

10023

Diagram No. LS-966

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-5-2-82  
Office No. .... H-10023

#### LOCALITY

State ..... Wisconsin -- Minnesota  
General Locality ..... Lake Superior  
Locality ..... Connors Point to Hog Island

1982

CHIEF OF PARTY  
CDR W.S. Simmons

#### LIBRARY & ARCHIVES

DATE ..... June 19, 1986

☆U.S. GOV. PRINTING OFFICE: 1980-786-230

Area 7  
EXIS

1975  
1986  
1986

TO SIGN OFF SOB  
"RECORD OF APPLICATION"

HYDROGRAPHIC TITLE SHEET

H-10023

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-05-2-82

State WISCONSIN-MINNESOTA

General locality SUPERIOR BAY

Locality CONNORS POINT TO HOG ISLAND

Scale 1:5000 Date of survey June 8, 1982-October 18, 1982

Instructions dated March 31, 1982 Project No. OPR-2137-PE-82

Vessel LAUNCH 1009, LAUNCH 1017, MONARK, BOSTON WHALER, ZODIAC

Chief of party CDR. WALTER S. SIMMONS

Surveyed by A. ARMSTRONG, G. LEIGH, N. MILLET, R. MANDZI, M. MOZGALA, J. BAILEY, R. HARRIS, S. ANDREEVA

Soundings taken by echo sounder, hand lead, pole ROSS MODEL # 5000 and RAYTHEON DE-719

Graphic record scaled by N.M., R.M., M.M., J.B., R.H., S.A., I.P.R., B.M., G.S.

Graphic record checked by G. LEIGH, R. HARRIS

Protracted by \_\_\_\_\_ Automated plot by \_\_\_\_\_

Verification by \_\_\_\_\_

Soundings in ~~FOOT~~ feet <sup>and tenths</sup> ~~X NEW~~ ~~NEW~~

REMARKS: (1) All times recorded in this survey are Coordinated Universal Time.

(2) ~~Water level reducers are not applied to soundings.~~

STANDARDS CK'D 6-25-86  
C.Wy

Awois and SURF ✓ 5/87 RWD

Descriptive Report  
 To Accompany  
 Hydrographic Survey H-10023  
 (Field Number PE 05-2-82)  
 CDR. Donald E. Nortrup, COMDG  
 CDR. Walter S. Simmons, COMDG

A. PROJECT

This basic hydrographic survey is part of Project OPR-Z137-PE-82, Lake Superior. It was conducted in accordance with project instructions dated March 31, 1982. The changes to the project instructions that affect this survey are as follows:

- Change No. 1 ..... Supplement to Instructions dated April 21, 1982
- Change No. 2 ..... Amendment to Instructions dated June 16, 1982

B. AREA SURVEYED

The area surveyed is the Superior Bay extending from Connors Point to Hog Island. The approximate limits of the survey are as follows:

Northwest	46° 44' <sup>50</sup> 30" N	092° 08' <sup>38</sup> 38" W
Northeast	46° 45'30" N	092° 04'00" W
Southwest	46° 42'12" N	092° 02' <sup>30</sup> 18" W
Southeast	46° 43'00" N	092° 01' <sup>00</sup> 12" W

This survey was conducted between June 8, 1982 (JD 1<sup>5</sup>19) and October 18, 1982 (JD 291).

C. SOUNDING VESSELS

Five sounding vessels were used to conduct this survey. The vessels and their corresponding EDP numbers are as follows: Launch 1009, (VesNo 2839), Launch 1017 (VesNo 2837), Monark (VesNo 2835), Boston Whaler (VesNo 2832) and Zodiac (VesNo 2831). Both of the ship's Type I Jensen survey launches, 1009 and 1017, were equipped with the hydroplot system. Data acquisition was obtained manually while utilizing the other three survey vessels. No unusual problems were encountered.

#### D. SOUNDING EQUIPMENT AND CORRECTION TO ECHO SOUNDINGS

This survey was conducted using the Ross digital fathometer Model #5000 and the Raytheon DE-719 fathometer, a portable fathometer. The sounding equipment serial numbers and dates used are listed below:

<u>VESNO</u>	<u>RANGE OF DEPTH</u>	<u>FATHOMETER S/S</u>	<u>JULIAN DAYS</u>
2837	1.8 - 54 Feet	1079 (Ross) 1087 (Ross)	159-162, 200-202 163-177, 187
283 <sup>9</sup> <del>7</del>	1.8 - 33 Feet	1087 (Ross)	207, 211, 274
2835	1.8 - 34 Feet	5441 (Raytheon)	193-201, 272, 278 281, 291
2832	1.2 - 33 Feet	5441 (Raytheon)	259, 270

Other sounding apparatus used during this survey were the sounding pole and the leadline. The sounding pole was utilized where depths could not be accurately measured with the fathometer in depths less than eight feet. The depths obtained by the sounding pole were primarily read and recorded to the nearest 0.2 foot in lieu of 0.5 foot as specified by Section AF.1.2 of the Hydrographic Manual Fourth Edition

The leadline was utilized during bottom sampling on June 13, 1982 (JD 164) through the June 15, 1982 (JD 166).

There were no major problems with the sounding apparatus used during this survey. An initial correction of -0.2 ft should be applied to a small portion of data collected on July 28, 1982. The initial was drifting constantly while conducting hydrography on September 3, 1982. The initial corrections should be applied to hydrography via the TC/TI tape (See Sounding Correction Abstract for VesNo 2835, JD 209 and JD 246). Other small deviations from the initial were corrected during the scanning of the graphic record. Although initial drifts were fairly frequent while using the Raytheon DE-719, the drifts were negligible and the problem was usually counteracted by frequent visual checks and resetting of the initial. There were no adjustments made to compensate for variations in the temperature to force agreement between recorded soundings and bar checks results. No other problems were encountered with the sounding equipment.

Velocity of sound corrections were computed from bar checks and TDC cast data. All TDC cast data was obtained by Launch 1017 (VesNo 2837). Sounding corrections from bar check data were determined by grouping series of bar checks based on three criteria: (1) vessel, (2) area, and (3) date of hydrography.

For example, bar checks performed in Superior Bay were not grouped with bar checks taken in Lake Superior (Lakeward of Minnesota Point) with the exception of bar checks performed on September 16, 1982 (JD 269). Because of minimum bar checks (VesNo 2832) to group together to obtain a velocity table, the bar check taken in Lake Superior at approximate  $46^{\circ}42'30''N$  and  $092^{\circ}00'36''W$  was grouped with those taken in Superior Bay. Bar checks results were graphed and scaled at increments of 0.2 foot. Information on the grouping of bar check data can be found in the supplemental files.

Because bar checks that covered the full range of depths were not always obtained, velocity corrections for these days were determined from TDC cast data. Velocity of sound corrections computed via TDC cast data are used only for hydrography conducted in Lake Superior (lakeward of Minnesota Point) and bar check data was used for velocity corrections in the Superior Bay area. The TDC cast and bar check data was scaled at increments of 0.2 foot. The casts were performed by the Martek VIII, Model #167-20, S/N 177, water quality instrument with the Martek Sensor, Model #167-20, S/N 177. This instrument was calibrated in February 1982. Comparisons between TDC casts and bar checks indicated negligible differences (See Velocity of Sound Correction graphs, with explanations, located in the supplemental file.

The measured draft of 1.6 ft was used for both launches and was applied during on-line data acquisition and to the off-line data via the off-line corrector tape. Since data was acquired manually by the other three vessels, measured drafts of 1.1 ft for the Monark and 0.5 ft for the Boston Whaler were applied to the off-line data tapes. A transducer was affixed to the hull of the Monark. The transducer on the Boston Whaler was mounted to the starboard side of the boat. Draft corrections were not applied to soundings obtained by pole or leadline. Soundings obtained by pole were notated with the letter "P" in the sounding volumes.

Settlement and squat correctors were determined for both launches and the Monark on July 2, 1982 (JD 183). The tests were conducted from the Northwest bulkhead along the northern section of Duluth Harbor Basin, Duluth, Minnesota. Settlement and squat test were performed for the Boston Whaler on October 18, 1982, however, a corrector value of zero was determined for all speeds of this vessel. All readings were obtained using the Zeiss level instrument, S/N 18946 and the Philadelphia rod positioned over each vessel's transducer. Corrector values for speeds in this survey can be found in the supplemental data files of this report.

The following is a list of oceanographic stations observed during the survey:

<u>STATION</u>	<u>VESNO</u>	<u>JD</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>
TDC CAST #2 (Table #12)	2837	169	46°53'54"N	092°49'18"W
*TDS CAST #3 (Table #13)	2837	174	46°49'00"N	092°00'54"W
*TDC CAST #4 (Table #13)	2837	176	46°51'12"N	092°55'54"W
TDC CAST #9 (Table #14)	2837	188	46°51'36"N	092°51'24"W
TDC CAST #17	2837	211	46°53'42"N	092°51'12"W

\*TDC Casts 3 and 4 were combined because correctors from both cast did not vary from the mean corrector value for that period by more than 0.25% of the depth.

All other velocity tables were determined by bar checks (See Direct Comparison sheets in the supplemental data files). Velocity correction tapes are labeled to specify the vessel and area for which the corrections are to be applied. The tapes are designated south for Superior Bay areas and north for survey areas located in Lake Superior (seaward of Minnesota Point).

The Sounding Correction Abstracts, listings of velocity and TC/TI tapes are in Appendix D of this report.

#### E. HYDROGRAPHIC SHEETS

The final field sheets were constructed and drawn on board PEIRCE. The sheets were prepared by the ship's PDP 8/E computer and complot systems utilizing program RK 201.

All hydrographic data is presented on six plotter sheets. Four plotter sheets that are designated south survey sheets and represent the area in Superior Bay are plotted at a skew angle of 318°. The other two plotter sheets which are designated north survey sheets and represent the area lakeward of Minnesota Point (Lake Superior) are plotted at a skew angle of 312°. All six plotter sheets are at a scale of 1:5000. The sheets depict the following data:

South (1)	Mainscheme, Mainscheme Split, Shoreline Soundings
South (2)	Mainscheme Split, Developments, Shoreline Soundings, Crosslines

South (3)	Detached Positions
South (4)	Bottom Samples
North (1)	Mainscheme, Mainscheme Splits, Shoreline Soundings
North (2)	Bottom Samples, Crosslines, Shoreline Soundings, Detached Positions

The final smooth sheets will be compiled by Atlantic Marine Center. All field records will be forwarded to Atlantic Marine Center for final verification. A listing of sheet parameters is in Appendix A.

#### F. CONTROL STATIONS

The hydrographic survey required the use of twenty-six horizontal control stations. The following control stations have been monumented and described:

<u>SIGNAL #</u>	<u>STATION NAME</u>	<u>SOURCE</u>	<u>TYPE</u>
002	DULUTH ENGER MEMORIAL TOWER, 1952	NGS	Initial
007	WEST GATE, 1980	AMC	Initial
010	MINNESOTA POINT N <sup>BASE</sup> (USLS), 1870	NGS	Initial
011	CEMENT, 1980	AMC	Electronic
013	SUPERIOR ST FRANCIS <sup>CATHOLIC CH STEEPLE</sup> XAVIER <sup>CH</sup> , 1952	NGS	Initial
016	ST CROIX, 1981	WH	Electronic
017	461 USE, 1981	WH	Electronic
<del>026</del> 25	PETRA, 1980	AMC	Electronic
035	396 USE, 1982	PE	Electronic
036	391 USE, 1982	PE	Electronic
037	BRIDGE, 1982	PE	<del>Electronic</del>
038	BURL, 1982	PE	Electronic
<del>042</del>	<del>SUPER, 1982</del>	PE	<del>Electronic</del>
043	MINNOW, 1982	PE	Electronic
044	DULUTH HARBOR N PIER LT, 1982	PE	Visual
049	SKY HARBOR AIRPORT BEACON, 1982	PE	Initial
050	318 USE, 1982	PE	Electronic
113	ANDERSON RM 1, 1981	AMC	Electronic
114	MN PT ARGO, 1980	AMC	Electronic

<u>SIGNAL #</u>	<u>STATION NAME</u>	<u>SOURCE</u>	<u>TYPE</u>
138	SUPERIOR ENTRY S BREAKWATER LT, 1982	PE	Visual
142	DULUTH BELL TEL TOWER CENTER, 1982	PE	Initial

DULUTH ENGER MEMORIAL TOWER, 1952 is a published third order intersection station, QUAD 460921, Station 1047.

MINNESOTA POINT N B USLS, 1870 is a published first order triangulation station, Quad 460921, Station 1015.

SUPERIOR ST FRANCIS XAVIER CH, 1952 is a published third order intersection station, Quad 460921, Station 1106.

