

FE392

NOAA FORM 76-35A

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

## DESCRIPTIVE REPORT

Type of Survey ..... Field Examination .....  
Field No. .... AHP-10-10-93 .....  
Office No..... FE-392 .....

### LOCALITY

State ..... Wisconsin .....  
General Locality ..... SW Shore of Lake Michigan .....  
Locality ..... Praire Cove to Oak Creek .....

19 93

CHIEF OF PARTY  
LCDR James E. Waddell, Jr. ....

### LIBRARY & ARCHIVES

DATE ..... AUG 16 1995 .....

Diagram R5-7

P/L

PRODUCTS

CP-6  
14925  
14904  
14901

## HYDROGRAPHIC TITLE SHEET

FE-392

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.

AHP-10-10-93

State WisconsinGeneral locality SW Shore of Lake MichiganLocality Praire Cove to Oak CreekScale 1:10,000 Date of survey 7/12/93 to 8/20/93Instructions dated April 30, 1993 Project No. S-Y902-AHPVessel NOAA Launch 1292Chief of party LCDR James E. Waddell, Jr.Surveyed by Atlantic Hydrographic PartySoundings taken by echo sounder, ~~hand lead, pole~~ Innerspace Model 448, S/N 187Graphic record scaled by BAL, TMRGraphic record checked by BALEvaluation by: ~~Projected by~~ Gordon E. Kay Automated plot by PHS Xynetics PlotterVerification by Gordon E. KaySoundings in ~~fathoms fms~~ meters and decimeters at ~~MLLW~~ MLLW

REMARKS: Time in UTC, revisions and marginal notes in black were generated  
during office processing. All separates are filed with the  
hydrographic data, as a result page numbering may be interrupted  
or non-sequential.

All depths listed in this report are referenced to mean lower low  
water unless otherwise noted.

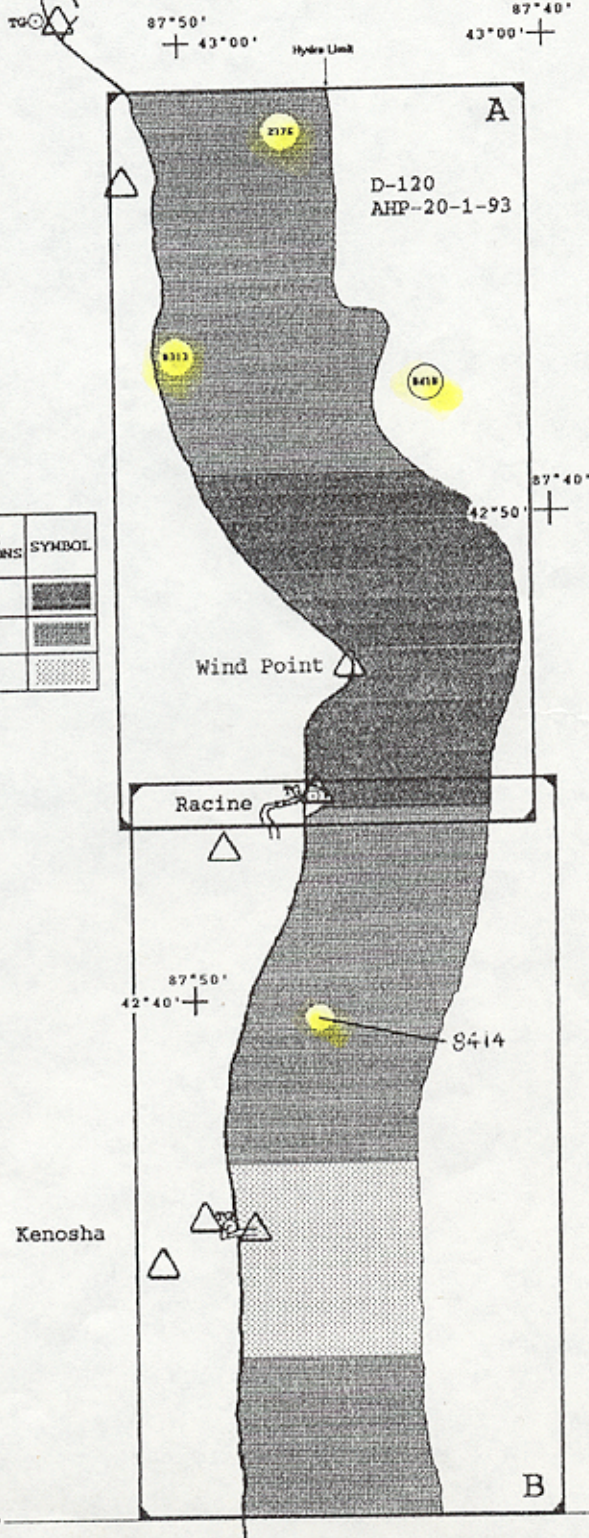
8/16/95

Awois and SURF ✓ Rnd

PROGRESS SKETCH  
 S-Y902-AHP  
 SW SHORE OF LAKE MICHIGAN  
 ATLANTIC HYDROGRAPHIC PARTY  
 LT. JAMES E. WADDELL, CMDG

MONTH	LINEAL NM SOUNDINGS	SQUARE NM SOUNDINGS	LINEAL NM SS	LINEAL NM T/F & MISC	DP'S	CONTROL STATIONS	TIDE STATIONS	SYMBOL
JUNE	108.9	21	0	27	0	4	3	
JULY	277.4	38	0.5	137	16	0	0	
AUGUST	94.2	20	0	15	6	0	2	

Milwaukee



VI/IL State Line

Descriptive Report to Accompany  
FE-392  
AHP-10-10-93  
S-Y902-AHP  
Scale: 1:10,000  
Atlantic Hydrographic Party  
Chief of Party: LCDR James E. Waddell, Jr., NOAA  
1993

A. PROJECT

This survey was conducted in accordance with Hydrographic Project Instructions for S-Y902-AHP, Southwest Shore of Lake Michigan, Wisconsin, dated April 30, 1993. No changes to these instructions were issued. ✓

The purpose of project S-Y902-AHP is to provide hydrographic data to be used for the construction of updated and accurate large-scale maps of the shoreline and coastal zone for a systematic regional assessment of erosion, sedimentation, and flooding. This is in response to a need expressed by the International Joint Commission for updated and accurate large-scale maps of the shoreline and coastal zone and Public Law 100-200, the "Great Lakes Shoreline Mapping Act of 1987." ✓

FE-392 addresses the AWOIS items and ~~the~~ newfound features for this project as well as the hydrographic development which resulted from Reconnaissance Surveys D-120 and D-121. ✓

B. AREA SURVEYED

The area surveyed for FE-392 extends from the Illinois/Wisconsin state line northward along the southwest shore of Lake Michigan, to Cudahy, Wisconsin, a village just south of Milwaukee, Wisconsin. The survey area extends offshore six kilometers. The area is bounded by the following geographic points: ✓

Northwest - 42°58'20"N, 087°51'00"W  
Southwest- 42°29'45"N, 087°48'15"W  
Northeast - 42°43'48"N, 087°41'30"W  
Southeast - 42°29'45"W, 087°43'30"W

This survey was conducted from July 12, 1993 (DN 193) to August 17, 1993 (DN 229). ✓

C. SURVEY VESSELS

NOAA launch 1292 (EDP No. 1292), a 21-foot MonArk, was used to collect all data on this survey. No problems were encountered with the vessel. ✓

D. AUTOMATED DATA ACQUISITION AND PROCESSING

The Hydrographic Data Acquisition and Processing System (HDAPS) was used to process all hydrographic data for this survey. Listings of version numbers for the various HP-DPS programs used for all data processing are appended to this report. In addition to the HDAPS, the following non-HDAPS computer programs were used: ✓

VELOCITY	Ver. 1.11 (3/9/90)
NADCON	Ver. 1.01
MONITOR	Ver. 1.31

PC-DAS programs, in the NOAAEXE directory, Version 5.00 were used for on-line data acquisition on the survey vessel for the entire survey. This version has DGPS capabilities, including the new sensor initialization program. ✓

E. SONAR EQUIPMENT

Side Scan SONAR was used on this survey as an identification tool only. The equipment was not interfaced with the PC-DAS on the vessel, nor was it used for any least depth determinations. When an item or feature was identified by echo sounder or marked by a buoy, the side scan was deployed to determine the nature of the feature only. ✓

F. SOUNDING EQUIPMENT

Innerspace depth sounder, model 448, serial number 187, was used for echo sounding data collection for the entire survey. No problems were experienced with this echo sounder. ✓

A standard lead line calibrated in meters, serial number 1292, was used during this survey for comparison readings with the echo sounder. No pole soundings were obtained on this survey. ✓

G. CORRECTIONS TO SOUNDINGS

Corrections for the speed of sound through the water column were computed from data obtained with a Seabird Electronics, Seacat Velocity Probe Model 19-03, serial number 192276-287. This instrument was calibrated by the manufacturer on March 19, 1993. A copy of this calibration is in the Survey Separates, section IV.\* ✓

