

H10792

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. OPR-N368-PHP
Registry No. H-10792

LOCALITY

State Washington
General Locality Bellingham Channel
Sublocality Burrows Island to Sinclair Island

19 99 -2000

CHIEF OF PARTY
LT James Crocker, NOAA

LIBRARY & ARCHIVES

DATE OCT 12 2000

HYDROGRAPHIC TITLE SHEET

H-10792

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.

PHP-10-1-98

State Washington

General locality Bellingham Channel

Locality Burrows Island to Sinclair Island

Scale 1:10,000 Date of survey Jan. 28, 1998 - Mar. 16, 1999

Instructions dated May 7, 1997 Project No. OPR-N368-PHP

Vessel Jensen Launch 1101(EDP0651), Sea Ark Launch 1102(EDP0652)

Chief of party LT James Crocker, NOAA

Surveyed by LT Crocker, ST Simmons, ST Brown, ST Rothmeyer, ET Wernicke

Soundings taken by echo sounder, hand lead, pole Raytheon DSF-6000, Innerspace 448, Knudsen 320M

Graphic record scaled by PHP Personnel

Graphic record checked by PHP Personnel

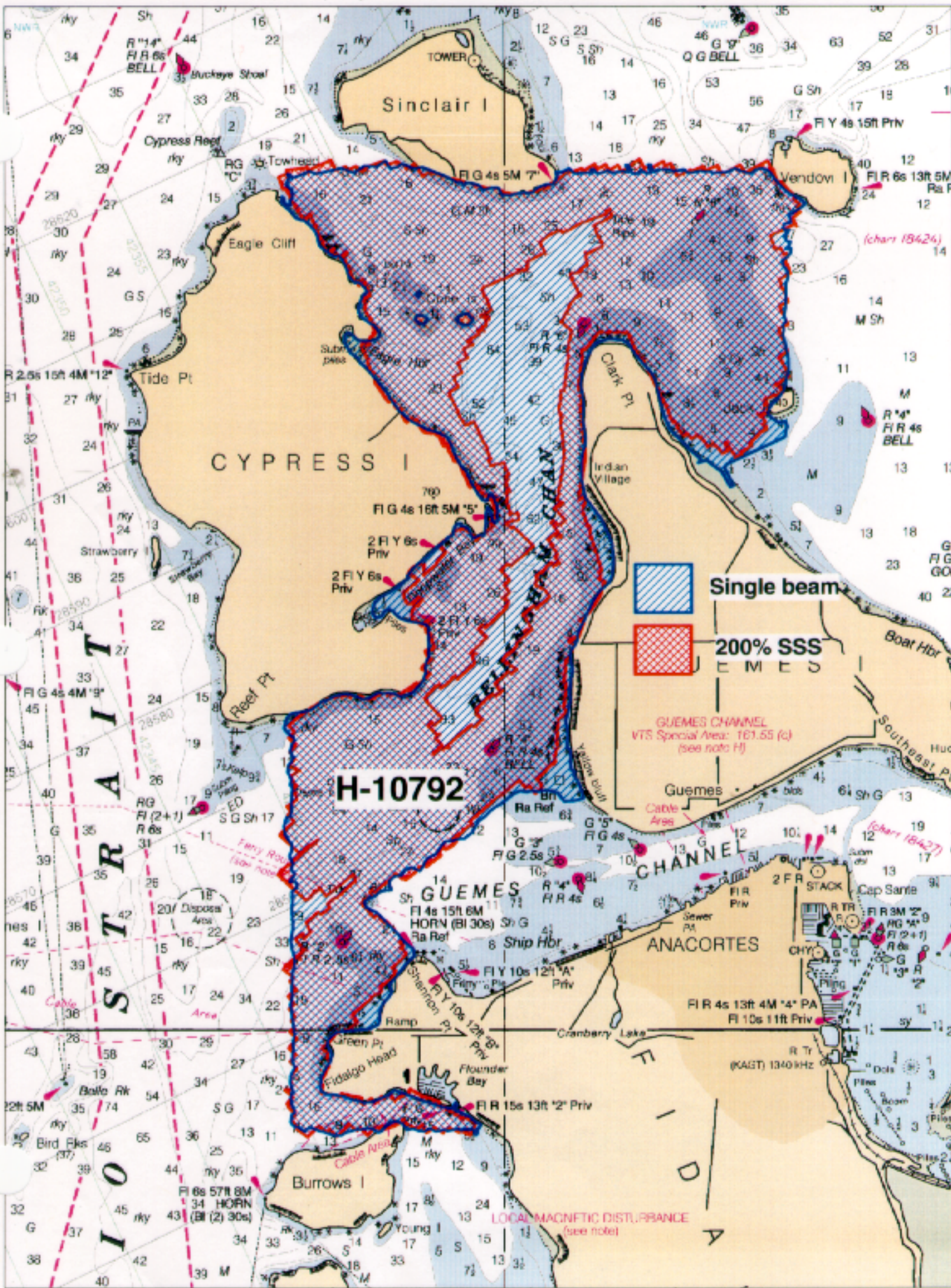
Evaluation by: R. Davies Automated plot by HP Design Jet 750C

Verification by R. Davies

Soundings in fathoms ~~FEET~~ at ~~MEAN~~ MLLW and tenths

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.