Stations 396 USE, 391 USE, BRIDGE, BURL, 319 USE, SUPER, MINNOW DULUTH HARBOR N PIER LT and 318 USE were established by Third Order, Class I traverse methods in 1982 by PEIRCE.

Stations WEST GATE, CEMENT, PETRA, MN PT ARGO were established by Third Order, Class I traverse methods in 1980 by Atlantic Marine Center. Station ANDERSON RM 1, 1981 was established by Third Order, Class I traverse methods, by Atlantic Marine Center.

Stations ST CROIX and 461 USE were established by Third Order, Class I traverse methods in 1981 by WHITING.

SKY HARBOR AIRPORT BEACON, SUPERIOR ENTRY S BREAKWATER LT, and DULUTH BELL TEL TOWER CENTER were established by Third Order, Class I intersection methods by PEIRCE.

Unmonumented control stations used in this survey are the following:

<u>SIGNAL #</u>	<u>STATION NAME</u>	<u>PURPOSE</u>	<u>SOURCE</u>	<u>TYPE</u>
046	OFFRED	Del Norte Offset	PE	Electronic
047	OFFSUP	Del Norte offset	PE	Electronic
048	BRIDGE NORTE	Del Norte offset	PE	Electronic
055	HOG	R/AZ (Range/Azimuth)	PE	Electronic

The above unmonumented control stations were established by Third Order, Class I traverse methods.

All horizontal control used in this survey is based on the North American Datum of 1927. The positions of all N.G.S. stations are from the N.G.S. data printout for Western Lake Superior. A complete list of hydro signals and stations used in this survey is included in Appendix F of this report.



### G. HYDROGRAPHIC POSITION CONTROL

Hydrographic sounding position control was by range/azimuth using a Wild T-2 theodolite initialed on third-order control stations for azimuth and Del Norte system for range. Range/range mode with Del Norte and ARGO systems were used only for wire drag investigations and bottom sampling.

The Del Norte equipment and serial numbers used in the survey are as follows:

<u>DMU/MASTER</u>	<u>REMOTE (S/N)</u>	<u>DATE(S) USED</u>
123/273	72 (221)	163, 193, 207
	74 (249)	159 - 162
	76 (216)	162
	78 (927)	207
505/273	72 (221)	164 - 168, 172
505/1318	72 (221)	173, 174, 187, 200-202
	74 (249)	175, 176, 206
188/1066	72 (221)	207, 270, 278, 291
	74 (249)	242, 245, 256
	76 (216)	257
	78 (927)	207
192/1318	78 (927)	207 - 209, 211
	78 (1134)	272, 274
192/1066	74 (249)	165, 166
	78 (927)	165, 166

Baseline calibration for the Del Norte units were conducted according to specifications set forth in OORDER 79, Section II.A. Static daily system checks were performed by fixed point observations along a known range. A minimum of ten discreet observations were observed and recorded (Separate calibrations were made for units with an attenuator). Prior to daily system checks, the equipment was allowed an initial warm up period of 30 minutes. All specifications in OORDER 79 were followed with exception of the use of the 30 db attenuator while performing in ranges less than 2000 meters. The 30 db attenuator worked occasionally, however, it frequently caused excessive fluctuations or freezing of rates. In order to alleviate this problem, a 10 db or 20 db attenuator was used in lieu of the 30 db (See Sounding Volumes for daily use of attenuators).

Daily corrector values were based on opening and closing baseline calibrations. If an excessive drift was observed between two baseline calibrations, the corrector was computed by pro-rating the shift over that time period. All corrector values were applied to the raw data tapes via the off-line corrector tape.

On Julian Day 163-166, range/range Del Norte was used to collect bottom samples and on JD 207 this same method of hydrographic position control was used for a wire drag investigation (See Section K, PSR #3).

For information on daily system checks or Del Norte baseline calibrations, refer to the sounding volumes and/or Del Norte Baseline Calibration file which accompanies this report.

Range/range positioning for Launch 1017 (VesNo 2837) on July 30, 1982 (JD 211) was accomplished using a DM-54 Automatic Grid Overlay (ARGO) positioning system. The hydrography (bottom sampling only) was controlled by reference stations ANDERSON RM 1, 1981 (113) and MN PT ARGO, 1980 (114). The system was calibrated via the three point sextant fix method with check angle using stations DULUTH ENGER MEMORIAL TOWER, 1952 (002), DULUTH HARBOR N PIER LT (044), SKY HARBOR AIRPORT BEACON (049), and SUPERIOR ENTRY S BREAKWATER LT (138). Calibrations were taken twice that day. On-line partial rate correctors were based on the opening calibration. The average of the opening and closing partial rate correctors were used as the final corrector value. Correctors were applied via the off-line corrector tape.

The ARGO system was maintained at a smoothing code of 02. Two time slots (02-06-00-00) were incorporated into the system to allow for a one second update of rates. Fixed shore stations' AGC value and antennae range tune values were monitored twice that day. The ARGO system was operating on a frequency of 1646.70 kHz, and was processed using a false frequency of 1647.22 kHz to account for the velocity of propagation over Lake Superior (See information on the computation of the false frequency in the Supplemental data files).

The ARGO equipment and serial numbers used on July 30, 1982 are as follows:

	ARGO EQUIPMENT	
	<u>EQUIPMENT</u>	<u>SERIAL NUMBER</u>
VesNo 2837	Range Processing Unit	R047854
	Control Display Unit	C047824
	Antenna Loading Unit	A0980310
	Strip Chart Recorder	S097944
	Power Supply	V0378124
	Thermal Printer	2126A06969
Station ANDERSON RM 1, 1981	Range Processing Unit	R0379115
	Antenna Loading Unit	A0379119
	Power Supply	V0379110
Station MN PT ARGO, 1980	Range Processing Unit	R047864
	Antenna Loading Unit	A0379120
	Power Supply	V0379127

On September 30, 1982 (JD 273), the Electronic Distance Measuring Unit (EDM) (HP83810B, S/N 1928A00361) was used to control hydrography in the vicinity of Hog Island. The EDM was set up at unmonumented station HOG, 1982, which was located by PEIRCE using third order, Class I traverse methods the same day. Azimuths were obtained by initializing the EDM on station SKY HARBOR AIRPORT BEACON (049) and an initial checks were performed by observing the angular difference between SKY HARBOR AIRPORT BEACON and SUPERIOR FRONT CHANNEL FRONT RANGE LT. Ranges were obtained by setting a prism (on tripod) inside the Zodiac (VesNo 2831). The azimuths and ranges were recorded after the EDM (in the tracking mode) would lock on and display a reading. Depths were obtained via the sounding pole.

The Electronic Corrector Abstract is in Appendix E.

#### H. SHORELINE

The shoreline for this survey <sup>and TP-01086</sup> was taken from Class I maps TP-01081, TP-01082, ~~and TP-01085~~, Job CM-8008. The location and delineation of features offshore of this survey that may or may not be depicted in the T-sheets will be discussed in detail in Section L (Comparison with the Chart). Discrepancies, changes, or additions to the shoreline are discussed below.

##### TP-01081

There were no changes or additions to the shoreline on this map.

##### TP-01082

A small area of shoreline located at approximately 46°44'42"N., 092°04'00"W is inaccurate. Soundings in this area were run approximately 5 to 10 feet from shore. The revision of the shoreline is depicted on the field sheet in red.

##### TP-01085

A floating pier extending from the shoreline of Barkers Island was not shown on the map. This new feature (pier end) is located at approximately 46°42'19"N, 092°02'38"W. The pier was probably constructed after field edit had been performed. The pier appears in red on the field sheet.

The bulkhead located 46°42'41"N., 092°02'37"W is described by field editor as bulkhead ruins and notated with a dashed line. This face of the bulkhead has been replaced with new steel. The revision of this shoreline is drawn with a solid red line.

There were no discrepancies between hydrographic and photogrammetric locations of details seaward of the shoreline. There were no control stations used in this survey that were seaward of the shoreline.

## I. CROSSLINES

A total of 33.9 nautical miles of crosslines were run. This constitutes approximately 14.3% of the total mainscheme hydrography. Ninety-nine percent (99%) of the crossline and mainscheme agreements were within  $\pm 2$  feet for depths ranging from 4-54 feet.

## J. JUNCTIONS

This survey junctioned with the following contemporary surveys:

<u>SURVEY REGISTRY NO.</u>	<u>SCALE</u>	<u>DATE</u>	<u>POSITION RELATIVE TO H-10023</u>
H-9953	1:5,000	1981	Northwest
H-9960	1:10,000	1981	East
H-10028	1:5,000	1982	Southeast

### H-9953 (WH 5-1-81)

Junction comparisons were made with unverified survey H-9953. Comparisons were made by mentally applying an assumed water level correction of -1.0 feet to soundings obtained during this survey (Soundings from survey H-9953 were reduced to LWD). Comparisons were excellent with 100% of the sounding comparisons within  $\pm 1$  foot. H-9953 is in the process of final verification at the Atlantic Marine Center. Curves are continuous throughout the junction area. *Partial butt junction made with present survey. See Evaluation Report.*

### H-9960 (WH 20-1-81)

Junction comparisons were made with unverified survey H-9960. An assumed water level correction of -1.0 feet was mentally applied to all soundings obtained during this survey for comparisons with H-9960 which had been reduced to Low Water Datum of Lake Superior. Comparisons were excellent with 100% of sounding comparisons within  $\pm 1$  foot. Curves are continuous throughout the junction zone.

### H-10028 (PE 5-3-82)

Junction comparisons with contemporary survey H-10028 were excellent with 99% of all sounding comparisons within  $\pm 1$  foot. One percent (1%) of the sounding comparisons were within  $\pm 2$  feet. Curves are continuous throughout the junction area.

## K. COMPARISONS WITH PRIOR SURVEYS

The Lake Superior Presurvey Review was issued 18 March 1981. There are two presurvey review items located within the limits of this survey.

PSR #3 #2374

This PSR item was reported as a wreck, covered 4 feet (LWD), charted at 46°44'16"N, 92°03'18"W. The item originated with a U.S. Army Corps of Engineers letter of 1963 which, according to the Lake Superior PSR report, was unavailable. An attempt was made to obtain the letter during this survey; letter was unavailable. On June 16 1982, the wreck was searched for by running mainscheme split lines (25-meter spacing). No evidence of the wreck was found during this investigation. On July 26, 1982 (JD 207), the area was searched by small boat chain ~~wire~~ drag methods using the ship's survey launches. A control-<sup>(See attached Dive Rpt.)</sup> led diver search also took place during the ~~wire~~<sup>chain</sup> drag investigation (the area covered by the ~~wire~~<sup>chain</sup> drag is presented on a 1:1000 blow-up sheet and will be submitted with this report).

The result of the investigation revealed scattered debris tentatively identified as a wooden barge. The <sup>corrected</sup> least depth over the wreck is a ~~45.5~~ foot leadline depth at Latitude 46°44'10.5"N, Longitude 092°03'13.2"W. (See Master Printout, JD 207, VesNo 2837, Pos #9030). This position was determined in the range/range mode using the Del Norte system. On 30 July 1982, another position (Pos #7029) was obtained over the wreck in the range/azimuth mode using Del Norte. This position charted the wreck at Latitude 45°44'10.3"N, Longitude 092°03'13.5"W. Both positions indicate that the wreck is approximately 198-202 meters SSE of the charted wreck.

It is recommended that the wreck be charted at 46°44'10.5"N, 092°03'13.2"W with a 10-meter radius from this position. It is also recommended that the symbol of a submerged wreck be retained with the clearance over the wreck being based on the ~~corrected~~ <sup>corrected</sup> 5.5' foot leadline sounding ~~after water levels reducers have been applied~~, (See Dive Report). All geodetic computations were via program RK 300 and Hewlett Packard 9815A Geodetic Program 800610. Do not concur. Chart as ~~Wreckage~~ <sup>Wreckage</sup>

The difference in the charted and surveyed position of the wreck is probably the result of frequent storms which shifted and scattered the wreck.

PSR #5 #2375

The item was reported as a submerged wreck charted at Latitude 46°44'20.5"N, Longitude 92°05'39"W. The item originated with the 1955 edition of the chart.

The investigation was performed by visually searching the charted position of the wreck by a small boat. The wreck is a partly submerged wooden vessel. The submerged portion of the wreck is covered with 1 to 1.5 feet of water. The other part of the wreck which is visible along the shore bares 1½-2 ft and presents no hazard to navigation as surrounding water is very shallow. The wreck is approximately ~~20-30~~<sup>60</sup> feet in length along the shore and extending from shore approximately 6-7 feet (See sounding Volume 10, pg. 49). Riprap and other debris is along the shoreline where the wreck is located.

