10094

Diagram No. LS-9

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No. PE-50-1-83

Office No. H-10094

LOCALITY

State Minnesota--Wisconsin

General Locality Lake Superior

Locality Silver Bay to Apostle Islands

1983

CHIEF OF PARTY
CDR W.S.Simmons

LIBRARY & ARCHIVES

DATE June 21, 1985

☆U.S. GOV. PRINTING OFFICE: 1980—766-230

10094

NOAA FORM 77-28 (11-72) | U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION | REGISTER NO.

HYDROGRAPHIC TITLE SHEET

H-10094

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. PF-50-1-83

State MINNESOTA -- WISCONSIN

General locality LAKE SUPERIOR

Locality ~~OFFSHORE OUTER ISLAND TO~~ SILVER BAY TO APOSTLE ISLANDS

Scale 1: 50,000 Date of survey 6 JUNE - 31 AUG, 1983

Instructions dated 11 MAY, 1983 Project No. OPR-Z137-PF-83

Vessel NOAA SHIP PEIRCE VESNO 3280

Chief of party CDR WALTER S. SIMMONS

Surveyed by

Soundings taken by echo sounder, hand lead, pole ROSS MODEL 5000, RAYTHEON ~~DE 7230~~ UGR

Graphic record scaled by

Graphic record checked by

Protracted by XYNETICS 1201 PLOTTER (AMC) Automated plot by ~~HYDROPLOT~~

Verification by D. V. MASON

Soundings in ~~FATHOMS~~ feet at ~~MLW~~ ~~MLLW~~ L.G.L.D

REMARKS: 1. All times recorded in this survey are Coordinated Universal time

2. WATER level reducers are not applied to soundings

NOTES IN RED WERE MADE DURING office PROCESSING

SURF/ANVOIS ✓ AAA 5/21/86

SC 5-2-97

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

☆ U.S. GPO: 1974-0-768-081/1207

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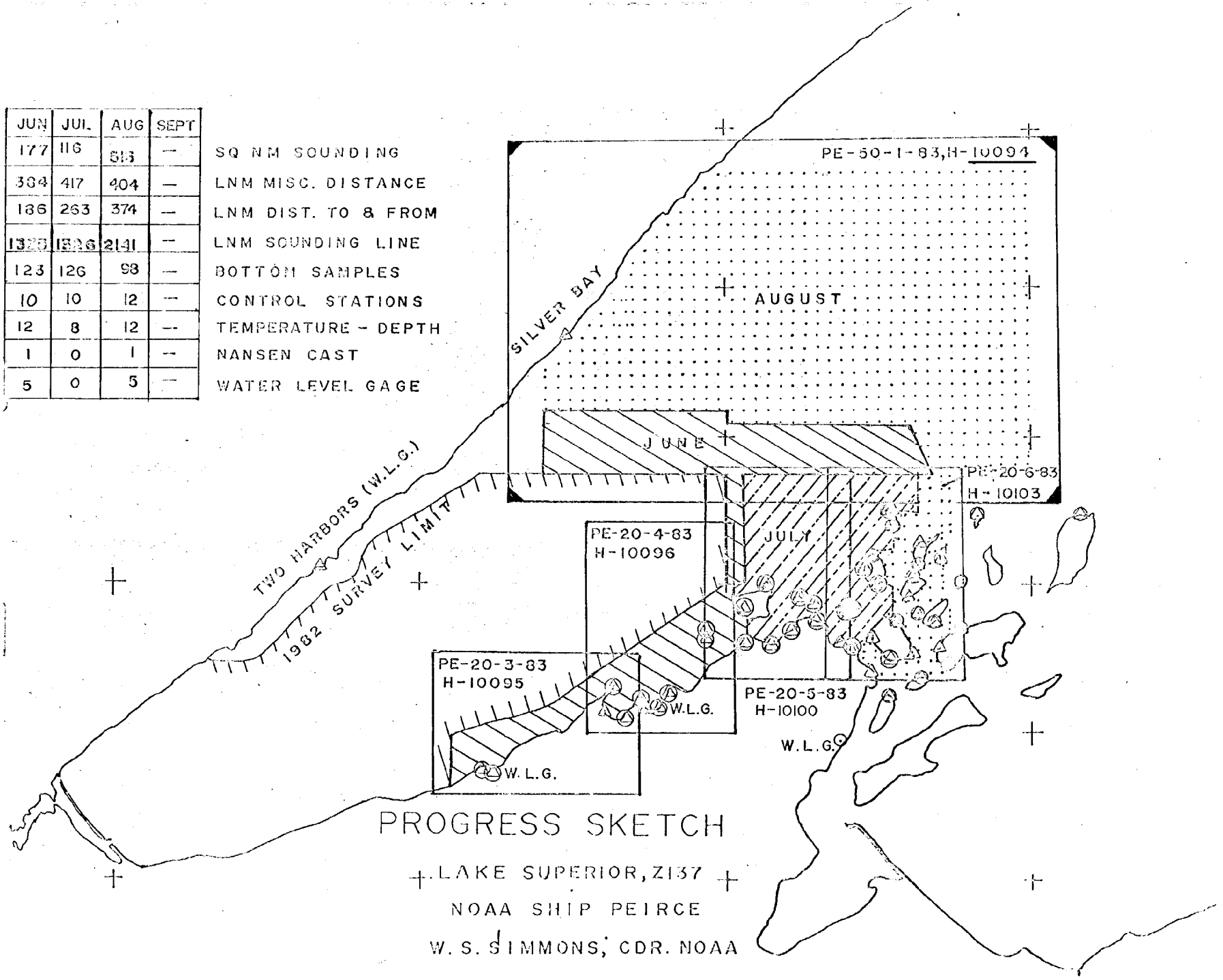
APPROVAL SHEET

JUN	JUL	AUG	SEPT	
177	116	516	—	SQ NM SOUNDING
384	417	404	—	LNM MISC. DISTANCE
186	263	374	—	LNM DIST. TO & FROM
1320	1826	2141	—	LNM SOUNDING LINE
123	126	98	—	BOTTOM SAMPLES
10	10	12	—	CONTROL STATIONS
12	8	12	—	TEMPERATURE - DEPTH
1	0	1	—	NANSEN CAST
5	0	5	—	WATER LEVEL GAGE



PROGRESS SKETCH

LAKE SUPERIOR, Z137

NOAA SHIP PEIRCE

W. S. SIMMONS, CDR. NOAA

FROM CHART 14961, SCALE 1:600,000

DESCRIPTIVE REPORT
TO ACCOMPANY
HYDROGRAPHIC SURVEY H-10094
(FIELD NO. PE-50-1-83)
CDR. W.S. Simmons, COMDG.

A. PROJECT

This basic Hydrographic Survey was conducted in accordance with Hydrographic Project Instructions OPR-Z137-PE-83 dated May 11, 1983; change No. 1, DATED May 17, 1983; change No. 2, DATED Aug. 1, 1983; and change No. 3, Oct. 12, 1983. NOT APPLICABLE TO THIS SURVEY This survey will contribute to a new data base for maintenance of existing charts and construction of new, reformatted, or reschemed nautical charts.

B. AREA SURVEYED

This survey is located near the western end of Lake Superior extending west from Outer Island to Silver Bay. The actual limits of this survey are as follows:

47°27'40"N 091°00'00"W	47°27'40"N 090°30'00"W
47°12'00"N 091°18'00"W	
47°07'10"N 091°18'00"W	47°07'10"N 090°30'00"W

This survey was conducted from June 6, 1983 to August 31, 1983 (JD 157 to 243).