AWOIS ✓ SURF ✓ 9/25/00 by MSA



STRAIT

IO

SINCLAIR I

CYPRESS I

H-10792

GUEMES

ANACORTES

BURROWS I

Single beam

200% SSS

GUEMES CHANNEL
VTS Special Area: 161.55 (c)
(see note H)

LOCAL MAGNETIC DISTURBANCE
(see note I)

TOWER

BUCKEYE SHOAL

CYPRESS REEF

TIDE PT

STRAWBERRY I

REEF PT

CABLE AREA

BALLO Rk

BIRD Rks

FLOURIDER BAY

YOUNG I

CLARK Pt

INDIAN VILLAGE

YELLOW BLUFF

CABLE AREA

CRANBERRY LAKE

GREEN Pt

FLOURIDER BAY

YOUNG I

VENDOR I

GUEMES CHANNEL

GUEMES CHANNEL

ANACORTES

CHYO

STACK

Cap Santa

Room

Piles

Boat Hbr

Southeast Pt

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FL R 6s 13ft 5M Ra F

(chart 18426)

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Descriptive Report to Accompany Hydrographic Survey H-10792

Field Number PHP-10-1-98

Scale 1:10,000

1998

Pacific Hydrographic Party

Chief: LT James Crocker

A. PROJECT ✓

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-N368-PHP, Northern Puget Sound, Washington, dated May 7, 1997.

This project was authorized in response to requests from the Puget Sound Pilots, the Thirteenth Coast Guard District, and the National Ocean Service (NOS) Office of Ocean and Coastal Resource Management. The primary objective is to have the charted wire drag clearance depths superceded by modern, full-bottom-coverage hydrography. The charted wire drag clearance depths, which originate from surveys conducted in 1935, 1943, 1962 and 1972, are often considered controlling depths.

The project area includes parts of the Strait of Juan de Fuca, Rosario Strait, Haro Strait, Bellingham Channel, Middle Channel and San Juan Channel. Traffic throughout the project area is heavy and includes both foreign and domestic cargo ships, pleasure craft, automobile ferries as well as tugs and barges. Oil refineries north of Lummi Island and in Anacortes are used for receipt of crude oil, shipment of petroleum products, bunkering vessels, and receipt of alumina and liquefied petroleum gas. According to the Puget Sound Pilots, routes for approaches and departures of tankers with drafts up to 56 feet occur throughout the area.

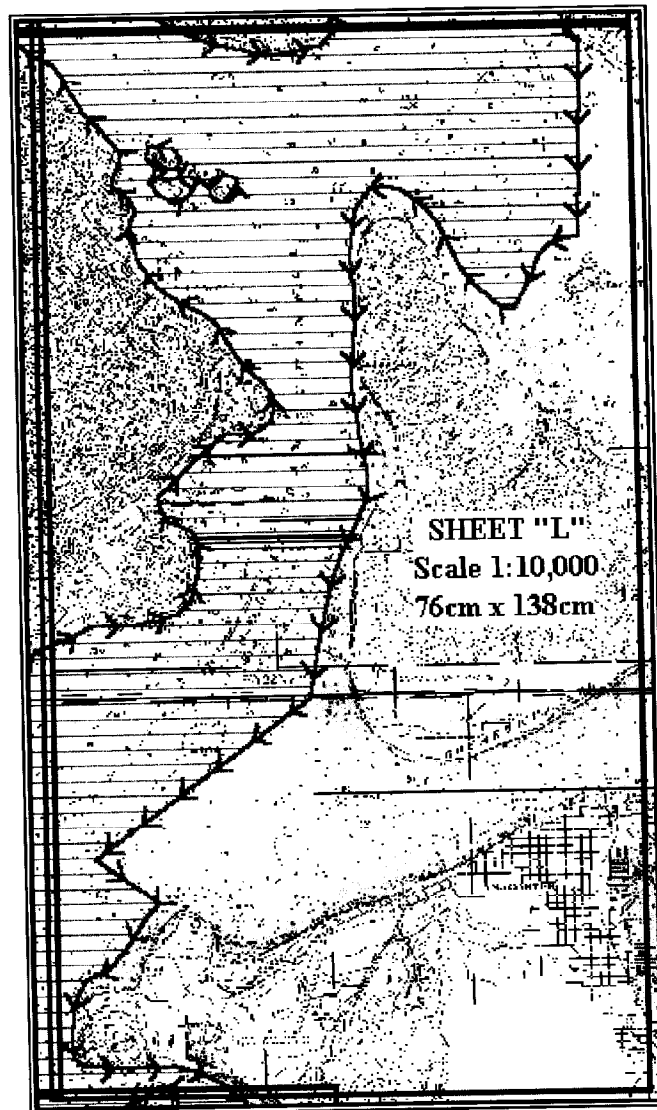
The entire project is environmentally sensitive and lies within the limits of the proposed Northwest Straits National Marine Sanctuary.

This is the fourth survey of the project. The sheet letter is "L" as specified by Project Instructions; registry number is H-10792; designation: Burrows Island to Sinclair Island, Bellingham Channel, Washington.

B. AREA SURVEYED ✓

Sheet limits extend from latitude $48^{\circ}29'14.2''\text{N}$ to latitude $48^{\circ}36'39.7''\text{N}$ and from longitude $122^{\circ}36'12.3''\text{W}$ to longitude $122^{\circ}42'28.1''\text{W}$. Plotter sheet limits measure 76 cm x 138 cm.