(dead reckoning)  
A DR<sub>A</sub> position was determined on the wreck using TO-01081 and an aerial photograph of the area. This method of positioning the wreck was used because the line-of-sight from the electronic stations was blocked by a moored vessel (see aerial photograph of the Howards Bay area).

It is recommended that the wreck be charted at Latitude 46°44'18.0"N, Longitude 092°05'38.2". This position indicates that the wreck is located 64m SSE of the charted position of the wreck. It is also recommended that the symbol of a submerged wreck be changed to a partly submerged wreck.

*Do not concur, chart as visible stranded wreck (3)*

Comparisons were made with the following prior surveys:

<u>PRIOR SURVEY</u>	<u>SCALE</u>	<u>DATE</u>
LS 1-251	1:16,000	1861
LS 1-1824	1:15,000	1943

#### LS 1-251

Prior survey LS-251, surveyed in 1861, covers the entire area of this survey. Because LS1-251 had no grid and because complex changes have occurred since the 1861 survey, sounding-to-sounding comparisons were not made. A general discussion concerning depth curves and shoreline features follows:

The majority of the depth curves compared favorably with the prior survey. The curves appear to be similar in shape and displacement. The only noticeable difference is a small area of the 18-foot curve in Lake Superior (Lakeward of Minnesota Point). The 18-foot curve in the southern end of prior survey LS-1-251 tends to be more complex than this survey 18-foot curve.

Most of the curves inside of the bay area have changed dramatically. The reason for these changes is due to mass construction in the harbor that took place subsequent to the 1861 survey. The most important feature noted during the comparison was the river bed that ran through the bay area. This survey revealed some evidence of the old river bed. It is recommended that this survey supersede prior survey LS 1-251 for charting purposes.

LS-1-1824

Prior survey LS 1-1824 covers a small area of this survey in the vicinity of the 30-foot curve outside of Minnesota Point. Comparison with the survey indicate excellent agreement with 100% of all sounding comparisons within ±2 feet. It is recommended that this survey supersede prior survey LS-1824 for charting purposes.

L. COMPARISON WITH THE CHART

Comparisons were made with Chart 14975, 26th Edition, April 26, 1980, scale 1:15,000.

Ninety-eight (98%) of all charted soundings were within ±2 feet of soundings obtained during this survey for depths ranging from 4 - 54 feet. Two percent of all sounding comparisons were within ±6 feet. Discrepancies between survey and charted soundings are listed below:

<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>CHARTED</u>	<u>SURROUNDING SURVEY SOUNDINGS (uncorrected)</u>
46°43'57.0"N	092°04'21.5"W	21	27 - 29
46°43'59.5"N	092°04'26.0"W	20	26 - 27
46°43'02.0"N	092°01'34.3"W	20	24 - 27
46°43'02.8"N	092°01'25.3"W	25	30 - 33
46°43'32.7"N	092°02'26.5"W	6	11 - 13
46°43'33.0"N	092°02'11.2"W	19	24 - 26
46°43'40.0"N	092°02'09.0"W	28	32 - 34
46°43'39.8"N	092°02'20.0"W	20	25 - 28

Note: Charted soundings have been reduced to LWD. Water level reducers have not been applied to the survey soundings listed above. Maximum discrepancies are within ±4-6 feet if a -1.0 ft is applied to survey soundings listed above.

The general trend and displacement of survey depth curves in Lake Superior (lakeward of Minnesota Point) agrees favorably with charted depth curves. The trend of depth curves in Superior Bay is similar to the charted depth curves. The trend of curves along docks and the Superior Front Channel are in excellent agreement with that of the chart.

The depth curves in the vicinity of Barkers Island have dramatically changed. This change is the result of the construction of the Barkers Island marina. The area, especially at the southern end of the island, has been dredged for access to the marina.

Barkers Island is a land fill that was constructed from dredge spoils (See Class I map TP-01085 and field sheet for comparison with the chart).

The shoreline in the vicinity of the sewage treatment plant charted at 46°43'38"N, 092°04'24"W, has been changed dramatically by construction of a square, stone levee. The shoreline in that area should be recharted to agree with the Class I map TP-01082. Depths in that area are shoaler than charted depths. <sup>concur</sup>

There were no noticeable differences between survey depths and COE controlling depths in the channels and anchorage areas within this survey limits.

A <sup>awash 1 ft</sup> submerged breakwater ruin, located 46°44'29.5"N, 092°03'47.9"W, should be charted (See field sheet and Class I map). ~~The ruin is covered by one foot of water.~~ Surrounding water depths are 2-3 feet. This item is not a hazard to navigation, however, small craft moor near this area. The shore end of the ruin can be seen along the beach. <sup>concur</sup>

A pile located at 46°42'25.3"N, 092°02'35.2"W, should be charted. The pile bares 1.5-2.0 ft in 16 ft of water. The item is located at the end of a docking slip. This item is not a hazard to navigation. <sup>concur</sup>

The following shoal developments were performed during this survey:

<u>DEVELOPMENT</u>	<u>LAT/LONG</u>	<u>POSITION #</u>	<u>REMARKS</u>
A	46°44'35.3"N 092°04'50.8"W	101-122 1749-1780	Investigation of 6' shoal sounding charted 46°44'35.8"N, 092°04'50.0"W using 20-25 m spacing. Least depth found: 18 feet. Recommended supersede the chart.
		6-ft sdg. from misc. source - charted in early 1965	
B	46°44'31.5"N 092°04'56.8"W	3223-3231	Investigation of jagged area with survey depths from 6-28 ft. Least depth found: 5 ft. Recommend supersede the <sup>(corrected)</sup> chart. <sup>concur</sup>
C	46°43'36.2"N 92° 03' 38.0"W.	6378-6384	Investigation of 7' survey sounding. Least depth found: 7 ft. Recommend supersede the chart. <sup>concur</sup>

The area in the vicinity of the submarine pipeline and cables <sup>(lat. 46°42'55"N, long 92°02'33"W)</sup> was developed to delineate the depth curves in the area. The area was developed by running sounding lines perpendicular and parallel to depth curves. The bottom topography in the area is very jagged (depths ranging from 6-28 feet) as a result of dredging that occurred in that vicinity. <sup>concur</sup>



The following items are non-sounding charted features that were investigated during this survey. Some of the items had previously been investigated by the field editor in 1981. Recommendations are made for each item. See the charts on the following page for item identification (See Notes to Hydrographer on Class 1 maps).

#### ITEM 1

Item 1 is pilings charted  $46^{\circ}44'25.5''N$ ,  $092^{\circ}05'34.3''W$  extending northwest to  $46^{\circ}44'28.4''N$ ,  $092^{\circ}05'40.1''W$ . The pilings are charted as visible ~~and submerged~~ objects. A group of 30 or more pilings bares one to five feet along the shore. The area should be charted foul with pilings using the boundary that is depicted on the final field sheet. *concur*

There was no evidence of any pilings northwest of the point of land charted at  $46^{\circ}44'26''N$ ,  $092^{\circ}05'36.7''W$ . This area was investigated extensively by a visual search and small boat wire drag methods. Range/azimuth control was used to position the boats during the wire drag. The investigation was performed in water depths ranging from 2-4 feet and along of the edge of the channel in Howards Bay. It is, therefore, recommended that charted pilings extending northwest from  $46^{\circ}44'26.0''N$ ,  $092^{\circ}05'40.1''W$  be deleted from chart. *concur* (no plot provided)

#### ITEM 2

Item 2 is a <sup>submerged</sup> wreck charted at  $46^{\circ}44'20.5''N$ ,  $092^{\circ}05'39''W$ . See Section K (Comparison with Prior Surveys), PSR #5 for information and recommendations on this item.

#### ITEM 3

Item 3 is a submerged pile charted at  $46^{\circ}44'20.5''N$ ,  $092^{\circ}05'27.0''W$ . Item was investigated thoroughly by small boat wire drag methods on October 5 and October 7, 1982. No evidence of a submerged pile could be found. Because the item was not disproved, it is recommended that the pile be retained as charted. *Do not concur. considered disproved, remove from chart.*

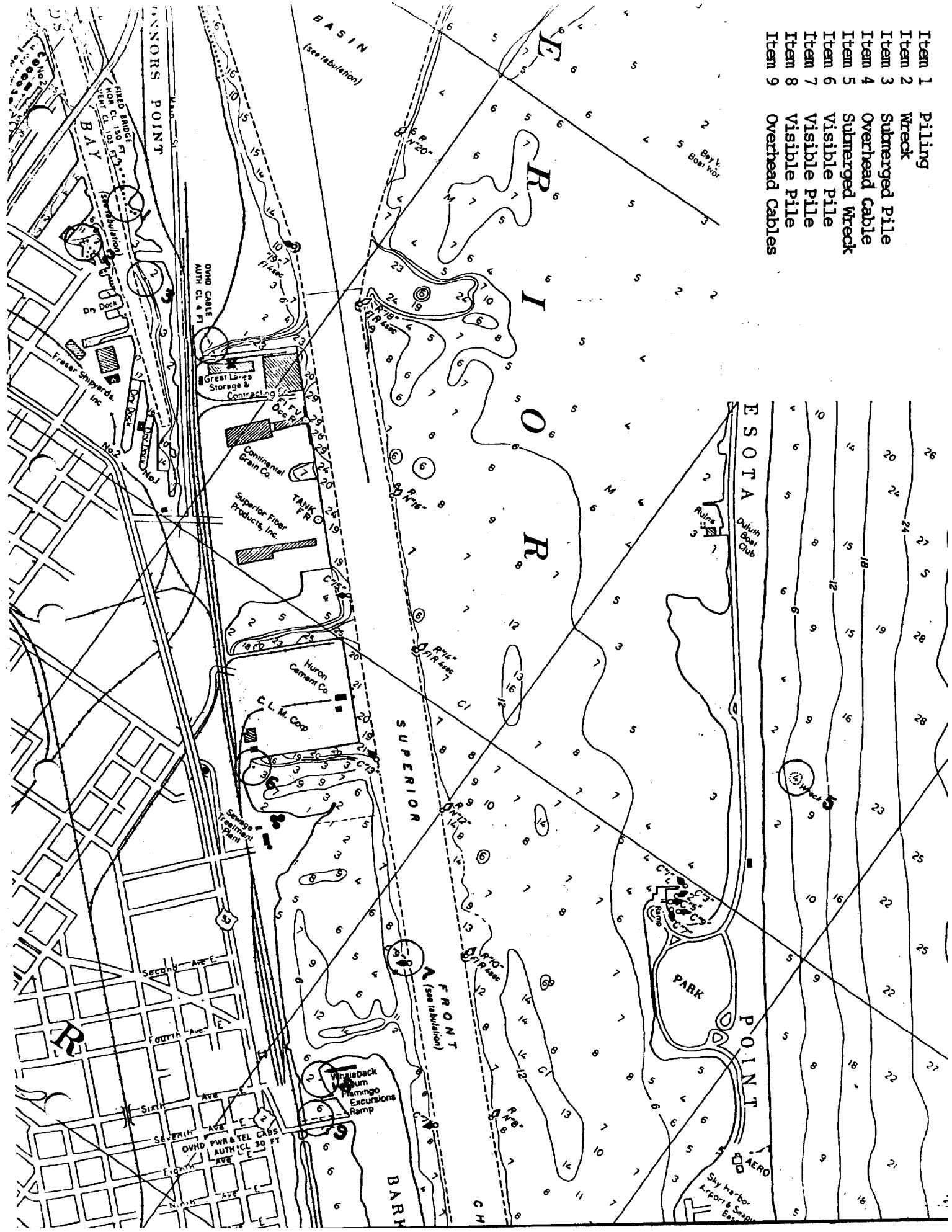
#### ITEM 4

Item 4 is an overhead cable charted at  $46^{\circ}44'18.1''N$ ,  $092^{\circ}5'12.6''W$ . The item was investigated in 1981 and no cable was found. The item was investigated again during this survey on July 25, 1982. There was no overhead cable in that area. It is, therefore, recommended that this item be deleted from the chart. *concur*

#### ITEM 5

Item 5 is a wreck charted approximately  $46^{\circ}44'16''N$ ,  $092^{\circ}03'18''W$ . See Section K, PSR #3 for information and recommendations on this feature.

