

# 10043

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-20-2-82

Office No. .... H-10043

### LOCALITY

State ..... Wisconsin

General Locality ..... Lake Superior

Locality ..... Iron River to Bardon Creek

1982

CHIEF OF PARTY  
CDR W.S. Simmons

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DATE ..... October 5, 1984

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

Area 7

CHTS

14966

14961

14960

14500

For signing off  
see "Record of Application"

# HYDROGRAPHIC TITLE SHEET

H-10043

**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.

PE-20-2-82

State Wisconsin

General locality Lake Superior

Locality Iron River Bardon Creek  
~~Bardon Creek to Iron River~~

**Scale** 1:20,000

April 21, 1982, JUNE 16, 1982 SEPT 16, 1982

Date of survey 20 Aug 1982 to 16 Oct 1982

Instructions dated 31 Mar 1982

Project No. OPR-2137-PF-82

Vessel NOAA Ship PEIRCE (2830), Launches 1009 (2839) and 1017 (2837)

Chief of party CDR Walter S. Simmons

Surveyed by N. G. Millett, R. M. Mandzi, R. B. Harris, S. I. Andreeva

**Soundings taken by echo sounder, hand lead, etc.**

Graphic record scaled by NGM, RMM, MPC, RBH, SIA, TPR, WEM, TO, EK

Graphic record checked by GEL. RMM

Protracted by NA

XyNETICS 1201 PLOTTER (AMC)  
Automated plot by Hydroplot

Verification by J. B. Wilson

**Soundings in fathoms feet**

LAKE SUPERIOR L. W. D. IGLD (1955)

~~McW~~ ~~McW~~ ~~I~~ ~~G~~ ~~I~~ ~~D~~

REMARKS: All times are Coordinated Universal Time.

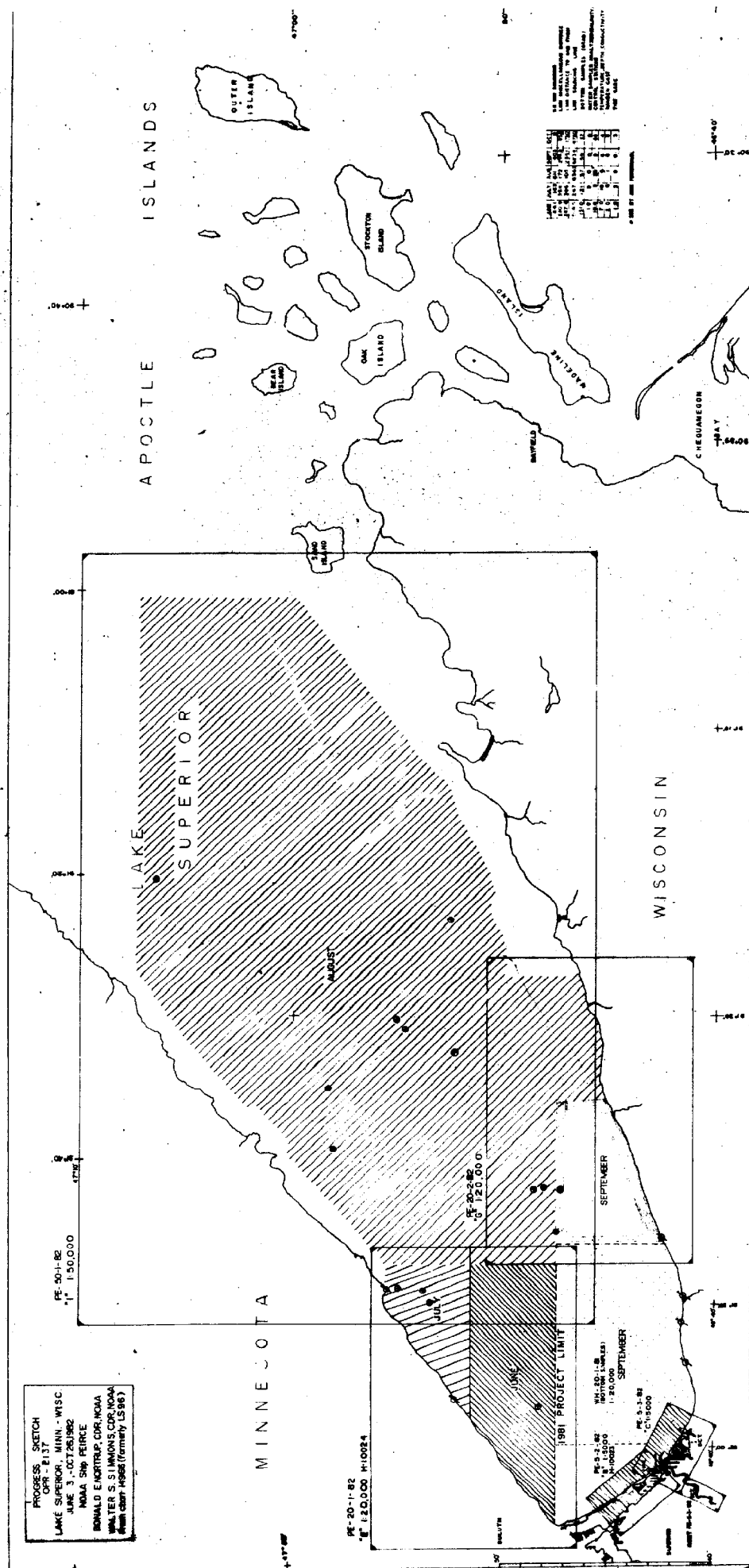
Water level correctors have not been applied to field sheet soundings.