C. SOUNDING VESSEL

All soundings were acquired by PEIRCE (VESNO ~~3280~~ 2830), which was equipped with the automated Hydroplot system.

D. SOUNDING EQUIPMENT AND CORRECTIONS TO ECHO SOUNDINGS

This survey was conducted utilizing a Raytheon Universal Graphics Recorder, Model UGR-196C-23, Serial Number 164, and a Ross 5000 Fineline ~~Fathometer~~ ECHO SOUNDER Serial Number 1078. UGR and Ross graphic recorders were operated simultaneously, with the Ross digital depths input to the Hydroplot. During Julian dates 157-171 there were intermitant problems with one of the recorders, the other providing the graphic record for that period. The faults in these instruments did not affect the accuracy of the acquired soundings.

The velocity correctors were determined by XBT, Martex and Nansen casts obtained throughout the survey.

Problems were encountered with the XBT at the beginning and near the end of the project. On Julian Days 161-187 the surface temperatures recorded by

the XBT were in error. Values used were determined by interpolation between Nansen, Martek, and bucket temperatures.

The XBT data on J.D. 222 was rejected due to questionable values.

On Julian Days 233-243 the XBT values from depths of 20 meters to 100 meters were in error and were interpolated from bracketing Martek and Nansen Casts.

The equipment used was Martek, Model 167, SN 177, and XBT Model MK 2A-1 371, S/N 781209 TD.

The following table summarizes the dates and location of each station taken on this survey.

DATE	STATION	LATITUDE	LONGITUDE
July 6, 1983 (157)	XBT #1	47°06'12"	091°20'06"
June 6, 1983 (157)	NANSEN	47°06'12"	091°20'06"
June 10, 1983 (161)	XBT #2	46°50'42"	091°24'00"
June 13, 1983 (164)	XBT #3	46°55'18"	091°01'00"
June 16, 1983 (167)	XBT #4	46°54'54"	091°09'24"
June 20, 1983 (171)	XBT #5	47°10'00"	091°16'00"
June 21, 1983 (172)	XBT #6	46°55'54"	091°12'12"
July 24, 1983 (205)	XBT #14	46°59'36"	090°58'51"
July 26, 1983 (207)	MARTEX #5	46°56'00"	090°47'00"
August 4, 1983 (216)	MARTEX #6	46°57'42"	090°42'06"
August 21, 1983 (233)	XBT #17	46°12'30"	091°12'00"
August 25, 1983 (237)	XBT #18	47°15'15"	091°08'00"
August 30, 1983 (242)	XBTR #19	47°22'00"	091°57'48"
August 31, 1983 (243)	XBT #20	47°13'00"	091°47'30"
Sept., 01, 1983 (244)	XBT #21	47°09'06"	091°02'00"
Sept., 01, 1983 (244)	NANSEN	47°09'06"	091°02'00"
Sept., 01, 1983 (244)	NARTEK	47°09'06"	091°02'00"

Phase checks of the Ross Echo Sounder were done on a regular basis during the survey, usually at the beginning, middle, and end of each line. No other calibration adjustments were made. The initial pulses for all echo sounders were set at zero. Temporary deviations of the initial were accounted for while scanning fathograms.

The draft correction applied on line was 10.6 feet.

Settlement and squat tests for the ship were run on June 6, 1983 at Two Harbors, Minnesota; using the Zeiss Level Instrument, S/N 7423 and a stadia rod positioned over the ship's transducer. Draft and settlement and squat test can be found in Appendix D of this report.

No unusual or unique methods or instruments were used for this survey.

The sounding correction abstract, the printout for velocity, draft determination report, settlement and squat report and TC/TI tables can be found in Appendix D of this report.

E. HYDROGRAPHIC SHEETS

All field sheets were made on board PEIRCE using the Digital PDP 8/E computer system and roll bed plotter with program RK 201. The data is presented on four (4) plotter sheets (2 North, 2 South) at the scale 1:50,000 with skew 0,21.5,52. Two plotter sheets contain the mainscheme while 2 overlays contain the crosslines and developments.

The smooth sheets will be plotted by the Atlantic Marine Center (AMC) for final verification. All sheet parameters are appended to this report.

F. CONTROL STATIONS SEE SECTION 2. OF THE EVALUATION REPORT.

The following third order stations were used to control this survey:

SIGNAL	STATION NAME	SOURCE	USE
102	TWO HARBORS LIGHTHOUSE, 1952	NGS	Visual calibration
103	TWO HARBORS RADIO MAST, 1977	NGS	Visual calibration
114	BARK 1953	NGS	Visual calibration
115	LONG, 1982	APO	Visual calibration
142	DEVILS ISLAND LIGHTHOUSE, 1978	NGS	Visual calibration
146	AGATE BAY ARGO, 1983	PE	ARGO Station
147	SILVER BAY ARGO, 1983	PE	ARGO Station
150	*LOG HUB, 1983	PE	Visual calibration
151	PORT WING EAST PIER LT, 1983	PE	Visual calibration
152	*RUT REBAR, 1983	PE	Visual calibration
153	QUARRY NAIL, 1983	PE	Visual calibration
158	TWO HARBORS ~~PWR~~ POWER AND ~~LT~~ LIGHT CO ~~STK~~ STACK, 1952	NGS	Visual calibration
167	WAAND, 1982	APO	Visual calibration
168	CORNUCOPIA EAST PIER LT, 1982	APO	Visual calibration
169	*ALMOST SIGNAL, 1983	PE	Visual calibration
170	*KEYES FLAGPOLE, 1983	PE	Visual calibration

171	WALBAY, 1983	PE	Visual calibration
172	RAMP, 1983	PE	Visual calibration
181	DEVILS ISLAND ARGO, 1983	PE	ARGO Station
194	OUTER ISLE LT HSE, 1963	NGS	Visual calibration
195	SAND IS LH NEW, 1982	APO	Visual calibration
200	NORTH TWIN, 1978	NGS	MR Station
210	*ROCKY ISLAND MR, 1983	PE	MR Station
212	*SAND LH MR, 1983	PE	MR Station
213	*DEVILS LH MR, 1983	PE	MR Station
214	*OUTER LH MR, 1983	PE	MR Station

* NOT PERMANENTLY MONUMENTED

All horizontal control used in this survey is based on the North American Datum of 1927 except AGATE BAY ARGO and SILVER BAY ARGO which were positioned from Doppler adjusted stations initialing on NAD27 stations. This caused a destortion of 2.6 meters at AGATE BAY ARGO. See the Horizontial Control Report Addendum for a complete discussion. An adjustment of all stations in the area should be performed by N.G.S. A complete list of signals is located in Appendix "F" of this report. Geodetic abstracts and computations for all PEIRCE control work are included in the project Horizontal Control Report. All stations used in this survey meet the required Third Order, Class 1 accuracy standards. Positions of "NGS" stations were obtained from the NGS data base printout for western Lake Superior. "APO" field positions were obtained from the 1982 Apostle Islands Project Report, OPR-Z137. "PE" field positions were obtained from the 1983 PEIRCE Horizontal Control Project Report, OPR-Z137. SEE SECTION 2a. OF THE EVALUATION REPORT.