- Item 1 Piling
- Item 2 Wreck
- Item 3 Submerged Pile
- Item 4 Overhead Cable
- Item 5 Submerged Wreck
- Item 6 Visible Pile
- Item 7 Visible Pile
- Item 8 Visible Pile
- Item 9 Overhead Cables



ITEM 6

Item 6 is a visible pile charted at 46°43'43"N, 092°04'28"W. Pilings that bare approximately 1-2 feet are located in that area. Since a new position was not determined, it is recommended that the feature remain as charted. The pilings present no hazard to navigation. ~~concur~~

ITEM 7

Item 7 is a visible pile charted at 46°43'36.2"N, 092°03'50.9"W near buoy C "9". The item was not visible on aerial photographs and could not be found by the field editor in 1981. On October 5, 1982 the item was searched for using the echo sounder while circling buoy C "9". On October 8, 1982, small boat wire drag methods (via Monark and Boston Whaler) were used to locate the pile. The boats circled the buoy and snagged a submerged object three times out of four attempts. The boat equipped with the positioning system was stationed over the object to obtain a position. Positions taken over the submerged object are as follows:

<u>POSITION #</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>
7088	46°43'34.6"N	092°03'50.3"W
7089 } not plotted	46°43'34.7"N	092°03'50.3"W
7090 }	46°43'34.6"N	092°03'50.4"W

The three positions were within 2-3 meters. This is a positive indication that there is a submerged object in that area. A controlled diver investigation was planned to determine the identity of the obstruction. Because of a limited number of divers, the investigation was cancelled. It is recommended that the visible pile symbol in that area be changed to a submerged <sup>obstr</sup>pile and that the geographic position of the <sup>obstr</sup>pile be changed to agree with the survey position of the obstruction. ~~concur~~

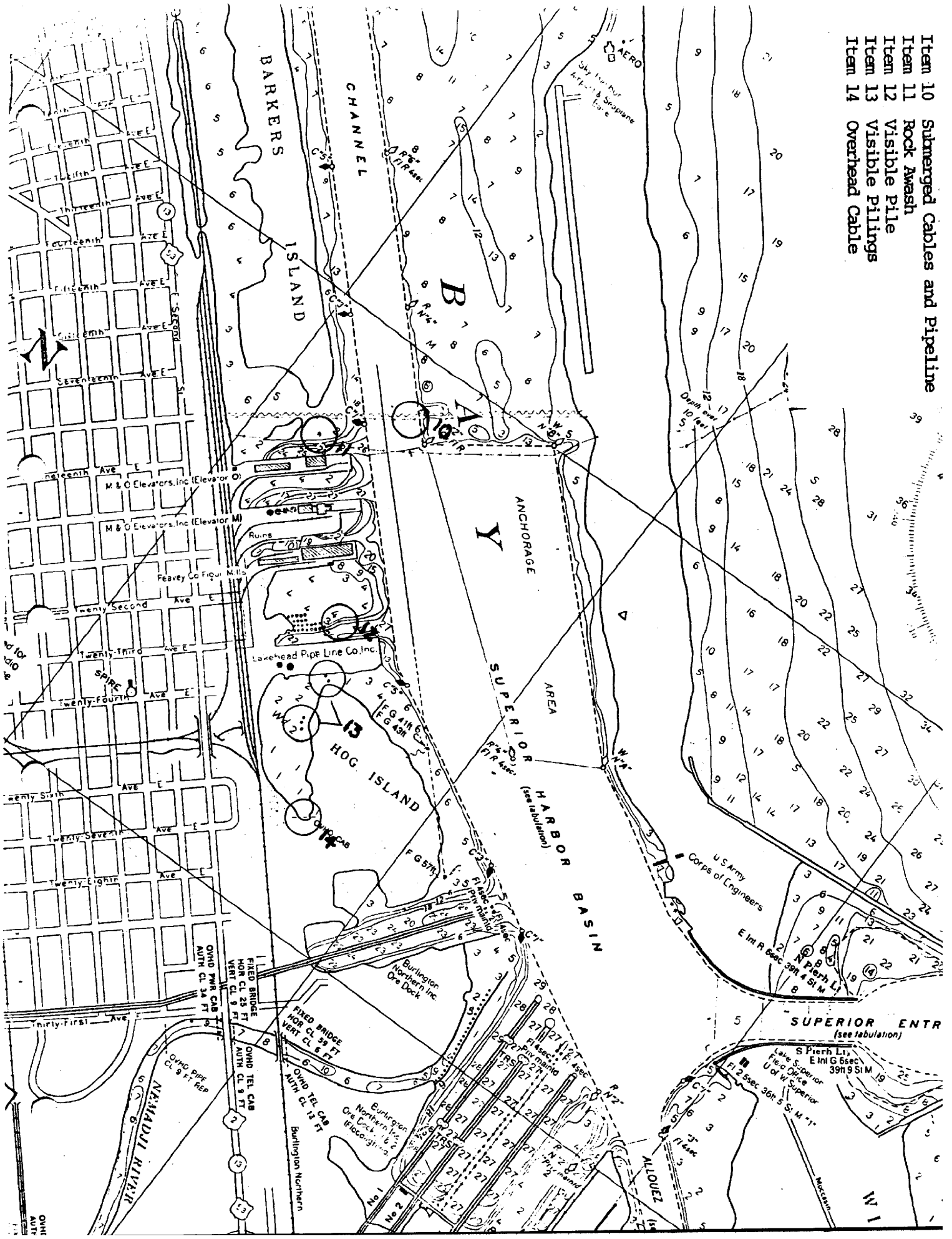
ITEM 8

Item 8 is a visible pile charted at 46°43'<sup>20 0</sup>13.8"N, 092°03'<sup>3</sup>50.8"W. The item was investigated on October 7, 1982 by visually searching the area and by small wire drag investigation using range/azimuth to position control boat. The piling is charted close to the Barkers Island shoreline but no evidence of a piling was found in that area. It is recommended that this pile be deleted from the chart. ~~concur~~

ITEM 9

Item 9 is an overhead cable. It was investigated on July 25, 1982. No overhead cable was found in that area. It is recommended that the overhead cable charted at 46°43'15.0"N, 092°03'49.0"W, be deleted from the chart. ~~concur~~

- Item 10 Submerged Cables and Pipeline
- Item 11 Rock Awash
- Item 12 Visible Pile
- Item 13 Visible Pilings
- Item 14 Overhead Cable



ITEM 10

Pipelines continue into Lake Superior.

Item 10 is a submerged cable and pipeline area. Cable and pipelines run across Superior Bay (See Chart #14975). The field editor could not find the shore ends in 1981. The items were further investigated during this survey but no shore ends could be found. Information on the cables and pipelines in this area can be found in the letter from the Superior Water, Light, and Power Company on the following page. A copy of the water line drawing that was received from Cloquet will be submitted with the report. Retain as charted.

ITEM 11

Item 11 is a rock awash charted at 46°42'4<sup>6</sup>3.3"N, 092°02'50.0"W. The item was investigated on October 5, 1982 with small boats. Three rocks were found during the investigation and all three rocks were located approximately 35-40 meters SSW of the charted position. The rocks were not visible at the time of observation, however, predicted water levels were 1.4 feet above LWD.

It is recommended that the new position of the rocks be charted and rock symbols (i.e., Rock Awash or Submerged Rock) be charted after actual water level reducers have been applied to soundings. Because of the hydrographers uncertainty that all rocks were located during this investigation, it is recommended that a warning (i.e., numerous rocks or foul with rocks) be noted in that area. The rocks are not a hazard to navigation, however, they are located near the southern entrance to Barkers Island marina. *concur, (only two plotted because of congestion) revise charted position to agree with present survey.* Positions of the three rocks located in this area can be found in Sounding Volume 10, JD 278, p. 49-50, Positions 7075-7077.

ITEM 12

Item 12 is a visible pile charted at 46°42'31.2"N, 092°02'30"W. Item was investigated on October 5, 1980 by small boat chain drag methods sweeping along the edge of the docking slip in that area. The boats snagged on a possible submerged objects twice plotted as subm piles out of four attempts. The investigation was controlled via range/azimuth Del Norte (See Sounding Volume 10, pg. 50, Pos #7078, 7079). ~~Since the hydrographer is uncertain of the identity of the submerged object,~~ it is recommended that the pile be ~~charted~~ as submerged. *concur retained*

ITEM 13

Item 13 is pilings charted at 46°42'26"N, 092°02'25.5"W and 46°42'20.4"N, 092°02'24.7"W. The items were not visible on aerial photos and had not been investigated by the field editor. The area was visually investigated on several occasions and no pilings were observed. The water in that area is extremely shallow; this prohibited wire drag investigations. There is little chance that pilings are submerged, therefore, it is recommended that the piling be deleted from the chart. *concur*

#### ITEM 14

Item 14 is a charted overhead cable located 46°42'12.3"N, 092°02'15.7"W. The cable was not visible on aerial photos and the field editor did not locate it. The cable was not investigated during this survey, therefore, it is recommended that overhead cable remain as charted. ~~concur~~

#### M. ADEQUACY OF SURVEY

This survey is considered complete and adequate to supersede charted information and the prior surveys in the common areas.

#### N. AIDS TO NAVIGATION

Thirty-two floating aids were located within the survey limits. The following floating aids to navigation serve to mark the boundary of superior Front Channel. These buoys are maintained by the U.S. Coast Guard, Duluth, Minnesota. The following table is a comparison between the survey and the latest edition of the chart (Chart 14976<sup>5</sup>, 26th Edition, April 26, 1980):

<u>BUOY</u>	<u>SURVEY POSITION</u>	<u>CHARTED POSITION</u>	<u>POSITION RELATIVE TO CHARTED POSITION</u>
Buoy "19"	46°44'32.5" N	46°44'32.3" N	24 m (WNW of)
F1 4 sec	092°05'11.7" W	092°05'10.6" W	
R "18"	46°44'30.5" N	46°44'31.0" N	19 m (SE of)
F1 R 4 sec	092°44'56.4" W	092°04'57.0" W	
N "16"	46°44'16.4" N	46°44'15.8" N	31 m (NW of)
WHISTLE	092°04'36.3" W	092°04'35.2" W	
C "15"	46°44'04.8" N	46°44'04.5" N	19 m (NW of)
	092°04'32.2" W	092°04'31.5" W	
R "14"	46°44'03.6" N	46°44'03.7" N	3 m (SW of)
F1 R 4 sec	092°04'18.1" W	092°04'18.0" W	
C "13"	46°43'51.2" N	092°44'51.5" N	29 m (SE of)
	092°04'11.6" W	092°04'12.9" W	
N "12"	46°43'50.3" N	46°43'51.1" N	28 m (SE of)
	092°03'59.2" W	092°03'59.9" W	
R "10"	46°43'38.8" N	46°43'39.6" N	31 m (SE of)
F1 R 4 sec	092°03'42.6" W	092°03'43.4" W	
WHISTLE			
C "9"	46°43'34.7" N	46°43'35.4" N	32 m (SE of)
	092°03'48.9" W	092°03'50.0" W	
N "8"	46°43'27.3" N	46°43'26.9" N	13 m (NNW of)
	092°03'25.6" W	092°03'25.4" W	

<u>BUOY</u>	<u>SURVEY POSITION</u>	<u>CHARTED POSITION</u>	<u>POSITION RELATIVE TO CHARTED POSITION</u>
C "7"	46°43'22.3" N 092°03'31.8" W	46°43'22.8" N 092°03'31.8" N	15 m (S of)
R "6"	46°43'14.4" N 092°03'07.6" N	46°43'14.9" N 092°03'08.2" W	22 m (SE of)
Fl R <sub>sec</sub> Whistle			
C "5"	46°43'08.9" N 092°03'12.8" W	46°43'10.3" N 092°03'13.8" W	47 m (SSE of)
N "4"	46°43'01.2" N 092°02'48.7" W	46°43'02.8" N 092°02'50.9" W	68 m (SE of)
C "3"	46°42'56.6" N 092°02'54.4 W	46°42'58.6" N 092°02'57.4" W	86 m (SE of)
R "2"	46°42'51.8" N 092°02'34.9" W	46°42'52.1" N 092°02'35.7" W	18 m (SE of)
Qk Fl R			
C "1"	46°42'49.8" N 092°02'44.7" W	46°42'50.1" N 092°02'45.3" W	16 m (SE of)

The following floating aids are located in the Superior Harbor Basin. Two of the buoys serve to mark the Superior Harbor Basin anchorage area. Buoy C "5" only serves to mark the limits of the channel.

<u>BUOY</u>	<u>SURVEY POSITION</u>	<u>CHARTED POSITION</u>	<u>POSITION RELATIVE TO CHARTED POSITION</u>
N "B"	46°42'58.8" N 092°02'18.8" W	46°43'00.1" N 092°02'19.1" W	41 m (S of)
R "4"	46°42'29.4" N 092°01'55.5" N	46°42'30.4" N 092°01'54.7" W	37 m (SW of)
Fl R 4 sec			
C "5"	46°42'29.8" N 092°02'14.6" W	46°42'30.0" N 092°02'15.0" W	7 m (S of)

The following five buoys are located in the vicinity of Minnesota Point park and serve to mark the entrance leading to the park's boat ramp and small floating piers. They are maintained by the Coast Guard.