NOTES IN THE DESCRIPTIVE REPORT WERE MADE IN RED DURING OFFICE PROCESSING.

STANDARDS CK'D 10-11-84

C. Lay

AWOIS - 3/7/85 mg  
SURF - 3/7/85 mg



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*\* FILED WITH ORIGINAL FIELD DATA.*

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Descriptive Report to Accompany

Hydrographic Survey H-10043

(Field No. PE 20-2-82)

Walter S. Simmons, Commanding Officer

A. PROJECT

Survey H-10043 (PE 20-2-82) was conducted in accordance with Hydrographic Project Instructions dated March 31, 1982, supplemented April 21, 1982 and June 16, 1982 and paragraph three of a radio message from the Director, AMC of September 16, 1982 (See Appendix 3).

B. AREA SURVEYED

This survey covered an area along the south shore of western Lake Superior. The area extends from the mouth of Bardon Creek east to <sup>2.6 KILOMETERS EAST OF</sup> the mouth of Iron River and north three to five miles from the south shore. The survey was conducted from August 20 to October 16, 1982.

The shoreline in the survey area is a dynamic one, receding southward as mud slides continually erode the clay banks. In the vicinity of Brule Point, many rocks

line the shore. The area is devoid of harbors and good landmarks. *SEC. N DISCUSSES THE VISUAL VERIFICATION OF FIVE LANDMARK SITES.*

C. SOUNDING VESSEL

All soundings were taken from the ship's two type I aluminum survey launches, 1009 (VESNO 2839) and 1017 (VESNO 2837), using Ross 5000 echo sounders. In addition, some bottom samples were taken by <sup>NOAA Ship</sup> PEIRCE (VESNO 2830).

D. SOUNDING EQUIPMENT AND CORRECTIONS TO ECHO SOUNDINGS

Each launch was equipped with a Ross Model 5000 echo sounder; Launch 1009 (VESNO 2839) used S/N 1079 and Launch 1017 (VESNO 2837) used S/N 1087. These echo sounders were the only sounding equipment used during the survey. The <sup>ECHO SOUNDER</sup> ~~fathometer~~ paper in VESNO 2839 jammed occasionally. All soundings for which no analog trace was obtained because of jammed paper were rejected. Whenever two or more consecutive soundings were lost, that section of the line was rerun. Otherwise, the <sup>ECHO SOUNDERS</sup> ~~fathometers~~ performed satisfactorily throughout the survey.

The echo sounder initial was kept at 0.0 feet throughout the survey. Temporary deviations of the initial were accounted for while scanning <sup>ECHOGRAMS</sup> ~~fathograms~~.

Velocity corrections to echo soundings were derived from XBT and Martek cast data obtained throughout the survey. The survey was divided into five time

periods, with velocity correctors for each period obtained by averaging corrector data and plotting corrector curves for all casts taken during that period. For each depth, it was determined that the corrector from each individual cast did not vary from the mean corrector for that period by more than .25% of the depth.

The location, dates, and grouping of casts are summarized in the table below:

<u>Table #</u>	<u>Hydro Days</u>	<u>Cast</u>	<u>JD</u>	<u>Lat</u>	<u>Long</u>
1 - #26	232-238	Martek #18	230	46°49'00"	91°31'00"
		Martek #20	238	46°49'24"	91°30'12"
2 - #27	250-256	XBT #6	252	46°48'30"	91°42'06"
		XBT #7	256	46°48'00"	91°42'00"
3 - #28	264-265	XBT #8	264	46°47'24"	91°45'24"
4 - #29	277	XBT #10	273	46°55'00"	91°49'00"
		XBT #11	278	46°48'18"	91°57'30"
5 - #30	289	XBT #13	287	46°52'30"	91°23'12"
		XBT #14	288	46°52'25"	91°32'30"

(Cast data, velocity correction curves and tables, and velocity tape printouts are included in Appendix D). The XBT (S/N 781209 TD; Model MK 2A-1) was tested November 30, 1981. The Martek (S/N 177, Model 167-10) was tested February 1982.

Bar check data from each time period was compared with the cast data curve for that period. Correctors generally agreed within 0.1 foot; therefore, no additional correction based on bar check data was necessary.

Settlement and squat corrections for both launches are based on tests conducted on July 2, 1982 in Duluth Harbor Basin. All speed changes during the survey were noted in the sounding volume and master printout. (Copies of the settlement and squat test results and TC/TI tape are in Appendix D).



## E. HYDROGRAPHIC SHEETS

The field sheets were plotted aboard <sup>NOAA Ship</sup> PEIRCE using the ship's PDP 8/E computer and complot rollbed plotter.

Data was plotted on six sheets. The east and west sheets each depict the shoreline, mainscheme hydrography and the most inshore line of shoreline hydrography. The east and west overlay sheets each depict other lines <sup>Running</sup> ~~run~~ parallel to the shore, crosslines, splits and developments. The east and west bottom sample sheets depict bottom samples only.

The final smooth sheet will be <sup>VERIFIED THE</sup> ~~compiled~~ at Atlantic Marine Center. All field records will be forwarded to AMC for verification.