G. HYDROGRAPHIC POSITION CONTROL

The positional control system used for this survey was the DM-54 Automatic Ranging Grid Overlay (ARGO) positioning system. Two time slots were used to give a one second update with a smoothing code of 2 and an ARGO frequency of 1646.70 KHZ. Fixed shore station AGC values and antenna range/tune values were recorded hourly during the hours of hydrography and are included in the supplemental data to this report.

The electronic equipment used for this survey follows:

	VESNO/STATION	EQUIPMENT	S/N	JD
Initial Installation	PEIRCE	RANGE PROCESSING UNIT	R047859	157-172
		CONTROL DISPLAY UNIT	C047821	157-172
		POWER SUPPLY UNIT	V0379124	157-172
		ANTENNA LOADING UNIT	A0379109	157-172
Initial Installation	AGATE BAY ARGO 146	RANGE PROCESSING UNIT	R047854	157-243
		ANTENNA LOUDING UNIT	A0379116	157-243
		POWER SUPPLY UNIT	V0478108	157-243
Initial Installation	SILVER BAY ARGO 147	RANGE PROCESSING UNIT	R0379122	157-172
		ANTENNA LOUDING UNIT	A0379123	157-172
		POWER SUPPLY UNIT	V0379122	157-172
Initial Installation	DEVILS ISLAND ARGO 181	RANGE PROCESSING UNIT	R037940	234-243
		ANTENNA LOADING UNIT	A0980310	234-243
		POWER SUPPLY UNIT	V03789110	234-243
Change due to Silver Bay RPU failure	SILVER BAY ARGO 147	RANGE PROCESSING UNIT	R0379117	176-243
		ANTENNA LOADING UNIT	A0379123	176-243
		POWER SUPPLY UNIT	V0379122	176-243
Change due to Ships RPU failure	PEIRCE (3280)	RANGE PROCESSING UNIT	R047850	213-234
		CONTROL DISPLAY UNIT	C047822	213-234
		POWER SUPPLY UNIT	V0379124	213-234
		ANTENNA LOADING UNIT	A0379109	213-234
Change due to Ships RPU failure	PEIRCE (3280)	RANGE PROCESSING UNIT	R0379115	234-243
		CONTROL DISPLAY UNIT	C047821	234-243
		POWER SUPPLY UNIT	V0379124	234-243
		ANTENNA LOADING UNIT	A0379109	234-243

The fresh water operating area necessitated the use of a pseudo ARGO frequency. The frequency used was calculated and confirmed by PEIRCE in Project OPR-Z137-PE-82. A summary of velocity follows:

VELOCITY (km/s)	SOURCE	FREQ (khz)	SOURCE
299,670	Programmed in Hydroplot	1646.70	True frequency of ARGO system
299,350	Table 4-3 Hyd. Manual	1648.46	Calculated pseudo frequency
299,575.4	Calculated from frequency at right	1647.22	Iterative pseudo frequency (on signal tape)

The pseudo frequency 1647.22 was verified by calibrations at short, intermediate, and long ranges in 1982 and again in 1983. USED FREQUENCY 1647.22 DETERMINED BY FIELD

ARGO shore stations at AGATE BAY ARGO (#146) and SILVER BAY ARGO (#147) were used to control the southwestern portion of the survey, (JD157-147).

On J.D. 176 a Range Processing Unit (RPU) failed at Silver Bay.

A third ARGO Station was installed at DEVILS ISLAND ARGO on J.D. 200 to provide control in conjunction with SILVER BAY ARGO, for the northeast portion of the sheet.

On Julian day 234, an Range Processing Unit on PEIRCE failed for unknown reasons. The replacement also failed for unknown reasons and was replaced by yet another RPU. This unit continued to work for the duration of the survey. In the above instances no descrepancies were observed in electronic control calibrations and all data was retained.

During JD 157-214 calibrations were made twice daily using 3 point sextant fixes.

Several questionable correctors were observed for AGATE BAY ARGO when calibration took place within 10 lanes of that station. As a precaution, an average of all daily correctors was applied to the corrector tapes for the days with descrepancies.

On JD 233-243, calibrations were made using positions computed by the MINI-RANGER FALCON 484 using four ranges. Three of the MINI-RANGER reference stations were located atop lighthouses and the last on a 10 foot tower section. This method provided an almost immediate calibration throughout much of the survey area and it also provided a quick lane check whenever there was any question of losing lanes during electrical storms or other problems.

Lane checks could be accomplished on-line whenever 2-4 ranges were being received. Calibrations were performed simply by stopping the ship anywhere in the work area where four ranges could be received and where geometry of the fix

was adequate. This calibration capability saved a considerable amount of ship time running to and from calibration areas. The procedures follow:

1. Procedures common to LANE CHECK and CALIBRATION (and parameters different from FALCON default values):

   a. Enter baseline correctors for each code to be used.

   b. Enter SITE NO.; CODE; X,Y, & Z COORDINATES for each reference station location.

   c. Require "RANGE WITH X-Y".

   d. Require "PLANE" ranges.

   e. Enter "INITIAL POSITION ESTIMATE". (Not required but reduces chance of erroneous solution)

   f. Require "RANGE WITH X-Y" screen or "POSITION STATISTICS" screen (which contains range residuals and X-Y)

2. Lane check Procedure:
   After watching for consistency (no "fliers"), adequate signal strength (15+, depending on baseline calibration) and low residuals (usually less than 5 meters) simultaneously freeze FALCON screen and key "X" on Hydroplot TTY. This was done frequently on-line. Typical differences were 0-8 meters in X and Y, thus immediately confirming lanes. This was recorded on the master printout.

3. Calibration Procedure:

   a. Ship dead in water.

   b. Simultaneously freeze FALCON screen and key "X" on TTY, as above.

   c. Use program RK300 to convert FALCON least squares X-Y position to ARGO lanes.

   d. By subtraction of lanes, determine lanes to be set in ARGO via delta lane feature and/or partial lane correctors to be entered on-line as "NAV-CAL" values in Hydroplot programs. These partial correctors were also the final electronic correctors applied to the corrector tape.

MINI-RANGER FALCON EQUIPMENT:

STATION/VESNO	EQUIPMENT	S/N	JULIAN DATE
3280	Falcon Console	D0017	233-243
3280	CRT	D0057	233-243
3280	Receiver-transmitter	D2123	233-243

H. SHORELINE

There is no shoreline within the limits of this survey.

I. CROSSLINES *See section 3.a. of the Evaluation Report.*

Crosslines totaling 150.1 nautical miles were run (10.8% of the total mainscheme milage). Crosslines show very good agreement with mainscheme and are well within the 1-3% criterion prescribed by section 1.1.2 of the Hydrographic Manual.

J. JUNCTIONS *See section 5 of the Evaluation Report*

This survey junctions with contemporary surveys H-10036 (PE 50-1-82) to the west, H-10100 (PE 20-5-83) to the southwest, and H-10103 (PE 20-6-83) to the southeast.

H-10036 (PE 50-1-82)

Junctions made with H-10036, 1:50,000, agree very well, with most sounding agreeing within 0-3 feet. There were three soundings that disagree substantially. The following are the soundings and location of each.

H-10094	H-10036	Latitude	Longitude
607	619-627	47°07'17"	091°13'45"
607	635	47°07'17"	091°14'24"

These soundings did not fall directly on top of each other but lie within 2-3mm. Topography of the area was noted in the 1982 Descriptive Report as being that of hills and valleys. This survey agrees. The discrepancies are undoubtedly due to the irregular bottom.