<u>BUOY</u>	<u>SURVEY POSITION</u>	<u>CHARTED POSITION</u>	<u>POSITION RELATIVE TO CHARTED POSITION</u>
C "1"	46°43'58.1" N 092°03'20.2" W	46°43'59.3" N 092°03'22.0" W	53 m (SE of)
C "3"	46°43'57.0" N 092°03'20.4" W	46°43'57.7" N 092°03'22.3" W	46 m (SE of)

<u>BUOY</u>	<u>SURVEY POSITION</u>	<u>CHARTED POSITION</u>	<u>POSITION RELATIVE TO CHARTED POSITION</u>
C "5"	46°43'55.8" N 092°03'20.3" W	46°43'56.9" N 092°03'22.5" W	58 m (SE of)
C "7"	46°43'55.4" N 092°03'19.9" W	46°43'56.3" N 092°03'21.6" W	47 m (SE of)
C "9"	46°43'55.4" N 092°03'19.9" W	46°43'56.6" N 092°03'20.4" W	52 m (SSE of)

Six privately maintained floating aids to navigation mark the northern and southern approaches to the Barkers Island marina area. These aids are not listed in the latest edition of the Light List and do not appear on chart #14975. Four buoys located on the southeast end of Barkers Island serve to mark the Channel to the Barkers Island Marina. They are maintained by the marina. Two non-floating aids (day beacons) located on the southeast tip of Barker Island and a small islet south of Barkers Island also serve as navigational aids for the southern entrance to the marina. Geographic positions and descriptions of these two non-floating aids can be found in Appendix I of this report.

The other three private aids are orange and white horizontally banded buoys. Two of the buoys are located at the northern end of Barkers Island and serve to mark the entrance to a boat ramp and piers on the island. The other buoy is located between the small islet south of Barkers Island and the M&O Elevator Dock. This buoy probably serves to mark the limits of a docking slip. The geographic position of the seven private floating aids and their descriptions are listed below:

<u>BUOY</u>	<u>POSITION #</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>
#Orange/White Horizontal Banded	6178	46°43'18.9"N	92°03'52.2"W
#Orange/White Horizontal Banded	6179	46°43'18.5"N	92°03'52.4"W
#Orange/White Horizontal Banded	4058	46°42'41.2"N	92°02'55.3"W
*Black/Green Reflector	6423	46°42'46.8"N	92°03'05.4"W
*Black/Green Reflector	743	46°42'49.2"N	92°02'49.3"W
*Red/White Reflector	742	46°42'50.7"N	92°02'50.0"W
*Red/White REflector	6422	46°42'44.9"N	92°03'05.3"W

\* Buoys are small post-type buoys  
# Small Buoys



New positions were determined for Superior Front Channel range lights. The positions were determined by third order, Class I intersection methods (See Horizontal Control Report for additional information). Listed below are the observed and charted positions of the range lights:

SUPERIOR FRONT CHANNEL RANGE

	<u>CHARTED POSITION</u>	<u>OBSERVED POSITION</u>	<u>POSITION RELATIVE TO CHARTED</u>
Front Light	46°42'25.83" N 092°02'06.55" W	46°42'25.78" N 092°02'06.75" W	4.5 m (WSW of)
Rear Light	46°42'15.75" N 092°01'52.19" W	46°42'16.45" N 092°01'53.46" W	3.5 m (WNW of)

Computations indicate that the rear light (using field positions) is approximately 1,324 ft (403.5 m), azimuth 135°35' from the front light. The latest edition of the Light List (Volume IV, 1982) states that the rear light is approximately 1,420 ft (432.8m), 136° from the front light.

On July 21, 1982 (JD 202) a sounding line (Pos #1924-1941) was run on the Superior Front Channel range to verify the steering azimuth of the range. Checks were made by computing the azimuths from a few discreet positions to both the front and rear range lights using the new positions of the lights. The computations indicate that the steering azimuth for southbound traffic in the channel is approximately 135°43'. This azimuth is in agreement with the chart, the Light List and the horizontal control positions. It is recommended, however, that the new positions of the front and rear range lights be charted.

Other non-floating aids and landmarks that are recommended for charting can be found in Appendix I of this report.

Submarine cables and pipelines in the vicinity of Barkers Island have been mentioned in Section L of this report. The charted submarine cables and pipelines south of Barker Island were searched for but shore ends could not be found. It is recommended that these cables and pipelines be retained as charted. The shore end of a submarine cable leading to Superior Front Channel Front Light (Light List 1800) could not be found. It is also recommended that this cable be retained as charted.

O. STATISTICS

	<u>2839</u>	<u>2837</u>	<u>2835</u>	<u>2832</u>	<u>2831</u>	<u>TOTAL</u>
Nautical Miles of Hydrography	156.7	8.8	61.8	94.	----	236.7
*Number of Positions	1926	199	1405	127	32	3689 43
TDC Cast	----	----	----	----	----	----
Bottom Samples	34	54	99	----	----	187
Water Level Stations	----	----	----	----	----	5
Settlement & Squat	1	1	1	1	----	4

\*Note: Total number of positions does not include rejected and omitted positions.

P. MISCELLANEOUS

A total of 187 bottom samples were taken during this survey. A copy of the Oceanographic Log sheets "M" is included in Appendix H. The bottom samples were submitted to Dr. Thomas Johnson, Department of Geology, University of Minnesota at Duluth. A listing of all Not To Be Smooth Plotted Soundings (NSP) is in Appendix G.

Q. RECOMMENDATIONS

It is recommended that data compiled for this survey supersede all existing charts and information with exception of information provided by the U.S. Army Corps of Engineers concerning the limits and controlling depths of channels and anchorage areas covered by this survey. Specific recommendations regarding charted features and general bottom topography were made in Sections H, K, L, and N of this report

R. AUTOMATED DATA PROCESSING

The following programs were used in acquiring and processing data for this survey.

<u>PROGRAM</u>	<u>PROGRAM NAME</u>	<u>VERSIONS</u>
RK 112	Hyperbolic R/R Hydroplot	08/04/81
RK 116	Range-Azimuth Real Time Plot	08/24/81
RK 201	Grid, Signal Lattice Plot	04/18/75
RK 211	Range/Range Non Real Time Plot	02/02/81

<u>PROGRAM</u>	<u>PROGRAM NAME</u>	<u>VERSIONS</u>
RK 212	Visual Station Table Load	04/01/74
RK 216	R/Az. Non Real Time Plot	02/09/81
RK 300	Utility Computations	10/21/80
RK 330	Reformat and Data Check	05/04/76
RK 360	Electronic Corrector Abstract	02/02/76
AM 550	Predicted Tide Generator	11/10/72
RK 530	Layer Correctors for Velocity	05/10/76
RK 561	H/R Geodetic Calibration	02/19/75
RK 602	Extended Time Oriented Editor	05/20/75
AM 612	Line Printer List	03/22/78

S. REFERENCE TO REPORTS

The ship's personnel installed three water level gages during this survey. A water level report, leveling records, and monthly water level records have been submitted to Tides and Water Levels Branch, Rockville, Maryland (See water level report in Appendix B).

The following is a list of reports that have been or will be submitted to the following offices:

<u>REPORT</u>	<u>SUBMITTED TO</u>	<u>DATE</u>
Coast Pilot Report	Coast Pilot Section Rockville, Maryland	December 1982
Loran-C Comparisons	Operations Branch AMC	September 1982
Magnetic Report	Operations Branch AMC	January 1982
Horizontal Control Report	Operations Branch AMC	January 1983

All other supplemental data and related data will be forwarded with this report.

Respectfully submitted

*Roslyn B. Harris*

Roslyn B. Harris, ENS, NOAA

92° 03' 30"

92° 03' 15"

46° 44' 30"

46° 44' 30"

46° 44' 15"

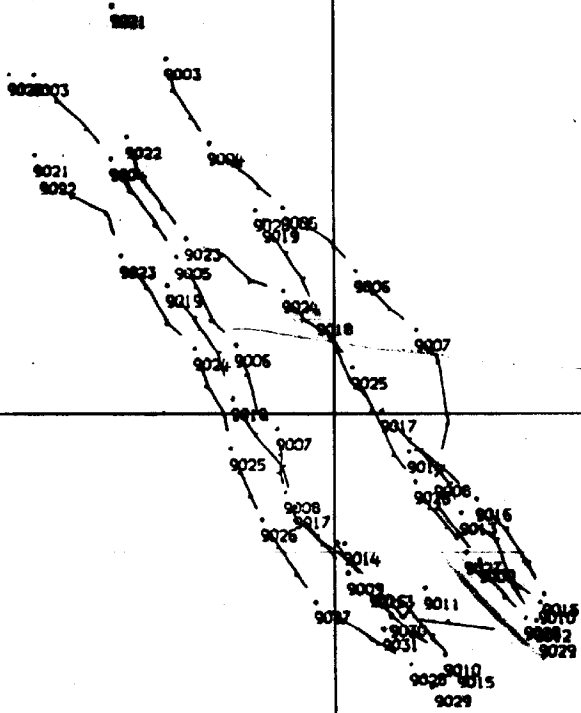
46° 44' 15"

46° 44' 00"

46° 44' 00"

92° 03' 30"

92° 03' 15"



CHAIN DRAG  
PSR ITEM 3  
H-10023

CHART 67

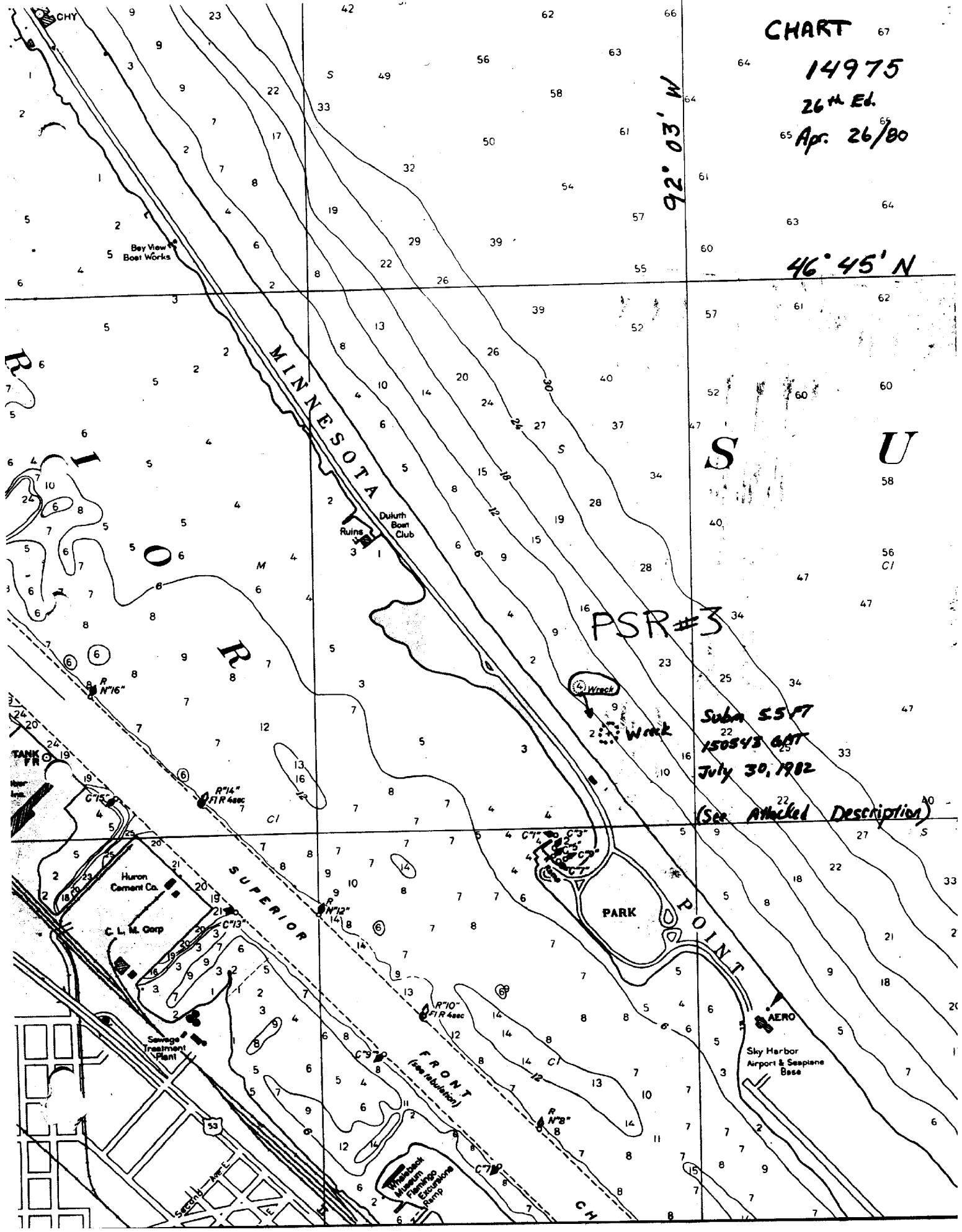
14975

26<sup>th</sup> Ed.