Hydrographic limits are depicted on the chartlet which follows; inshore sounding limit is the 3-fathom depth curve



Charts 18424 and 18427

Data acquisition was conducted from January 28, 1998, (DN 028) through March 16, 1999 (DN 075).

C. SURVEY VESSELS ✓

The following NOAA survey vessels were used throughout the project:

| Vessel | EDP # | LOA | Beam | Draft | Tonnage | Power |
|--------------|-------|---------|---------|-------|---------|----------------|
| 1101 Jensen | 0651 | 29 feet | 10 feet | 0.4m | 5 tons | Jet Drive |
| 1102 Sea Ark | 0652 | 19 feet | 8 feet | 0.4m | 2 tons | 150hp outboard |

Both launches were used for detached positions, bottom samples, and for mainscheme and development hydrography. In addition, NOAA Launch 1101 was used for side scan sonar operations, velocity casts and dive investigations. No changes to the standard vessel sounding configuration were necessary for either vessel.

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

HYPACK Software produced by Coastal Oceanographics was used for all data acquisition. HPTOOLS, a program developed by Hydrographic Surveys Division, Systems Support Branch, N/CS32, was used to convert HYPACK data to HPS format. HPS Software, also developed by HSD/SSB, was used for hydrographic data processing. MapInfo Professional and Vertical Mapper were used in conjunction with HPS for survey planning and layout, for data display, and as tools to evaluate data quality.

CAT version 3.0 was used to download data from Seacat conductivity, temperature and depth recorders. The VELOCITY program was used through December 3, 1998, (DN 337) to compute sound velocity correctors. VELOCWIN was used to process all cast data subsequent to DN337.

A list of software used to complete the survey is included in Appendix H* along with respective versions and issue dates.

E. SIDE SCAN SONAR

Side scan sonar (SSS) operations were conducted using an EG&G model 260 slant-range correcting SSS recorder and an EG&G 272-T dual channel, single frequency towfish. The following sonar equipment was used throughout the survey:

| Type | Serial Number |
|---------------|---------------|
| 272-T Towfish | 015598 |
| 260 Recorder | 015602 |

* Filed with the hydrographic data

The towfish was operated on the 100 kHz frequency and was configured with a 20° beam depression. It was deployed from the aft starboard quarter using a Kevlar cable passed through a block and powered by a Superwinch Model W115. Block and winch were mounted to a swing-arm davit. The Kevlar cable was connected to the EG&G recorder cabling with a slip-ring assembly cable. Tape markings at measured intervals indicated length of cable deployed from the block up to 55 meters, the maximum deployable. Markings are at one-meter intervals up to 10 meters and at five-meter intervals thereafter.

SSS operations were conducted at a speed of 5 knots or slower when using range scales of 75 or 100 meters. At higher range scales the speed was maintained at 4 knots or slower. Range scales of 75, 100, 150 and 200 meters were used. The SSS towfish was maintained at a height off the bottom equivalent to 8 to 20 percent of the range scale except where quickly changing depths prohibited compensatory adjustments in cable length. In such cases, the hydrographer believes the sonargram trace is adequate for identification of any significant contacts. Two hundred percent side scan coverage was acquired from the 3-fathom/5.5-meter-curve to the 24-fathom/43.9-meter-curve in accordance with Section 7.2 of project instructions.

Two hundred percent coverage was achieved using orthogonal patterns. Because of the configuration of the survey area; i.e., changes in shoreline orientation and current direction, as well as the constraints of narrow channels, the survey sheet was sectioned into three parts: north, middle and south. Side scan track lines in each section were oriented at angle to the contours, where possible, with line spacing of 150 meters. One-hundred-percent coverage is identified by fixes in the 20,000-29,999 range; two-hundred-percent coverage by fixes in the 30,000-39,999 range. The coverage was plotted on two separate swath plots and reviewed to assure acquisition of adequate overlap and full coverage.

The SSS recorder gain was adjusted for the best return for the prevalent bottom material. Contacts or identifiable features (e.g., buoy anchors, change in bottom texture) visible on the outer edge of the sonargram assure acceptable SSS recorder tuning and served as confidence checks during operations.

Following guidelines in Section 7.2.2 of project instructions, sonargrams were manually scanned for significant contacts. A total of 1739 contacts were labeled and entered into one HPS contact table. Where contacts appeared in a cluster on the sonargram, only the most significant was entered. Apparent significance was determined with the PHP-developed Contact-O-Meter, a scale proportioned for shadow length and fish height. Contact heights and raw depths were derived using the HPS Side Scan Utility Program and all recorded contacts were plotted.

Lacking an algorithm to sort contacts into levels of priority based on the combination of height, offset, slope, number of local soundings and local depth, the hydrographer employed various techniques for selecting contacts for development. A large number of contacts were determined to be insignificant based on (1) water depth at contact, (2) height exaggeration

caused by proximity to the towfish and/or (3) steepness of the slope; these were not developed. Final analysis entailed re-scanning all sonargrams and manually listing for further review all of the most prominent contacts. These were plotted on Mapinfo layer *priority 1* and hydrography was evaluated to confirm adequate development. All contacts on this list were developed. *Concur*

The contact table is included in Separate III.*

F. SOUNDING EQUIPMENT ✓

Innerspace Model 448 (INN448) single-frequency echosounder, Serial Number 239, was used on Vessel No. 0652 throughout the survey.

