F00468

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No.

Registry No. F00468

LOCALITY

State **Washington**

General Locality **Puget Sound**

Sublocality **Eagle Harbor and Elliott Bay**

2000

CHIEF OF PARTY
Kathryn Simmons

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

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

REGISTER NO.

F00468

HYDROGRAPHIC TITLE SHEET

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.

State Washington

General Locality Puget Sound

Sublocality Eagle Harbor and Elliott Bay

Scale 1:5,000

Date of Survey August 18 - October 19, 2000

Instructions Date 4/19/00

Project No. OPR-N411-NRB

Vessel Launch 1101(EDP 6501)

Chief of Party Kathryn Simmons

Surveyed by K. Simmons, K. Brown, E. Wernicke

Soundings taken by echo sounder, hand lead, pole Knudsen 320m, EG&G 272-T SSS

Graphic record scaled by NRT3 personnel

Graphic record checked by NRT3 personnel

Evaluation by R. Davies

Automated plot by HP Designjet1050c

Verification by R. Davies

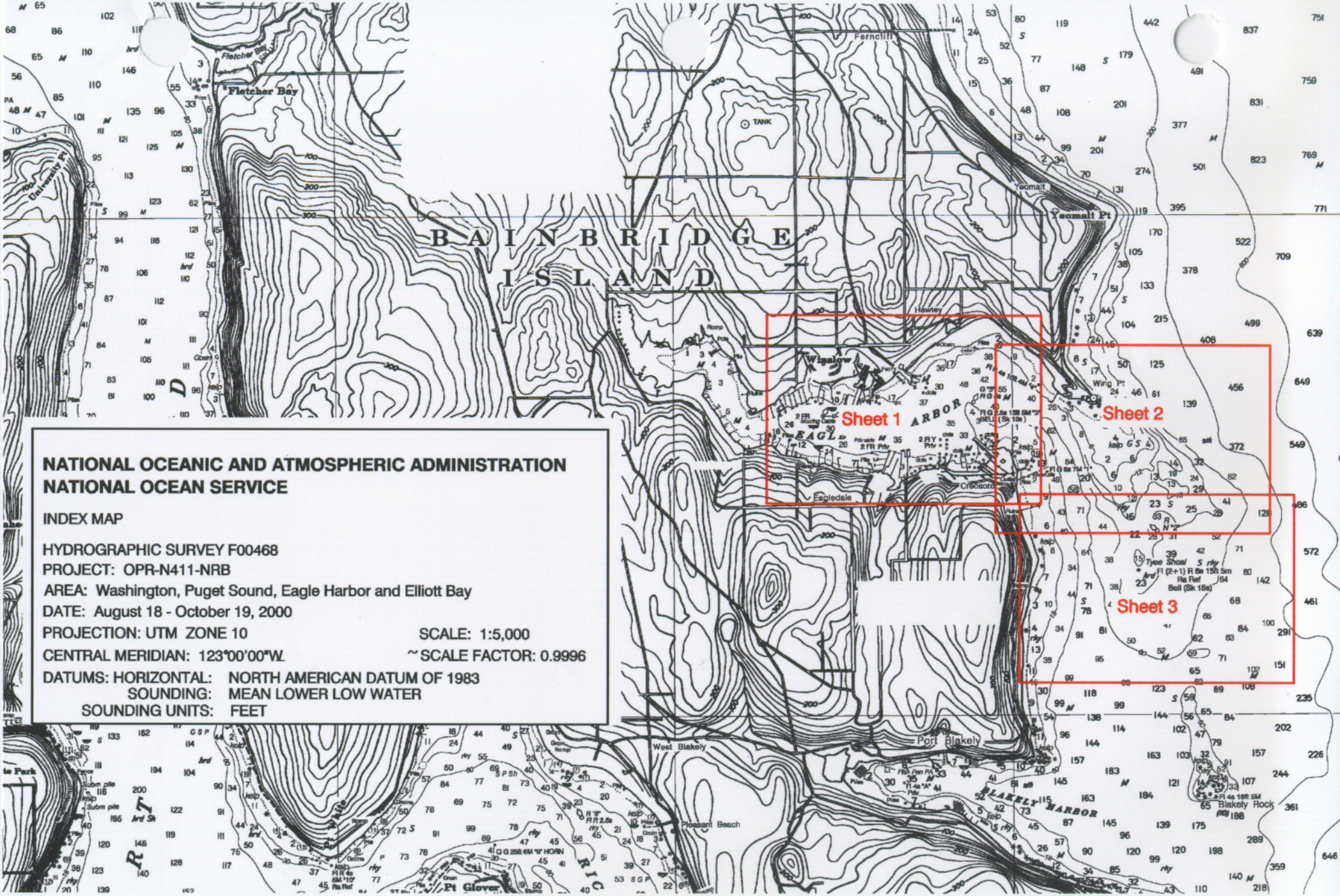
Soundings in Feet at MLLW

REMARKS: Time in UTC.

Revisions and annotations appearing as endnotes were generated during office processing.

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

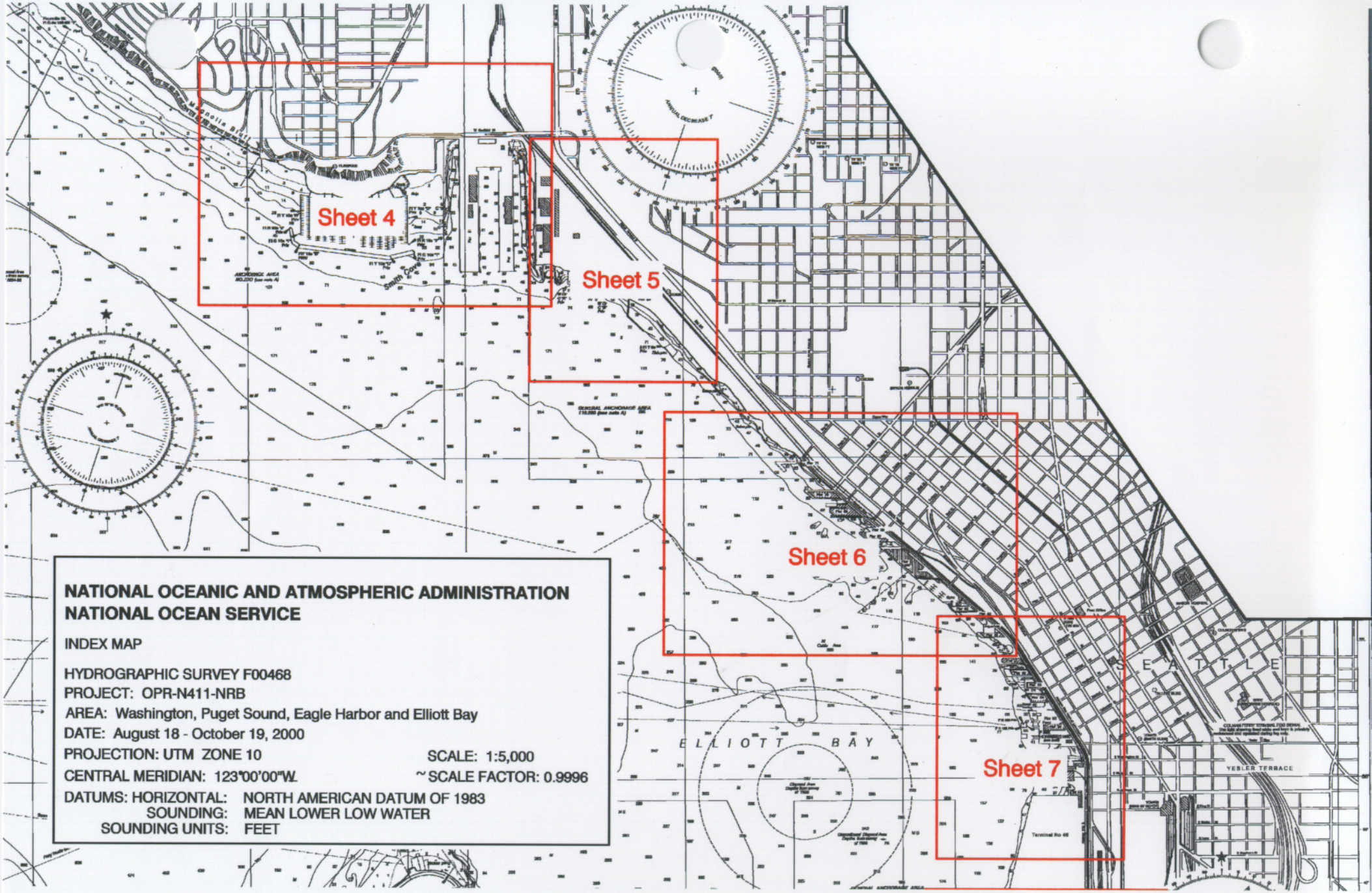
NOAA FORM 77-28 SUPERSEDES FORM C&GS-537 U.S. GOVERNMENT PRINTING OFFICE: 1986 - 652-007/41215