## F. CONTROL STATIONS

The following third-order traverse stations are within the sheet limits and were used <sup>for</sup> this survey:

<u>Signal #</u>	<u>Station Name</u>	<u>Source</u>	<u>USE</u>
113	ANDERSON RM 1, 1981 (field position)	AMC	ARGO Station
125	EROSION, 1981 (field position)	AMC	Visual Calibration
126	ORIENTA, 1981 (field position)	AMC	Visual Calibration
127	ANDERSON RM 2, 1981 (field position)	AMC	Visual Calibration
128	QUARRY INN, 1981 (field position)	AMC	Visual Calibration
139	EROSION POST, 1982 (field position)	PE	R/AZ Initial (not permanently monumented)

140	EROSION RM 1, 1982 ( <i>FIELD POSITION</i> )	PE	R/AZ T2, Initial, Del Norte
141	EROSION RM 2, 1982 ( <i>FIELD POSITION</i> )	PE	R/AZ T2, Initial

In addition, the following third-order traverse (except as noted) stations were used on this survey but do not fall within the sheet limits: *ALL POSITIONS ARE FIELD POSITIONS WITH THE EXCEPTION OF DULUTH ENGER MEMORIAL TOWER, 1952.*

<u>Signal #</u>	<u>Station Name</u>	<u>Source</u>	<u>Use</u>
102	WICK, 1981	AMC	ARGO Station
114	MN PT ARGO, 1980	AMC	ARGO Station
122	SPIT, 1981	WH	Visual Calibration HP 3810 Calibration
123	CABIN SIGNAL, 1981	WH	Visual Calibration
124	MIDDLE RIVER SIGNAL, 1981	WH	Visual Calibration HP 3810 Calibration
135	<sup>NOS</sup> AMNICON, 2, 1982	PE	Visual Calibration
138	SUPERIOR ENTRY S BREAKWATER LT, 1982	PE*	Visual Calibration
2	DULUTH ENGER MEMORIAL TOWER, 1952	NGS*	Visual Calibration
44	DULUTH HARBOR N PIER LT, 1982	PE*	Visual Calibration
49	SKY HARBOR AIRPORT BEACON, 1982	PE*	Visual Calibration

\* Intersection Station.

The following third-order traverse stations are within the sheet limits,  
but were not used for hydrographic survey control:

<u>Signal #</u>	<u>Station Name</u>	<u>Source</u>	<u>Use</u>
147	ANDERSON, 1981	AMC	---
137	REBECCA, 1982	PE	Magnetic Observation
136	REBECCA RM 1, 1982	PE	Possible Future Visual Calibration

All preliminary field positions (See signal tape listing in Appendix F) are based on the North American Datum of 1927. Geodetic abstracts and computations for all <sup>NOAA Ship</sup> PEIRCE control work are included in the project horizontal control report.

#### G. HYDROGRAPHIC POSITION CONTROL

During most of the hydrographic operations, positioning was obtained in the Range/Range mode using the ARGO system. Positioning in a small inshore area on the east sheet was by Range/Azimuth <sup>using</sup> Del Norte. The electronic equipment and serial numbers used during the survey are as follows (with Julian Days used in parentheses):

VESNO 2830	Range Processing Unit (RPU)	(238-251) RO47843
	Antenna Loading Unit (ALU)	(238-251) AO379123
	Control Display Unit (CDU)	(238-251) CO47823
	Power Supply	(238-251) VO038167
	Thermal Printer	(238-251) AO2842
	Strip Chart Recorder	(238-251) SO97959 & SO97960
	<del>Echo sounder</del> Fathometer	(238-251) 1078

VESNO 2837	Range Processing Unit (RPU)	(238-265) (278) RO47859; RO379107
	Antenna Loading Unit (ALU)	(238-278) AO980310
	Control Display Unit (CDU)	(238-253, 278) (255-265) CO47824; CO47822
	Power Supply	(238-278) VO379124
	Thermal Printer	(238-278) AO6969
	Strip Chart Recorder	(238-278) SO97944
	<i>Echosounder</i> <del>Fathometer</del>	(238-278) 1087
VESNO 2839	Range Processing Unit (RPU)	(232-233) (233-289) RO379121 RO47854
	Antenna Loading Unit (ALU)	(232-289) AO47859
	Control Display Unit (CDU)	(232-233) (234-289) CO47824 CO37948
	Power Supply	(232-289) VO379112
	Thermal Printer	(232-237, 289) (250-264) AO6969; None
	Strip Chart Recorder	(250-264) (264) (232-237, 289) 00155; SO97959; SO97944
	<i>Echosounder</i> <del>Fathometer</del>	(232-289) 1079

WICK	Range Processing Unit (RPU)	(232-289) RO47855
	Antenna Loading Unit (ALU)	(232-289) AO379127
	Power Supply	(232-289) VO478103
ANDERSON RM I	Range Processing Unit (RPU)	(232-252) (253-264) (265-289) RO379115; RO379117; RO379119
	Antenna Loading Unit (ALU)	(232-289) AO379109
	Power Supply	(232-289) VO478106
MN PT ARGO	Range Processing Unit (RPU)	(232-289) RO47864
	Antenna Loading Unit (ALU)	(232-289) AO379120
	Power Supply	(232-289) H46339

The numerous changes in ARGO equipment were caused by frequent breakdowns. This, combined with time lost to ~~hydroplot~~ <sup>HYDRO PLOT</sup> system breakdowns, resulted in approximately 27 hours lost during survey days, or about 20% of the hours of hydrography attempted.