Apr. 26/80

92° 03' W

46° 45' N



S U

PSR #3

Subm 5577  
150543 GAT  
July 30, 1982

(See Attached Description)

R

O

R

TANK

Huron Cement Co.

C. L. M. Corp.

Sewage Treatment Plant

Whitcomb Museum  
Flamingo  
Excavation  
Ramp

PARK POINT

AERO  
Sky Harbor  
Airport & Seaplane  
Base

SUPERIOR

FRONT  
(ice station)

CH

PSR#3

Wreck Description to Accompany Chart Letter  
for Chart 14975

Wreck charted at 46 44' 16" N., 92 03' 18" W. was found by PEIRCE divers to be actually located at 46 44' 10.5" N., 92 03' 13.2" W., or approximately 202 meters SSE of the charted location. <sup>Corrected</sup> Least depth obtained during the investigation was a <sup>4</sup> 1/2 foot (150543 GMT, July 30, 1982) leadline depth, ~~without applying water level corrections.~~ The charted depth is 4.0 feet. The wreck consisted of wooden debris scattered over a 10-meter radius as observed by PEIRCE divers. It is recommended that the chart be revised to indicate the new location and depth over the wreck.



Walter S. Simmons, CDR., NOAA  
Commanding Officer  
NOAA Ship PEIRCE S-328

PSR #3

DIVE REPORT: OPR-Z137-PE-82/DV 1

DIVE DATE: September 2, 1982

I. AREA OF INVESTIGATION

- A. Location - Lake Superior, 0.1 NM offshore of Minnesota Point, Duluth, Minnesota.
- B. Position - Lat.  $46^{\circ} 44' 10.5'' N$  and Long.  $092^{\circ} 03' 13.1'' W$
- C. Project - OPR-Z137-PE-82, LAKE SUPERIOR, Survey No. H-10023.

II. PURPOSE OF INVESTIGATION

To investigate Presurvey Review Item # 3, a charted wreck covered at 4 feet.

III. SURVEY PROCEDURE

- A. Dive site was determined after an obstruction was located via small boat chain drag using the ship's Type I-Jensen survey launches.
- B. Divers descended to item and visually inspected.
- C. Not enough remains of the wreck to determine orientation and dimensions. Least depth over wreck was determined by lead line.
- D. Area covered is a 200-yd radius of Lat.  $46^{\circ} 44' 10'' N$  and Long.  $92^{\circ} 03' 13.1'' W$  in depths ranging from 5 - 15 feet.

IV. DIVE DATA

Divers: T. Owens/E. Kintzing  
Time: 58 min (BT)  
Max. Depth: 15 feet  
Current: Light  
Visibility: 10 - 12 feet

V. RESULTS

Diver investigation revealed the remains of a wooden barge, not enough to determine the section or position, in approximately 9 feet of water. The following information was acquired during the dive:

Corrected Least Depth:	4.1	5.5 foot Lead line depth
Height Off Bottom:		Measured 3 feet
Greatest Depth:		12 feet
Surrounding Depth:		9 feet

VI. RECOMMENDATIONS

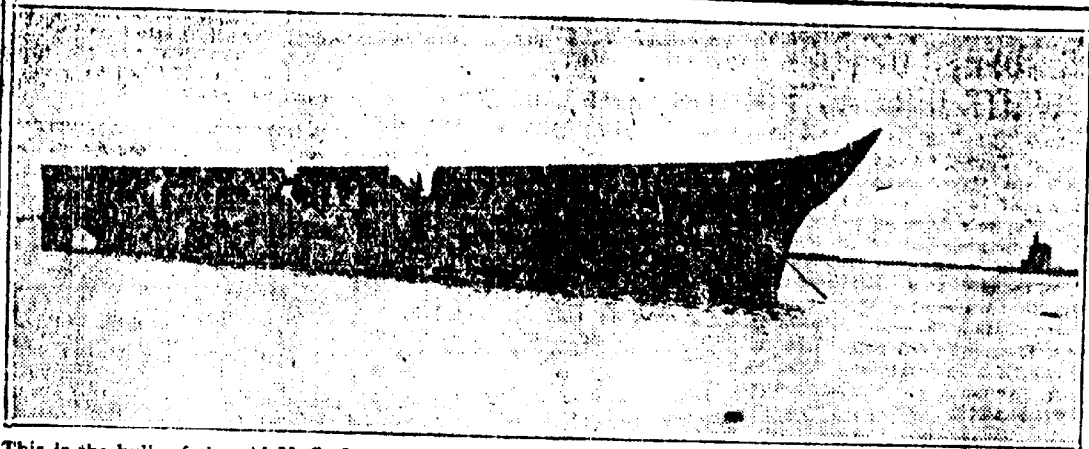
The <sup>corrected</sup> least depth is <sup>4.1</sup> 5.5 feet via lead line. The position of the wreck was located at Lat.  $46^{\circ} 44' 10.5'' N$  and Long.  $092^{\circ} 03' 13.1'' W$ . It is recommended that the wreck be charted at this location, ~~least depth over the wreck dependent upon water level reducers.~~

CANAL PARK MARINE MUSEUM  
Duluth, Minnesota 55802

RECORD OF GREAT LAKES SHIPS

Name U. S. S. ESSEX, Registry Number NONE  
Year of Build 1875, Place KITTERY, ME (COMPLETED AT BOSTON)  
Name of Shipbuilders U. S. NAVY & D. MCKAY, Hull Number \_\_\_\_\_  
Dimensions 185, x 35, x 14.3: Tonnage; <sup>DISPL</sup> Gross 1375, Net \_\_\_\_\_  
Type of Vessel STEAM FRIGATE WOOD  
Engines FORE & AFT CPO., \_\_\_\_\_, \_\_\_\_\_ dia. x \_\_\_\_\_ Stroke  
Built by ATLANTIC WORKS BOSTON, Year 1876  
Owners of Ship: 1) U. S. NAVY

**Essex Grounded and Ready for Giant Bonfire**

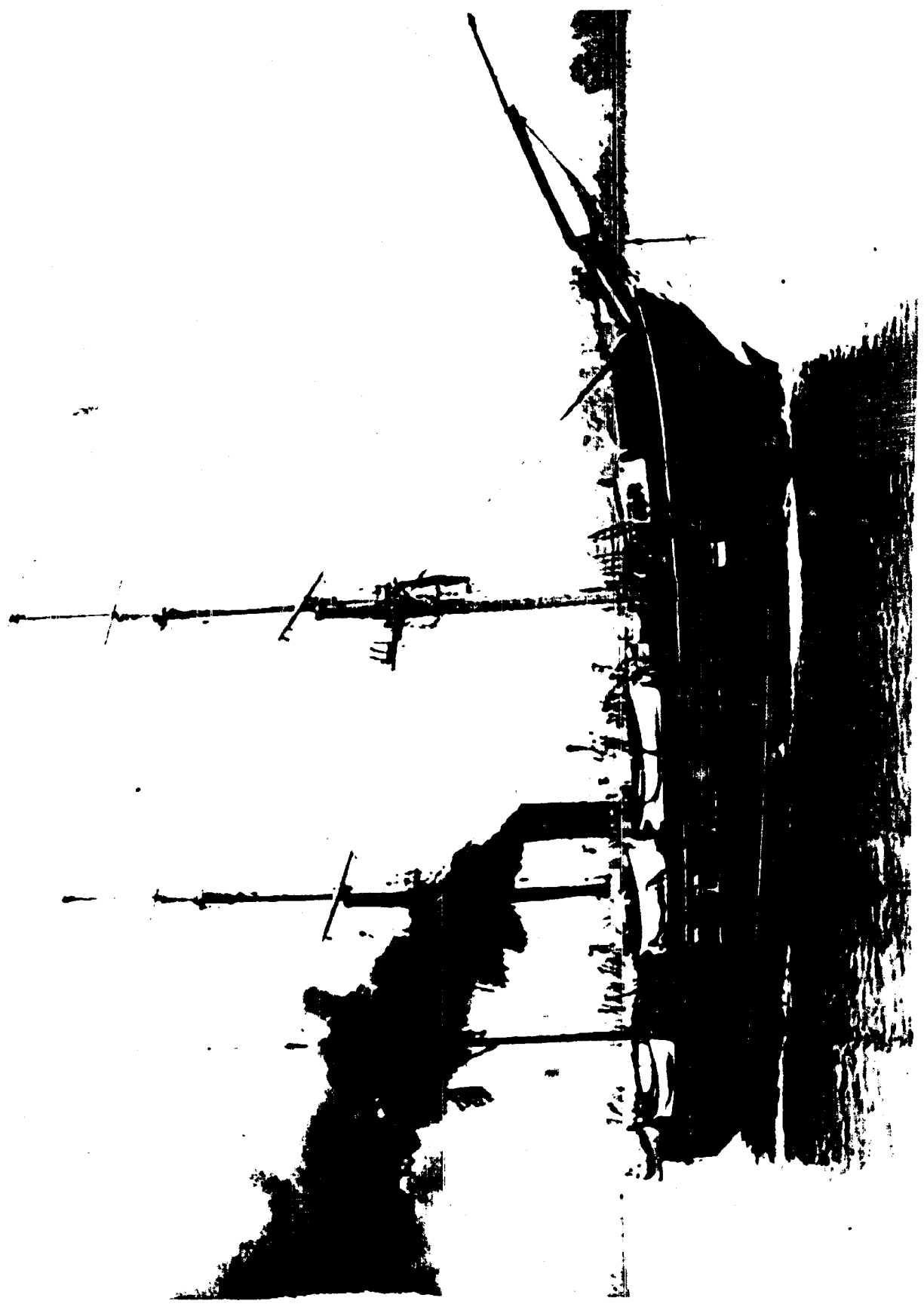


This is the hulk of the old U. S. S. Essex, oldest steam cruiser in the navy, as she looks grounded in Lake Superior, north of the Superior entry, and ready for the giant bonfire to be started when the wind is right. The Essex was towed to the beach yesterday, and those in charge are waiting for favorable winds before consigning her to the flames. The vessel, after serving on the Great Lakes, was changed into a land training ship and stationed in the harbor here for several years. About two years ago she was sold for \$400 to a local junk dealer, who stripped the ship of all brass and metals.

Undated clipping from SS Jacobs



ESSEX





**SUPERIOR WATER, LIGHT AND POWER COMPANY**

P. O. BOX 573 1230 TOWER AVENUE  
SUPERIOR, WISCONSIN 54880

2 September 1982

Lieutenant George Leigh  
NOAA Ship Pierce  
General Delivery  
Duluth, MN 55802

Dear Lt. Leigh:

Per our conversation yesterday, we have two sets of power cables running from Superior Water, Light and Power's Water Plant over to facilities on Minnesota Point. One set consists of four 500 mcm copper conductors energized at 14,000 volts and buried along with the Cloquet water line as shown on sheet G-8 of the drawing entitled "Cloquet Water Line Project D."

The other set consists of three No. 6 copper conductors contained in a single cable and energized at 4,000 volts and buried with Superior Water, Light and Power's water line as shown on our drawing entitled "Water Works - Bay Pipe 1934 Construction." A single communications cable is also buried with the line.

You mentioned you were about to received a set of Cloquet water line drawings. I understand you have already received information on Superior Water, Light and Power's water line, so with this letter the documentation of Superior Water, Light and Power's facilities under the Superior Harbor Basin should be complete.

If you have any further questions, please feel free to contact me.

Yours truly,

G K Anderson, Manager  
Electric Department

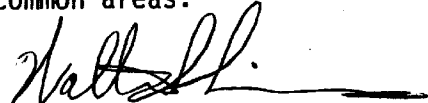
dat

APPROVAL SHEET

H-10023

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.