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

INDEX MAP

HYDROGRAPHIC SURVEY F00468
PROJECT: OPR-N411-NRB
AREA: Washington, Puget Sound, Eagle Harbor and Elliott Bay
DATE: August 18 - October 19, 2000
PROJECTION: UTM ZONE 10 SCALE: 1:5,000
CENTRAL MERIDIAN: 123°00'00"W ~SCALE FACTOR: 0.9996
DATUMS: HORIZONTAL: NORTH AMERICAN DATUM OF 1983
SOUNDING: MEAN LOWER LOW WATER
SOUNDING UNITS: FEET



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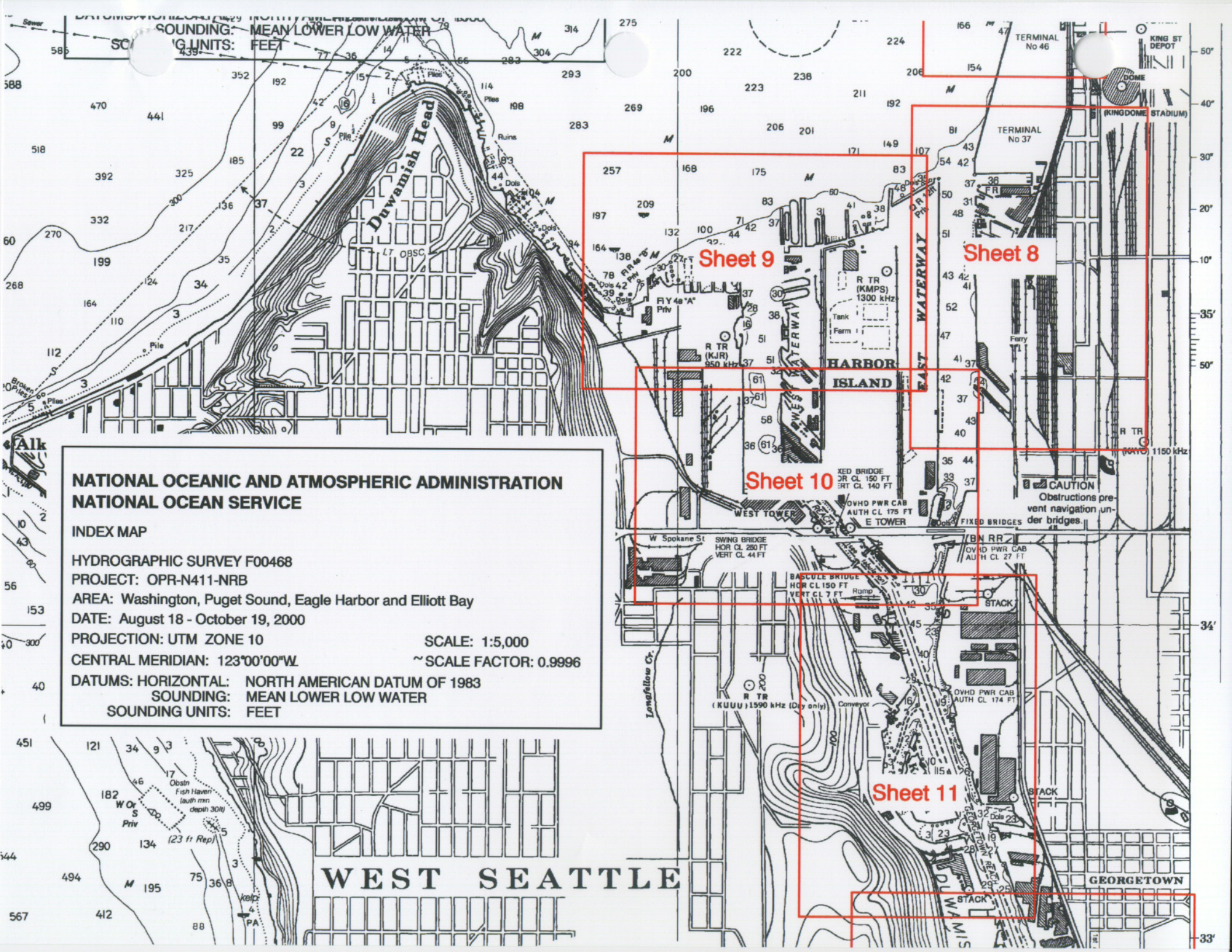

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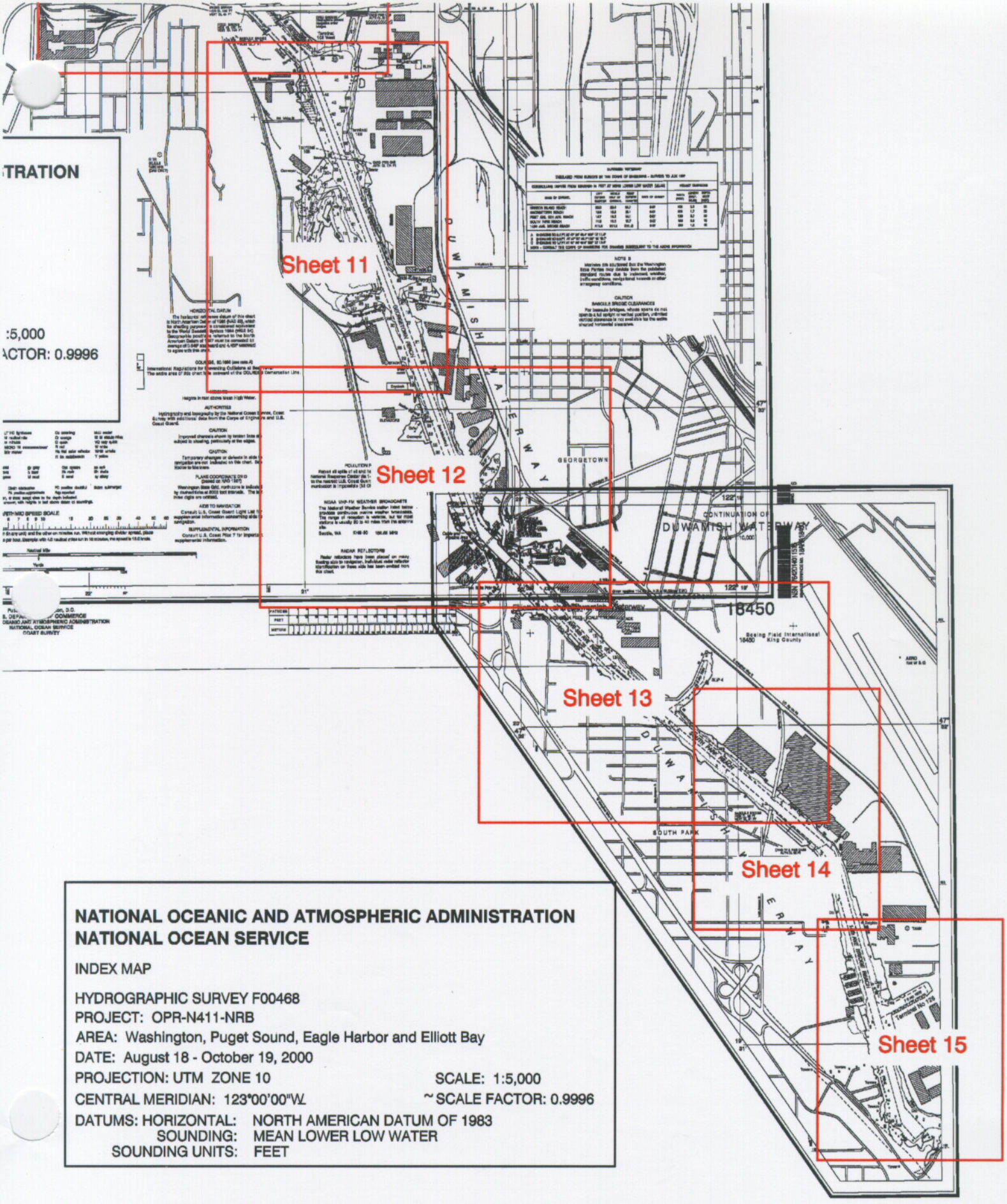