Raytheon, dual-frequency Digital Sounding Fathometer 6000N (DSF 6000), Serial Number A121N, was employed on Vessel No. 0651 on all days of hydrography except for DN's 189, 352, 356, 363, 364, 011, 015 and 075. On those days the Knudsen 320M, Serial Number K98577, was used. For both of these fathometers the high-frequency beam was selected for plotting throughout the survey. The low-frequency depth was scanned and edited only when the high-frequency did not track the bottom or when a more significant depth was acquired with the low-frequency beam

Data acquired with the Knudsen echosounder through DN 015 were marginal. The poor quality was traced to grounding problems which have since been resolved; however, difficulties with low-frequency tracking persist. Misdigitization and poor trace quality occurred frequently. Where data quality was compromised, the hydrography was reacquired using the DSF 6000.

Metric leadlines were used for depth comparisons with the echosounder. PHP fabricated the leadlines following Hydrographic Survey Guideline (HSG)69. Leadline calibration forms are included in Appendix E.*

A MOD III diver least depth gauge, S/N 68335, was used to obtain least depths on dive investigations. The unit was operated in accordance with Section 7.2.2.1 of the Field Procedures Manual (FPM). PTC Electronics calibrated the gauge on March 12, 1998; the calibration report is included in Appendix E.*

G. CORRECTIONS TO SOUNDINGS ✓

Tides and Water Levels

In compliance with Section 5.8 of Project Instructions, tide stations were established at the historical sites shown below:

| Station Number | Station Name | Latitude | Longitude |
|----------------|----------------------------------|------------|-------------|
| 944-9982 | Richardson Point Lopez Island | 48°26'48"N | 122°54'00"W |
| 944-9932 | Armitage Island | 48°32'06"N | 122°47'48"W |

Real-time, portable acoustic gauges with satellite capability were installed to provide information on zoning, tidal datums and harmonic constants for predictions on sheet "L." Primary tide stations at Port Townsend, WA (944-4900), Cherry Point, WA (944-9424), and Friday Harbor, WA (944-9880), serve as controls for datum determination at the above sites.

Project Instructions define nine tide zones within the limits of Sheet L. Time/height correctors are listed below; zone parameters are included in the Field Tide Note located in Appendix D. ✕

| HPS Zone | Tide Zone | Reference Station | Time Corrector | Range Ratio |
|----------|-----------|-------------------|----------------|-------------|
| 1 | NPS70 | Cherry Point | -30 min | x0.90 |
| 2 | NPS72 | Port Townsend | 36 min | x0.96 |
| 3 | NPS73 | Port Townsend | 18 min | x0.94 |
| 4 | NPS75 | Port Townsend | 24 min | x0.92 |
| 5 | NPS76 | Port Townsend | 12 min | x0.92 |
| 6 | NPS77 | Port Townsend | 06 min | x0.90 |
| 7 | NPS78 | Port Townsend | -06 min | x0.92 |
| 8 | NPS71 | Cherry Point | -18 min | x0.91 |
| 9 | NPS74 | Port Townsend | 24 min | x0.95 |

Preliminary, six-minute, real tides recorded by the two reference stations were downloaded from the Ocean and Lake Levels Division web site. Using DPAS Utilities, the tides were imported into the respective HPS table established for each reference station. Zone Utilities computed the appropriate zone for each sounding; time and height adjustments were computed; and corrected tides were applied to sounding data. *Approved tides were applied to this survey, see tide note, dated June 17, 1999.*

Velocity of Sound

Corrections for the speed of sound through the water column were computed from data obtained with a Seacat conductivity, temperature and depth recorder. SEA-BIRD Electronics (SBE) Model 19-03, 335m, S/N 1912344-1892, was used for casts 1 and 4-18; Model 19-01, S/N 1917166-2530 was used for casts 2 and 3; and Model SBE-19, S/N 2044, was used for casts 19 and 20. The recorder was initialized using program CAT v. 2.0 and the VELOCITY program was used to determine the speed of sound correctors for Casts 1-14. VELOCWIN was used for all processing for casts 15-20.