On JD 233 the RPU on VESNO 2839 broke down during survey operations. After replacing the RPU and recalibrating, survey operations were continued; however, no closing calibration was obtained with the first RPU. All data was saved.

On JD 234 the CDU in VESNO 2839 broke down before sounding commenced, and was replaced.

On JD 236 a storm developed suddenly in the late afternoon during survey operations by VESNO 2839. The sounding line was broken and the launch headed directly to the calibration area, but the storm passed directly overhead and caused a loss of lane count from station WICK (102) before the closing calibration could be accomplished. Partials obtained in the closing calibration were used to help determine the daily corrector. The strip chart was checked carefully to confirm that the lane count had remained consistent throughout sounding operations, and all data was saved.

On JD 250, three lanes were lost on the lane count from station MN PT ARGO (114) after the opening calibration by VESNO 2839, but before the start of sounding operations. When the resultant position shift was noted during a crossline, soundings were stopped and a closing calibration obtained. After a check of the strip chart confirmed that no lane jump had occurred during sounding operations, the three lost lanes were accounted for in the corrector applied to the morning hydrography. The ARGO system was then retuned and recalibrated, and sounding operations resumed.

On JD 252 the RPU at master ARGO station ANDERSON RM 1 (113) broke down, causing the entire system to fail while both launches were sounding. Although no closing calibrations could be obtained, all data was kept after a thorough check. Hydrography resumed the following day with a replacement RPU at station ANDERSON RM 1.

On JD 253 the ARGO system in VESNO 2837 lost lane count during sounding operations. After recalibrating, operations were resumed, only to have the system fail again. All data was kept after a careful check to insure its validity.

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On JD 254 the ARGO system in VESNO 2837 lost lane count at sometime during the day. Since the time of lane count loss could not be determined, all data for that day was rejected. Survey operations resumed on the following day with a replacement CDU.

On JD 265 the ARGO system in VESNO 2837 failed during sounding operations, precluding a closing calibration. All data was kept after a careful check to insure its validity. The RPU and CDU were replaced before VESNO 2837 resumed its survey operations on JD 278.

On JD 264 the strip chart recorder pen marking rates from station WICK (102) broke, resulting in the loss of the trace during part of the survey operations. The strip chart recorder was replaced during the day. No ARGO problems were experienced during the time the trace was lost, or at any time during that day. Therefore, all survey data was kept.

Daily ARGO calibrations were normally done by three point sextant fix with check angle, using RK 561. However, on JD 254, poor visibility prohibited sextant fixes and the ARGO system in VESNO 2839 was calibrated using a HP3810 EDM. An operator occupied station SPIT (122) with the instrument, initialed on station MIDDLE RIVER SIGNAL (124) and observed a horizontal angle and distance to a reflector positioned next to the ARGO antenna. The resultant traversed position and correctors were determined using RK 300.

On JD 237 and 265, VESNO 2839 ran hydrography near shore controlled by Range/Azimuth <sup>USING</sup> Del Norte. The Del Norte corrector used was determined by averaging baseline calibration correctors determined on JD 225 and 270. Check calibrations were taken twice daily and agreed with the baseline calibration within  $\pm 3$  meters as specified in OpOrder 79. The opening check calibration on JD 225 was not included in the sounding volume, and has been lost. (Del Norte calibrations are summarized in Appendix G). Range readings could not be obtained using the 30db attenuator; therefore, it was not used.

The following Del Norte equipment was used both days:

		S/N
Remote	Code 72	221
Master		1066
DMU		188

The remote unit was used at station EROSION (125) and station EROSION RM 1 (140).

EROSION POST (139) was the initial station for EROSION (125), EROSION RM 2 (141) was the initial station for EROSION RM 1 (140), and EROSION RM 1 (140) was the initial station for EROSION RM 2 (141).



#### H. SHORELINE

Shoreline for the field sheets was obtained from <sup>1:20,000 scale</sup> enlargements of 1:24,000 scale USGS quads revised by NOS from 1981 high altitude photographs. This shoreline is continually shifting southward due to erosion. The shoreline, as mapped, was verified by the hydrographer and is adequate for charting.

#### I. CROSSLINES

60.8 nautical miles of crosslines were run across 449.7 nautical miles of main scheme hydrography (excluding splits); the percentage of crosslines run was 13.5%. Agreement between crosslines and main scheme was generally within one foot, although disagreement was sometimes two feet in the area of very irregular bottom between 30 feet and 80 feet of depth. This agreement meets the standard set in the Hydrographic Manual section I.1.2 Part B. II.1.

#### J. JUNCTIONS *SEE SECTION 5 OF THE EVALUATION REPORT.*

This survey junctions with H-9979 (WH20-1-81) to the west and H-10036 (PE 50-1-82) to the north. Agreement with both surveys is good, with 100% of the junction soundings comparing within 0-3 feet. *JOINS H-10095 (1983) TO THE EAST.*

# K. COMPARISON WITH PRIOR SURVEYS

<sup>LS</sup> Surveys ~~X~~-249 and <sup>LS</sup>~~X~~-250, 1:16,000 scale surveys completed by the U.S. Lake  
<sup>(U.S.L.S.)</sup>  
 Survey in 1861, compare well to H-10043. 1861 depths generally agree within  
 ± 3 feet of 1982 depths. Since the 1861 survey sheets have no <sup>PROJECTION</sup> ~~geodetic~~ grid,  
 comparisons were made by aligning the shorelines of the old and new surveys.  
<sup>LS-249 HAS SYMBOLS FOR ROCKS ALONG THE SHORELINE FROM BRULE POINT WEST TO THE PRIOR SURVEY LIMIT</sup>  
<sup>LS</sup> Survey ~~X~~-256 (1:200,000) and <sup>LS</sup>~~X~~-257 (1:60,000) were conducted by the U.S.L.S.  
 in 1861. The surveys generally agree with H-10043 however, the absence of <sup>A PROJECTION</sup> ~~geodetic~~  
 grid and <sup>THE</sup> small scale of the prior surveys preclude precise comparison with the  
 current survey.