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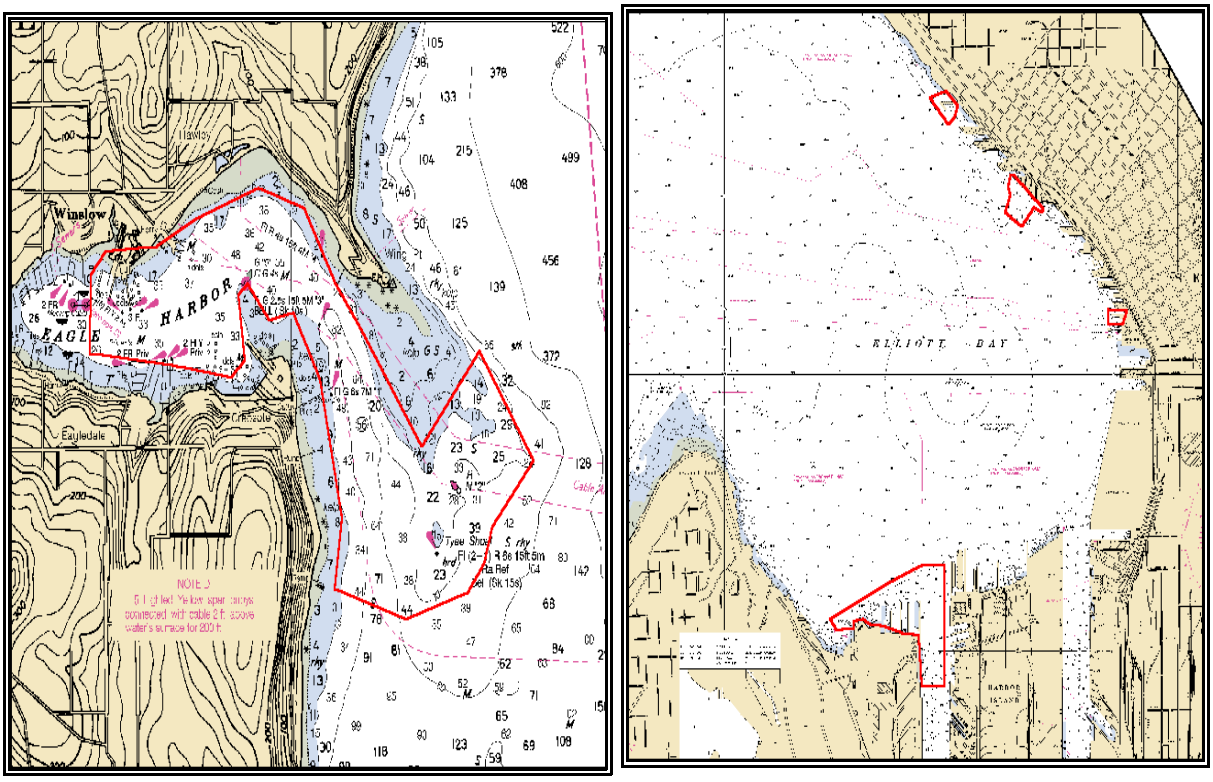
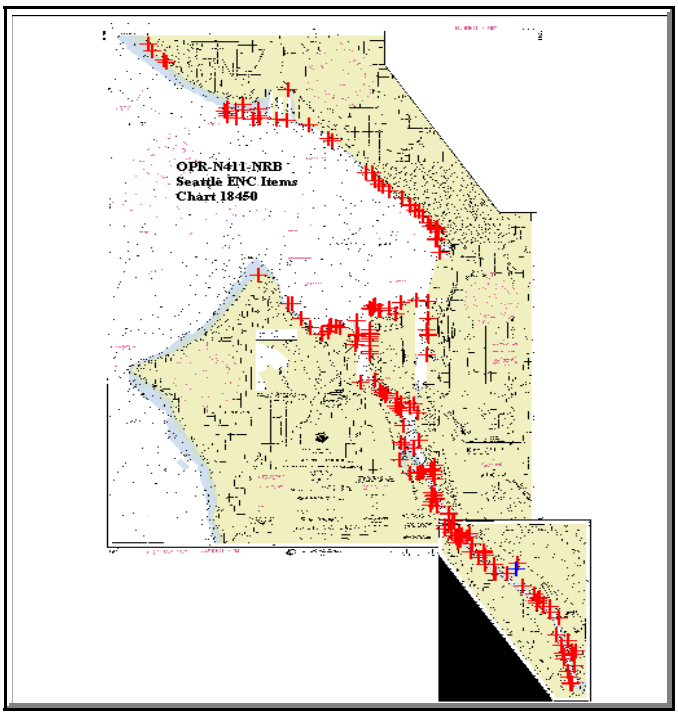
Descriptive Report to Accompany F00468
OPR-N411-NRB
2000
Navigation Response Team 3

A. AREA SURVEYED [1]

This survey was conducted in accordance with Port Instructions OPR-N411-NRB, Puget Sound, Washington, dated April 19, 2000. F00468 includes hydrographic data and electronic navigation chart (ENC) data. Hydrography was conducted in Eagle Harbor, at the entrance to the West Waterway in the Port of Seattle, and alongside piers 53, 66, and 71 in Elliott Bay. The hydrography in Eagle Harbor was performed at the request of the Washington State Ferries following a ferry grounding near Tyee shoal. The Elliott Bay hydrography was collected at the request of the Puget Sound Pilots. The areas are depicted in the graphics below.



ENC data were collected along the shoreline of Seattle Harbor, including Elliott Bay and the Duwamish Waterway, as shown in the graphic below:



ENC data acquisition was conducted from August 18, 2000 *(DN 231)* through October 19, 2000 *(DN 293)*. [2]

B. DATA ACQUISITION AND PROCESSING

B1. Equipment and Vessels

NOAA Launch 1101, a 29-foot Jensen, was used for all hydrographic data collection. The five-ton launch is ten feet wide, has a static draft of 0.4 meters and is powered by a jet drive. No changes to the standard vessel sounding configuration were necessary.

Sounding data were collected using a Knudsen 320M echosounder, SN K98576.

Side scan sonar (SSS) data were collected using the following equipment:

Type	Serial Number
EG&G 272-T Towfish	015598
EG&G 260 Recorder	015602

GPS data were collected using the following equipment:

Equipment Location	Type Receiver/Antenna	Receiver Serial No.	Antenna Serial No.
VN 0651	Trimble DSM212L 27207	0220164491	0220166460
Backpack	Trimble TSC1	224011684	220187539

Corrections for speed of sound through the water column were computed with data obtained from Seacat conductivity, temperature and depth recorders, SN's 1892 and 0220.

Coastal Oceanographic's Hypack software, Version 5.0, was the computer software used for hydrographic data collection.

Trimble TSC1 datalogger and Asset Surveyor software v. 5.00 were used for ENC vector data collection. Pathfinder Office 2.51 was used for processing.

NOAA's VELOCWIN software was used to download and process sound velocity data.