Program VELOCITY was used for computing the speed of sound correctors. Speed of sound corrections were applied to the plotter sheets using the HDAPS "Reapply Depth Correctors" function as required by the Field Procedures Manual. Copies of the tables and support documentation are in the Survey Separates, section IV.\* ✓

The following speed of sound casts were taken on this survey: ✓

No.	DN	DATE	Latitude	Longitude	Depth
					Actual/Extended
1	180	6/29/93	42°50.0'N	087°45.0'W	20.4m/26.5m
2	194	7/13/93	42°35.0'N	087°45.0'W	21.3m/27.7m
3	200	7/19/93	42°40.0'N	087°42.0'W	18.8m/24.4m
4	215	8/03/93	42°32.0'N	087°40.0'W	35.7m/46.4m

The following table shows the Velocity Tables used for field processing, which is also recommended for final processing at the Pacific Marine Center: ✓

*Hydrographic Section*

Cast No.	Table No.	Use for Days
4	4	208 - 232

Note: No velocity was applied to DN 193 because it is detached positions only for FE-392. ✓

Survey records were scanned by AHP employees in accordance with the Hydrographic Manual. With the digital reading taking precedence over the analog trace, significant peaks and deeps which occurred between selected soundings, missed depths, incorrectly digitized soundings, and effects of sea and swell action were inserted or corrected, as appropriate, while scanning. ✓

*\* filed with the survey records*

Lead line comparisons were conducted each day of hydrography on surveys D-120 and D-121, except day 195 when it was too rough, as well as day 232 on FE-392 to determine an instrument corrector. The average corrector for the Innerspace depth sounder, S/N 187, was 0.1 meters. This correction was not applied to the field sheets. The lead line, calibrated in meters, was checked on 6/23/93. No lead line corrections were necessary. A lead line comparison form, as well as the lead line calibration form, can be found in the Survey Separates.\* ✓

A static draft of 0.3 meter was applied to all sounding plots using the HDAPS "Reapply Depth Correctors" program. The draft was measured by subtracting the difference from a punch mark on the side of launch 1292, 0.6 meters above the transducer, to the water surface. ✓

Settlement and squat measurements for vessel 1292 were performed on March 31, 1993 using the level method. Settlement and squat correctors were applied to all sounding plots using the HDAPS "Reapply Depth Correctors" program. Data from the settlement and squat test are included in the Survey Separates, section IV.\* ✓

Daily water level correctors determined by readings taken from the ETG at station 908-7054, Racine, WI or station 908-7052, Kenosha, WI, whichever was closest to the daily survey area, were applied to all plotter sheets. The readings were reduced to the IGLD of 1985 for Lake Michigan of 176.0 meters. An abstract of the determination of the daily correctors is included in the Survey Separates.\* ✓

Actual water level heights were requested from the Great Lakes Section, N/OES211, in a letter dated September 14, 1993. A copy of the letter is appended to this report.\* ✓

A correction from local time to UTC of six hours was used for data collected on day 193. The correction should have been five hours. This data was subsequently block edited to correct this time error before any re-application of depth correctors or plotting was done. While the times shown on both the graphic records and the printouts were not individually changed, a warning note was annotated on both. Times for the records should be one hour earlier than shown. ✓

#### H. CONTROL STATIONS

The horizontal control datum for this project is the North American Datum of 1983. Station 001 was used as the base station antenna site for the Global Positioning System (GPS) for the entire survey. ✓

\* Filed with the survey records.



Station 001, WIND 1993, was located by GPS observations between NGS first and second order stations and WIND 1993. Stations PUGH (002) and KELT (003), a point referred to in the calibration records as Kenosha Light, were also located by the same methods for use as DGPS calibration points. The Horizontal Control Report was written by AHP and submitted with the field records to the Chief, Pacific Photogrammetry Party, N/CG2333. A list of the control stations is appended to this report. ✓

## I. HYDROGRAPHIC POSITION CONTROL

Differential GPS was used as the method of positioning for all hydrographic data on this survey. An Ashtech model XII receiver, serial number 700283E1389 was used for the reference station. An Ashtech Sensor, serial number 700417B1207 was used for the remote station on vessel 1292. Maxxon VHF radios using channel one (Frequency 170.200 MHz) were used as the data link between reference and remote stations. ✓

To confirm the reference site as required by section 3.4.6.3 of the Field Procedures Manual, program MONITOR was run for 24 hours starting on June 21, 1993. The GPS availability at this site was determined to be 100% from this test. A copy of the outlier.sum file from the test, showing the statistics, as well as the "Plot of Radial Error in Position", is included in the Survey Separates. ✓

Performance checks, as required by section 3.4.4 of the Field Procedures Manual, were accomplished by comparing the DGPS position of the vessel to points established with GPS by AHP to Third-Order standards. Performance checks were obtained daily, except day 231. Data from day 231 was not affected, since the calibration on day 232 was within tolerances. "DGPS Fixed Point Performance Check" forms used during this survey are in the Survey Separates. ✓

The HDOP during this survey never exceeded the maximum allowed value of 7.5. This was calculated by the formula found in the Field Procedures Manual, using an ESE value of 4m, an EPE value of 30m, and an EDE value of 0.2m. *See Evaluation Report, section 2* ✓

Occurrences of "lost lock" were minimal and caused by loss of broadcast correctors from the reference station. Operations were suspended during these periods. ✓

*\* filed with the survey records.*

J. SHORELINE

Shoreline shown on the 1:120,000 scale page plot included with this survey was transferred by hand from chart 14904, for orientation purposes only. Enlargement plots at the survey scale of 1:10,000 do not have shoreline applied because no 1:10,000 scale shoreline source was available.

No shoreline verification was requested in the Project Instructions for S-Y902-AHP.

*section 4.1.2.*

K. CROSSLINES

Not applicable.

L. JUNCTIONS

Not Applicable.

M. COMPARISON WITH PRIOR SURVEYS *SEE Evaluation Report, section 6*

Comparison with prior surveys will be accomplished by N/CG245.

N. ITEM INVESTIGATION REPORTS

Because of time constraints mentioned in the Project Instructions, only 4 of 15 assigned items were resolved on this project. The items resolved were 2176, 8409, 8410, and 8414. ✓

N.1 SUMMARY OF ITEMS INVESTIGATED

<u>Sheet Number</u>	<u>AWOIS No.</u>	<u>Section</u>	<u>Status</u>	<u>Recommendation</u>
2	8409	N2.	Resolved	Chart at surveyed position.
3	2176	N3.	Resolved	Shift* to surveyed position.
4	8410	N4.	Resolved	Shift* to surveyed position and delete PA notation.
5	8414	N5.	Resolved	Shift* to surveyed position and delete PA notation.

*\* Delete Charted feature, chart feature at survey position.*

N2. AWOIS ITEM 8409 *on sheet 2*

Item Description: Submerged Breakwater

Source: CL532/89--USCG; LNM7/89 (4/21/89)--9th CGD

AWOIS Position: 42/54/12.06N 087/50/36.28W

Required Investigation: ES, DI

Charts Affected: 14904

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INVESTIGATION

Date(s)/DN(s): 7/12/93 Project/Survey: S-Y902-AHP/FE-392

Position Numbers: 585 - 588 Launch Number: 1292

Investigation Used: Visual Search

Position Determined By: DGPS

Investigation Summary: The breakwater was located by detached position. While the barge described by this item was sunk to the bottom, the height of the barge is greater than the depth of the water, and the resulting breakwater was never submerged. Positions were taken on the southeast (with red light) and southwest corners of the barge, which is 10 meters wide. The southerly side of the barge forms the northerly side of the entrance into Oak Creek. Two large steel tanks, welded together, were sunk as a breakwater to form the southerly side of the entrance to Oak Creek. These were also located by detached positions.

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CHARTING RECOMMENDATION

Chart breakwaters <sup>*Position #585*</sup> at 42/54/15.<sup>*43*</sup>N, 087/50/32.<sup>*35*</sup>W (offshore end, north side <sup>*03*</sup> with private red light) and at 42/54/16.6N, 087/50/34.<sup>*00*</sup>W (offshore end, south side, with private green light). <sup>*2.4*</sup> The red light on the north breakwater is exposed <sup>*12.8*</sup> 12.8 ft. (<sup>*3.9*</sup> 3.9 m); the barge is exposed 3.9 ft. (1.2 m) at the southeast corner to 9.5 ft. (2.9 m) at the southwest corner. <sup>*3.3*</sup> The green light on the south breakwater is exposed <sup>*16.8*</sup> 16.8 ft. (<sup>*4.8*</sup> 4.8 m); the steel tanks is exposed 9.5 ft. (2.9 m). Elevations are corrected to LWD, IGLD 1985, using <sup>*the*</sup> ~~the preliminary~~ <sup>*approved water levels.*</sup> daily ~~corrector.~~

*M/C  
✓14904  
✓14901*

N3. AWOIS ITEM 2176 Sheet 3 of 8

Item Description: Submerged Wreck (Dipper Dredge)

Source: BP123485/84, Port Washington Maritime Museum

AWOIS Position: 42/58/08.05N, 087/47/05.28W

Required Investigation: ES, DI, SD

Charts Affected: 14904

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INVESTIGATION

Date(s)/DN(s): 7/27/93/208 Project/Survey: S-Y902-AHP/FE-392

Position Numbers: 1056 Launch Number: 1292

Investigation Used: ES, (Side Scan was used as identifying tool only)

Position Determined By: DGPS

Investigation Summary: The wreck was found marked by a small plastic float, and was passed over several times with the echo sounder to determine the least depth. A detached position was taken as soon as the least depth was passed over. The charted green wreck buoy was discontinued April 25, 1993, according to the ATON team at the USCG Station Kenosha.