<sup>LS</sup> Surveys ~~X~~-1492 and <sup>LS-1943</sup>~~X~~-149, 1:20,000 scale surveys completed by the U.S.L.S.  
 in 1927, generally compare well to H-10043. The 1927 survey depths are generally  
 shoaler; this is partially due to the difference in water level datums used. Still,  
 depths agree within 6 feet with the following exceptions: <sup>600.5 ON 1927 SURVEY</sup>  
<sup>600.0 ON PRESENT SURVEY</sup>

Depth discrepancies between the surveys are sometimes greater than 6  
 feet in areas of steep slope where small positioning errors <sup>ON</sup> ~~in~~ the prior survey  
 would greatly change the sounding depth.

A 154 foot sounding was obtained in 1927 at <sup>LATITUDE</sup> ~~46~~<sup>46</sup>° 48.83' N, <sup>LONGITUDE</sup> ~~91~~<sup>91</sup>° 31.10' W; a  
<sup>168</sup> 170 foot sounding was obtained there <sup>ON</sup> ~~at~~ this survey. No indication of shoaler depths  
 in this area could be found upon inspection of the fathograms.

The area immediately north and east of Brule Point, from shore to the 24  
 foot curve, has changed considerably since 1927. The shoreline has receded to

the south, and depths from this survey are up to 15 feet deeper than depths surveyed in 1927.

Survey <sup>LS</sup>X-1994 <sup>15</sup>was a <sup>1:120,000</sup>~~1:20,000~~ scale survey completed by the U.S.L.S. in 1956. Agreement with H-10043 is good, with all <sup>56</sup>~~1927~~ soundings agreeing with 1982 soundings within  $\pm 6$  feet.

There were no <sup>P</sup>presurvey <sup>R</sup>review <sup>I</sup>items for this survey.

It is recommended that H-10043 super<sup>S</sup>~~cede~~ all prior surveys.

#### L. COMPARISON WITH THE CHART

This survey was compared with chart 14966, 18th edition, dated December 22, 1979. Agreement was generally good, with 32 of the 41 charted depths in the survey area agreeing with H-10043 within  $\pm 6$  feet.

Additionally, six charted depths near the eastern end of the survey area would agree with H-10043 within  $\pm 4$  feet if these charted depths could be displaced approximately 300 meters to the southeast. A summary of those depths follows:

<u>Latitude</u>	<u>Longitude</u>	<u>Charted Depth</u>	<u>H-10043 Depth</u>	<u>H-10043 Depth Approx. 300m SE</u>
46°48.2'N	91°30.3'W	73	86.5	74
46°49.4'N	91°29.8'W	157	175	158
46°49.2'N	91°28.9'W	139	153.6	139
46°47.2'N	91°28.4'W	31	43.7	33
46°47.6'N	91°27.9'W	37	48	41.39
46°48.3'N	91°27.8'W	85	99.107	82.81

The source survey of these charted depths could not be determined. It is possible that a systematic positioning error in that survey resulted in depths being charted to the northwest of their proper position.

Three other charted depths vary widely from depths determined <sup>on</sup> this survey.

Those depths are as follows:

<u>Latitude</u>	<u>Longitude</u>	<u>Charted Depth</u>	<u>H-10043 Depth</u>
46°47.8' N	91°38.0' W	163	183
46°46.8' N	91°34.5' W	83	507
46°47.9' N	91°29.0' W	43	73

In each case, sounding lines were run at one half the required spacing and fathograms from the vicinity were carefully inspected. No sign of the charted depths were revealed. The source survey of these charted depths could not be determined. No prior survey available for comparison agrees with these charted depths. It is recommended that H-10043 supercede all soundings in the common area of chart 14966. *CONCUR*

On JD 233 at 180031Z (POSNO 52) VESNO 2839 ran hard aground on a rock <sup>AT</sup> *LAT. 46°45'29.22" N* lying 1.0 feet below water level. The depth of this rock with respect to low water <sup>LON. 91°34'16.85" W</sup> datum should <sup>BE</sup> determined by the <sup>VERIFIER</sup> ~~computer~~ when final water level correctors are available.

On JD 265 at 175613, a detached position (POSNO 1464) was taken directly north of a rock awash. The rock was 15 meters off shore and 0.3 feet below water level, and could not be reached by boat. The position and depth of this rock should be determined by the <sup>VERIFIER</sup> ~~computer~~ using final water level correctors. <sup>THE</sup> *LAUNCH IS 45 METERS OFFSHORE*  
*POSITION OF THE ROCK WAS SCALED FROM THE BOAT SHEET AT LATITUDE 46°45'24.69" N,*  
*LONGITUDE 91°34'38.16" W.*

These two rocks lie on either side of, and offshore of, the <sup>SUBMERGED</sup>rock presently charted ~~rock~~ at Brule Point, and should replace that rock for charting purposes.