B2. Quality Control

Only one crossline was run in Eagle Harbor which represented 2.2% of the mainscheme. Agreement was excellent. [3] The ten and twenty-meter splits were run on separate days from the mainscheme and from each other and no inconsistencies in the sounding data or in the contours was observed among this data. The hydrographer, therefore, believes the splits may serve as supporting evidence of the internal consistency and integrity of the survey data. [4]

Point data and line data were evaluated by comparison to the chart, to IKONOS satellite imagery, and to feature drawings prepared in the field. Where multipathing is known to occur; i.e., under bridges or other obstruction, points were examined with more rigorous attention. Positions significantly inconsistent with the above sources were deleted.

B3. Corrections to Echo Soundings

There were no deviations from methods described in the **Correction to Echo Soundings** section of the **Data Acquisition and Processing Report**. [5]

C. VERTICAL AND HORIZONTAL CONTROL

Tides and Water Levels

Port Instructions define eight tide zones within the project area. The tide corrector values referenced to the primary tide station at Seattle, WA (944-7130) are provided in the zoning file "N411NRT32000CORP" which is included on the project CD.

Preliminary, six-minute real tides recorded at this station were downloaded from the NOAA, NOS, CO_OPS web site (http://www.opsd.nos.noaa. gov/cgi-bin/prelimqry.pl). With HPTools, the tides were imported into HPS Tide Table 1. Zone Utilities computed the appropriate zone for each sounding; time and height adjustments were computed; and corrected tides were applied to sounding data.

No tide station downtime was experienced during the times of hydrography.[6]

Horizontal Datum

The horizontal control datum for this project is North American Datum of 1983 (NAD83).

Position Control

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The U.S. Coast Guard beacon at Whidbey Island (302kHz) was used.

For ENC data collection, differential correctors were provided by Racal Landstar via the Trimble receiver.

Velocity of Sound

Three velocity casts were conducted for the project as shown in the table below.

Cast No/Day	Latitude/Longitude	Depth(m)	Location
1 / 231	47° 35' 36"N / 122° 22' 42"W	89.2	Port of Seattle
2 / 249	47° 36' 08"N / 122° 29' 31"W	40.8	Eagle Harbor
3 / 292	47° 35' 19"N / 122° 22' 15"W	54.1	Port of Seattle

Corrections for speed of sound through the water column were computed from data obtained with a Seacat conductivity, temperature and depth recorder. Sea-Bird Electronics Model SBE-19, S/N 0220, was used for cast No.1, and S/N 1892 was used for cast Nos. 2 and 3. NOAA VELOCWIN software was used to initialize the recorder as well as to process all casts.

Appendix E [7]contains calibration reports for Seacat instruments S/N 1892 and S/N 0220.

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison [8]

The survey area is represented on the following charts:

Chart No.	Date	Edition	Scale
18440	July 31, 1999	24th	1:150,000
18441	August 7, 1999	40th	1:80,000
18445	June 26, 1999	28th	1:80,000
18474	March 21, 1998	6th	1:40,000
18449	May 4, 1996	16th [9]	1:25,000
18450	May 16, 1998	15th [10]	1:10,000

Eagle Harbor (Chart 18449)

The hydrography in Eagle Harbor was conducted in response to a Washington State Ferry grounding on a rock at latitude 47°36'31.9"N, longitude 122°29'19.9"W**.** WSF divers located the rock at a depth of 26 feet. The vicinity of the rock was developed to 5-meter line spacing. Least depth within a radius of 30 meters is 24 feet. located at latitude 47°36'31.965"N, longitude 122°29'18.588"W, (position no. 3136, DN 251), and at latitude 47°36'31.054"N, longitude 122°29'20.619"W, (position no. 4426, DN 256). [11]

Surveyed depths over the Tyee shoal are slightly shallower than charted and may indicate some accretion. The 30-foot curve as surveyed is approximately 90 meters SSE of the charted curve. [12]

Other minor changes in contours were observed throughout the surveyed area.

The 56-foot depth charted at latitude 47°36'31.9"N, longitude 122°29'19.9"W [13] should be replaced with the surveyed 54-foot depth. [14]

A shoal with its least depth of 17 feet located at latitude 47°37'20.1"N, longitude 122°30'32.4"W, (Pos. No. 4756, DN 256) was developed. The shoal lies between the two slips at the main ferry terminal and is most likely caused by ferry wash from docked ferries. [15]

The ferry route around Tyee shoal to the Eagle Harbor entrance should be moved to the center of the channel. According to Captain Jim Malde of the Washington State Ferries (206-583-2311) the ferry captains use a range defined by Light 4 and Restoration Point, south of Eagle Harbor, as the actual route.[16]

West Waterway Entrance (Chart 18450)

The two finger piers charted at the north end of Terminal 5 on the west side of the entrance to the West Waterway no longer exist and should be removed from the chart. [17] The area was intensively surveyed at the request of the Puget Sound Pilots who were concerned about the depths where the piers had been as well as the 28-foot depth charted at latitude 47 35'07.3"N, longitude 122 21'41.4"W. Their ships often tend to get set down in that direction. Hydrography at 10-meter line spacing located a least depth of 24 feet at latitude 47 35'07.125"N, longitude 122 21'42.137"W (Pos. No. 1666, DN 234). [18]

Pier 53 (Chart 18450)

Part of the structure of Pier 53 just north of the Colman Ferry Dock no longer exists. The configuration of the Pier is as drawn on layer F00468Shapes. See also IKONOS satellite imagery. Soundings were acquired over the charted pier. [19]

Pier 66 (Chart 18450)

Hydrography was acquired alongside Pier 66 at the request of the Puget Sound Pilots who were concerned about the 27-foot and 29-foot depths charted alongside the pier. With 10-meter line spacing, both horizontal and perpendicular, depths of 35-50 feet were found alongside the pier; no indication of the charted 27 and 29-foot depths was observed.[20] Some changes in contours have apparently occurred with surveyed depths slightly deeper than charted depths. [21]

Pier 71 (Chart 18450)

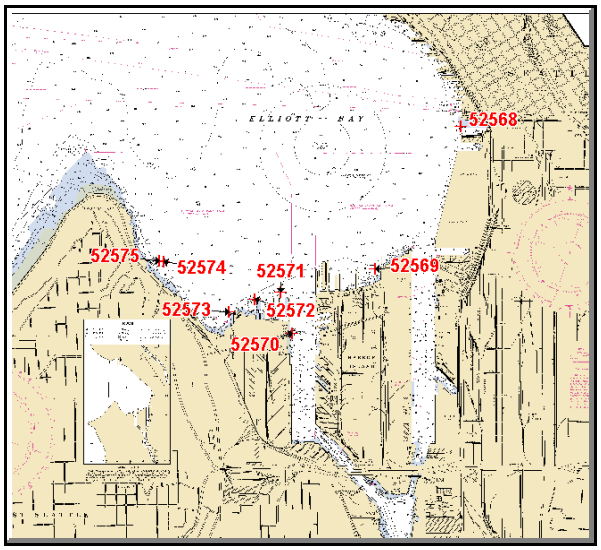
The pier charted as submerged no longer exists and should be removed from the chart. [22] The area was surveyed with side scan sonar; build-up of sediment under the former pier was evident on the sonargram but ruins or remnants of the pier were not. Chart the soundings from the current survey. [23]

ENC DATA (Chart 18450)

All ENC data were plotted in Mapinfo. A separate layer was created for point data collected in each ENC series. A layer containing shapes drawn from these data points and supplemented by field drawings, IKONOS imagery and digital photos was also created (F00468Shapes). A number of new features were positioned; other features are different from charted. Since the point data collected for this survey were acquired at high accuracy, the chart should be corrected as drawn on shapes layer. [24]

AWOIS Items

Eight AWOIS items are located within Seattle Harbor as shown in the graphic below. Investigation results were recorded in the database: SeattleAwois.mdb. Copies of the reports and supporting data are included with this report. [25]



D.2 Additional Results

The following aids to navigation were positioned with the Trimble DGPS receiver to one-meter accuracy: [26]