* Filed with the hydrographic data

| HPS Table | DN | DN Range | Extrapolated Depth | Cast Latitude | Cast Longitude |
|-----------|-----|----------|--------------------|---------------|----------------|
| 1 | 033 | 028-054 | 153.5m | 48°33'48"N | 122°39'42"W |
| 2 | 055 | 055-074 | 147.8m | 48°33'00"N | 122°40'00"W |
| 3 | 075 | 075-112 | 140.4m | 48°35'17"N | 122°40'09"W |
| 4 | 113 | 113-130 | 146.4m | 48°33'34"N | 122°39'20"W |
| 5 | 131 | 131-180 | 141.9m | 48°33'58"N | 122°39'02"W |
| 6 | 181 | 181-195 | 157.5m | 48°33'43"N | 122°34'42"W |
| 7 | 196 | 196-209 | 153.7m | 48°38'34"N | 122°44'13"W |
| 8 | 210 | 210-228 | 147.1m | 48°33'54"N | 122°39'11"W |
| 9 | 229 | 229-278 | 108.9m | 48°34'55"N | 122°39'50"W |
| 10 | 279 | 279-295 | 096.6m | 48°33'48"N | 122°39'42"W |
| 11 | 296 | 296-308 | 135.3m | 48°33'57"N | 122°39'34"W |
| 12 | 309 | 309-321 | 145.6m | 48°34'02"N | 122°39'38"W |
| 13 | 322 | 322-336 | 143.7m | 48°33'56"N | 122°39'44"W |
| 14 | 337 | 337-347 | 123.6m | 48°34'06"N | 122°39'46"W |
| 15 | 348 | 348-003 | 152.8m | 48°34'00"N | 122°39'43"W |
| 16 | 004 | 004-012 | 113.6m | 48°34'38"N | 122°39'56"W |
| 17 | 013 | 013-025 | 159.1m | 48°33'52"N | 122°39'42"W |
| 18 | 026 | 026-047 | 70.6m | 48°32'15"N | 122°40'36"W |
| 19 | 048 | 048-063 | 17.7m | 48°30'38"N | 122°41'08"W |
| 20 | 075 | 075 | 71.2m | 48°32'15"N | 122°40'36"W |

Appendix I ^{*} contains copies of all velocity cast data and HPS Velocity Corrector Tables.

SEACAT instrument S/N 1892 was calibrated on February 10, 1998; S/N 2530 was calibrated on October 27, 1997; and S/N 2044 was calibrated on November 11, 1995. Copies of the calibration reports, all of which were produced by SEA-BIRD Electronics, are included in Appendix E. ^{*}

Leadline Comparisons

Periodic leadline comparisons, annotated on the echogram, confirm proper digitization of the echosounder depths. Leadline comparison forms are located in Appendix E. ^{*}

Static Draft

Static draft for VN 0652 was determined on June 3, 1997, (DN 154). First, the depth of the transducer face from a reference mark on the hull was measured. Next, with the launch in the water, fuel tanks half full and two persons aboard, the depth from this reference mark to the waterline was measured. Combining the two measurements, a static draft of 0.4 meters was calculated.

^{*} Filed with the hydrographic data.

A static draft of 0.4 meters was determined for vessel 0651 on June 27, 1997, (DN 178) using a method similar to above.

Dynamic Draft

Settlement and squat measurements were conducted for VN 0651 on February 9, 1998, (DN 040) and for VN 0652 on June 3, 1997 (DN 154). All measurements were performed in Guemes Channel, WA. Field records are included in Appendix E. *

Transducer and antenna offsets, static draft, and settlement and squat correctors are entered into offset tables. * Table 2 for VN 0652 and Table 3 for VN 0651. Correctors are applied during processing in HPS using the Reapply Vertical Correctors Utility.

Corrections to Echosoundings

Occasional problems with misdigitization or bottom tracking were encountered during this survey. Where the echogram trace was adequate and unambiguous, the digital record was corrected to reflect the analog trace. Where the echogram trace was discontinuous, the selected soundings were deselected or rejected. Gaps in the sounding interval greater than 6mm at the scale of the survey were resurveyed.

H. HYDROGRAPHIC POSITION CONTROL ✓

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 during the survey with the exception of November 30 (DN 334) and December 2-4 (DN's 336-338) when the Whidbey beacon was out of service. On those days the Canadian Coast Guard beacon in Richmond, BC, (320kHz) was used.

A separate Horizontal Control Report for this project was submitted to the Pacific Hydrographic Branch (PHB) in June 1997.

DGPS Performance Checks

DGPS performance check stations were established to Third Order, Class 1, standards at pilings in Cornet Bay Marina and Skyline Marina. All DGPS performance checks were successful and are included in Appendix F. *

* Filed with the hydrographic data

Positioning Equipment

The following GPS equipment was used:

| Equipment Location | Type Receiver/Antenna | Receiver Serial No. | Antenna Serial No. |
|--------------------|--|-----------------------|--------------------|
| VN 0651 | Ashtech (v. 1E08d) CSI Beacon Revr MBXI | 700417B1042 X-1112 | 700378A272 |
| VN 0652 | Starlink Receiver | 865 | 4207 |

L SHORELINE *See Evac Report, section*

Digital shoreline derived from photogrammetric source data was not available for this project. Section 4.1.1 directed that shoreline for project field sheets be derived, for orientation purposes only, from NOS Charts 18421, 18424, 18427, 18429, 18430, 18433 and 18434. To facilitate verification in the field for this survey, PHP created a digital shoreline document based on BSB electronic charts produced by Maptech. No single chart covers the entire survey but Charts 18424, 18427, 18429 and 18430 overlap and are the largest scale charts of the area. The charts were imported into Mapinfo; a trace of the shoreline was created on the cosmetic layer, saved as a DXF file and imported into HYPACK. As the launch moved along the shore, its position was displayed over the digital shoreline. Correctly charted features were easily verified and uncharted features or items requiring disapproval were also apparent.

During final evaluation of shoreline, prior surveys H08318, H08332, and H06607 were digitized into Mapinfo Layer *Shoreline Priors* for comparison with the survey. H08318 shoreline is dark blue, H08332 is pink and H06607 is light blue. Shoreline from these surveys represents the observed shoreline more accurately than do the charts.