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CHARTING RECOMMENDATION

*Delete*  
*Chart Wreck at*  
Revise the charted wreck to the surveyed position at 42/58/05.80N, 087/47/11.73W. Least depth found over the wreck was 23.79 ft (7.15 meters) corrected to LWD, IGLD 1985, using the preliminary daily corrector.  
*Actual water levels.*

*APPD  
✓14904 ✓14901  
1-29-99  
JMT*

N4. AWOIS ITEM 8410 *Sheet 4*

Item Description: Submerged Wreck (126' Schooner, "Lumberman")

Source: CL1633/84--USPS

AWOIS Position: 42/52/07.52N, 087/45/21.73W

Required Investigation: ES, S2, DI, SD

Charts Affected: 14904

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INVESTIGATION

Date(s)/DN(s): 7/27/93/208<sup>✓</sup> Project/Survey: S-Y902-AHP/FE-392

Position Numbers: 1034 - 1035 Launch Number: 1292

Investigation Used: ES (Side Scan was used as identifying tool only)

Position Determined By: DGPS

Investigation Summary: The wreck was marked by a small plastic float. Side Scan was deployed to positively identify the object as the wreck. Several passes with the echo sounder were made over the wreck to determine the least depth, and a detached position was taken. The wreck lies in an east/west orientation. The side scan picture shows the wreck to be well preserved and intact.

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CHARTING RECOMMENDATION

*Delete*  
*Chart wreck at*  
Revise the charted wreck, to <sup>the</sup> surveyed position ~~at~~  
~~42/52/10.7N, 087/45/24.7W (east end), 42/52/10.2N, 087/45/25.9W~~  
(west end). Least depth found over wreck is 53.14 ft. (16.2m) on  
the west end.\* ~~Least depth over the east end is 56.8 ft. (17.3m).~~  
Elevations are corrected to LWD, IGLD 1985, Delete the charted PA  
notation. *CONCUR*

\* because of scale only the shallowest sounding was considered.

*App'd*  
*1/17/94*  
*1-29-99*  
*14901*

N5. AWOIS ITEM 8414 *sheets*

Item Description: Submerged Wreck (Open Scow Barge)

Source: LNM68/75 (8/27/75)--9th CGD

AWOIS Position: 42/38/30.07N, ✓ 087/47/12.26W ✓

Required Investigation: ES, BD, DI, SD

Charts Affected: 14904

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#### INVESTIGATION

Date(s)/DN(s): 8/19/93 (231) Project/Survey: S-Y902-AHP/FE-392

Position Numbers: 143

Launch Number: 1292

Investigation Used: ES (Side Scan was used as an identifying tool only)

Position Determined By: DGPS

Investigation Summary: While running a crossline, a spike was noted in the vicinity of this item. Side scan was deployed in the area of the spike, which was identified as a wreck. Several passes with the echo sounder were made over the wreck to determine the least depth, and a detached position was taken.

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#### CHARTING RECOMMENDATION

*Delete*  
Revise ~~the~~ <sup>Chart a Wreck at</sup> charted wreck PA ~~to~~ the surveyed position <sup>at</sup> 42/38/45.0N, 087/47/28.1W. Least depth found over wreck was 37.52 ft (9.92 m) corrected to LWD, IGLD 1985, using the ~~preliminary~~ <sup>Actual</sup> daily corrector. Delete the charted PA notation. *Concur*

*App'd  
1/19/2011  
2-1-99  
AT*

O. COMPARISON WITH THE CHART

This survey was compared with Chart 14904, 1:120,000 scale, 21st edition, dated February 17/90 and Chart 14925, 22nd edition, June 27/92.

Several dangers to navigation were identified on this survey. The following table summarizes them.

Dangers to Navigation Affecting Charts 14904 and 14925

PN	Feature	Latitude(N)	Longitude(W)	Elevation
572	Submerged Pipe (12" Dia.) (E) 3	42/52/21.82	087/50/33.4'	covers 0.3 ft ✓ 0.1 m ✓ ✓ 14904 NC
573	Boulder (10' Dia.) (E) 3	42/52/25.7	087/50/32.6	covers 0.3 ft ✓ 0.1 m ✓ ✓ 14904 NC
576	Submerged Breakwater (E) 3	42/52/35.6	087/50/35.8	see descrip. ✓ 14904 below NC
*	Revised Depth Charted 12' Shoal	42/57/30	087/50/07	L.D. 9.8 ft ✓ 3.0 m previously app'd ✓ 14904
1407 to 1408	Obstruction (X) 7 17 ft obstn 10/6/93	42/45/23.2	087/45/58.9 NM 40/93	L.D. 18.0 ft ✓ 5.5 m ✓ ✓ 14925 ✓ 14904
vic. 1307	Shoal (E) 6	42/49/32.5	087/45/59.7	L.D. 34.7 ft ✓ 10.6 m ✓ ✓ 14904 prev. app'd ✓ 14904
1075	Submerged Rock Groin (X)'	42/33/47.92	087/48/39.169	covers 2.3 ft ✓ 0.7 m ✓ ✓ 14904 NC
1076	Submerged Rock Groin (X)'	42/33/53.62	087/48/40.45	covers 2.6 ft. 0.8 m 1.0
1077	Submerged Rock Groin (X)'	42/33/34.12	087/48/40.91	covers 3.3 ft. 1.0 m 2

- \* - Found and Discussed as part of Survey D-120.
- ( ) - Indicates plotter sheet letter for feature, found in the appendix of this report, revised to smooth sheet - NUMBERING.

*attached.*

A copy of the Danger to Navigation Letter is ~~included in the Survey Separates.~~ All of the listed features are recommended for charting. The position listed for the submerged breakwater is the approximate center of two separate sections of submerged breakwater. For charting, a breakwater in ruins should be shown between 42°52'28.1"N, 087°50'33.2"W (South end) and 42°52'47.6"N, 087°50'38.7"W (North end). See ~~plotter sheet 3~~ <sup>SS</sup> appended to this report. ✓  
NC

Three indications of shoaling found while conducting Reconnaissance Survey D-120 were developed as part of FE-392. The first is in an area currently charted with depths between 48 and 51 feet. This area was found to have shoaler depths of ~~34.8~~ <sup>34.8</sup> ft. (10.87 meters) centered around 42°49'35.1<sup>05</sup>N, 087°46'00"W<sup>33</sup>. The shoaler depth is recommended for charting in this area. See ~~plotter sheet 6~~ <sup>SS</sup> appended to this report. ✓ 14904  
✓ 14901  
CONCUR

The second development was in an area currently charted with depths between 45 and 56 feet. This area was found to have depths of ~~47.1~~ <sup>47.1</sup> feet (12.45 meters) centered around 42°48'50"N, 087°45'29"W. The shoaler depth is recommended for charting in this area. See ~~plotter sheet 6~~ <sup>SS</sup> appended to report. ✓ 14904  
✓ 14901

The third development was in an area currently charted as 33 feet just west of the south end of Wind Point South Shoal. An area, with depths of ~~25.76~~ <sup>25.76</sup> feet (7.78 meters) was found centered at 42°45'53"N, 087°45'03"W. This 25-foot depth should replace the currently charted 33 foot depth. See ~~plotter sheet 6~~ <sup>SS</sup> appended to this report. ✓ 14914  
✓ 14925  
✓ 14901

A foul limit line was run from position 580 to position 584 to delineate an area found foul with boulders. A 12" diameter steel pipe was also found in this area. It is the hydrographer's opinion that charting the boulder and the pipe listed in the table above, will adequately depict this area at the chart scale of 1:120,000. CONCUR  
SS  
Scan sheet 7 doesn't agree with location!  
Used both  
JAT

Recommendations for changes to scale, coverage and format are described in the "User Evaluation Report", a copy of which is appended to this report. ✓

P. ADEQUACY OF SURVEY

This field examination survey is complete <sup>to supplement</sup> and ~~adequate~~ for use in nautical chart updating. CONCUR



Q. AIDS TO NAVIGATION

The GR"WR" wreck buoy, charted at 42°58'08.0"N, 087°47'05.3"W was found not to be marking the AWOIS item 2176 wreck. Contact was then made with the USCG ATON team at Kenosha, Wisconsin (phone - 414-657-7202), who reported the buoy discontinued in April 1993. A copy of the USCG teletype message is appended to this report. The buoy is recommended for removal from chart 14904. *CONCUR*