The presently charted <sup>SUBMERGED</sup>rock could not be verified. *DO NOT CONCUR. RECOMMEND THE PRESENTLY CHARTED SUBMERGED ROCK REMAIN AS CHARTED AND THE TWO ROCKS ABOVE BE ADDED TO THE CHART.*

M. ADEQUACY OF SURVEY

This survey is sufficiently complete and adequate to supersede <sup>THE</sup> prior surveys and the <sup>SECTION</sup>common area of chart 14966<sub>x</sub> IN THE COMMON AREA.

N. AIDS TO NAVIGATION

The three landmark silos in the vicinity of <sup>LATITUDE</sup>46° 41.4' N, <sup>LONGITUDE</sup>91° 42.0' W and the <sup>LANDMARKS</sup>two silos in the vicinity of <sup>LATITUDE</sup>46° 42.2' N, <sup>LONGITUDE</sup>91° 42.0' W were verified visually. No form 76-40 was filed. No additional objects of landmark quality were found in

the area. *IT WAS STATED BY CDR WALTER S. SIMMONS THAT THESE SILOS ARE NOT GOOD LANDMARKS*

<sup>FIXED OR FLOATING</sup>  
There are no aids to navigation in the survey area.

O. STATISTICS

The following are the statistics for this survey:

VESNO:	2830	2837	2839	Total
Total no. of positions	35	836	1598	2469
Nautical miles of sdgs.	0	274.4	461.2	735.6
Sq. NM of sdgs.	0	19.6	33.2	52.8
Bottom samples	35	12	0	47
Tide stations	---	---	---	2
Oceo. casts used	---	---	---	9

P. MISCELLANEOUS

None.

Q. RECOMMENDATIONS

It is recommended that H-10043 super<sup>S</sup>ede all prior surveys and the ~~common~~<sup>SECTION</sup>  
~~area~~<sup>IN THE COMMON AREA.</sup> of chart 14966. No further field work is required.

R. AUTOMATED DATA PROCESSING*HYDRO PLOT*

The following PDP 8E ~~hydroplot~~ system programs were used in processing the survey data:

<u>Program</u>	<u>Title</u>	<u>Version</u>
112	Hyperbolic, R/R Hydroplot	8/04/81
201	Grid, Signal, and Lattice Plot	4/17/81
211	Range-Range Non-Real Time Plot	2/02/81
216	Range-Azimuth Non-Real Time Plot	2/09/81
300	Utility Computations	10/21/80
330	Reformat and Data Check	5/04/76
360	Electronic Corrector Abstract	2/02/76
530	Layer Corrections for Velocity	5/10/76
561	H/R <sup>EO</sup> Geodetic Calibration	2/19/75
602	Elinore--Line Oriented Editor	5/21/75
612	Line Printer List	3/22/78

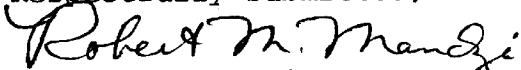
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S. REFERRAL TO REPORTS

The following supplemental reports for project OPR-Z137-PE-82 have been or will be submitted:

<u>Report:</u>	<u>Submitted to:</u>	<u>Date</u>
Coast Pilot	Coast Pilot Section, Rockville	Dec 82
Coast Pilot	Hydrographic Surveys Branch, AMC	Dec 82
LORAN C Comparision	Operations Branch, AMC	Sep 82
Magnetics	Operations Branch, AMC	Jan 83
Horizontal Control	Operations Branch, AMC	Jan 83

Respectfully submitted;

  
Robert M. Mandzi, LTJG, NOAA



APPENDICES

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**F. LIST OF STATIONS**

## SIGNAL TAPE PRINTOUT

PE-20-2-82

102	0	47	07	31515	091	28	54048	250	0000	164722	WICK, 1981	(AMC)
113	5	46	46	22364	091	27	05678	250	0000	164722	ANDERSON RM 1, 1981	(AMC)
114	0	46	43	04575	092	02	05673	250	0000	164722	MN PT ARGO, 1980	(AMC)
122	4	46	41	2451 <sup>4</sup> <sub>8</sub>	091	49	37164	139	0000	000000	SPIT, 1981	(AMC)
123	7	46	41	10594	091	54	11857	139	0000	000000	CABIN SIGNAL, 1981	(WH)
124	6	46	41	23953	091	49	46038	139	0000	000000	MIDDLE RIVER SIGNAL, 1981	(WH)
125	0	46	45	24672	091	30	42063	250	2012	220000	EROSION, 1981	(AMC)
126	5	46	40	04521	091	29	01814	139	0000	000000	ORIENTA, 1981	(AMC)
127	4	46	46	23305	091	27	02372	139	0000	000000	ANDERSON RM 2, 1981	(AMC)
128	3	46	46	23191	091	27	09880	139	0000	000000	QUARRY INN, 1981	(AMC)
002	0	46	46	34185	092	07	29003	139	0000	000000	DULUTH ENGER MEMORIAL TOWER, 1952	(NGS)
044	5	46	46	51551	092	05	17035	139	0000	000000	DULUTH HARBOR N PIER LT, 1982	(PE)
135	5	46	41	3197 <sup>5</sup> <sub>4</sub>	091	51	25935	139	0002	000000	AMNICON <sup>NO5</sup> V2, 1982	(PE)
136	5	46	42	21149	091	45	27909	139	0021	000000	REBECCA RM 1, 1982	(PE)
137	5	46	42	19467	091	45	27250	139	0022	000000	REBECCA, 1982	(PE)
138	5	46	42	36746	092	00	2224 <sup>8</sup> <sub>7</sub>	139	0000	000000	SUPERIOR ENTRY S BREAKWATER LT, 1982	(PE)
049	5	46	43	38172	092	02	4625 <sup>60</sup> <sub>9</sub>	139	0000	000000	SKY HARBOR AIRPORT BEACON, 1982	(PE)
139	7	46	45	23823	091	30	45092	243	0000	000000	EROSION POST, 1982*	(PE)
140	7	46	45	27462	091	30	35025	250	0002	000000	EROSION RM 1, 1982	(PE)
141	7	46	45	24532	091	30	51015	139	0004	000000	EROSION RM 2, 1982	(PE)
147	6	46	46	20476	091	27	05310	139	0000	000000	ANDERSON, 1981	(AMC)