H-10100 (PE20-5-83)

Junctions made with H-10100, 1:20,000 agree very well with all overlapping soundings falling within 0-3 feet.

H-10103 (PE 20-6-83)

Junctions made with H-10100, 1:20,000, agree very well with almost all overlapping soundings agreeing within 0-2 feet. Only three soundings varied as much as 3 feet.

K. COMPARISON WITH PRIOR SURVEYS

There were no presurvey review items located within the limits of this survey.

Comparisons were made with the following prior surveys.

LS- 457	1:120,000	1869
LS-1505	1:20,000	1928
LS-1506	1:20,000	1928
LS-1994	1:120,000	1956
LS-1995	1:120,000	1956
LS-1996	1:120,000	1956

Prior survey LS-457 showed very good agreement with this survey although there is no coordinate grid on this very old prior survey. Out of all the depths within the limits of this survey, 80% agree better than 10 feet and 50% of the same depths agree with 1-3 feet. The other depths were found to be inconsistent with the priors' contour lines and with this survey's soundings.

Prior surveys LS-1505 and LS 1506 were done in 1928. These prior surveys were done in fathoms with a wire sounding machine and compared very well with the current survey. The two worst discrepancies were at 47°23.3'N, 090°54.0'W (LS 1505) where the sounding was 65 feet deeper than the current survey and at 47°23.6'W 89°54.4'W where the sounding was 21 feet deeper than the current survey. The rest of the soundings were found to be 0 to 10 feet deeper then the current survey with no pattern being evident.

Prior surveys LS-1994, LS-1995, and LS-1996 ~~was~~ were done in 1956 using Shoran positioning. These surveys had a Datum of 601.6 feet above the mean tide at New York. The sheets also included soundings from surveys done in 1902 and 1927 and soundings from the contemporary chart. The soundings from the other surveys and chart were placed on the sheets using a color code. These were then photo copied in black and white making it impossible for the hydrographer to distinguish between the soundings. In general, the soundings shoaler than 400 feet agreed very well. Soundings deeper than 400 feet were usually 0 to 30 feet deeper with no patterns being evident.

It is recommended that the current survey supersede all prior surveys. Because of the large number of inaccurate prior depths (greater than 400 feet), the hydrographer recommends that no prior depths be used deeper than 400 feet.

L. COMPARISONS WITH THE CHART

See Section 7 of the Evaluation Report.

Comparisons made with Chart 14966, ~~1:10,000~~ 1:120,000 scale, 19th Edition, Jan. 15, 1983, and chart 14967, 1:120,000 scale, 19th Edition, Oct 30, 1983. Most soundings shoaler than 600 feet (65%) agreed very well and varied only as much as 10 feet. Many soundings greater than 600 feet (35%) were found to be 10 to 20 feet deeper than those on the chart. Decreased line spacing of 200 or 400 meters was run on most soundings that differed by more than 30 feet.

The following is a list of those charted soundings that were found to disagree with the acquired soundings

POSITION (Latitude / Longitude)	CHARTED SOUNDINGS	PRESENT SURVEY
47°16'05"		
091°07'30	889 ft	921

LAT. 47°15'07" LONG. 091°06'45"	727 ft	~~827~~ 821
47°14'20" 091°10'10"	883 ft	~~922~~ 923
47°13'30" 091°15'05"	817 ft	~~876~~ 866
47°11'20" 091°16'15"	829 ft	~~909~~ 913
47°11'20" 091°13'18"	805 ft	~~919~~ 917
47°09'08" 091°17'10"	877 ft	~~918~~ 929
47°09'25" 090°56'00"	361 ft	~~454~~ 453
47°12'33" 090°47'50"	237 ft	285
47°20'14" 090°56'49"	~~528~~ 582 ft	643
47°13'06" 091°09'35"	781 ft	~~886~~ 849
47°12'30" 091°12'30"	859 ft	920
47°12'30" 091°14'10"	871 ft	922
47°10'25" 091°17'50"	870 ft	~~905~~ 904
47°10'10" 091°15'55"	871 ft	~~938~~ 937
47°10'25" 091°12'55"	637 ft	791
47°11'20" 091°11'45"	691 ft	~~754~~ 713
LAT 47°07'25" LONG. 091°15'10"	583 ft	~~633~~ 631

47°14'05" 090°49'05"	427 ft	~~487~~ 432
47°11'10" 090°48'10"	220 ft	~~345~~ 226
47°10'20" 091°51'30"	372 ft	~~418~~ 364
47°09'00" 090°50'20"	224 ft	~~331~~ 226
47°07'35" 090°50'20"	171 ft	~~240~~ 172
47°07'45" 090°51'30"	220 ft	~~309~~ 216
47°14'30" 090°53'20"	505 ft	~~537~~ 547
47°08'35" 090°53'00"	252 ft	~~323~~ 331
47°07'25" 090°53'00"	289 ft	~~342~~ 274
47°11'10" 090°59'40"	547 ft	~~601~~ 561
47°16'10" 091°00'30"	642 ft	~~684~~ 614
47°14'40" 091°02'00"	595 ft	~~643~~ 599
47°15'35" 091°03'00"	643 ft	~~687~~ 647

Recommend that all soundings listed be changed to the acquired soundings of this survey. Concur

M. ADEQUACY OF SURVEY

This survey is complete and adequate to supersede the presently charted soundings and prior surveys. Concur

N. AIDS TO NAVIGATION

The following landmarks, which are visible from the survey area, are also triangulation stations, and have been verified by theodolite cuts:

(1) (PALISADES MN ST PATROL MAST), R TR 3 Vert Lts Occ R 2 FR
(2) (SPLIT ROCK LIGHTHOUSE), ABAND LT HO
N.G.S. name in parenthesis.

DANGERS TO NAVIGATION

Negative Report to Dangers to Navigation

The characteristics of the following landmarks and fixed aids visible from the sheet area were verified visually, positions were not determined:

TANK	47/17/52	91/16/03	
R MAST F R	47/17/33	91/15/55	
STACK	47/17/12	91/15/37	POWER PLANT STACK
(14967)	47/17/13	91/15/36 (14967 Inset)	POWER PLANT NORTH STK
FI 30 sec 126 ft Priv. maintd			POWER PLANT LIGHT
FI R 10 sec HORN Priv. maintd			BEAVER IS. LIGHT
FI G 4 sec 6 ft. Priv. maintd			SILVER BAY HARBOR
FI G 10 sec 25 ft. Priv. maintd			PELLET IS. LIGHT
R Bn 304			SILVER BAY MARKER RBN

Information obtained from Dipfile Listings of Charts 14966 and 14967

O. STATISTICS

	VESNO 3280	TOTAL
Total number of positions		1555
Nautical miles of sounding lines		1690
Square miles of Hydrography		580.0
Bottom Samples		29.0
Water level stations		5
XBT's		12
Martek casts		3
Nansen		2

P. MISCELLANEOUS

Twenty-nine bottom samples were taken, a copy of the Oceanographic Log Sheet-M is included in Appendix "H". The small number of samples was due to the uniformity of the bottom, the great depth of the water and the fact that a previous sediment study had been made.

Q. RECOMMENDATIONS

It is recommended that data compiled for this survey supersede all existing charts and information. Specific recommendations have been made in Section L and G of this report.