Navigational Aid	LLN	Latitude	Longitude
Marina West Entrance Light 1	16837	47°37'42.142"N	122°23'45.548"W
Marina West Entrance Light 2	16837.1	47°37'43.268"N	122°23'48.068"W
Breakwater Light A	16838	47°37'46.317"N	122°23'45.569"W
Breakwater Light B	16838.1	47°37'39.965"N	122°23'45.518"W
Breakwater Light C	16838.2	47°37'37.819"N	122°23'21.002"W
Breakwater Light D	16838.3	47°37'45.093"N	122°23'15.815"W
Marina East Entrance Light 1	16839	47°37'38.785"N	122°23'14.329"W
Marina East Entrance Light 2	16839.1	47°37'40.411"N	122°23'15.903"W
Fish Pen Lights (2)	16852	47°37'20.683"N 47°37'19.629"N	122°22'04.367"W 122°22'02.917"W
Colman Ferry Terminal Lights (4)	16855	47°36'09.849"N 47°36'09.645"N 47°36'07.750"N 47°36'07.561"N	122°20'27.370"W 122°20'27.370"W 122°20'27.276"W 122°20'27.263"W
East Waterway Pier Light	16860	47°35'25.770"N	122°20'45.720"W
Georgetown Reach Range Front Light	16880	47°16'18.493"N	122°25'09.867"W [27]
Georgetown Reach Range Rear Light	16885	47°16'48.838"N	122°24'51.974"W [28]

The two charted lights at the Colman Ferry Terminal at Pier 52 have been relocated and two additional lights should be charted at the above positions. [29]

The fish pen light charted at latitude 47°37'24"N, longitude 122°22'06"W, LLN 16852, should be replaced with two fish pen lights at the positions in the table above. [30]

APPROVAL SHEET

for

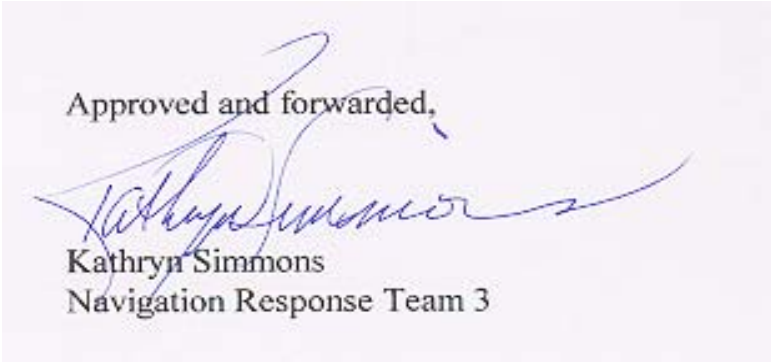
Chart Evaluation F00468

Standard field surveying and processing procedures were followed in producing this survey in accordance with the Navigation Response Branch Operations Manual, the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; and the Field Procedures Manual.

The data were reviewed daily during acquisition and processing.

The digital data and supporting records have been reviewed by me, are considered complete and adequate for charting purposes, and are approved. All records are forwarded for final review and processing to N/CS34, Pacific Hydrographic Branch.

A Coast Pilot report will follow.



1. PHB Revision - Fifteen page-size plots (11"x16" and 8.5"x11") have been generated during office processing.

F00468_1a, 1b and 1c (sheets 1, 2, and 3 of 15) are centered at latitude 47/37/00N, longitude 122/29/45W, scale 1:5,000. Washington State Ferries requested investigations in this area. Basic hydrography to the four-meter depth curve and 200% side scan sonar was performed in the required area.

F00468_2 (sheet 4 of 15) is centered at latitude 47/32/45N, longitude 123/23/30W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_3 (sheet 5 of 15) is centered of latitude 47/37/30N, longitude 122/22/15W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_4 (sheet 6 of 15) is centered of latitude 47/36/45N, longitude 122/21/15W, scale 1:5,000. The Puget Sound Pilots requested hydrographic survey coverage adjacent to Pier 66. The sheet also covers the disapproval of the charted submerged ruins (pier 71). Basic hydrography and 200% side scan sonar coverage was accomplished in these two areas. There were also investigations of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_5 (sheet 7 of 15) is centered of latitude 47/36/10N, longitude 122/20/21W, scale 1:5,000. This sheet covers an investigation of charted configuration of pier 53. There were also investigations of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB. This survey area also includes the investigation of AWOIS item 52568.

F00468_6 (sheet 8 of 15) is centered of latitude 47/35/10N, longitude 122/20/30W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_7 (sheet 9 of 15) are centered of latitude 47/35/10N, longitude 122/21/38W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB. This survey area also includes the investigation of AWOIS items 52569, 52570, 52571, 52572 and 52573.

F00468_8 (sheet 10 of 15) is centered of latitude 47/34/23N, longitude 122/21/23W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_9 (sheet 11 of 15) is centered of latitude 47/33/38N, longitude 122/20/45W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.F00468_10 (sheets 12 of 15) is centered of latitude 47/32/45N, longitude 122/20/15W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_11 (sheet 13 of 15) is centered of latitude 47/32/05N, longitude 122/19/23W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_12 (sheet 14 of 15) is centered of latitude 47/31/45N, longitude 122/18/45W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB.

F00468_13 (sheet 15 of 15) is centered of latitude 47/31/00N, longitude 122/18/15W, scale 1:5,000. It is the investigation of ENC (Electronic Nautical Chart) items identified in the letter instructions for OPR-N411-NRB

The hydrographer has determined the inshore limits of safe navigation by defining a Navigable Area Limit Line (NALL) throughout the survey area. Charted features and soundings inshore of this limit line have not been specifically addressed during survey operations and should be retained as charted.

No bottom samples were taken during field operations. Depths range from 2.0 to 114.0 feet.

2. PHB Revision - Hydrographic data was collected at the sametime.

3. PHB Revision - Concur

4. PHB Revision - Do not concur. Adjacent lines of hydrography were compared throughout the survey area and reflect good agreement. Crosslines were not run in according to Hydrographic specifications. Development lines, splits, are not a replacement for crosslines, they are used for the development of critical areas. The evaluator feels that the data is consistent for the depth and positional accuracy and adequate to supersede prior information in the common area.

5. PHB Revision - Concur

6. PHB Revision - Concur, approved tide note dated December 7, 2000 is attached.

7. PHB Revision - Filed with the hydrographic data.

8. PHB Revision - The following prior surveys were compared with F00468 and discussed as follows;

Survey	Year	Scale	Datum
H05711	1936	1:10,000	NAD27
H10792	1998	1:10,000	NAD83

Prior survey H05711 covers the entire areas of F00468_1a,F00468_1b and F00468_1c. The present survey was compared to a digital copy of H05711. Sounding agreement is fair with present survey soundings generally shoaler by 2 to 4 feet with a few extreme cases of 5 to 7 feet in areas of cultural development. These differences may be attributed to natural accretion, erosion and man-made development. Bottom characteristics were transferred because no samples were taken during survey operations.

Prior survey H10792 covers all the rest of survey F00468, smooth sheet plots; F00468_2 - F00486_13. The present survey was compared to a digital copy of H10792. Sounding agreement is fair with present survey soundings generally shoaler or deeper by 2 to 4 feet with a few extreme cases of 5 to 7 feet in areas of cultural development. These differences may be attributed to natural accretion, erosion and man-made development.

F00468 is adequate to supersede the area of common coverage, except where noted in the report.

9. PHB Revision - Chart comparison was made with Chart 18449, 17th Edition, dated Jan. 20, 2001.

10. PHB Revision - Chart comparison was made with Chart 18450 16th Edition, dated May 13, 2000.

11. PHB Revision - Chart 24 foot rock at latitude 47/36/31.054N, longitude 122/29/20.619W. A rky note was annotated in the vicinity of the other 24 foot sounding.

12. PHB Revision - Concur

13. PHB Revision - latitude 47/36/54.18N, longitude 122/29/38.36W

14. PHB Revision - Concur

15. PHB Revision - Concur, chart 17 foot depth at the survey position.

16. PHB Revision - Concur, It is recommended that MCD revise the ferry route based on the hydrographer's information

17. PHB Revision - The two piers which should be removed from the chart are located at 47/35/07.46N, longitude 122/21/42.47W and latitude 47/35/07.09N, longitude 122/21/46.86W.