No other aids to navigation were addressed as part of FE-392. ✓

R. STATISTICS

Description

Total Positions	<i>28130 total</i>
Detached Positions	<i>22</i>
Total Miles of Hydrography	5.6
Bottom Samples	0
Velocity Casts	4
Water Level Stations	2
Days of Production	6

S. MISCELLANEOUS

No bottom samples were taken on this survey, as per Project Instructions section 6.7

T. RECOMMENDATIONS

A Surf form submitted as part of this project requests that chart 14925 be extended northward to include the Wind Point North Shoal. A copy of this request is appended to this report. The hydrographer feels this is a valid request because of the amount of recreational boating traffic in this area. *CONCUR*

U. REFERRAL TO REPORTS

<u>Title</u>	<u>Transmittal Information</u>
Horizontal Control Report for S-Y902-AHP2	Pacific Photogrammetry Party Seattle, WA (N/CG2333)9/93
User Evaluation Report S-Y902-AHP	Pacific Hydrographic Section (N/CG245) Seattle, WA 9/93
Coast Pilot Report S-Y902-AHP	Pacific Hydrographic Section (N/CG245) Seattle, WA 9/93
Descriptive Report for D-121	Pacific Hydrographic Section (N/CG245) Seattle, WA 9/93
Descriptive Report for D-120	Pacific Hydrographic Section (N/CG245) Seattle, WA 9/93

Submitted by: Brian A. Link  
Atlantic Hydrographic Party

Control Station List  
S-Y902-AHP  
Wisconsin  
SW Shore of Lake Michigan

001	-	42°46'52.230"N	087°45'30.347"W	WIND 1993 ✓
002	-	42°44'01.703"N	087°46'51.892"W	PUGH 1993 ✓
003	-	42°35'19.733"N	087°48'30.992"W	KELT 1993 ✓

001 - Used as the DGPS Reference Station  
002 - Used as a DGPS Calibration Point  
003 - Used as a DGPS Calibration Point



UNITED STATES DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
NATIONAL OCEAN SERVICE  
Coast and Geodetic Survey  
Norfolk, Virginia 23510-1114

**ADVANCE  
INFORMATION**

Atlantic Hydrographic Party  
439 West York St.  
Norfolk, VA 23510-1114

August 23, 1993

Commander, (OAN)  
Ninth U. S. Coast Guard District  
1240 East 9th Street  
Cleveland, Ohio 44199-2060

Dear Sir,

While conducting reconnaissance surveys (Registry No.'s D-120 and D-121) of the west shore of Lake Michigan, between the Illinois/Wisconsin state line and Milwaukee Harbor, several uncharted features were identified which pose potential dangers to navigation. These features are listed on an attachment to this letter and are recommended for inclusion in the Local Notice to Mariners.

The positions are in NAD 83 datum and the elevations have been reduced to Low Water Datum (LWD) for Lake Michigan using preliminary water level correctors. The features were located using Differential GPS. This information affects chart 14904, 21st Edition/February 17/90, NAD 1983 datum and chart 14925, 22nd edition, June 27/92, NAD 1983. Chart sections showing the locations of these dangers are attached.

Questions concerning this report should be directed to me at (904) 492-1050 or Mr. Dennis Hill at the Pacific Hydrographic Section, Seattle, WA at (206) 526-6853.

Sincerely,

Lt. James E. Waddell, Jr., NOAA  
Chief, Atlantic Hydrographic Party

Attachment

cc: N/CG221  
N/CG245  
DMAHTC



## ADVANCE INFORMATION

### Dangers to Navigation Affecting Charts 14904 and 14925

Post#	Feature	Latitude(N)	Longitude(W)	Elevation
	=====			
	=====			
572	(A) Submerged Pipe (12" Diameter)	42/52/21.82	087/50/33.41	covers 0.3 ft. 0.1 m
573	(B) Boulder (10' Diameter)	42/52/25.70	087/50/32.63	covers 0.3 ft. 0.1 m
576	(C) Submerged Breakwater	42/52/35.62	087/50/35.85	covers 1.0 ft. 0.3 m
	(D) Revised Depth Charted 12' Shoal	42/57/30	087/50/07	L.D. 10 ft. 3.0 m
	(E) Obstruction	42/45/23.2	087/45/58.9	L.D. 18 ft. 5.2 m
130	(F) Shoal	42/49/32.66	087/45/59.138	L.D. 34 ft. 10.67 m
1075	(G) Submerged Rock Groin	42/33/47.92	087/48/39.769	covers 2 ft. 0.79 m
1076	(H) Submerged Rock Groin	42/33/53.62	087/48/40.45	covers 2 ft. 0.8 m
1077	(I) Submerged Rock Groin	42/33/34.12	087/48/40.91	covers 3 ft. 1.0 m

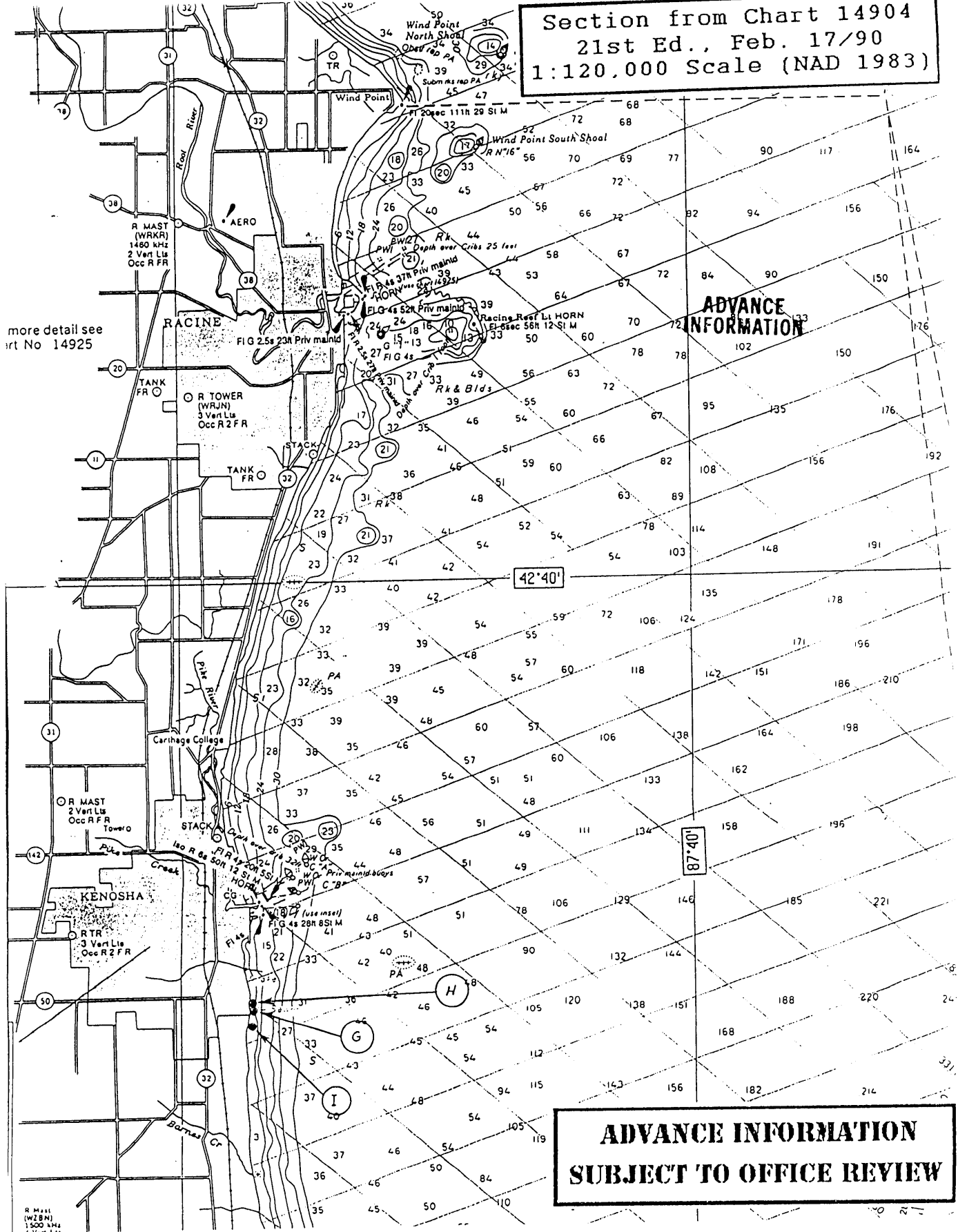
*see p 11  
for final  
depth*

THIS IS ADVANCE FIELD INFORMATION  
SUBJECT TO OFFICE VERIFICATION

Section from Chart 14904  
21st Ed., Feb. 17/90  
1:120,000 Scale (NAD 1983)