R. AUTOMATED DATA PROCESSING

The following programs were used in acquiring and processing data for t is survey:

PROGRAM	PROGRAM NAME	
RK 112	Hyperbolic R/R Hydroplot	05/11/83
RK 201	Grid, Signal, Lattice Plot	04/18/75
RK 211	R/R Non-Real Time Plot	02/02/81
RK 300	Utility Computations	10/21/80
RK 330	Reformat and Data Check	05/04/76
PM 360	Electronic Corrector Abstract	02/02/76
RK 530	Layer Corrections for Velocity	05/10/76
RK 561	H/R Geodetic Calibration	02/19/75
AM 602	Elinore-Extended Line Oriented Editor	05/21/75
RK 612	Line Printer List	03/22/78

S. REFERRAL TO REPORTS

The following reports for Project OPR-Z137-PE-83 have been submitted.

REPORTS	SUBMITTED	DATE
Coast Pilot	Coast Pilot Section, Rockville	Oct. 83
Horizontal Control	Operations Branch, AMC	Oct. 83
Geographic Names	Operations Branch, AMC	Oct. 83
Mini-Ranger Electronic Calibration	Verification, AMC	Oct. 83

Respectfully Submitted:

George E Leigh for

Jason H. Maddox, Ens., NOAA

J. APPROVAL SHEET

APPROVAL SHEET

H-10094

Field work on this survey was conducted under my supervision with frequent personal examination of the field sheet and records. This report and the final sheet have been revised and found to represent a complete and adequate survey.

No additional field work is required. This survey should supersede all prior surveys and charted information in the common areas.

Until such time as a new chart is constructed, the geographic position of any information from this survey must be converted to chart datum before application. Horizontal datum for this survey is NAD 27.

Walter S. Simmons, CDR, NOAA
Commanding Officer
NOAA Ship PEIRCE

F. LIST OF STATIONS

SIGNAL TAPE LISTING

PE-50-1-83

OPR Z-137

102	0	47	00	50488	091	39	49274	139	0000	000000	TWO HARBORS LIGHTHOUSE, 1952
103	0	47	00	45259	091	41	13275	139	0000	000000	TWO HARBORS RADIO MAST, 1977
114	5	46	53	08683	091	10	49935	139	0002	000000	BARK, 1953
146	0	47	00	48487	091	39	47683	250	0000	164722	AGATE BAY ARGO, 1983
147	0	47	17	08757	091	15	08616	250	0000	164722	SILVER BAY ARGO, 1983
150	7	46	47	31386	091	22	40073	254	0003	000000	LOG HUB, 1953
151	7	46	47	34729	091	23	10067	139	0000	000000	PORT WING EAST PIER LT, 1983
[illegible]	7	46	47	24968	091	23	37378	254	0002	000000	RUT REBAR, 1983
[illegible]	5	46	47	36709	091	24	08267	139	0002	000000	QUARRY NAIL, 1983
158	0	47	01	06713	091	39	35795	139	0000	000000	TWO HARBORS PWR AND LT CO STK, 1952
168	7	46	51	35110	091	06	16548	139	0000	000000	CORNUCOPIA FAST PIER LT, 1982
169	5	46	52	48815	091	05	36963	139	0000	000000	ALMOST SIGNAL, 1983
115	5	46	52	22318	091	08	05325	139	0005	000000	LONG, 1982
142	7	47	04	46342	090	43	41069	139	0000	000000	DEVILS ISLAND LIGHTHOUSE, 1978
167	7	46	51	15771	091	09	56520	139	0002	000000	WAAND, 1982
[illegible]	5	46	51	22750	091	07	31452	139	0001	000000	KEYES FLAGPOLE, 1983
[illegible]	5	46	51	17366	091	12	05495	139	0001	000000	WALRAY, 1983
172	0	46	52	35181	091	11	17314	139	0001	000000	RAMP, 1983
181	6	47	04	46941	090	43	40313	250	0000	164722	DEVILS ISLAND ARGO, 1983
194	7	47	04	36147	090	24	59688	139	0001	000000	OUTER ISLAND LT HSE, 1963
195	7	47	00	11913	090	56	14716	139	0000	000000	SAND IS LH NEW, 1982
200	7	47	04	32561	090	35	11631	139	0006	000000	NORTH TWIN, 1978
212	5	47	00	11971	090	56	14716	250	0019	000000	SAND LH MR, 1983
[illegible]	5	47	04	46419	090	43	41110	250	0030	000000	DEVILS LH MR, 1983
[illegible]	5	47	04	36187	090	24	59749	250	0038	000000	OUTER LH MR, 1983

I. LANDMARKS FOR CHART

NOAA FORM 76-40
(8-74)

Replaces C&GS Form 567.

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

NONFLOATING AIDS OR LANDMARKS FOR CHARTS

ORIGINATING ACTIVITY
- [X] HYDROGRAPHIC PARTY
- [ ] GEODETIC PARTY
- [ ] PHOTO FIELD PARTY
- [ ] COMPILATION ACTIVITY
- [ ] FINAL REVIEWER
- [ ] QUALITY CONTROL & REVIEW GRP.
- [ ] COAST PILOT BRANCH

(See reverse for responsible personnel)

[ ] TO BE CHARTED [X] TO BE REVISED [ ] TO BE DELETED	REPORTING UNIT (Field Party, Ship or Office)	STATE	LOCALITY	DATE
	NOAA Ship PEIRCE S-328	Wisconsin	Lake Superior	1 Sep 83

The following objects HAVE [ ] HAVE NOT [ ] been inspected from seaward to determine their value as landmarks.

CHART PROJECT NO.	JOB NUMBER	SURVEY NUMBER	DATUM
CPR-7137-PE-83		H-10094 H-10095 H-10096✓ H-10100 H-10103✓	NAD 1927

CHARTING NAME	DESCRIPTION (Record reason for deletion of landmark or aid to navigation. Show triangulation station names, where applicable, in parentheses)	POSITION LATITUDE ° ′	LATITUDE ″ D.M. Meters	POSITION LONGITUDE ° ′	LONGITUDE ″ D.P. Meters	METHOD AND DATE OF LOCATION (See instructions on reverse side) OFFICE	FIELD	CHARTS AFFECTED
Pier Lt 4sec 30ft St M	(PORT WING EAST PIER LT, 1983) L-664(83)	46 47	34.73	91 23	10.07		F-2-6-L 6-12-83	14960 14961 14966
East Pier Lt G 2.5sec ft 4 St M	(CORNUCOPIA EAST PIER LT, 1982) L-664(83)	46 51	35.11	91 06	16.55		F-2-6-L 8-12-82	14960 14961 14966
6sec 0ft 7 St M	(SAND IS LH NEW, 1982) L-848(83)	47 00	11.91	90 56	14.72		F-2-6-L 8-12-82	14960 14961 14966 14973
2.5sec 5ft 7 St M	(RASPBERRY IS LT NEW, 1982) L-848(83)	46 58	13.20	90 48	17.47		F-3-6-L 8-12-82	14960 14961 14966 14973
4sec 1ft 6 St M	(LITTLE MANITOU IS LT, 1982) L-848(83)	46 57	40.19	90 41	07.36		F-2-6-L 8-12-82	14960 14961 14966 14973
2.5sec 5ft 7 St M	(GULL IS LT 1982) L-848(83)	46 54	24.85	90 26	35.16		F-3-6-L 8-12-82	14960 14973 14961 14965 14966
Int G 5ft V maintd	(BAYFIELD MUNC BRKW LT, 1982) L-848(83)	46 48	41.69	90 48	39.96		F-2-6-L 8-12-82	14973
R 4sec 5ft 4 St M	(BAYFIELD N BRKW LT, 1982) L-848(83)	46 48	35.98	90 48	39.33		F-2-6-L 8-12-82	14966 14973
4sec 5ft 10 St M	(BAYFIELD S BRKW LT, 1982) L-848(83)	46 48	34.62	90 48	41.05		F-2-6-L 8-12-82	14960 14973 14961 14966