18. PHB Revision - Concur, chart area according the this survey.

19. PHB Revision - Concur, the IKONOS imagery was use to draw the approximate shoreline in dashed red in this area. See smooth sheet for the depiction of the area.

20. PHB Revision - Concur, remove current charted sounding and chart soundings from present survey.

21. PHB Revision - Chart according to this survey, see F00468_5 for the correct portrayal of the area..

22. PHB Revision - Concur

23. PHB Revision - Chart according to this survey, see F00468_4 for the correct portrayal of the area

24. PHB Revision - Concur, see revisions in red and dashed red on the smooth sheet and H-drawing for portrayal of changes and additions to the MHWL.

25. PHB Revision - Concur, see attached AWOIS Reports.

26. PHB Revision - Below are two fixed aids which were not listed by the hydrographer in the report and are recommended for charting.

Light List name	Light List number	Latitude(N)	Longitude(W)
Alaska Hydro-Train Light A	16900	47/35/02.168	122/22/13.051
Alaska Hydro-Train Light B	16905	47/35/02.787	122/22/16.092

There were no features of landmark value located within the area of this survey.

27. PHB Revision - incorrect position, correct position is latitude 47/32/32.10N, longitude 122/20/09.39W

28. PHB Revision - incorrect position, correct position is latitude 47/32/25.68N, longitude 122/20/06.06W

29. PHB Revision - Concur

30. PHB Revision - Concur, remove charted light and chart the two light found on this survey.

RECRD	52568	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 36 04.16	LONG83	122 20 23.23	NATIVDATUM	31
LATDEC:	47.601155555556	LONDEC:	122.33978611111	GPQUALITY	Low
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	30	INIT	MCR	ASSIGNED	4/1/00
TECNIQ	S2,SD				

Techniqnote

History

HISTORY
CL678/82--PMC, CHART CORRECTION LETTER, 1982; REVISION TO SHORELINE INDICATED ON CHART SECTION. PILES INDICATED IN THE VICINITY OF PILE NOW CHARTED IN 47-36-04.16 N 122-20-23.23 W, NAD 83. ENTERED 2/00 MCR

Fieldnote

Not Investigated

EVALUATOR COMMENTS: Retain as charted

Proprietary

YEARSUNK NIMANUM

Print Record

RECRD	52569	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 35 19.78	LONG83	122 21 03.01	NATIVDATUM	31
LATDEC:	47.588827777778	LONDEC:	122.35083611111	GPQUALITY	Med
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	0	INIT	MCR	ASSIGNED	4/3/00

TECNIQ: S2,ES,SD,BD

Techniqnote: DEVELOP AN AREA BOUNDED BY 47-35-20 N TO 47-35-14 N (SHORE) AND 122-21-10 W 122-21-01 W FOR SOUNDING INFORMATION AND VERIFY OR DISPROVE ALL CHARTED PILES AND DOLHINS

History:

HISTORY
H-9167/70--PILES AND DOLHINS SHOWN IN THE AREA.
H10749/99-- RA-5-1-98; HYDOGRAHIC COVERAGE OF THE AREA, HOWEVER, FEATURES WERE NOT ADDRESSED AND HAVE BEEN REVISED TO SUBMERGED.

Fieldnote:

INVESTIGATION

DATE(S) September 21, 2000 (DN:265); October 18, (DN 292)

VN: 0651 TIME: 1859 GMT

INVESTIGATION METHODS USED: Side Scan Sonar, Echosounder

INVESTIGATION SUMMARY: The side scan swath coverage was inadequate to cover all charted dols and submerged dols; however, a number of contacts were identified and developed. Results are inconclusive. Echosounding lines were run over the charted submerged dols which were not covered by the sonargram. Three lines at three-to-five-meter line spacing (Pos. Nos. 10104-10120) were acquired. No evidence of submerged obstructions was observed.

The offshoremost dols were positioned; however, all were not..

CHARTING RECOMMENDATION (HYDROGRAPHER): Delete submerged dols. Retain charted dols.

EVALUATOR COMMENTS: Do not concur, the results of side scan sonar and sounding development over the area was inconclusive to warrant disproval of these features, therefore, the above charted obstruction and charted submerged dols should be retained as charted. Two additional visible piles were located in this vicinity at latitude 47/35/18.00N, longitude 122/21/06.98W and latitude 47/35/18.33N, longitude 122/21/04.08W. These piles should be charted at their survey position.

Proprietary

YEARSUNK NIMANUM

Print Record

RECRD	52570	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 34 59.64	LONG83	122 21 41.5	NATIVDATUM	31
LATDEC:	47.583233333333	LONDEC:	122.36152777778	GPQUALITY	Low
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	20	INIT	MCR	ASSIGNED	4/3/00
TECNIQ	VS,S2,SD,BD				

Techniqnote

History

HISTORY
CL1541/74--USPS REPORT, 1974; PILE REPORTED
CL530/85--USPS REPORT, 1985; PILE NOT SEEN.

Fieldnote

INVESTIGATION

DATE(S) August 29, 2000

VN: 0651

INVESTIGATION METHODS USED: Visual search

INVESTIGATION SUMMARY: Concrete dolphin exists at location of charted submerged pile - see ENC Data Point 482a located at latitude 47:34:59.600N, longitude 122:21:41.235W

CHARTING RECOMMENDATION (HYDROGRAPHER): Delete submerged pile; chart dolphin at latitude 47:34:59.600N, longitude 122:21:41.2357W position of ENC item no. 482a.

EVALUATOR COMMENTS:Concur

Proprietary

YEARSUNK NIMANUM

Print Record

~~FOOTLOS~~ ~~PAPER COPY~~

RECRD	52571	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 35 12.55	LONG83	122 21 46.86	NATIVDATUM	31
LATDEC:	47.586819444444	LONDEC:	122.36301666667	GPQUALITY	Med
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	0	INIT	MCR	ASSIGNED	4/6/2000

TECNIQ: VS,S2,BD,SD

Techniqnot: SEARCH 20M ABOUT THE POSITIONS LISTED IN HISTORY (BELOW)

History

HISTORY
H-9167/70--DOLPHINS SHOWN AND CHARTED IN NAD 83 POSTIONS
47-35-10.7 N 122-21-47.44 W
47-35-11.41 N 122-21-46.68 W
47-35-12.55 N 122-21-46.86 W
****SOURCE UNKNOWN--PILE CHARTED IN 47-35-12.55 N 122-21-46.86 W
H10749/99-- RA-5-1-98; HYDOGRAHIC COVERAGE OF THE AREA. HOWEVER, THE FEATURE WAS NOT ADDRESSED AND HAS BEEN REVISED TO SUBMERGED.

Fieldnot

INVESTIGATION

DATE(S) September 21, 2000 (DN:265)

VN: 0651 TIME: 1919 GMT

INVESTIGATION METHODS USED: Side Scan Sonar, Echosounder investigation

INVESTIGATION SUMMARY: Two obstructions were observed on both swaths: 10029.2p/10057.4p and 10029.3p/10057.3p. The contacts were fully developed. Least depth for contact 10029.2p/10057.4p is 36 feet (Pos. No. 10181.2) located at latitude 47:35:12.418N, longitude 122:21:46.151W. Least depth for contact 10029.3p/10057.3p is 28 feet (Pos. No. 10149.3) located at latitude 47:35:11.670N, longitude 122:21:46.175W.

The location of these contacts and the charted piles is seaward of a charted pier which has also been removed.

CHARTING RECOMMENDATION (HYDROGRAPHER): Delete the charted piles. Chart the soundings from this survey.

EVALUATOR COMMENTS:Do not concur. AWOIS item 52571, obstruction, charted at latitude 47/35/12.55N, longitude 122/21/46.86W was investigated and confirmed with side scan sonar. This feature, a 28 ft obstruction, should be retained as charted. Two submerged dols located at latitude 47/35/11.67N and longitude122/21/46.39W and latitude 47/35/11.26N, longitude 122/21/46.35W should be removed from the chart and replaced by an obstruction with a least depth of 28 feet at MLLW that was located at latitude 47/35/11.67N, longitude 122/21/46.17W. Two other submerged dols located at latitude 47/35/10.44N, longitude 122/21/46.08N, and latitude 47/35/10.59N, longitude 122/21/47.21W were adequately investigated and discussed and should be removed from the chart.