**ADVANCE  
INFORMATION**

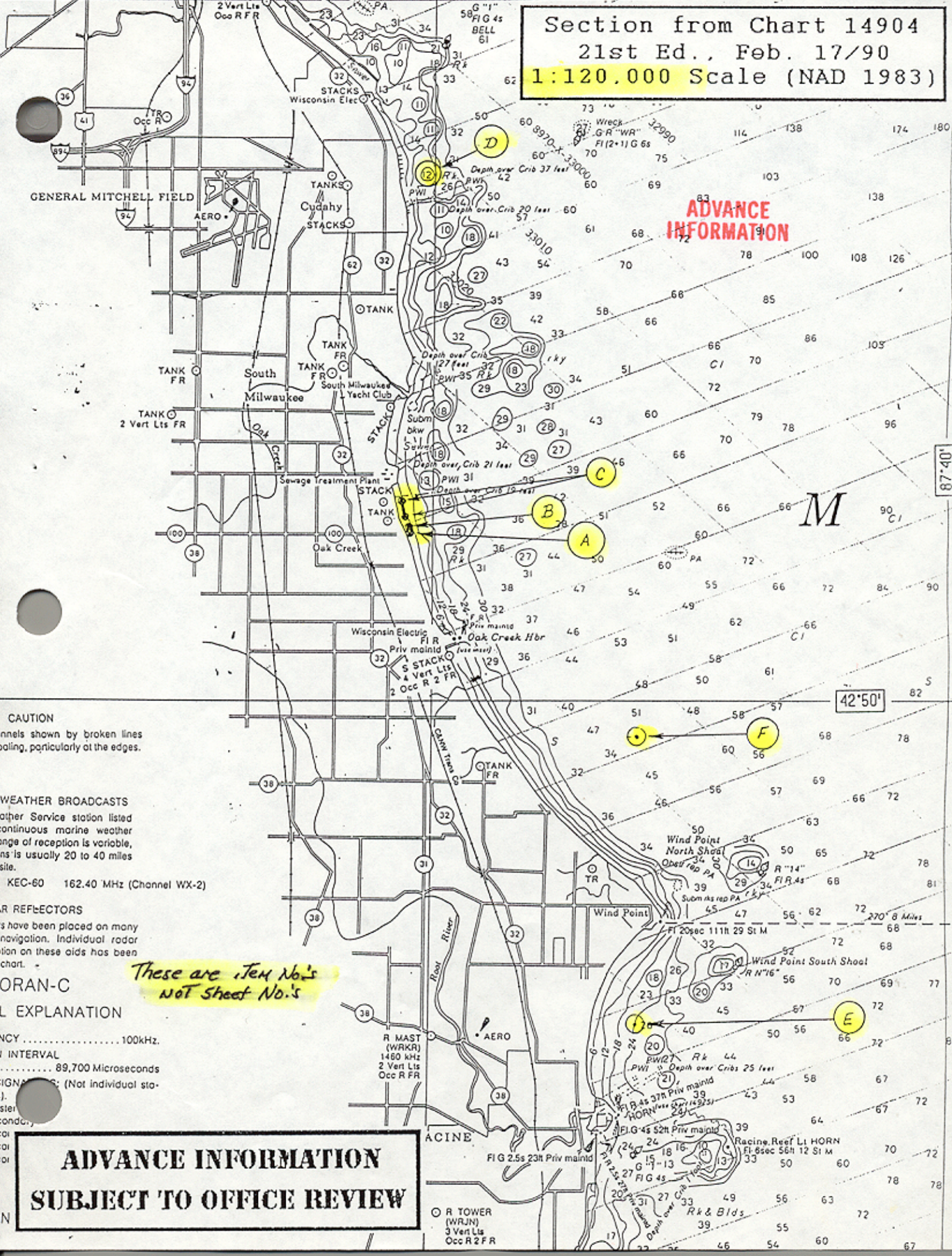
**ADVANCE INFORMATION  
SUBJECT TO OFFICE REVIEW**



more detail see  
chart No 14925

R Mast  
(WZBN)  
1500 kHz  
4 Vert Lis

Section from Chart 14904  
 21st Ed., Feb. 17/90  
 1:120,000 Scale (NAD 1983)



**ADVANCE  
 INFORMATION**

**CAUTION**  
 Channels shown by broken lines  
 shoaling, particularly at the edges.

**WEATHER BROADCASTS**  
 Weather Service station listed  
 continuous marine weather  
 range of reception is variable,  
 usually 20 to 40 miles  
 to site.

KEC-60 162.40 MHz (Channel WX-2)

**RAVING REFLECTORS**  
 Reflectors have been placed on many  
 aids to navigation. Individual radar  
 return on these aids has been  
 listed in this chart.

**LORAN-C**  
**EXPLANATION**

Frequency ..... 100kHz.  
 Pulse Interval ..... 89,700 Microseconds  
 Designation: (Not individual sta-  
 tions).  
 Master secondary.  
 Secondary.

*These are Ten No.'s  
 NOT Sheet No.'s*

**ADVANCE INFORMATION**  
**SUBJECT TO OFFICE REVIEW**

○ R TOWER (WRJN)  
 3 Vert Lts  
 Occ R 2 FR

Reference to the charted depths, if the lake level is above or below Low Water Datum, the existing depths are correspondingly greater or lesser than the charted depths.

Section from Chart 14925  
22nd Ed., June 27/92  
1:10,000 Scale (NAD 1983)

NOTE A

Navigation regulations are published in Chapter 2, U.S. Coast Pilot 6. Additions or revisions to Chapter 2 are published in the Notices to Mariners. Information concerning the regulations may be obtained at the Office of the Commander, 9th Coast Guard District in Cleveland, Ohio, or at the Office of the District Engineer, Corps of Engineers in Detroit, Michigan.  
Refer to charted regulation section numbers.

AND CABLES  
s and submarine  
line and cable

Cable Area

marine pipelines  
exist within the  
marine pipelines  
required to be  
originally buried  
Mariners should  
rating vessels in  
to their draft in  
bles may exist,  
y or trawling.  
ed by lighted or

Zoological  
Park

STACK

Lake View  
Park

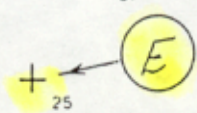
Lake Crest - Dr.

Lombard - Ave.

Outfall

**ADVANCE INFORMATION  
SUBJECT TO OFFICE REVIEW**

**ADVANCE  
INFORMATION**



42°45'

42°46'

87°46'

I<sub>25</sub>



U.S. Department of Commerce  
National Oceanic and Atmospheric Administration  
National Ocean Service

Water Level Note for Hydrographic Sheet

ORIGINAL

Processing Division : Pacific Hydrographic Section (N/CG245)

Hourly heights are approved for: Kenosha, WI (908-7052)  
Racine, WI (908-7054)  
Water Level Stations

Period: 7/12/93 - 8/20/93

Project: S-Y902-AHP

Hydrographic Sheet: AHP-10-10-93

Registry No: FE-392

Locality: Wisconsin, SW shore of Lake Michigan  
Prairie Cove to Oak Creek

Plane of reference: Low Water Datum (IGLD 1985 : 176.0 Meters)

Remarks:

Zoning required, for locations south of 42°39'30" use Water Level Station Kenosha, WI (908-7052) and for locations north of 42°39'30" use Water Level Station Racine, WI (908-7054). Data from other permanent gauges indicate no unusual water level movement during the survey period.

for   
Chief, Great Lakes Section

NOAA FORM 77-27(H) (9-83)		U.S. DEPARTMENT OF COMMERCE		REGISTRY NUMBER FE-392			
<b>HYDROGRAPHIC SURVEY STATISTICS</b>							
RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.							
RECORD DESCRIPTION		AMOUNT		RECORD DESCRIPTION			
SMOOTH SHEET		in 7 parts		SMOOTH OVERLAYS: POS., ARC, EXCESS			
DESCRIPTIVE REPORT		1		FIELD SHEETS AND OTHER OVERLAYS			
DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS		
ACCORDION FILES							
ENVELOPES							
VOLUMES							
CAHIERS							
BOXES							
<b>SHORELINE DATA</b>							
SHORELINE MAPS (List):							
PHOTOBATHYMETRIC MAPS (List):		None					
NOTES TO THE HYDROGRAPHER (List):		None					
SPECIAL REPORTS (List):		None					
NAUTICAL CHARTS (List):		14925 22nd Ed., 6/27/92 and 14904 22nd Ed., 8/7/93					
<b>OFFICE PROCESSING ACTIVITIES</b> <i>The following statistics will be submitted with the cartographer's report on the survey</i>							
PROCESSING ACTIVITY				AMOUNTS			
				VERIFICATION	EVALUATION	TOTALS	
POSITIONS ON SHEET						133	
POSITIONS REVISED							
SOUNDINGS REVISED							
CONTROL STATIONS REVISED							
				TIME-HOURS			
				VERIFICATION	EVALUATION	TOTALS	
PRE-PROCESSING EXAMINATION							
VERIFICATION OF CONTROL							
VERIFICATION OF POSITIONS				112		112	
VERIFICATION OF SOUNDINGS				46		46	
VERIFICATION OF JUNCTIONS							
APPLICATION OF PHOTOBATHYMETRY							
SHORELINE APPLICATION/VERIFICATION							
COMPILATION OF SMOOTH SHEET				59		59	
COMPARISON WITH PRIOR SURVEYS AND CHARTS					25	25	
EVALUATION OF SIDE SCAN SONAR RECORDS							
EVALUATION OF WIRE DRAGS AND SWEEPS							
EVALUATION REPORT					30	30	
GEOGRAPHIC NAMES							
OTHER: Digitization							
*USE OTHER SIDE OF FORM FOR REMARKS				TOTALS	217	55	272
Pre-processing Examination by D. Haines				Beginning Date 11/29/93	Ending Date 2/4/94		
Verification of Field Data by G. Kay				Time (Hours) 217	Ending Date 10/4/94		
Verification Check by G. Kay, B. Olmstead				Time (Hours) 8	Ending Date 6/10/95		
Evaluation and Analysis by G. Kay				Time (Hours) 55	Ending Date 5/12/95		
Inspection by Bruce Olmstead				Time (Hours) 6	Ending Date 8/11/95		