Because project instructions define the limit of inshore hydrography as the 3-fathom curve, the zero curve was not acquired in most areas; thus, definition of the zero curve at MLLW cannot be depicted with certainty. Obvious discrepancies are corrected on the Final Field Sheet which is a composite of the charts listed above. Because the PHP plotter prints the color brown in a shade very close to red, the color green was selected to depict correctly charted shoreline and features; recommended changes are red. Per Table B-1 of the Hydrographic Manual, the zero depth contour estimated from hydrographic data is sketched in dashed red lines.

The Cone Islands are not depicted accurately on any chart of the area. Detached positions were recorded to define the limits of ledges; the remaining boundaries were defined by hydrographic data. *See smooth sheet for the depiction of approximate shoreline changes.*

J. CROSSLINES ✓

The 122 miles of two-hundred percent side-scan sonar coverage were run perpendicular to mainscheme hydrography and represent crossline hydrography equivalent to 40% of mainscheme. Agreement is excellent.

K. JUNCTIONS See EVAC Report, section L

H-10792 does not join any other contemporary survey. However, it joins H-10534 at the entrance to Guemes Channel. Two shoal soundings on H-10534 not acquired during mainscheme hydrography or contact development were searched for but not found:

- (2.9 FA) A 5.3-meter sounding (Pos. No. 78610, DN 075) was acquired at the location of the 4.8 meter sounding centered at latitude $48^{\circ}31'56.89862''$ N, longitude $122^{\circ}39'33.5704''$ W on H-10534. (2.6 FA)
(3.1 FA) A 9.3-meter sounding (Pos. No. 55957, DN 322) was found at the location of the 8.9-meter sounding centered at latitude $48^{\circ}31'58.949''$ N, longitude $122^{\circ}39'42.261''$ W. (2.8 FA)

The above soundings occur over a very rocky area where many contacts were located. All recorded contacts in this area were developed and the hydrographer is satisfied that the hydrography from this survey is adequate to supercede H-10534 in the area of overlap.

were transferred to the smooth sheet from survey H-10534. Do not concur, the above soundings

L. COMPARISON WITH PRIOR SURVEYS See Section M of the EVAC Report.

The following priors were downloaded from the digital data base* on the Internet and imported into Mapinfo to facilitate comparison with soundings and shoreline from the current survey:

| Registry No. | Dates of Survey | Scale |
|--------------|-------------------|----------|
| H-06607 | Dec 1939-Apr 1940 | 1:10,000 |
| H-08318 | 1956 | 1:10,000 |
| H-08332 | 1955 | 1:10,000 |
| H-09283WD | 1972 | 1:20,000 |

Prior H-06607 See EVAC Report, section M

Differences between this prior and the current survey were observed at the point on the south side of Fidalgo Head. The prior depicts a sounding of 2fm, 4ft, at latitude $48^{\circ}29'27.9''$ N, longitude $122^{\circ}42'01.1''$ W, (see Item Investigation No. 11) and a sounding of 6fm, 1ft at latitude $48^{\circ}29'28.1''$ N, longitude $122^{\circ}42'04.5''$ W. The point was developed with 5-meter line spacing and neither of these soundings was located. A sounding of 6.6 fathoms/12.2 meters (Pos. No. 55165, DN 310) was acquired at latitude $48^{\circ}29'26.506''$ N, longitude $122^{\circ}42'07.145''$ W, fifteen

meters shoreward of prior survey sounding of 6fm, 4ft, located at latitude 48°29'26.7"N, longitude 122°42'02.2"W. The 10-fathom curve of this survey is sharper than the 10-fathom curve of the H-06607, indicating scouring of the point. The strong eddies and currents prevalent at the entrance to Burrows Pass support this observation.

Prior H-08318 *See Eumc Report, section M*

The poor image quality of this prior makes observation of shoaling or deepening trends difficult. However, individual soundings are readable at large scale. Some shoaler soundings were acquired during the current survey; however, most are in generally good agreement with the prior.

Prior H-08332 *See Eumc Report, section M*

With a few exceptions, only minor changes in contours are evident in a comparison of this survey with the current survey. The exceptions are addressed in the Item Investigation Reports in Separate IV. (Attached)

Prior H-09283 *See Eumc Report, section M*

The survey depicts a wire drag hang at latitude 48°31'43.778"N, longitude 122°41'09.674"W. The hang occurred at depth 83 feet/13.8 fathoms/25.3 meters and cleared at 78 feet/13 fathoms/23.8 meters. Five contacts were observed directly within the radius of the 83-ft hang: 30623.6p (DN 194), 21346.9p (DN 126), 21421.2p (DN 126), 34292.2s (DN 236), and 30739.7p (DN 194). A feature with a height of 2.7 meters was located at latitude 48°31'43.64235"N, longitude 122°41'09.703523"W, (Pos. No. 50203, DN 279). Its top depth is 101 feet/16.9 fathoms/31.0 meters. Charted depth at this location is 17 fathoms. No other hangs occur with the limits of this survey. *See Eumc Report, section M.*

M. ITEM INVESTIGATION REPORTS

Detailed reports of twelve investigations are located in *Separate IV in this report.*