RESPONSIBLE PERSONNEL

TYPE OF ACTION	NAME	ORIGINATOR
OBJECTS INSPECTED FROM SEAWARD	Robert M. Mandzi Robert M. Mandzi, LT, NOAA NOAA Ship PEIRCE	☐ PHOTO FIELD PARTY ☒ HYDROGRAPHIC PARTY ☐ GEODETIC PARTY ☐ OTHER *(Specify)*
POSITIONS DETERMINED AND/OR VERIFIED	Robert M. Mandzi, LT, NOAA	FIELD ACTIVITY REPRESENTATIVE
		OFFICE ACTIVITY REPRESENTATIVE
FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES		☐ REVIEWER ☐ QUALITY CONTROL AND REVIEW GROUP REPRESENTATIVE

INSTRUCTIONS FOR ENTRIES UNDER 'METHOD AND DATE OF LOCATION'

(Consult Photogrammetric Instructions No. 64,

OFFICE

I. OFFICE IDENTIFIED AND LOCATED OBJECTS

Enter the number and date (including month, day, and year) of the photograph used to identify and locate the object.

EXAMPLE: 75E(C)6042
8-12-75

FIELD

I. NEW POSITION DETERMINED OR VERIFIED

Enter the applicable data by symbols as follows:

F - Field	P - Photogrammetric
L - Located	Vis - Visually
V - Verified	
1 - Triangulation	5 - Field identified
2 - Traverse	6 - Theodolite
3 - Intersection	7 - Planetable
4 - Resection	8 - Sextant

A. Field positions* require entry of method of location and date of field work.

EXAMPLE: F-2-6-L
8-12-75

*FIELD POSITIONS are determined by field observations based entirely upon ground survey methods.

FIELD (Cont'd)

B. Photogrammetric field positions** require entry of method of location or verification, date of field work and number of the photograph used to locate or identify the object.

EXAMPLE: P-8-V
8-12-75
74L(C)2982

II. TRIANGULATION STATION RECOVERED

When a landmark or aid which is also a triangulation station is recovered, enter 'Triang. Rec.' with date of recovery.

EXAMPLE: Triang. Rec.
8-12-75

III. POSITION VERIFIED VISUALLY ON PHOTOGRAPH

Enter 'V-Vis.' and date.

EXAMPLE: V-Vis.
8-12-75

**PHOTOGRAMMETRIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods.

/(2)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
~~NATIONAL OCEAN SURVEY~~
Rockville, Md. 20852
NATIONAL OCEAN SERVICE
CHARTING AND GEODETIC SERVICES N/CG142:LDH

July 18, 1983

TO: Cdr. Paul M. Duernberger
Chief, Operations Branch
ATTN: N/MOA11
Atlantic Marine Center
National Ocean Service, NOAA
439 W. York Street
Norfolk, Virginia 23510

FROM: N/CG142 - Larry D. Hothem L.D. Hothem

SUBJECT: Doppler Point Position Results for Lake Superior Doppler Project

Attached are the following information and data for the point position results of the Doppler observations performed by AMC in the Lake Superior region during September 1982:

1. Geodetic Summaries for all Doppler stations of the Lake Superior project and Apostle Island project (performed in 1978).

2. Tables of datum shift computations used to transform the Doppler stations to the NAD 1927 datum.

It is apparent from Table 3 there is considerable inconsistencies in the horizontal control between station FINLAND (50281) located on the west side of the lake and project area, and station MCM91 (50299) located on the eastern part of the project area. The differences between the NAD 1927 and transformed Doppler are relative to the two stations ORONTO (50302) and BLACK (50303) located in the central region of the project area. Because of the large spread in latitude of 4 meters and in longitude of 5.4 meters between the 4 stations, the Doppler coordinates were transformed using the datum shift appropriate for each region.

The transformed stations and corresponding datum shift used were:

Datum Shift Computed From	Stations Transformed
50281	50283, 50284, 50285, 50286, 50287
Mean 50302 and 50303	50288, 50289, 50300, 50301, 50290, 50291, 50292
50299	50293, 50294, 50295, 50296, 50297, 50298, 50304, 50305, 50306

The estimated uncertainties for the horizontal coordinates are given for each station in the geodetic summaries.

We are now in the final stages of testing the most updated version of the Doppler short arc program GEODOPV. We expect to begin within a couple of weeks the reduction of the Lake Superior data. The relative position results will be analyzed by comparison with the point position data. It is expected there will be some improvement in the internal consistency of the Doppler derived raw coordinates. However, the improvements will only be in the precision of the unadjusted coordinates since the distortions in the NAD 1927 network will affect the accuracy of the final transformed Doppler coordinates. After the NAD 83 readjustment is completed, the differences between the Doppler derived control and NAD 83 should be under a few decimeters.

Should you have any questions or if you would like additional information, please contact Ms. Madeline White, Lt. David Minkel, or myself. Our telephone number is (FTS) 443-8580.

Attachments

cc:
Mr. Gary Fredericks, AMC

The local network which the ARGO positioning data is based upon,(stations AGATE BAY ARGO, 1983 and SILVER BAY ARGO, 1983 were located from doppler stations), relative to the local net in the vicinity of the Apostle Islands, are probably accurate to +/- 2 meters. This is insignificant regarding the ARGO positioned hydrographic data in the survey area. Further inquiry if desired may be had by contacting Mr. Larry D. Hothen, NOS Rockville Md. or Mr. Gary Fredericks, AMC.

R.D. Sanocki

NOAA FORM 61-29 (12-71)

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

LETTER TRANSMITTING DATA

REFERENCE NO.
MOA23-L5-85 RHW

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

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

TO:

CHIEF, DATA CONTROL SECTION
HYDROGRAPHIC SURVEYS BRANCH, N/CG243
NATIONAL OCEAN SERVICE, NOAA
ROCKVILLE, MD 20852

DATE FORWARDED
7 JUNE 1985

NUMBER OF PACKAGES
1 TUBE 1 BOX

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.

H-10094 (PE-50-1-83) OPR-E137-PE-83
MINNESOTA--WISCONSIN, LAKE SUPERIOR, SILVER BAY TO APOSTLE ISLANDS

PKG #1 (TUBE)
- ✓1 MYLAR SMOOTH SHEET
- ✓1 MYLAR SMOOTH POSITION OVERLAY
- ✓2 MYLAR SMOOTH EXCESS OVERLAYS
- ✓2 FINAL FIELD SHEETS
- ✓2 FINAL FIELD SHEET OVERLAYS
- ✓5 PRELIMINARY FIELD SHEETS
- ✓1 ORIGINAL DESCRIPTIVE REPORT

PKG #2 (BOX)
- ✓1 ACCORDIAN FILE CONTAINING ECHOGRAMS, FIELD DATA PRINTOUTS AND CORRECTOR PRINTOUTS FOR:
  VESNO 2830: TO 157, 171, 172, 213, 214, 233, 234 235, 236, 237, 238, 242 AND 243
- ✓2 BUNDLES OF SAWTOOTH POSITION CHARTS

PG 1 OF 2

FROM: (Signature) for G. H. Whitfield
DAVE MACFARLAND, LCDR, NOAA

Return receipted copy to:

ATLANTIC MARINE CENTER
HYDROGRAPHIC SURVEYS BRANCH, N/MOA23
NOAA, NATIONAL OCEAN SERVICE
439 W. YORK STREET
NORFOLK, VA 23510

RECEIVED THE ABOVE
(Name, Division, Date)
Scott Clark
June 21, 1985
N/CG243

NOAA FORM 61-29 SUPERSEDES FORM C&GS 413 WHICH MAY BE USED.

