\_  
Date



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL OCEAN SURVEY  
Rockville, Md. 20852

C352

October 14, 1976

TO: *A. J. Patrick*  
A. J. Patrick  
Chief, Marine Surveys Division

THRU: Chief, Quality Control Branch

FROM: K. W. Wellman *K. W. Wellman*  
Quality Evaluator

SUBJECT: Quality Control Report for H-9611 (1976), Hawaii, Lanai, North  
Portion of Kealaikahiki Channel

A quality control inspection of H-9611 has been accomplished to evaluate the accuracy and adequacy of the survey with respect to data acquisition, delineation of the bottom, determination of least depths and navigation hazards, decisions and actions by the verifier, and cartographic presentation of data. In general, it was found to conform with National Ocean Survey standards and requirements except as follows:

1. The source of the approximate shoreline penciled on the smooth sheet should be identified in section II of the Verifier's Report rather than in an addendum. (See provisional manual - section 6.6(7).)

2. Section III of the Verifier's Report lacks specific mention of the adequacy of the depth curves (Provisional Hydrographic Manual). Section III of the Verifier's Report is supplemented by the following:

The usual depth curves are adequately delineated.

3. Section VI of the Verifier's Report is supplemented by the following:

Comparison between the present and prior surveys reveals generally stable depths intermingled with scattered indications of present depths being 1 to 3 fathoms deeper than prior depths. The present survey depth curves follow the same general configuration as shown on the prior survey.

4. The Provisional Hydrographic Manual [section 5.3.4(L)] requires the hydrographer to compare the survey with the largest scale chart of the area. This requirement was not satisfied either by the hydrographer or the verifier. During quality control inspection, comparison was made



with the largest scale (1:80,000) chart of the area. Section VII of the Verifier's Report is entirely superseded by the following:

Comparison with Chart 19347 (formerly 4130) latest print date 4-19-75

A. Hydrography

The charted hydrography originates with the previously discussed prior survey which requires no further consideration.

The following soundings are considered to have been charted in error from H-8833 (1965) and should be deleted from the chart:

<u>Charted Depth (Fathoms)</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Source Document Depth (Fathoms)</u>
98	20°42.70'	156°53.90'	88
153	20°40.75'	156°46.22'	158

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

B. Aids to Navigation

The fixed aids to navigation on the present survey are in agreement with the charted positions and adequately mark the features intended.

5. The smooth sheet is unnecessarily large exceeding 36 inches in width. The standard width as specified in the provisional manual would have been adequate. (See provisional manual - sections 1.2.4 and 7.2.2.)

cc:  
C351

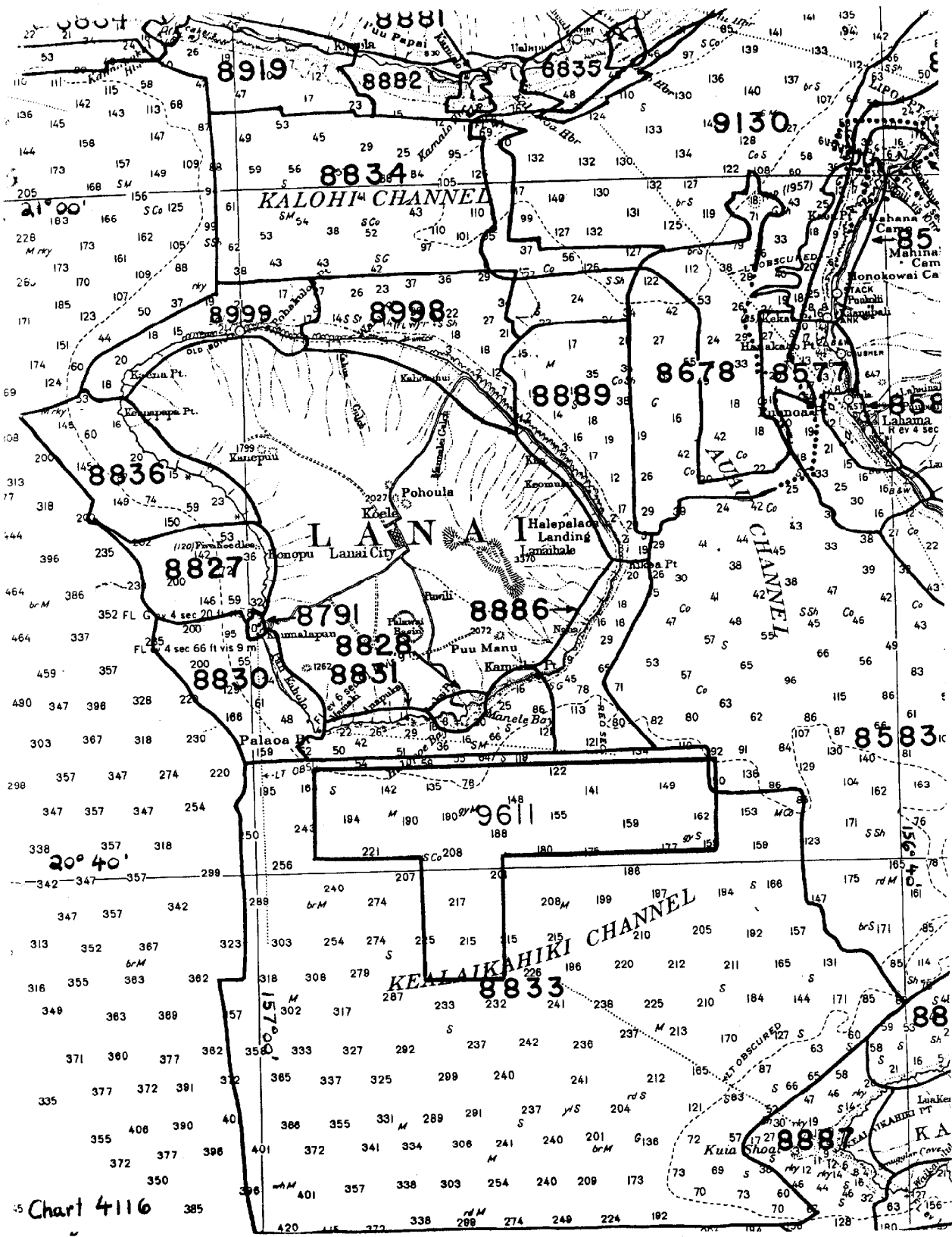


Chart 4116