N. COMPARISON WITH THE CHART *See Eumc Report, section O*

The survey area is represented on the following charts:

| Chart No. | Date | Edition | Scale |
|-----------|---------------|---------|-----------|
| 18400 | Mar. 30, 1996 | 39th | 1:200,000 |
| 18421 | Mar. 21, 1998 | 41st | 1:80,000 |
| 18423 | Jun. 18, 1994 | 30th | 1:80,000 |

| Chart No. | Date | Edition | Scale |
|-----------|---------------|---------|----------|
| 18424 | Jul. 12, 1997 | 25th | 1:40,000 |
| 18427 | Mar. 30, 1996 | 17th | 1:25,000 |
| 18429 | Mar. 16, 1996 | 7th | 1:25,000 |
| 18430 | Nov. 02, 1996 | 6th | 1:25,000 |

Charts 18421 and 18423 at scale 1:80,000 are the largest scale charts that cover the entire survey area. Chart 18429, scale 1:25,000, covers the survey south of latitude 48°33'48"N; Chart 18427, scale 1:25,000, covers the survey south of latitude 48°33'00"N; Chart 18430, scale 1:25,000, covers the survey west of longitude 122°40'00"W and north of latitude 48°30'00"N; and Chart 18424, Scale 1:40,000, covers all of the survey north of latitude 48°32'00"N. The survey was compared with all charts but most rigorously with the largest scale chart(s) covering any area.

USCG Notices to Mariners

Local Notice to Mariners (LNM), Monthly Edition Number 19 dated 12 May 1998, reported Skyline Marina Light 1 (LLN 19360) destroyed. A subsequent ^{working} edition, Monthly Edition No. 35 issued 01 September 1998, erroneously reported the light ~~watching~~ properly. Weekly Supplement No. 13, 30 March 1999, corrected the error and again reported the light destroyed.

LNM Weekly Supplemental Number 03, dated 19 January 1999, reported the Danger to Navigation issued regarding a wreck discovered at latitude 48°31'48.2714"N, longitude 122°40'11.996"W. See Danger to Navigation Report, Appendix A. *(attached to this report)*

Copies of the notices are included in Appendix J. *this report.*

Dangers to Navigation

One Danger to Navigation was discovered during the survey. A submerged wreck was located at latitude 48°31'48.2714"N, longitude 122°40'11.996"W. Dive investigation determined the least depth at the top of the mast as 3.9 fathoms/7.2 meters. See Appendix A ~~and~~ Item Investigation Report 9 in Separate IV in this report.

Comparison of Soundings

There is generally good agreement among the contours. Overall, the channel appears to be deepening and widening slightly, causing, in turn, slight steepening of the near shore area. Although this is noticeable throughout the survey, it is most pronounced in the channel between Cypress and Sinclair Islands at the north end of the survey. Shoal areas were found

to be slightly shallower as well as slightly smaller than charted. Significant discrepancies in soundings were investigated and are discussed in detail in Section M, Item Investigation Reports, located in ~~Separate IV~~: this report.

Comparison of Non-Sounding Features

The charted features listed below were not found and disproval detached positions were recorded at the charted location. Since several charts were used for comparison and since the exact charted position of a single feature was not consistent from chart to chart, the latitude/longitude below is the location of the disproval detached position:

| Charted Feature | Charted Position | | Disproval Position No. | DN | |
|----------------------------|----------------------------------|------------------------------------|------------------------|-----|--|
| | Latitude | Longitude | | | |
| Dol | 48°29'18.324"N | 122°40'26.915"W | 18160 | 103 | Remove |
| Marina Light | 48°29'21.420"N | 122°40'38.761"W | 18158 | 103 | Concur |
| Rock | 48°29'17.106"N | 122°40'23.156"W | 18161 | 103 | Concur |
| Rock | 48°29'50.358"N | 122°42'08.138"W | 18163 | 103 | Concur |
| Islet | 48°34'23.927"N | 122°40'28.370"W | 18260 | 117 | Concur |
| Dol | 48°35'53.527"N | 122°41'25.439"W | 18211 | 103 | Concur |
| Eagle Harbor Log Boom | 48°35'14.796"N 48°35'22.155"N | 122°41'42.186"W 122°41'50.042"W | 15922 15925 | 041 | Remove log boom Retain subson piles |
| Mooring Buoy | 48°36'24.895"N | 122°42'29.099"W | 18277 | 117 | Concur |
| Rock | 48°34'33.952"N | 122°37'49.566"W | 15913 | 302 | Concur |
| Rock | 48°33'58.449"N | 122°38'54.907"W | 18189 | 103 | Concur |
| Rock | 48°33'38.658"N | 122°38'44.153"W | 18185 | 103 | Concur |
| Rock | 48°33'32.017"N | 122°38'45.445"W | 18184 | 103 | Concur |
| S/L Projection Chart 18424 | 48°33'24.014"N | 122°38'54.195"W | 15914 | 302 | Dash red shoreline |
| Rock | 48°32'07.661"N | 122°39'14.370"W | 18177 | 103 | Rock transferred from prior survey H-8332 |
| Rock | 48°31'57.732"N | 122°39'11.781"W | 18176 | 10 | Concur |