## EVALUATION REPORT SURVEY FE-392

### 1. INTRODUCTION

Survey FE-392 is a field examination survey accomplished by the NOAA Atlantic Hydrographic Party, under Project Instruction S-Y902-AHP, dated April 30, 1993.

This survey was conducted in Wisconsin, and covers a portion of Lake Michigan. The surveyed area is composed of eight areas of investigation in Lake Michigan between latitude 42/55/00N, south to latitude 42/33/30N. The eastern limit is longitude 87/44/56W. The western limit is the western shoreline of Lake Michigan.

What is unusual about this survey is the way the data was gathered. First the field work was gathered for surveys D-120 and D-121 at a scale of 1:20,000. Then after the completion of those surveys, data was taken out or duplicated from those surveys and entered into survey FE-392 and plotted at 1:10,000. This technique did not provide for a cohesive data set, or allow for complete item investigations. This loss of continuity on this survey has hampered the survey's ability to provide a realistic data base that would be used to prove or disprove the AWOIS items. Only three of the requested 15 items have been investigated. However, some other investigations were made.

Survey FE-392 only provides marginally useful information to update existing charts. The shoreline manuscripts were not available for this survey. This coupled with poor shoreline depiction from the chart provided a field sheet that did not compare well with the 7.5 minute USGS Topographic maps of the area. No effort was made by the field to explain differences in shoreline detail. The user is cautioned in the use of shoreline detail from survey FE-392, shoreline is provided for orientation purpose only. Data is gathered on eight separate sheets and is attached to this report.

Depths range from less than a meter along the shoreline, to 17 meters. There are no bottom samples on this Field Examination, as per Project Instructions, section 6.7.

Depth curves depicted on the smooth sheet were selected from those authorized through HSG 69. However, instead of drafting all authorized curves only those curves considered necessary for the reasonable portrayal of the bottom were drafted. The selected curves were the 0, 2, 5, and 10-meter curve.

Daily water level corrections were determined by readings taken from the ETG at Kenosha, Wisconsin (908-7052), and Racine, Wisconsin (908-7054) were used for the reduction of soundings during field processing. Approved daily heights were zoned from Racine, Wisconsin (908-7054) and Kenosha, Wisconsin (908-7052). An accompanying computer printout contains the parameters and the correctors.

A digital file has been generated for this survey that includes categories of information required to comply with Hydrographic Survey Guideline No. 52, Standard Digital Data Exchange Format, April 15, 1986. Certain descriptive information, however, may not be in the digital records due to the restrictions of the presently available cartographic codes. The user should refer to the smooth sheet for a complete depiction of the survey data.

## 2. CONTROL AND SHORELINE

Sections H and I of the hydrographer's report contain adequate discussions of horizontal control and hydrographic positioning. Additional detailed information on horizontal control is found in the Horizontal Control Report for S-Y902-AHP2, dated June 1993.

Differential GPS (DGPS) was used to control this survey. A horizontal dilution of precision (HDOP) not to exceed 7.50 was computed for survey operations. However, this survey is plotted at a scale of 1:10,000 and infers a horizontal dilution of precision (HDOP) not to exceed 3.75. The data contained in this survey FE-392 does not exceed a (HDOP) value of 3.75.

Positions of horizontal control stations used during this survey are field values based on NAD 83.

The smooth sheets are annotated with NAD 27 adjustment ticks based on values determined with the NGS program, NADCON. Geographic positions based on NAD 27 may be plotted on the smooth sheets utilizing the NAD 83 projection by applying the following corrections.

Latitude: -0.066 seconds (-2.034 meters)  
Longitude: -0.273 seconds (-6.206 meters)

The year of establishment of control stations shown on the smooth sheets originates with the hydrographer's signal list.

The shoreline shown in brown on survey FE-392 originates from 1:10,000 scale photographic enlargements of the following U.S. Geological Survey topographic quads.

<u>Name</u>	<u>Year</u>	<u>Photo</u>	<u>Revised</u>	<u>Scale</u>
Kenosha, Wisconsin	1958	1971	1976	1:24,000
Racine South, Wisconsin	1958	1971	1976	1:24,000

## 3. HYDROGRAPHY

Except for what is noted here and elsewhere in this report, hydrography is adequate to:

- a. delineate the bottom configuration, determine least depths, and draw the standard depth curves;
- b. reveal there are no significant discrepancies or anomalies requiring further investigation; and

c. show the survey was properly controlled and soundings are correctly plotted.

A 5.6-meter shoal sounding, position number 1407/6 located at latitude 42/45/23.11N, longitude 87/45/58.85W was not adequately developed (sheet 7 of 8). The final field sheet plot identifies this shoal as an obstruction. However, there is no supporting information to support this claim. The smooth sheet plots the 5<sup>6</sup> meter sounding.

Standard depth curves were adequately drawn and developed except the zero curve. The inshore limit as defined by the Project Instructions (section 1.8), is the 1.5-meter depth curve.

#### 4. CONDITION OF SURVEY

The hydrographic records and reports received for processing are adequate and conform to the requirements of the Hydrographic Manual, 4th Edition, revised through Change No. 3, the Hydrographic Survey Guidelines, and the Field Procedures Manual, March 1993 Edition.

The amount and extent of developments on the AWOIS item investigations contains a very small amount of data to adequately prove or disprove these items. Specifically closely spaced sounding lines would normally be made to locate and define a shoal. This was not done and the determination of the least depth may not have been obtained. This data does not provide the chart compiler with enough hydrographic information to feel relatively sure that the items have been adequately developed during survey operations.

#### 5. JUNCTIONS

Not applicable as per Project Instructions, section 6.9.

#### 6. COMPARISON WITH PRIOR SURVEYS

Survey FE-392 was compared to the following prior surveys.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Sheet number</u>
LS-978	1903	1:10,000	6, 7
LS-979	1905	1:10,000	6, 7
LS-1128	1909	1:10,000	1
LS-1197	1909-11	1:20,000	1
LS-1200	1912	1:20,000	3, 4, 6, 7
LS-1201	1912	1:120,000	2, 8

Surveys LS-978 and LS-979 cover the same area. Prior survey LS-978 covers the inshore and offshore areas while prior survey LS-979 covers developments. These two prior surveys do not compare well with the present survey. Soundings vary between 0<sup>6</sup> to 1<sup>2</sup> meters (3-4 feet) shoaler or deeper than the present survey in depths ranging from 4<sup>5</sup> to 16<sup>7</sup> meters (14-55 feet) of water.

Surveys LS-1200 and LS-1201 were accomplished during the same times period. Soundings do not compare well with differences between 0<sup>3</sup> to 4<sup>8</sup> meters (1-14 feet) shoaler or deeper through out all depths . The wrecked schooner *Lumberman* lies in water 2 feet shoaler than the prior survey (sheet 6).

Survey LS-1955 covers the entire area of the present survey. Soundings do not compare well with one another. Some soundings are within 0<sup>3</sup> to 0<sup>9</sup> meters (1-3 feet), in depths of 9 meters (29 feet) and soundings in depths of 15 meters (49 feet) are off as much as 4 meters (13 feet).

The difference between these prior surveys and the present survey FE-392 is attributed to the less accurate positioning and sounding methods available at the time of the prior surveys were accomplished, along with changing to the International Great Lake Datum (IGLD 1985). The datum differences account for differences of 0.33 meters (1.1 feet) in the prior surveys.

There are no AWOIS items that originate with these prior surveys within the common area.

Except for survey LS-1955, all of these prior surveys contain sounding lines that are considerably denser and contain more sounding data than the present survey. Survey FE-392 is adequate to supplement these prior surveys within the area of common coverage.