☆U.S.GPO:1983-0-664-006/1192

NOAA FORM 61-29
(12-71)

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

REFERENCE NO.

LETTER TRANSMITTING DATA

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

☐ ORDINARY MAIL ☐ AIR MAIL

☐ REGISTERED MAIL ☐ EXPRESS

☐ GBL *(Give number)* _____

TO:

CHIEF, DATA CONTROL SECTION
HYDROGRAPHIC SURVEYS BRANCH, N/CG243
NATIONAL OCEAN SERVICE, NOAA
ROCKVILLE, MD 20852

DATE FORWARDED

NUMBER OF PACKAGES

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.

PKG 2 (CON'T)
- ✓1. CAHIER OF POSITION CALIBRATION RECORDS
- ✓1 EQUIPMENT FAIL LOG
- ✓1 CAHIER WITH FINAL CONTROL AND FINAL POSITION PRINTOUT
- ✓1 CAHIER WITH FINAL SOUNDING AND L-FILE PRINTOUT.
- ✓1 - ENV MISC DATA REMOVED FROM DR
- ✓1 - ENV SUPPLEMENT DATA

PKG #3 (BOX)
- ✓15 FOLDERS OF UGR FATHOGRAMS FOR VESNO 3280

Pg 2 OF 2

FROM: *(Signature)* R A Warfield
FOR CDR DAVE MACFARLAND, NOAA

RECEIVED THE ABOVE
(Name, Division, Date)
Scott Clark
June 21, 1985
N/CG243

Return receipted copy to:

ATLANTIC MARINE CENTER
HYDROGRAPHIC SURVEYS BRANCH, N/MOA23
NOAA, NATIONAL OCEAN SERVICE
439 W. YORK STREET
NORFOLK, VA 23510

NOAA FORM 61-29 SUPERSEDES FORM C&GS 413 WHICH MAY BE USED.

☆U.S.GPO:1983-0-664-006/1192

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

WATER LEVEL NOTE FOR HYDROGRAPHIC SHEET

Processing Division: Atlantic Marine Center: MOA231

Hourly heights are approved for

Water Level Station Used: Two Harbors, Minnesota (909-9070)

Period: June 6, 1983 - August 31, 1983

HYDROGRAPHIC SHEET: H-10094

OPR- Z137-PE-83

Locality: Lake Superior

Plane of reference: Low Water Datum (IGLD 1955: 600.00 Feet)

Remarks:

Zoning not required. Data from other gages on Lake Superior indicate no unusual water level movement during the survey period.

Philip C. Morris

Chief, Water Levels Section

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

H-10094

Name on Survey	A ON CHART NO. 14966	B ON PREVIOUS SURVEY NO. 14967	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	
APOSTLE ISLANDS (title)										1
LAKE SUPERIOR (title)										2
MINNESOTA (title)										3
SILVER BAY (title)										4
WISCONSIN (title)										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
										15
				Approved:						16
										17
				Charles C. Harrington						18
				Chief Geographer - NOS 2x5						19
				2 APRIL 1985						20
										21
										22
										23
										24
										25

NOAA FORM 76-155 SUPERSEDES C&GS 197

HYDROGRAPHIC SURVEY STATISTICS
REGISTRY NO.: H-10094

Number of positions	2053
Number of soundings	15369
Number of control stations	25

	TIME-HOURS	DATE COMPLETED
Preprocessing Examination	57	1/09/84
Verification of Field Data	216	12/14/84
Quality Control Checks	43	
Evaluation and Analysis	44	4/12/85
Final Inspection	5	4/16/85
TOTAL TIME	365	
Marine Center Approval		4/19/85

Transmittal letter of survey and survey records will be included in the Descriptive Report to identify the records accompanying the survey.

ATLANTIC MARINE CENTER
EVALUATION REPORT

SURVEY NO.: H-10094 FIELD NO.: PE-50-1-83

Minnesota--Wisconsin, Lake Superior, Silver Bay to Apostle Islands.

SURVEYED: 6 June through 31 August 1983

SCALE: 1:50,000 PROJECT NO.: OPR-Z137-PE-83

SOUNDINGS: Raytheon Universal Recorder (UGR), Ross Digital Echosounder

CONTROL: ARGO DM-54 (Range/Range)

Chief of Party.....W. S. Simmons

Surveyed by.....A. A. Armstrong
.....G. E. Leigh
.....R. M. Mandzi
.....M. P. Conricote
.....S. I. Andreeva

Automated plot by.....Xynetics 1201 Plotter (AMC)

1. INTRODUCTION

a. No unusual problems were encountered during verification.

b. Notes in the Descriptive Report were made in red during office processing.

2. CONTROL AND SHORELINE

a. The control is adequately discussed in sections F, G, and S of the Descriptive Report. See also letter dated July 18, 1983, Subject: Doppler Point Project, appended to the Descriptive Report.

b. There is no shoreline within the area surveyed.

3. HYDROGRAPHY

a. Soundings at crossings agree within the criteria stated in sections 4.6.1 and 6.3.4.3 of the Hydrographic Manual and section 6.6 of the Project Instructions.

b. Except in the junctional area where only segments of the 600 foot curve could be drawn, the standard depth curves were drawn in their entirety. The 360, 420, 480, 540 foot supplemental depth curves and brown curves were added to better show bottom topography.

4. CONDITION OF SURVEY

The smooth sheet and accompanying overlays, hydrographic records and reports are adequate and conform to the requirements of the Hydrographic Manual with the following exceptions:

a. For depths greater than 800 feet the fathom scale was used on the Ross echosounder with paper scaled in feet.

b. Five unmonumented and nonrecoverable control stations were given a 250 or 139 cartographic code which implies a monumented or recoverable station rather than the 243 or 254 cartographic code.

c. In development of shoal areas, least depths should be noted on the overlays and be brought through to the final field sheet.

d. Eight (8) landmarks and/or fixed aids were verified visually with no positions being determined.

e. Bottom samples were not taken as required by sections 1.6.3 and 4.7.1 of the Hydrographic Manual and section 8.1 of the Project Instructions in depths greater than 500 feet. However, see section P. of the hydrographer's Descriptive Report. The hydrographer did not identify the source of the sediment study noted in section P. of the Descriptive Report.

f. Loran-C Chart Verification Data was collected as required by section 8.4 of the Project Instructions. However, it was not discussed in the Descriptive Report.

g. No names were given as to who the sheet was surveyed by.

5. JUNCTIONS

H-10036 (1982) to the southwest
H-10100 (1983) to the south
H-10103 (1983) to the southeast

Excellent junctions were made between the present survey and the surveys mentioned above.

There are no contemporary surveys to the north, east and west of the present survey. The charted depths and present survey depths are in harmony to the north, east and west.