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

## SIGNAL NAME LIST

<u>SIGNAL #</u>	<u>NAME</u>	<u>SOURCE</u>	<u>YEAR</u>
002	DULUTH ENGER MEMORIAL TOWER, 1952	NGS	1952
007	WEST GATE, 1980	AMC	1980
010	MINNESOTA POINT N B USLS 1870	NGS	1870
011	CEMENT, 1980	AMC	1980
013	SUPERIOR ST FRANCIS XAVIER CH, 1952	NGS	1952
016	ST. CROIX, 1981	WH	1981
017	461 USE, 1981	WH	1981
025	PETRA, 1980	AMC	1980
035	396 USE	PE	1982
036	391 USE	PE	1982
037	BRIDGE	PE	1982
038	BURL	PE	1982
040	319 USE	PE	1982
042	SUPER	PE	1982
043	MINNOW	PE	1982
044	DULUTH HARBOR N PIER LT	PE	1982
046	OFF'SUP	PE	1982
047	OFF'RED	PE	1982
048	BRIDGE NORTE	PE	1982
049	SKY HARBOR AIRPORT BEACON	PE	1982
050	318 USE	PE	1982
055	HOG	PE	1982
113	ANDERSON RM 1, 1981	AMC	1981
114	MN PT ARGO, 1980	AMC	1980
138	SUPERIOR ENTRY S BREAKWATER LT	PE	1982
142	DULUTH BELL TEL TOWER CENTER	PE	1982

SIGNAL TAPE LISTING

PE 05-2-82

H-10023

002	0	46	46	34185	092	07	29003	139	0000	000000
007	0	46	44	46696	092	06	26542	250	0002	000000
010	4	46	45	27978	092	04	42663	139	0001	000000
011	6	46	43	59977	092	04	28374	250	0001	000000
013	0	46	42	12117	092	02	48974	139	0000	000000
016	0	46	44	21530	092	05	30565	250	0002	000000
017	0	46	45	16581	092	05	36895	250	0000	000000
025	5	46	42	46365	092	02	44140	250	0002	000000
035	3	46	43	51765	092	04	16519	250	0001	000000
036	7	46	43	55551	092	03	23810	250	0001	000000
037	5	46	43	16182	092	03	45948	250	0003	000000
038	5	46	42	46747	092	03	10453	250	0002	000000
040	5	46	42	16112	092	01	43141	139	0002	000000
042	5	46	42	33124	092	00	24825	250	0003	000000
043	3	46	42	42148	092	00	27883	250	0003	000000
044	5	46	46	51551	092	05	17035	139	0000	000000
046	3	46	42	42116	092	00	27958	250	0003	000000
047	5	46	42	33183	092	00	24785	250	0003	000000
048	5	46	43	16088	092	03	46034	250	0003	000000
049	5	46	43	38172	092	02	46259	139	0000	000000
050	5	46	43	01138	092	02	09816	250	0003	000000
055	4	46	42	24736	092	02	30155	254	0004	000000
113	6	46	46	22364	091	27	05678	250	0000	164722
114	0	46	43	04575	092	02	05673	250	0000	164722
138	5	46	42	36746	092	00	22247	139	0000	000000
142	4	46	47	25781	092	06	50127	139	0000	000000

NOAA FORM 76-40  
(8-74)

Replaces C&GS Form 567.

TO BE CHARTED  
 TO BE REVISED  
 TO BE DELETED

REPORTING UNIT  
(Field Party, Ship or Office)

NOAA SHIP PEIRCE

HAVE  HAVE NOT

JOB NUMBER

H-10023

STATE  
MINNESOTA  
WISCONSIN

DULUTH-SUPERIOR HARBOR

DATE  
11-19-82

U.S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NONFLOATING AIDS OR LANDMARKS FOR CHARTS

LOCALITY

DATE

ORIGINATING ACTIVITY

- HYDROGRAPHIC PARTY
  - GEODETIC PARTY
  - PHOTO FIELD PARTY
  - COMPILATION ACTIVITY
  - FINAL REVIEWER
  - QUALITY CONTROL & REVIEW GRP.
  - COAST PILOT BRANCH
- (See reverse for responsible personnel)

DATUM  
NORTH AMERICAN DATUM OF 1927

POSITION  
LATITUDE LONGITUDE  
D.M. Meters / D.P. Meters

METHOD AND DATE OF LOCATION  
(See instructions on reverse side)

OFFICE FIELD

CHARTS  
AFFECTED

CHARTING NAME DESCRIPTION  
(Record reason for deletion of landmark or aid to navigation. Show triangulation station names, where applicable, in parentheses.)

AERO (SKY HARBOR AIRPORT BEACON, 1982)  
*NC L-219(86)*

STACK (DULUTH STEAM COOP ASSN STACK, 1982)

STACK (HALBERT HEATING PLANT STACK, 1982)

TANK FR (SUPERIOR FIBER PRODUCTS TANK, 1982)

STACK (ST MARYS HOSP ABANDONED STACK, 1982)  
*NC - REMOVED L-601(86)*  
Superior Front Channel Range Front Light  
(SUPERIOR FRONT CHANNEL RANGE FRONT  
LT) *NC L-219(86)* Light List # 1800

F-G LIGHT Superior Front Channel Range Rear Light  
(SUPERIOR FRONT CHANNEL RANGE REAR  
LT) *NC L-219(86)* Light List # 1801

S Bkw Lt (SUPERIOR ENTRY S BREAKWATER LT)  
*NC L-219(86)* Light List # 1789

S Pierh Lt (SUPERIOR ENTRY INNER S PIERHEAD LT)  
*NC L-219(86)* Light List # 1792

N Pierh Lt (DULUTH HARBOR N PIER LT)  
Light List # 1809

*see L-680(86)*

RESPONSIBLE PERSONNEL	
TYPE OF ACTION	NAME
OBJECTS INSPECTED FROM SEAWARD	Roslyn B. Harris, ENS, NOAA
POSITIONS DETERMINED AND/OR VERIFIED	Robert Mandzi, LTJG, NOAA
FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES	
INSTRUCTIONS FOR ENTRIES UNDER 'METHOD AND DATE OF LOCATION' (Consult Photogrammetric Instructions No. 64,	
<p><b>OFFICE</b></p> <p><b>I. OFFICE IDENTIFIED AND LOCATED OBJECTS</b> 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</p> <p><b>FIELD</b></p> <p><b>I. NEW POSITION DETERMINED OR VERIFIED</b> Enter the applicable data by symbols as follows: F - Field L - Located V - Verified 1 - Triangulation 2 - Traverse 3 - Intersection 4 - Resection</p> <p><b>A. Field positions* require entry of method of location and date of field work.</b> EXAMPLE: F-2-6-L 8-12-75</p> <p><b>*FIELD POSITIONS are determined by field observations based entirely upon ground survey methods.</b></p>	<p><b>FIELD (Cont'd)</b></p> <p><b>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.</b> EXAMPLE: P-8-V 8-12-75 74L(C)2982</p> <p><b>II. TRIANGULATION STATION RECOVERED</b> 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</p> <p><b>III. POSITION VERIFIED VISUALLY ON PHOTOGRAPH</b> Enter 'V-Vis.' and date. EXAMPLE: V-Vis. 8-12-75</p> <p><b>**PHOTOGRAMMETRIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods.</b></p>
<p><b>ORIGINATOR</b></p> <p><input type="checkbox"/> PHOTO FIELD PARTY</p> <p><input type="checkbox"/> HYDROGRAPHIC PARTY</p> <p><input type="checkbox"/> GEODETIC PARTY</p> <p><input type="checkbox"/> OTHER (Specify)</p> <p>FIELD ACTIVITY REPRESENTATIVE</p> <p>OFFICE ACTIVITY REPRESENTATIVE</p> <p><input type="checkbox"/> REVIEWER</p> <p><input type="checkbox"/> QUALITY CONTROL AND REVIEW GROUP REPRESENTATIVE</p>	

NOAA FORM 76-40  
(6-74)

Replaces C&GS Form 567.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
U.S. DEPARTMENT OF COMMERCE  
**NONFLOATING AIDS OR LANDMARKS FOR CHARTS**

**ORIGINATING ACTIVITY**  
 HYDROGRAPHIC PARTY  
 GEODETIC PARTY  
 PHOTO FIELD PARTY  
 COMPILATION ACTIVITY  
 FINAL REVIEWER  
 QUALITY CONTROL & REVIEW GRP.  
 COAST PILOT BRANCH  
*(See reverse for responsible personnel)*

**REPORTING UNIT**  
*(Field Party, Ship or Office)*  
 NOAA SHIP PEIRCE

**STATE**  
 MINNESOTA  
 WISCONSIN

**LOCALITY**  
 DULUTH-SUPERIOR HARBOR

**DATE**  
 11-19-82

The following objects HAVE  BEEN INSPECTED FROM SEAWARD TO DETERMINE THEIR VALUE AS LANDMARKS.  
 OPR PROJECT NO. 2137

**JOB NUMBER**  
 H-10023

**SURVEY NUMBER**  
 H-10023

**DATUM**  
 NORTH AMERICAN DATUM OF 1927

CHARTING NAME	DESCRIPTION <i>(Record reason for deletion of landmark or aid to navigation. Show triangulation station names, where applicable, in parentheses.)</i>	POSITION		LONGITUDE //	D.P. Meters	METHOD AND DATE OF LOCATION <i>(See Instructions on reverse side)</i>	CHARTS AFFECTED
		LATITUDE ° /	LONGITUDE ° /				
F G	(BARKERS IS GREEN DAY BEACON) Privately maintained	46 42	45.73	092 02	54.18	F-2-6-L 10-27-82	14975
F R	(BARKERS IS RED DAY BEACON) Privately maintained	46 42	47.70	092 02	55.42	F-2-6-L 10-27-82	14975
ELEVATOR Strobe Lt	ST LAWRENCE CEMENT ELEVATOR Strobe Lights to be replaced by Fl R Light, Fall 1982	46 45	07.95	092 05	54.77	Outside survey limits	14975

*see L-680 (82)*



RESPONSIBLE PERSONNEL	
TYPE OF ACTION	NAME
OBJECTS INSPECTED FROM SEAWARD	Roslyn B. Harris, ENS, NOAA
POSITIONS DETERMINED AND/OR VERIFIED	Robert Mandzi, LTJG, NOAA
FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES	<input type="checkbox"/> PHOTO FIELD PARTY <input type="checkbox"/> HYDROGRAPHIC PARTY <input type="checkbox"/> GEODETIC PARTY <input type="checkbox"/> OTHER (Specify)  FIELD ACTIVITY REPRESENTATIVE  OFFICE ACTIVITY REPRESENTATIVE  <input type="checkbox"/> REVIEWER <input type="checkbox"/> QUALITY CONTROL AND REVIEW GROUP REPRESENTATIVE
INSTRUCTIONS FOR ENTRIES UNDER 'METHOD AND DATE OF LOCATION' (Consult Photogrammetric Instructions No. 64.)	
<b>OFFICE</b> <b>I. OFFICE IDENTIFIED AND LOCATED OBJECTS</b> 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	<b>FIELD (Cont'd)</b> <b>B. Photogrammetric field positions** require</b> 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
<b>FIELD</b> <b>I. NEW POSITION DETERMINED OR VERIFIED</b> Enter the applicable data by symbols as follows: F - Field L - Located V - Verified 1 - Triangulation 2 - Traverse 3 - Intersection 4 - Resection 5 - Field identified 6 - Theodolite 7 - Planetable 8 - Sextant  <b>A. Field positions* require entry of method of location and date of field work.</b> EXAMPLE: F-2-6-L 8-12-75  <b>*FIELD POSITIONS are determined by field observations based entirely upon ground survey methods.</b>	<b>III. TRIANGULATION STATION RECOVERED</b> 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  <b>III. POSITION VERIFIED VISUALLY ON PHOTOGRAPH</b> Enter 'V-Vis.' and date. EXAMPLE: V-Vis. 8-12-75  <b>**PHOTOGRAMMETRIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods.</b>

HYDROGRAPHIC SURVEY STATISTICS  
REGISTRY NO.: H-10023

Number of positions	3643
Number of soundings	17196
Number of control stations	32

	<u>TIME-HOURS</u>	<u>DATE COMPLETED</u>
Preprocessing Examination	24	14 FEB 83
Verification of Field Data	503	31 OCT 84
Quality Control Checks	199	
Evaluation and Analysis	82	24 JUL 85
Final Inspection	40	24 JUL 85
TOTAL TIME	848	
Marine Center Approval		17 SEP 85

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

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: Duluth, Minnesota (909-9068)

Period: June 8, 1982 - October 18, 1982

HYDROGRAPHIC SHEET: H-10023

OPR- Z137-PE-82

Locality: Lake Superior

Plane of reference: Low Water Datum (IGLD1955 : 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-10023

Name on Survey	Source of Name											
	A	B	C	D	E	F	G	H	K			
	ON CHART NO.	ON PREVIOUS SURVEY NO.	ON U.S. QUADRANGLE MAPS	FROM LOCAL INFORMATION	ON LOCAL MAPS	P.O. GUIDE OR MAP	GRAND McNALLY ATLAS	U.S. LIGHT LIST				
BARKERS ISLAND ✓												1
CONNORS POINT ✓												2
HOG ISLAND ✓												3
HOWARDS BAY ✓												4
LAKE SUPERIOR ✓												5
MINNESOTA (title)												6
MINNESOTA POINT ✓												7
PARK POINT ✓												8
SUPERIOR ✓												9
SUPERIOR BAY ✓												10
WISCONSIN (title)												11
												12
												13
												14
												15
												16
												17
												18
												19
												20
												21
												22
												23
												24
												25

Approved:

*Chas. E. Harrison*  
Chief Geographer - N/CG2x5

JAN 3 1955

ATLANTIC MARINE CENTER  
EVALUATION REPORT

REGISTRY NO.: H-10023

FIELD NO.: PE-05-2-82

Wisconsin-Minnesota, Superior Bay, Connors Point to Hog Island

SURVEYED: June 8 through October 18, 1982

SCALE: 1:5,000

PROJECT NO.: OPR-Z137-PE-82

SOUNDINGS: Ross 5000 Echo Sounder  
Raytheon DE-719 Echo Sounder  
Diver, Lead Line, Sounding Pole

CONTROL: Range/Azimuth-De1  
Norte/Theodolite  
Range/Range-ARGO  
Range/Range-De1 Norte

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

Surveyed by ..... A. A. Armstrong  
..... G. E. Leigh  
..... N. G. Millett  
..... R. M. Mandzi  
..... M. Mozgala  
..... J. W. Bailey  
..... R. B. Harris  
..... S. I. Andreeva

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

1. INTRODUCTION

a. There were no unusual problems encountered on this survey.