## 7. COMPARISON WITH CHART

Survey FE-392 was compared with the following charts.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>	<u>Datum</u>
14925	22nd	June 27, 1992	1:10,000	NAD 83
14904	22nd	August 7, 1993	1:200,000	NAD 83

### a. Hydrography

The charted hydrography on the above chart originates with the before mentioned prior surveys and miscellaneous sources. Survey FE-392 is adequate to supplement charted hydrography within the survey area.

### b. AWOIS

There are fifteen AWOIS items assigned for investigation and are numbered 2140, 2176, 8404 through and including 8416. These items originate with miscellaneous sources. However, due to time constraints imposed by the Project Instructions, sections 1.3 and 1.4, only AWOIS items 2176, 8409, 8410, and 8414 were investigated. These features are adequately discussed and disposed of, in the Descriptive Report and in the AWOIS item investigation write-ups attached.

c. Controlling Depths

There is one charted channel located on sheet one. However, the field party only investigated the private aids and the limits of the breakwaters. There was no investigation of the charted depths.

d. Aids to Navigation

As per Project Instructions section 4.2, (Aids to Navigation) were not required on this survey. However, during the course of this survey detached positions were obtained on two lights. These lights (private aids) are on drawing 2 of 8, and are positioned as follows.

<u>Light</u>	<u>Latitude North</u>	<u>Longitude West</u>
priv aid	42/54/15.43	87/50/32.35
priv aid	42/54/16.62	87/50/34.03

e. Geographic Names

There are no approved geographic names on the smooth sheets. The users are referred to surveys D-120 and D-121. Names appearing in the survey titles have been approved by the Chief Geographer.

f. Dangers to Navigation

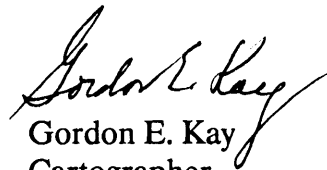
There are three dangers to navigation that were discovered during this survey. These dangers along with six dangers located on survey D-120 are discussed in the Descriptive Report for survey FE-392. A copy of these dangers to navigation has been forwarded to the U.S. Coast Guard and DMA\HTC. Copies of these reports are attached to this report. No additional dangers were found during office processing. These dangers are tabulated in the Descriptive Report, paragraph O, pages 11-12.

**8. COMPLIANCE WITH INSTRUCTIONS**

Survey FE-392 adequately complies with the Project Instructions.

**9. ADDITIONAL FIELD WORK**

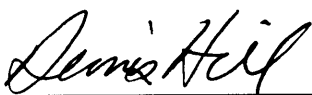
This is a fair hydrographic survey. Additional field work is not required.

  
Gordon E. Kay  
Cartographer


APPROVAL SHEET  
FE-392

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproval of charted data. The digital data have been completed and all revisions and processing have been entered in the magnetic tape record for this survey. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report. Final control, position and sounding printouts have been included with the survey records.

*for*  Date: 8/12/95  
Bruce A. Olmstead  
Senior Cartographer, Cartographic Section  
Pacific Hydrographic Branch

I have reviewed the smooth sheet, accompanying data, and reports. This survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Evaluation Report.

*for*  Date: 8/12/95  
Kathy Timmons  
Commander, NOAA  
Chief, Pacific Hydrographic Branch

\*\*\*\*\*

Final Approval

Approved:

 Date: 8/17/95  
Andrew A. Armstrong III  
Captain, NOAA  
Chief, Hydrographic Surveys Division



87° 49' 00"

NAD 27

GEK 9/29/94

42° 34' 30"

42° 34' 30"

# FE-392

**WISCONSIN  
SW SHORE OF LAKE MICHIGAN  
PRAIRE COVE TO OAK CREEK**

**Date of Survey: July-August 1993**

**Scale: 1: 10,000**

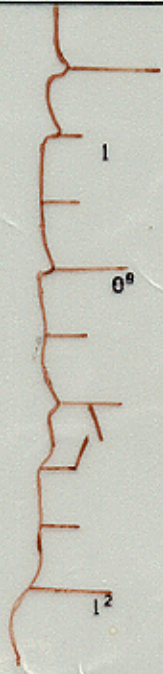
**Soundings in METERS and DECIMETERS at IGLD**

**Submerged rock groins**

**Sheet 1 of 8**

Shoreline in brown for orientation only from,  
USGS Quad Racine South, Wis.

42° 34' 00"



42° 33' 30"

87° 49' 00"

87° 48' 30"

87° 51' 00"

87° 50' 30"

87° 51' 00"

NAD 27

42° 55' 00"

G.E.K. 9/27/94

42° 55' 00"

**FE-392**

**WISCONSIN  
SW SHORE OF LAKE MICHIGAN  
PRAIRE COVE TO OAK CREEK**

Date of Survey: July-August 1993

Scale: 1: 10,000

Soundings in METERS and DECIMETERS at IGLD

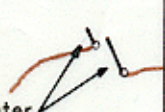
AWOIS item: 8409

Sheet 2 of 8

42° 54' 30"

Shoreline in brown for orientation only from  
USGS Quad South Milwaukee, Wis.

priv marker (lighted)  
priv marker (lighted)  
breakwater

A diagram showing a breakwater structure extending from the shore. Two lighted private markers are positioned at the end of the breakwater. The breakwater is represented by a brown line, and the markers are represented by small black circles with lines pointing to them.

42° 54' 00"

87° 51' 00"

87° 50' 30"

FE-392

WISCONSIN  
SW SHORE OF LAKE MICHIGAN  
PRAIRE COVE TO OAK CREEK

Date of Survey: July-August 1993

Scale: 10,000

Soundings in METERS and DECIMETERS at IGLD

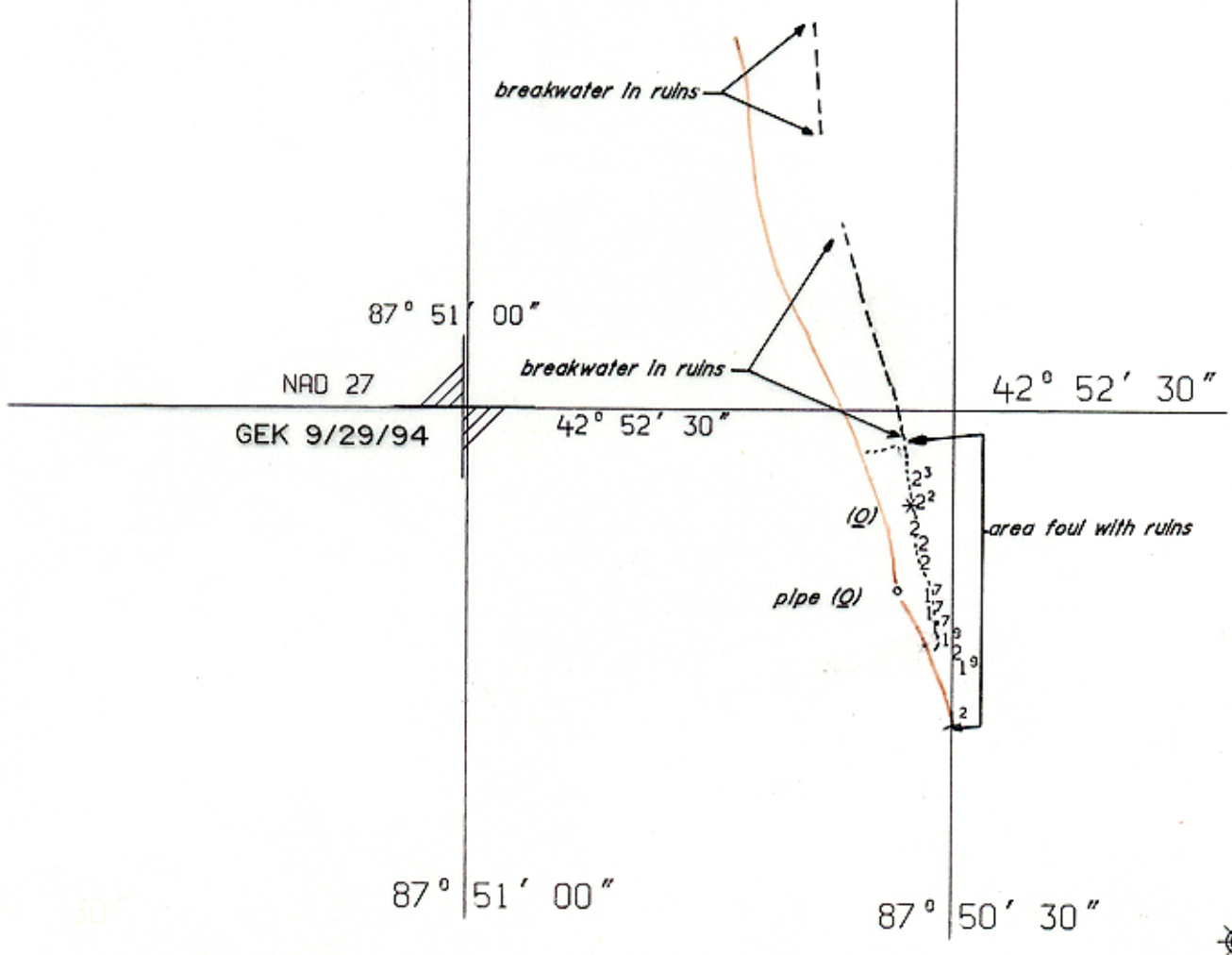
Datum: NAD 83

Along shore soundings

Sheet 3 of 8

42° 53' 00"

Shoreline in brown for orientation only from  
USGS Quad South Milwaukee, Wis.