6. COMPARISON WITH PRIOR SURVEYS

LS-457 (1869) 1:120,000
LS-1505 (1928) 1:120,000
LS-1506 (1928) 1:120,000
LS-1994 (1956) 1:120,000
LS-1995 (1956) 1:120,000
LS-1996 (1956) 1:120,000

The comparison with prior surveys in section K. of the present survey's Descriptive Report is adequate and needs no further discussion in this Evaluation Report. Differences between the present survey and the above prior surveys can generally be attributed to horizontal position control equipment and methods and improved sounding techniques.

Bottom characteristics were carried forward from prior surveys LS-1505 (1928) and LS-1506 (1928) to supplement present survey data. With this addition, the present survey is considered adequate to supersede the above prior surveys in the common area.

7. COMPARISON WITH CHARTS No. 14966 (19th Ed., Jan. 15/83)
No. 14967 (19th Ed., Oct. 30/82)

a. Hydrography

The charted hydrography originates with the previously discussed prior surveys and miscellaneous sources which need no further consideration. Specific soundings tabulated and discussed in section L., pages 9 through 11 of the Descriptive Report have charting recommendations on those pages and require no additional comments.

The present survey is adequate to supersede the charted hydrography.

b. Aids to Navigation

There are no fixed or floating aids to navigation in the survey area.

8. COMPLIANCE WITH PROJECT INSTRUCTIONS

This survey adequately complies with the Project Instructions except or noted in section 4 of this report.

9. ADDITIONAL FIELD WORK

This is an excellent basic survey. No additional work is necessary.

Douglas V. Mason
Cartographic Technician
Verification of Field Data

Richard H. Whitfield
Cartographic Technician
Evaluation and Analysis

Robert R. Hill
Senior Cartographic Technician
Verification Check

Inspection Report
H-10094

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 magnetic tape record for this survey. Final control, position, and sounding printouts of the survey have been made. The survey complies with National Ocean Service requirements except as noted in the Evaluation Report. The survey records comply with NOS requirements except where noted in the Evaluation Report.

Inspected

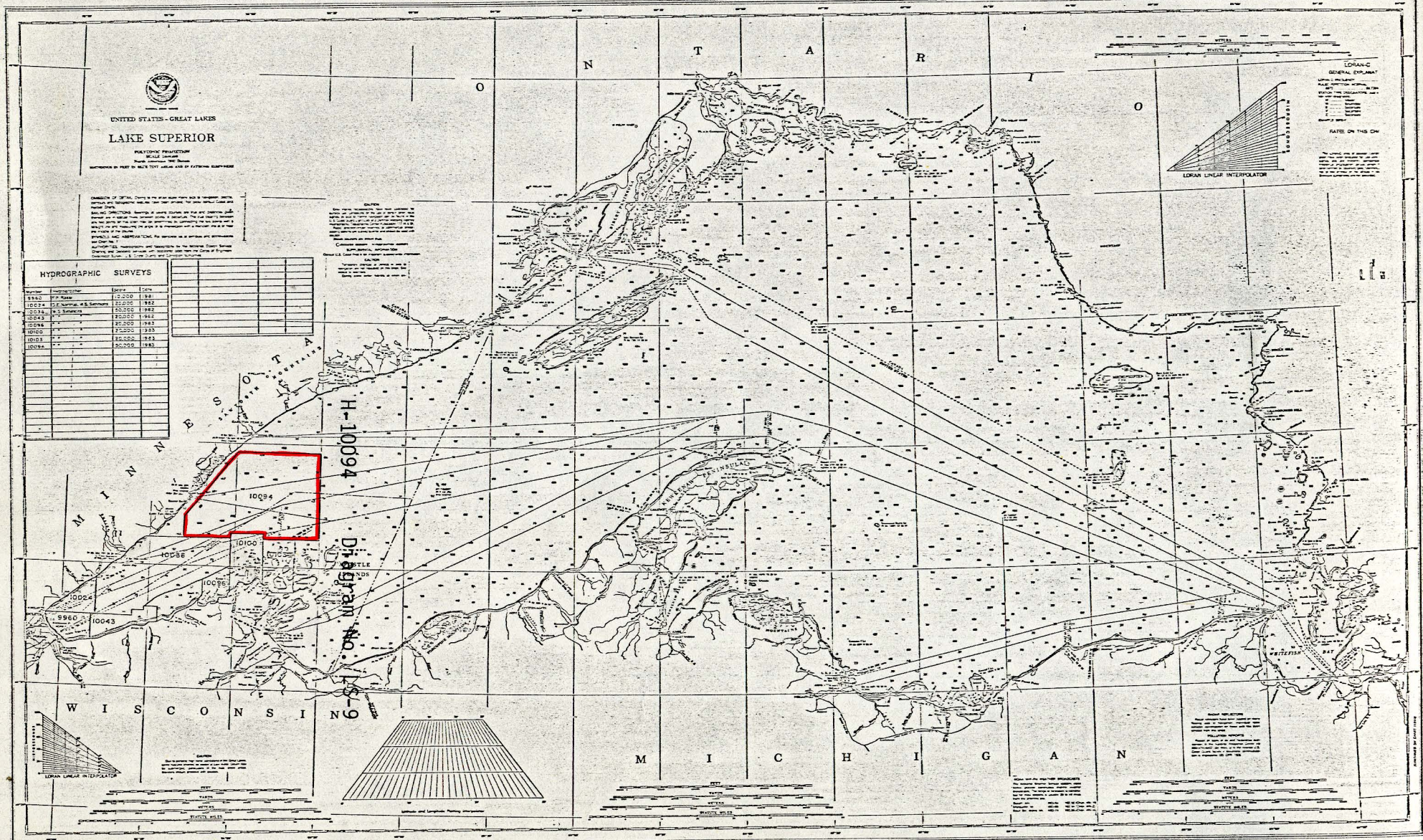
R. D. Sanocki
Chief, Hydrographic Surveys
Processing Section
Hydrographic Surveys Branch

David B. MacFarland, Jr., LCDR, NOAA
Chief, Hydrographic Surveys Branch

Approved April 19, 1985

Wesley V. Hull, RADM, NOAA
Director, Atlantic Marine Center

6-ST



Published at Washington, D.C.
U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SURVEY

LS-9

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-10094

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
14967	8-30-85	Ralph B. Rosa	Full Part Before After Marine Center Approval Signed Via Drawing No. 4. Applied in full - Entered (Silver Bay) (feet)
14966	8-30-85	Ralph B. Rosa	Full Part Before After Marine Center Approval Signed Via Drawing No. 4 Applied in full. (feet)
14960	9-3-85	Ralph B. Rosa	Full Part Before After Marine Center Approval Signed Via Drawing No. 5 applied in full (Fathoms)
14961	9-3-85	Ralph B. Rosa	Full Part Before After Marine Center Approval Signed Via Drawing No. 5 applied in full (Fathoms)
14965	9-3-85	Ralph B. Rosa	Full Part Before After Marine Center Approval Signed Via Drawing No. 4 applied in full (feet) (soundgs)
14973	9-3-85	Ralph B. Rosa	Full Part Before After Marine Center Approval Signed Via Drawing No. 3 Applied in full (feet) (at Proof)
~~14967~~	~~7-20-90~~	Dan Black	~~Full Part Before After Marine Center Approval Signed~~ Via ~~Drawing No. 5~~
			Full Part Before After Marine Center Approval Signed Via Drawing No.
			Full Part Before After Marine Center Approval Signed Via Drawing No.
			Full Part Before After Marine Center Approval Signed Via Drawing No.
			STANDARDS CK'D 6-28-85 C. Loy

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.