Proprietar

YEARSUNK:

NIMANUM:

Print Record

RECRD	52572	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 35 10.17	LONG83	122 21 58.93	NATIVDATUM	31
LATDEC:	47.586158333333	LONDEC:	122.36636944444	GPQUALITY	High
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	0	INIT	MCR	ASSIGNED	4/2/00

TECNIQ: VS,S2,BD,SD

Techniqnote: CONDUCT A 20M RADIUS SEARCH ABOUT THE CHARTED PILES AND DOLPHINS LOCATED WITHIN AN AREA BOUNDED BY 47-35-05 N TO 47-35-11N AND FROM 122-21-58 W TO 122-22-06.36.5 W TO AND AREA VERIFY OR DISPROVE THE 10 CHARTED PILES

History:

HISTORY
H-9167/70--PILES AND DOLPHINS LOCATED BY SURVEY. POSITION OF SEAWARD MOST PILE TO THE EAST IS 47-35-10.17 N 122-21-58.93 W
****SORCE UNKNOWN: A ROW OF PILES FROM POS. 47-35-10.81 N 122-22-02.02 W TO 47-35-06.94N 122-22-01.29W APPEARS ON THE FIRST EDITION OF CHART 18450, JUNE 1965.
H10749/99-- RA-5-1-98; HYDOGRAHIC COVERAGE OF THE AREA, HOWEVER, THE PILES AND DOLS WERE NOT ADDRESSED AND HAVE BEEN REVISED TO SUBMERGED EXCEPT FOR THE PILE IN POS 47-35-09.82N 122-22-04.3W .

Fieldnote:

INVESTIGATION

DATE(S) September 21, 2000 (DN:265)

VN: 0651 TIME: 1911 GMT

INVESTIGATION METHODS USED: Side Scan Sonar, Echosounder Development

INVESTIGATION SUMMARY: Charted submerged dols were not observed on side scan sonar image, nor was the pile charted at latitude 47:35:09.852N, longitude 122:22:04.238W (Pos. Nos. 10034-10037 and 10049-10052). Echosounder development at 5 to 10-meter line spacing located no submerged obstructions. All visible dols and piles were positioned.

CHARTING RECOMMENDATION (HYDROGRAPHER): Delete submerged dols. Chart piles and dols as positioned and soundings from current survey.

EVALUATOR COMMENTS:Concur, chart visible piles at latitude 47/35/10.03N and longitude 122/21/58.75W, latitude 47/35/09.74N and 122/21/58.97W, 47/35/07.68N and 122/22/05.04W, latitude 47/35/07.46N and longitude 122/22/05.54W, latitude 47/35/07.27N and longitude 122/22/05.97W.

Proprietary

YEARSUNK | NIMANUM

Print Record

RECRD	52573	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 35 06.17	LONG83	122 22 10.73	NATIVDATUM	31
LATDEC:	47.585047222222	LONDEC:	122.36964722222	GPQUALITY	Low
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	30	INIT	MCR	ASSIGNED	4/7/00
TECNIQ	VS,S2,BD,SD				

Techniqnote

History

HISTORY
****CHARTED SUBMERGED AND VISIBLE DOLPHINS FROM MISC. SOURCE. APPEARS ON THE FIRST EDITION OF CHART 18450, JUNE 1965.
47-35-06.17 N 122-22-10.73 W AS CHARTED VISIBLE
47-35-06.36 N 122-22-10.37 W AS CHARTED SUBMERGED

Fieldnote

INVESTIGATION

DATE(S) September 21, 2000 (DN:265), October 18, 2000 (DN 292)

VN: 0651 TIME: 1919 GMT

INVESTIGATION METHODS USED: Side Scan Sonar, Echosounder Development

INVESTIGATION SUMMARY: Submerged dols were not observed on SSS (Fix Nos. 10039-10041 and 10045-10047). No obstructions were located with echosounder development over the charted submerged dols

CHARTING RECOMMENDATION (HYDROGRAPHER): Delete submerged dols charted at the above location. Chart soundings from the current survey.

EVALUATOR COMMENTS:Concur

Proprietary

YEARSUNK NIMANUM

Print Record

RECRD	52574	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 35 21.85	LONG83	122 22 41.01	NATIVDATUM	31
LATDEC:	47.589402777778	LONDEC:	122.37805833333	GPQUALITY	High
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	20	INIT	MCR	ASSIGNED	
TECNIQ	VS,S2,SD				

Techniqnote

History

HISTORY
H-9167/70-- PRIVATELY MAINTAINED AID SHOWN. CHARTED IN POSITION 47-35-21.85 N 122-22-41.03 W
H10749/99-- RA-5-1-98; HYDOGRAHIC COVERAGE OF THE AREA, HOWEVER, THE FEATURE WAS NOT ADDRESSED AND HAS BEEN REVISED TO SUBMERGED.

Fieldnote

Not Investigated

EVALUATOR COMMENTS: Retained as charted

Proprietary

YEARSUNK		NIMANUM	

Print Record

RECRD	52575	VESSLTERMS	OBSTRUCTION	CHART	18450	AREA	N
		CARTOCODE	0067	SNDINGCODE		DEPTH	

LAT83	47 35 22.27	LONG83	122 22 43.07	NATIVDATUM	31
LATDEC:	47.589519444444	LONDEC:	122.37863055556	GPQUALITY	High
				GPSOURCE	Scaled

PROJECT	OPR-N411	ITEMSTATUS	Assigned	SEARCHTYPE	Full
RADIUS	20	INIT	MCR	ASSIGNED	4/7/00
TECNIQ					
Techniqnote	SEARCH IN CONJUNTION WITH ENC ITEM 1005,				

History

HISTORY
H-9167/70-- LOG BOOM FEATURE SHOWN, SEAWARD EXTENT OF FEATURE IS IN POS.47-35-22.27 N 122-22-43.07 NAD 83. W. DASHED LINES SHOWN THE CHART ARE LOGS TIED TO DOLPHINS.

Fieldnote

Not Investigated

EVALUATOR COMMENTS: Retained as charted

Proprietary

YEARSUNK		NIMANUM	

Print Record

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: December 7, 2000

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-N411-NRB-2000
HYDROGRAPHIC SHEET: F00468

LOCALITY: Puget Sound, WA
TIME PERIOD: August 18 - October 19, 2000

TIDE STATION USED: 944-7130 Seattle, WA
Lat. 47° 36.2'N Lon. 122° 20.3'W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.198 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: PS161, PS163, PS164, PS166, PS167, PS168 & PS169.

Refer to attachments for zoning information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time.

Thomas K. Mero 12/7/00

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

Final tide zone node point locations for OPR-N411-NRB-2000,
Sheet F00468.