87° 46' 00"

87° 45' 30"

87° 45' 00"

42° 52' 30"

16<sup>3</sup> Wk

Schooner Lumberman

87° 45' 30"

NAD 27

GEK 9/29/94

42° 52' 00"

42° 52' 00"

**FE-392**

WISCONSIN  
SW SHORE OF LAKE MICHIGAN  
PRAIRE COVE TO OAK CREEK

Date of Survey: July-August 1993

Scale: 1:10,000

Soundings in METERS and DECIMETERS at IGLD 42° 51' 30"

Datum: NAD 83

AWOIS item: 8410

Sheet of 4 of 8

42°39'30"

87° 47' 30"

NAD 27

42 39'30"

G.E.K. 9/29/94

42° 39' 30"

# FE-392

WISCONSIN  
SW SHORE OF LAKE MICHIGAN  
PRAIRE COVE TO OAK CREEK

Date of Survey: July-August 1993

Scale: 1:10,000

Soundings in METERS and DECIMETERS at IGLD

Datum: NAD 83

AWOIS item: 8414

Sheet 5 of 8

42°39'00"

42°39'00"

9<sup>2</sup> Wk

42°38'30"

42°38'30"

87° 48'00"

87° 47'30"

87° 47'00"

87° 47' 30"

87° 46' 30"

87° 46' 00"

87° 45' 30"

87° 45' 00"

42° 49' 30"

16 16<sup>7</sup> 17 16<sup>5</sup> 16<sup>3</sup> 15<sup>8</sup> 15<sup>4</sup> 14<sup>5</sup> 15<sup>8</sup>  
 16<sup>5</sup> 16<sup>4</sup> 16<sup>7</sup> 16 13<sup>1</sup>  
 16<sup>2</sup> 16<sup>4</sup> 15<sup>8</sup> 11<sup>4</sup> 15<sup>4</sup> 16<sup>1</sup> 15<sup>9</sup>  
 15<sup>7</sup> 16<sup>3</sup> 15<sup>8</sup> 11<sup>6</sup> 14<sup>8</sup> 16 16<sup>5</sup>  
 15<sup>7</sup> 15<sup>5</sup> 14<sup>9</sup> 10<sup>9</sup> 14<sup>5</sup> 15<sup>5</sup> 16<sup>4</sup> 16<sup>1</sup> 12<sup>9</sup>  
 15<sup>3</sup> 14<sup>4</sup> 10<sup>7</sup> 14<sup>4</sup> 16<sup>3</sup> 16<sup>2</sup> 16<sup>5</sup>  
 15<sup>8</sup> 15<sup>1</sup> 10<sup>7</sup> 15<sup>8</sup> 16<sup>2</sup> 16<sup>3</sup>  
 15<sup>8</sup> 15<sup>7</sup> 12<sup>5</sup> 14<sup>9</sup> 16<sup>3</sup>  
 15<sup>8</sup> 16 13<sup>3</sup> 14<sup>9</sup> 15<sup>9</sup>  
 15<sup>8</sup> 16 14<sup>2</sup> 16

87° 45' 30"

NAD 27

G.E.K. 9/27/94

42° 49' 30"

42° 49' 30"

# FE-392

## WISCONSIN SW SHORE OF LAKE MICHIGAN PRAIRE COVE TO OAK CREEK

42° 49' 00"

42° 49' 00"

Date of Survey, July-August 1993  
 Scale: 1:10,000  
 Soundings in METERS and DECIMETERS at IGLD  
 Datum: NAD 83  
 SHOALING  
 Sheet 6 of 8

12<sup>4</sup> 12<sup>9</sup> 13<sup>1</sup> 13<sup>2</sup> 13<sup>8</sup> 13 13<sup>4</sup> 14<sup>3</sup> 13<sup>6</sup> 13<sup>6</sup> 14<sup>6</sup> 15<sup>1</sup> 14<sup>6</sup> 13<sup>3</sup>  
 12<sup>4</sup> 13 13 12<sup>5</sup> 12<sup>7</sup> 13<sup>7</sup> 13<sup>8</sup> 14 14<sup>1</sup> 14<sup>1</sup> 14<sup>4</sup> 14<sup>3</sup> 15<sup>3</sup> 14<sup>9</sup> 13<sup>9</sup>  
 12<sup>8</sup> 13<sup>9</sup> 12<sup>5</sup> 13<sup>8</sup> 14 14<sup>2</sup> 14<sup>8</sup> 14<sup>1</sup> 14<sup>8</sup> 14<sup>7</sup> 14<sup>8</sup> 15<sup>6</sup>  
 12<sup>7</sup> 12<sup>4</sup> 12<sup>8</sup> 13<sup>9</sup> 14 12<sup>5</sup> 14<sup>3</sup> 14<sup>8</sup> 15<sup>2</sup> 14<sup>8</sup> 14<sup>5</sup> 15<sup>2</sup> 14 15 15

87° 47' 00"

87° 46' 30"

87° 46' 00"

87° 45' 30"

87° 45' 00"

# FE-392

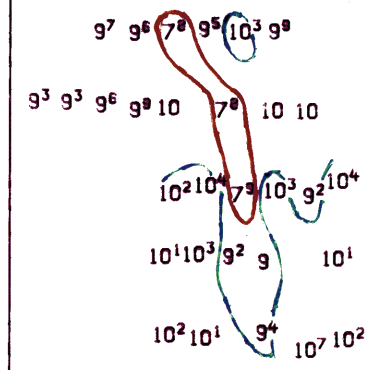
WISCONSIN  
SW SHORE OF LAKE MICHIGAN  
PRAIRE COVE TO OAK CREEK

8<sup>5</sup> 9 9<sup>2</sup> 8<sup>9</sup> 9<sup>8</sup> 9<sup>2</sup>

9<sup>1</sup> 9<sup>5</sup> 9<sup>3</sup> 9<sup>6</sup> 8<sup>5</sup>

42° 46' 00"

Date of Survey: July-August 1993  
Scale: 1:10,000  
Soundings in METERS and DECCIMETERS at IGLW  
DATUM: NAD 83  
Shoaling  
Sheet 7 of 8

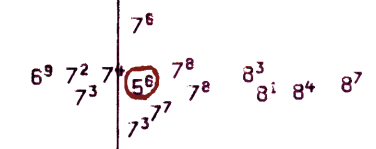


NAD 27

GEK 9/29/94

42° 45' 30"

42° 45' 30"



87° 47' 00"

87° 46' 30"

87° 46' 00"

87° 45' 30"

87° 45' 00"



87°47'30"

87°47'00"

42°59'00"

**FE-392**

**WISCONSIN  
SW SHORE OF LAKE MICHIGAN  
PRAIRE COVE TO OAK CREEK**

Date of Survey: July-August 1993

Scale: 1:10,000

42°58'30"

Sounding in METERS and DECIMETERS at IGLD

Submerged Wreck

Sheet 8 of 8

7<sup>3</sup> Wk

42°58'00"

87°47'30"

87°47'00"



MARINE CHART BRANCH  
**RECORD OF APPLICATION TO CHARTS**

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. FE-392

**INSTRUCTIONS**

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.

1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
14500	8/21/93	Bruce A. Omland	Full Part Before After Marine Center Approval Signed Via Drawing No. Examined, no corrections and soundings applied.
14901	10-19-95	Walter J. Oms	Full Part Before After Marine Center Approval Signed Via Drawing No. 9 Critical Corr already applied NM 40/93 L-1904/94
14904	10-19-95	Walter J. Oms	Full Part Before After Marine Center Approval Signed Via Drawing No. 6 Critical Corr. already applied NM 29/93 NM 40/93 L-1375/93
14925	10-19-95	Walter J. Oms	Full Part Before After Marine Center Approval Signed Via Drawing No. 6 Critical Corr already applied NM 40/93 LNM 29/93
14461	4-18-97	Walter J. Oms	Full Part Before After Marine Center Approval Signed Via Drawing No. 10
14925	1-29-99	Jerry Thacker	Full Part Before After Marine Center Approval Signed Via Drawing No. 6 Fully app'd Rev 2/4/99 TWA
14901	1-29-99	Jerry Thacker	Full Part Before After Marine Center Approval Signed Via Drawing No. 12 Fully app'd Rev 2/4/99 TWA
14904	1-29-99	Jerry Thacker	Full Part Before After Marine Center Approval Signed Via Drawing No. 25 Fully app'd Rev 2/4/99 TWA
			Full Part Before After Marine Center Approval Signed Via Drawing No.
			Full Part Before After Marine Center Approval Signed Via Drawing No.