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

2. CONTROL AND SHORELINE

a. Control is adequately discussed in sections F and G of the Descriptive Report.

b. Shoreline originates with final reviewed Class I photogrammetric shoreline maps TP-01081, TP-01082, TP-01085, and TP-01086 of 1980-81. The shoreline revisions in red are by the hydrographer.

3. HYDROGRAPHY

a. Depths at crossings are in good agreement.

b. The usual depth curves are adequately delineated except in some areas along bulkheads and in proximity to shore. Here, curves were delineated where sounding was practicable.

c. The development of the bottom configuration and the determination of least depths are considered adequate. The unsurveyed areas between piers and alongside wharfs were occupied by moored vessels during the survey.

#### 4. CONDITION OF SURVEY

The smooth sheet and accompanying overlays, hydrographic records, and reports comply with the requirements of the Hydrographic Manual with the exceptions listed below:

a. An elevator charted at latitude 46°44'17"N, longitude 92°04'53"W was not verified for its landmark value.

b. The existence of submerged piles and an area foul with cable were only partially described by the hydrographer on a field copy of TP-01081 and are not mentioned in the Descriptive Report nor shown on the final field sheet. These items as located were smooth plotted in the following vicinities during office processing.

<u>Items</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
Submerged piles	46°44'15"	92°05'28"
Foul with cable	46°44'20"	92°05'37"

#### 5. JUNCTIONS

Adequate junctions were effected with H-9960 (1981) on the north and H-10028 (1982) on the east. An adequate junction was effected with H-9953 (1981) on the west, except in the vicinity of Howards Bay where, because of improper junctioning techniques on H-9953, it was necessary to supersede H-9953 within the common area.

#### 6. COMPARISON WITH PRIOR SURVEYS

##### a. LS-251 (1861) 1:16,000

This prior survey is dated prior to changes resulting from Federal Channel Projects in the area. Extensive channel dredging and the cultural development along shore preclude a comparison with the present survey.

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

##### b. LS-1824 (1943) 1:15,000

This prior survey covers the northeast section of the present survey in offshore depths of greater than 30 feet. A comparison between prior and

present depths was not accomplished as only a few soundings on the prior survey fall within the common area.

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

## 7. COMPARISON WITH CHART 14975 (26th Edition, April 26, 1980)

### a. Hydrography

The charted hydrography originates with numerous U.S. Army Corps of Engineers surveys and other miscellaneous sources.

The following charted items, which originate with miscellaneous sources, were neither verified nor disproved by the present survey, and are deferred to the compiler for final disposition.

<u>Item</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
Visible piles	46°44'06"	92°05'07"
Visible piles	46°44'20"	92°05'37"
Visible and submerged piles	46°42'29"	92°02'35"
Pier ruins	46°44'37"	92°03'37"
<i>Except as noted above the present survey is considered adequate to supersede charted hydrography.</i>		
b. <u>Controlling Depths</u>		

The charted controlling depths for Howards Bay, East Gate Basin, Superior Front Channel, and Superior Harbor Basin taken together originate with U.S. Army Corps of Engineers surveys of February 1976 through November 1979. Present survey depths are in agreement with the tabulated controlling depths with the exception of a 23-foot sounding located in Superior Harbor Basin at latitude 46°42'32.5"N, longitude 92°01'51.4"W.

### c. Aids to Navigation

The aids to navigation within the area of the present survey adequately mark the features intended. However, some of the aids are not in substantial agreement with their charted positions. It is evident these aids, such as buoys C"3" and N"4" marking the limits of Superior Front Channel, have been moved from their 1980 positions.

### d. Chart Reconstruction

A comparison of the chart with the present survey reveals the need for a complete chart reconstruction. The recommendation is based on the following:

(1) The 1902 chart datum is not compatible with modern charting source data. Horizontal control for present surveys is based on the North American Datum of 1927.

(2) A comparison of the shoreline reveals large unaccountable discrepancies, especially in the vicinity of Minnesota Point and the northwestern portion of the present survey.

(3) The location of many charted aids to navigation are in disagreement within the common area of the present survey.

(4) Significant changes to the shoreline along the west side of Superior Bay have taken place due to extensive harbor improvements and construction projects alongshore.

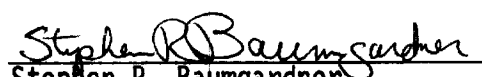
8. COMPLIANCE WITH INSTRUCTIONS

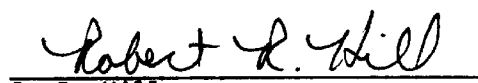
This survey adequately complies with the project instructions.

9. ADDITIONAL FIELD WORK

This is a good basic survey and no additional field work is required.

  
\_\_\_\_\_  
R. L. Keene  
Cartographic Technician  
Verification of Field Data

  
\_\_\_\_\_  
Stephen R. Baumgardner  
Cartographer  
Standards Section (N/CG242)  
Evaluation and Analysis


  
\_\_\_\_\_  
R. R. Hill  
Senior Cartographic Technician  
Verification Check



Certification of Digital Data  
H-10023

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, sounding and digitized data printouts of the survey have been made.


Certified: 17 September 1985

  
\_\_\_\_\_  
Robert G. Roberson  
Chief, Evaluation and Analysis Group

Inspection Report  
H-10023

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 survey complies with National Ocean Service (NOS) requirements except as noted in the Evaluation Report. The survey records comply with NOS requirements except where noted in the Evaluation Report.

Inspected

  
\_\_\_\_\_  
George K. Myers  
Chief, Standards Section (N/CG242)  
Hydrographic Surveys Branch

Approved

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

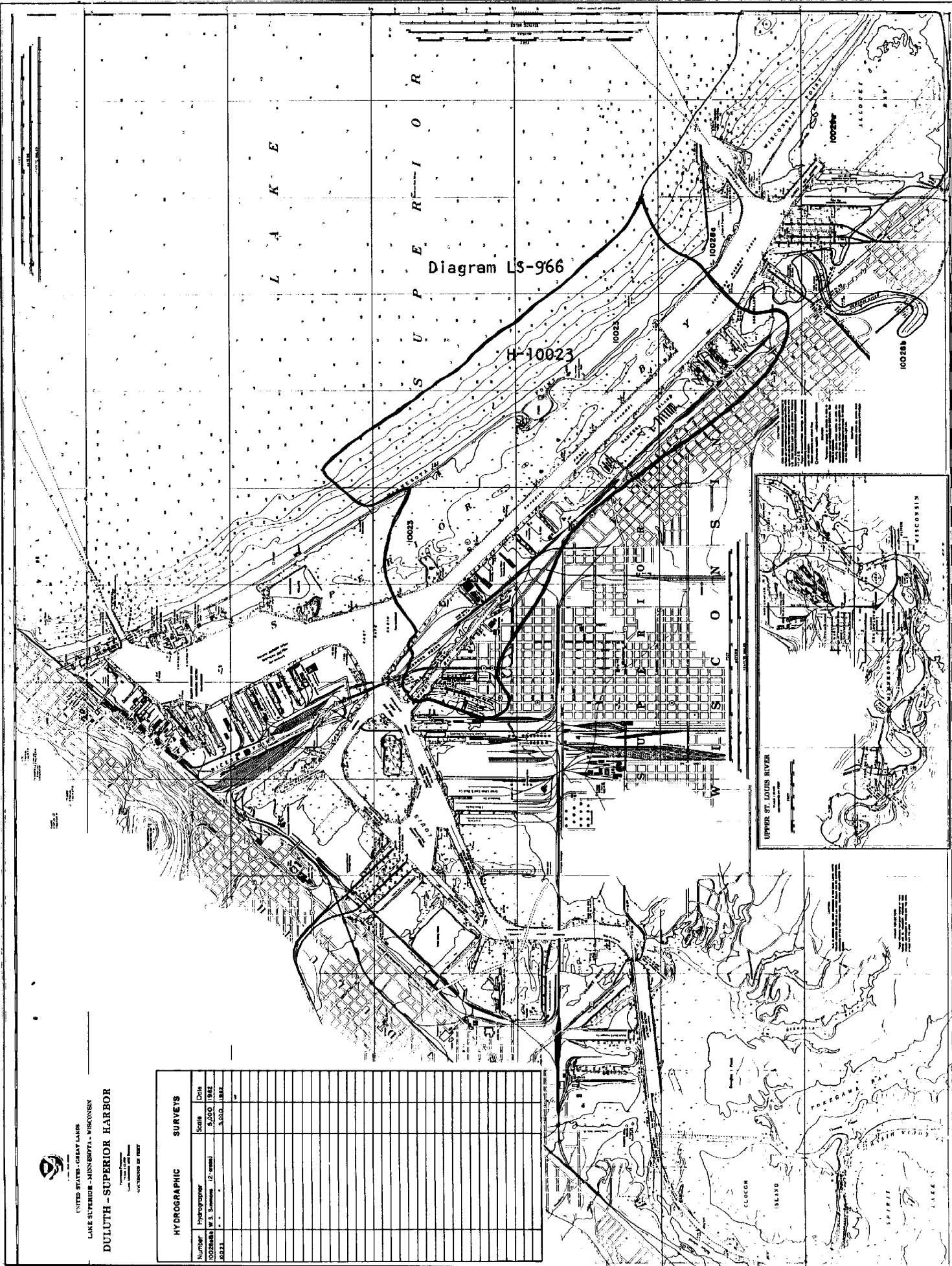


Diagram LS-966

L A K E S U P E R I O R

W I S C O N S I N



HYDROGRAPHIC SURVEYS	
Number	Date
10023	5,000 1962
10024	5,000 1962
10025	5,000 1962
10026	5,000 1962
10027	5,000 1962
10028	5,000 1962
10029	5,000 1962
10030	5,000 1962
10031	5,000 1962
10032	5,000 1962
10033	5,000 1962
10034	5,000 1962
10035	5,000 1962
10036	5,000 1962
10037	5,000 1962
10038	5,000 1962
10039	5,000 1962
10040	5,000 1962
10041	5,000 1962
10042	5,000 1962
10043	5,000 1962
10044	5,000 1962
10045	5,000 1962
10046	5,000 1962
10047	5,000 1962
10048	5,000 1962
10049	5,000 1962
10050	5,000 1962
10051	5,000 1962
10052	5,000 1962
10053	5,000 1962
10054	5,000 1962
10055	5,000 1962
10056	5,000 1962
10057	5,000 1962
10058	5,000 1962
10059	5,000 1962
10060	5,000 1962
10061	5,000 1962
10062	5,000 1962
10063	5,000 1962
10064	5,000 1962
10065	5,000 1962
10066	5,000 1962
10067	5,000 1962
10068	5,000 1962
10069	5,000 1962
10070	5,000 1962
10071	5,000 1962
10072	5,000 1962
10073	5,000 1962
10074	5,000 1962
10075	5,000 1962
10076	5,000 1962
10077	5,000 1962
10078	5,000 1962
10079	5,000 1962
10080	5,000 1962
10081	5,000 1962
10082	5,000 1962
10083	5,000 1962
10084	5,000 1962
10085	5,000 1962
10086	5,000 1962
10087	5,000 1962
10088	5,000 1962
10089	5,000 1962
10090	5,000 1962
10091	5,000 1962
10092	5,000 1962
10093	5,000 1962
10094	5,000 1962
10095	5,000 1962
10096	5,000 1962
10097	5,000 1962
10098	5,000 1962
10099	5,000 1962
10100	5,000 1962

UNITED STATES - GREAT LAKES  
 LAKE SUPERIOR - LAKE SUPERIOR, WISCONSIN  
**DULUTH - SUPERIOR HARBOR**  
 HYDROGRAPHIC SURVEYS  
 5,000 FEET