Format: Longitude in decimal degrees (negative value denotes Longitude West),
Latitude in decimal degrees
Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction

	Tide Station Order	AVG Time Correction	Range Correction
Zone PS161			
-122.4775 47.748685	944-7130	0	1.00
-122.539751 47.749408			
-122.522043 47.705945			
-122.531028 47.648028			
-122.493204 47.634317			
-122.43138 47.661495			
-122.400999 47.665697			
-122.399705 47.667448			
-122.394633 47.680395			
-122.401293 47.697613			
-122.44047 47.716091			
-122.468913 47.736374			
-122.4775 47.748685			
Zone PS163			
-122.43138 47.661495	944-7130	0	1.00
-122.493204 47.634317			
-122.454132 47.611852			
-122.414475 47.59963			
-122.385315 47.594109			
-122.375054 47.579733			
-122.362276 47.583946			
-122.358363 47.584914			
-122.351071 47.58674			
-122.346288 47.59011			
-122.341155 47.591544			
-122.328061 47.607913			
-122.378777 47.640654			
-122.43138 47.661495			

Zone PS164

-122.375054 47.579733	944-7130	+6	0.99
-122.364437 47.572993			
-122.355394 47.570953			
-122.334939 47.571738			
-122.336721 47.591041			
-122.341155 47.591544			
-122.346288 47.59011			
-122.351071 47.58674			
-122.358363 47.584914			
-122.362276 47.583946			
-122.375054 47.579733			

Zone PS166

-122.385315 47.594109	944-7130	+6	1.01
-122.414475 47.59963			
-122.454132 47.611852			
-122.493204 47.634317			
-122.495538 47.625254			
-122.500206 47.610671			
-122.499041 47.599633			
-122.49671 47.588986			
-122.539476 47.5659			
-122.560992 47.540933			
-122.541374 47.467087			
-122.495278 47.458593			
-122.45129 47.4477			
-122.381302 47.450472			
-122.33877 47.466953			
-122.385315 47.594109			

Zone PS167

-122.495538 47.625254	944-7130	+12	1.01
-122.526129 47.632985			
-122.552201 47.628049			
-122.534492 47.615797			
-122.500206 47.610671			
-122.495538 47.625254			

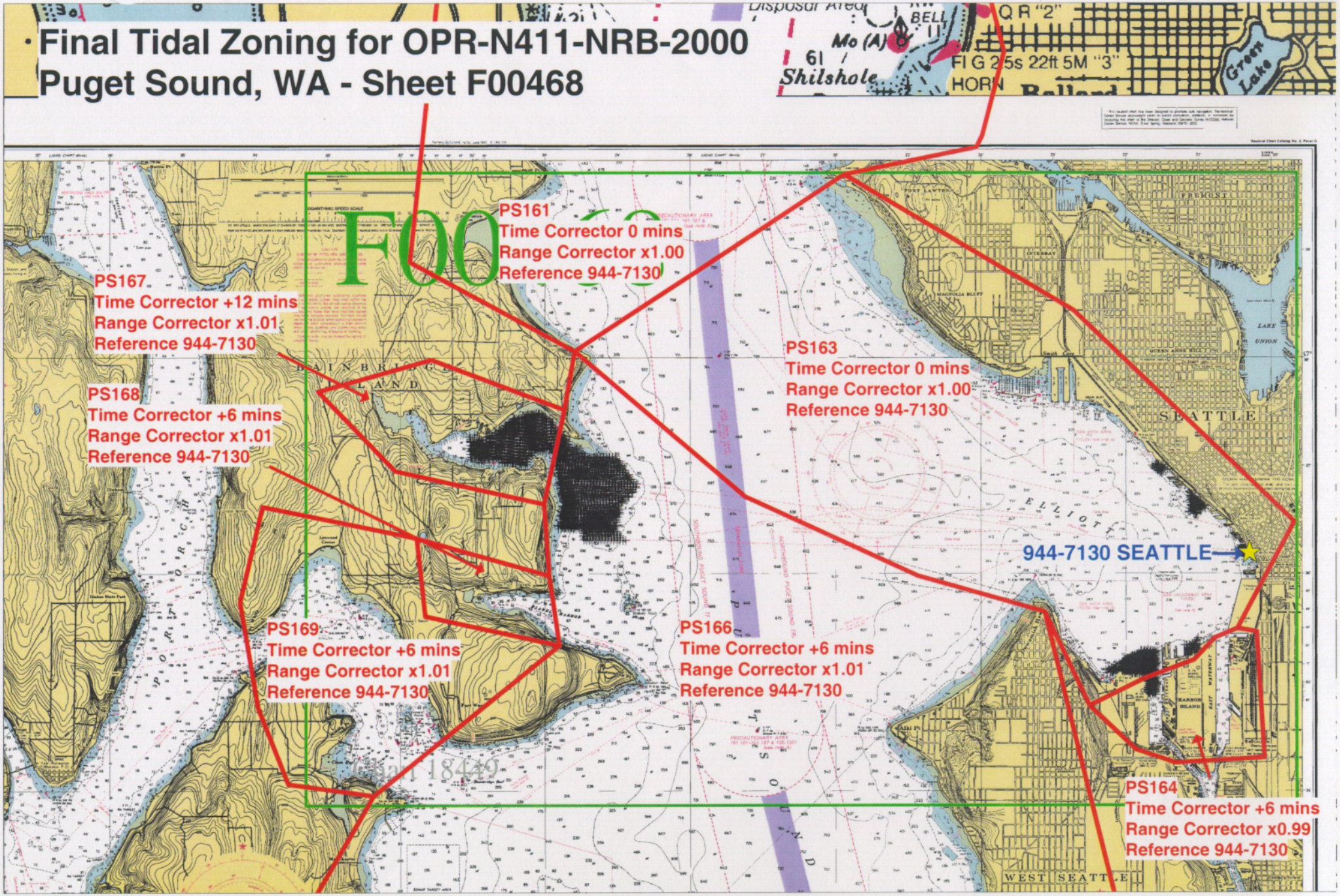
Zone PS168

-122.499041 47.599633	944-7130	+6	1.01
-122.529493 47.605406			
-122.527569 47.593453			
-122.49671 47.588986			
-122.499041 47.599633			

Zone PS169

-122.539476 47.5659	944-7130	+6	1.01
-122.559077 47.567719			
-122.566004 47.579514			
-122.570146 47.595625			
-122.564943 47.610279			
-122.529493 47.605406			
-122.527569 47.593453			
-122.49671 47.588986			
-122.539476 47.5659			

Final Tidal Zoning for OPR-N411-NRB-2000
Puget Sound, WA - Sheet F00468



NOAA FORM 77-27(H)
(9-83)

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER: F00468

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

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	3	SMOOTH OVERLAYS: POS., ARC, EXCESS	
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES	1					
ENVELOPES						
VOLUMES						
CAHIERS						
BOXES						

SHORELINE DATA

SHORELINE MAPS (List):

PHOTOBATHYMETRIC MAPS (List):

NOTES TO THE HYDROGRAPHER (List):

SPECIAL REPORTS (List):

NAUTICAL CHARTS (List):

OFFICE PROCESSING ACTIVITIES

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

PROCESSING ACTIVITY	AMOUNTS		
	VERIFICATION	*EVALUATION*	*TOTALS*
POSITIONS ON SHEET			
SITIONS REVISED			
UNDINGS REVISED			
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS			
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET			116
COMPARISON WITH PRIOR SURVEYS AND CHARTS			
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT			60
GEOGRAPHIC NAMES			
OTHER* (Chart Compilation)			94
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS			270

Pre-processing Examination by	*Beginning Date*	*Ending Date*
ification of Field Data by R. Davies	*Time (Hours)* 116	*Ending Date*
Verification Check by	*Time (Hours)*	*Ending Date*
Evaluation and Analysis by R. Davies	*Time (Hours)* 60	*Ending Date* 05/30/2003
Inspection by B. Olmstead	*Time (Hours)* 22	*Ending Date* 05/30/2003

U.S. GOVT. PRINTING OFFICE 1983: 764-006/6061

APPROVAL SHEET
F00468

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 survey records and digital data comply with NOS requirements except where noted in the Descriptive Report.

Bruce Olmstead Date: 5/30/03

Bruce Olmstead
Acting Chief, Cartographic Team
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 Descriptive Report.

Date: 6/27/03

John E. Lowell, Jr.
Commander, NOAA
Chief, Pacific Hydrographic Branch

****

AWOIS check
8/1/03

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. F00468

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
18449	4/16/01	RUSS DAVIES	Full ~~Part~~ ~~Before~~ After Marine Center Approval Signed Via
			Drawing No. Full Applications of soundings, features
			and curves from smooth sheet.
18450	4/18/01	RUSS DAVIES	Full ~~Part~~ ~~Before~~ After Marine Center Approval Signed Via Full Application
			Drawing No. of soundings, features and curves from the
			smooth sheet
18450 (inset)	4/18/01	RUSS DAVIES	Full ~~Part~~ ~~Before~~ After Marine Center Approval Signed Via Full Application
			Drawing No. of features from smooth sheet
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.