\* undescribed, non-recoverable station

NGS positions from Data Base for Western Lake Superior

AMC positions from AMC Horizontal Control Report, September, 1980

WH positions from WHITING Horizontal Control Report, 1981

PE positions from PEIRCE Horizontal Control Report, 1982

# I. LANDMARKS FOR CHARTS

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No Form 76-40's filed.

No Hazards to Navigation report filed.

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**J. APPROVAL SHEET**

## APPROVAL SHEET

H-10043

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 field sheet have been reviewed 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 1927.



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

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: Port Wing, Wisconsin (909-9058)

Period: August 20, 1982 - October 16, 1982

HYDROGRAPHIC SHEET: H-10043

OPR- Z137-PE-82

Locality: Lake Superior

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

Remarks:

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

  
Chief, Water Levels Section



## GEOGRAPHIC NAMES

H-10043

Name on Survey		ON CHART NO. 14966									
		A	B	C	D	E	F	G	H	K	
		ON PREVIOUS SURVEY	CON U.S. QUADRANGLE MAPS	FROM LOCAL INFORMATION	ON LOCAL MAPS	P.O. GUIDE OR MAP	RAND McNALLY ATLAS	U.S. LIGHT LIST			
BARDON CREEK	X									1	
BRULE PT.	X									2	
Bois BRULE RIVER	X									3	
FISH CREEK	X									4	
IRON RIVER	X									5	
LAKE SUPERIOR	X									6	
REEFER CREEK	X									7	
WISCONSIN (title)	X									8	
SMITH CREEK										9	
PEARSON CREEK										10	
										11	
										12	
										13	
										14	
										15	
										16	
										17	
										18	
										19	
										20	
										21	
										22	
										23	
										24	
										25	

Approved:

*Charles E. Hartman*  
Chief Geographer - NJ/CG27521

JUL 31 1984

NOAA FORM 77-27				U.S. DEPARTMENT OF COMMERCE		REGISTRY NUMBER	
HYDROGRAPHIC SURVEY STATISTICS						H-10043	
RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.							
RECORD DESCRIPTION		AMOUNT		RECORD DESCRIPTION		AMOUNT	
SMOOTH SHEET		1		SMOOTH OVERLAYS: POS., ARC, EXCESS		4	
DESCRIPTIVE REPORT		1		FIELD SHEETS AND OTHER OVERLAYS		13	
DESCRIP- TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR- GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS		
ACCORDIAN FILES	1						
ENVELOPES					2		
VOLUMES	4				1		
CAMERS	2						
BOXES							
SHORELINE DATA							
SHORELINE MAPS(List):							
PHOTOBATHYMETRIC MAPS(List):							
NOTES TO THE HYDROGRAPHER(List):							
SPECIAL REPORTS(List):							
NAUTICAL CHARTS(List):							
OFFICE PROCESSING ACTIVITIES							
The following statistics will be submitted with the cartographer's report on the survey							
PROCESSING ACTIVITY				AMOUNTS			
				VERIFICATION	EVALUATION	TOTALS	
POSITIONS ON SHEET						2469	
POSITIONS REVISED				8			
SOUNDINGS REVISED				229			
CONTROL STATIONS REVISED							
				TIME - HOURS			
				VERIFICATION	EVALUATION	TOTALS	
PRE-PROCESSING EXAMINATION				28		28	
VERIFICATION OF CONTROL				2		2	
VERIFICATION OF POSITIONS				21		21	
VERIFICATION OF SOUNDINGS				187		187	
VERIFICATION OF JUNCTIONS				5	2	7	
APPLICATION OF PHOTOBATHYMETRY							
SHORELINE APPLICATION/VERIFICATION				2	1	3	
COMPILATION OF SMOOTH SHEET				32		32	
COMPARISON WITH PRIOR SURVEYS AND CHARTS					10	10	
EVALUATION OF SIDESCAN SONAR RECORDS							
EVALUATION OF WIRE DRAGS AND SWEEPS							
EVALUATION REPORT					24	24	
OTHER					8	8	
Digitizing				4		4	
TOTALS				281	45	326	
Pre-processing Examination by C.D. Meador, F.L. Saunders, J.B. Wilson				Beginning Date 30 Dec 1982	Ending Date 5 Jan 1983		
Verification of Field Data by D. V. Mason, H. R. Smith, J. B. Wilson				Time(Hours) 248	Ending Date 23 May 1984		
Verification Check by G. F. Trefethen, J.S. Bradford, R.H. Whitfield				Time(Hours) 73	Ending Date 18 April 1984		
Evaluation and Analysis by R. H. Whitfield				Time(Hours) 45	Ending Date 10 August 1984		
Inspection by C. D. Meador				Time(Hours) 11	Ending Date 9 August 1984		

ATLANTIC MARINE CENTER  
EVALUATION REPORT

SURVEY NO.: H-10043

FIELD NO.: PE-20-2-82

Wisconsin, Lake Superior, Iron River to Bardon Creek

SURVEYED: 20 August through 16 October 1982

SCALE: 1:20,000

PROJECT NO.: OPR-Z137-PE-82

SOUNDINGS: Ross Digital Echo Sounder

CONTROL: Cubic Western  
DM-54 ARGO  
(Range/Range)  
Del Norte and  
Theodolite (Range/  
Azimuth)

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

Surveyed by.....N. G. Millett  
.....R. M. Mandzi  
.....R. B. Harris  
.....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 and G of the Descriptive Report.
- b. Shoreline was added in brown from 1:20,000 scale enlargements of 1:24,000 scale U.S. Geological Survey Quadrangles photo revised with 1981 NHAP photographs and is for orientation purposes only.

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 for the 6-foot curve, which could not be completely developed in the alongshore areas, the standard depth curves could be

drawn in their entirety. The charted supplemental 24-foot curve was drawn on the smooth sheet. Additional dashed and brown curves were drawn to better show bottom relief.

c. Development of the bottom configuration and determination of least depths is considered adequate with the following exception:

Lines of hydrography run normal to the depth curves should have been extended closer to the shore in order to provide a better delineation of the depth curves along the shore. The existing parallel lines of hydrography along the shore do not always provide sufficient data for the accurate drawing of the depth curves.

#### 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. The survey was not submitted to AMC in the prescribed time interval of six (6) weeks after termination of field operations found in section 6.13 of the Project Instructions. The survey was received nine and one-half (9½) weeks after the field work was completed.

b. The TC/TI tape did not cover year day 251 for vessel 2830, NOAA Ship PEIRCE. This was corrected during office processing of the survey.

c. The Descriptive Report states on page 16 that five (5) landmarks were verified visually. No NOAA Form 76-40 (Nonfloating Aids or Landmarks for Charts) was submitted with the survey.

d. No bottom samples were taken on the shoals in the vicinity of Latitude 46°44'36"N, Longitude 91°45'30"W and Latitude 46°45'00"N, Longitude 91°40'42"W as required by section 8.1 of the Project Instructions and section 4.5.9.2 of the Hydrographic Manual.

e. The chart enlargement used for comparison does not cover the entire survey area.

f. Many bar check data points were rejected by the field to make the velocity curve data appear to agree with the velocity curves from the TDC data. These rejected data points may have been an indication of instrument error.

g. The Descriptive Report should be carefully proofread to insure that grammar and spelling are correct and that information such as survey registry numbers, dates, scales, etc., are accurate.

h. The extent of the rocks lining the shore in the vicinity of Brule Point, mentioned on page 1 of the Descriptive Report, should have been determined by the hydrographer and shown as a dashed limit line on the smooth field sheet.

i. The Descriptive Report should be single spaced rather than double spaced in order to reduce its bulk.

j. The serial number of the theodolite used for the Range/Azimuth control was not given in section G of the Descriptive Report.

#### 5. JUNCTIONS

H-9979 (1981-82) to the west

H-10036 (1982) to the north

H-10095 (1983) to the east

Excellent junctions were effected between the present survey and the surveys listed above.

#### 6. COMPARISON WITH PRIOR SURVEYS

LS-249 (1861) 1:16,000

LS-250 (1861) 1:16,000

LS-256 (1861-1868) 1:200,000

LS-257 (1861) 1:60,000

LS-1492 (1927) 1:20,000

LS-1493 (1927) 1:20,000

LS-1994 (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.

The present survey is adequate to supersede the prior surveys in the common area.

#### 7. COMPARISON WITH CHART 14966 (18th Edition, Dec. 22/79)

##### a. Hydrography

The charted hydrography originates with the previously discussed prior surveys and miscellaneous sources.

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

##### 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 as noted in section 4 of this report.


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9. ADDITIONAL FIELD WORK

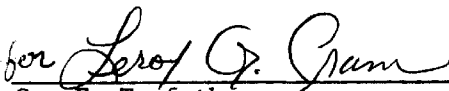
This is an excellent basic survey. No additional field work is recommended.

  
James B. Wilson

Cartographic Technician  
Verification of Field Data

  
Richard H. Whitfield

Cartographic Technician  
Evaluation and Analysis

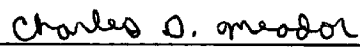
  
Guy F. Trefethen

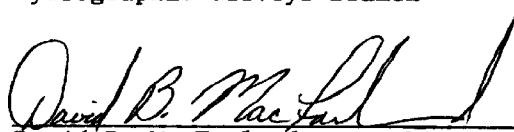
Senior Cartographic Technician  
Verification Check

Inspection Report  
H-10043


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

  
Charles D. Meador  
Chief, Evaluation and Analysis  
Group  
Hydrographic Surveys Branch

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

Approved August 10, 1984

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