The following are new features to be added to the chart:

| New Feature | Position | | Position No. | DN | |
|--------------|----------------|-----------------|--------------|-----|-------------|
| | Latitude | Longitude | | | |
| Piles | 48°32'35.101"N | 122°41'13.036"W | 18220 | | chart piles |
| Dolphins (3) | 48°32'35.184"N | 122°41'12.280"W | 18221 | 117 | |
| Pile | 48°33'54.910"N | 122°40'31.582"W | 18248 | 117 | Concur |

| New Feature | Position | | Position No. | DN | |
|------------------------|----------------|-----------------|--------------|-----|------------------------------|
| | Latitude | Longitude | | | |
| Dock and Floating Pier | 48°33'55.592"N | 122°40'31.115"W | 18250 | 117 | chart pier concur |
| | 48°33'56.152"N | 122°40'31.171"W | 18249 | | |
| Rock | 48°33'50.588"N | 122°40'17.056"W | 15797 | 061 | concur, * (4) |
| Rock | 48°33'59.393"N | 122°40'12.958"W | 15796 | 061 | concur, * (4) |
| Rock | 48°34'09.620"N | 122°40'12.887"W | 18254 | 117 | concur, * (3) |
| Piles (2) | 48°35'13.238"N | 122°41'41.748"W | 15928 | 041 | concur, chart piles |
| | 48°35'13.374"N | 122°41'41.660"W | 15927 | | |
| Rock | 48°35'38.911"N | 122°41'36.451"W | 15793 | 061 | concur, * (4) |
| Rock | 48°35'42.408"N | 122°41'40.400"W | 15792 | 061 | concur, * (2) |
| Rock Ledge | 48°35'50.124"N | 122°41'44.727"W | 18267 | 117 | concur, chart rock |
| Rock | 48°36'02.900"N | 122°42'02.019"W | 18268 | 117 | concur, * (3) |
| Rock Outcrop | 48°36'04.483"N | 122°42'07.523"W | 18269 | 117 | chart rock, * (4) |
| Rock | 48°36'19.680"N | 122°42'27.371"W | 18276 | 117 | concur, * (3) |
| Rock | 48°35'44.884"N | 122°41'01.076"W | 18204 | 103 | concur, * (3) |
| Rock | 48°36'29.594"N | 122°39'38.607"W | 15889 | 062 | Part of islet, Doubt chart * |
| Rock* | 48°36'38.127"N | 122°36'51.994"W | 15918 | 322 | concur, * (5) |
| Rocks (2) | 48°34'37.146"N | 122°39'05.020"W | 18193 | 103 | concur, * (2) Excessed |
| | 48°34'37.200"N | 122°39'04.541"W | 15890 | 062 | |
| Rock | 48°33'47.470"N | 122°38'45.446"W | 18187 | 103 | concur, * (2) |
| Rock | 48°33'41.750"N | 122°38'45.591"W | 18186 | 103 | concur, * (2) |
| Rock | 48°32'48.421"N | 122°39'13.125"W | 18183 | 103 | concur, * (4) |
| Rock | 48°32'35.331"N | 122°39'15.665"W | 18180 | 103 | concur, * (2) |
| Rock | 48°32'10.096"N | 122°39'14.656"W | 18178 | 103 | concur, * (4) |
| Submerged Wreck | 48°31'48.281"N | 122°40'11.996"W | 15919 | 015 | concur, 3 ₄ wk |
| Rock | 48°35'15.165"N | 122°41'45.688"W | 18266 | 117 | concur, * (5) |

*Prior survey H-08318 depicts this rock; it was apparently removed from the chart at some subsequent time or never charted.

Given that the source of shoreline features was a compilation of raster charts of different scales, determining the actual position of charted features was somewhat problematic. In cases where the surveyed position was slightly different from the charted position, a revised position only was recorded. Where the position appeared to be substantially different, disapproval positions were recorded at the charted location and positions recorded at the surveyed location. The feature is depicted on the final field sheet at the surveyed location only.

The ambiguous shoreline feature charted in the vicinity of latitude 48°32'35"N, longitude 122°41'12"W was apparently a ferry terminal which has since been abandoned. Three dolphins in ruins remain. The two offshoremost were positioned (Pos. Nos. 18220, 18221, DN

117). ~~Delete the charted ferry terminal; chart three dolphins as depicted on the final field sheet.~~ ^{Smooth} chart three dolphins as depicted on the final field sheet. (See Photos 18 & 19.) *See EVAL Report, section O.* *CONCUR*

Submerged piles and a log boom area are charted in Eagle Harbor in the vicinity of latitude 48°35'19"N, longitude 122°42'45"W. The log boom was not seen (*disproval Pos. 15925, DN 041*) nor was the charted pier (*disproval Pos. 18265, DN 117*). Efforts to search for the submerged piles using side scan sonar were unsuccessful due to the shallow water. Hydrography at 5-meter line spacing was conducted over the charted piles; however, the results were inconclusive. Subsequent to completion of hydrographic operations in the area, two deadheads were observed in the harbor on DN 049 (*Pos. Nos. 15934, 15926*) and reconfirmed on DN 063 (*Pos. Nos. 15937, 15938*). The conclusion of the hydrographer is that the likelihood that a mariner entering the harbor will encounter debris either floating or on the bottom warrants designation of the harbor as foul. The recommended foul area is depicted with dashed red lines on the final field sheet. *CONCUR add foul area and retain subm piles. See smooth sheet for depiction of the area.*

Lights charted in Secret Harbor and Deepwater Bay in the vicinity of latitude 48°33'N, longitude 122°41'W were not found as charted. The lights mark the offshore limit of fishpens which have apparently been relocated. Disproval positions were recorded on the charted positions of the fishpen lights. One exception is the light charted at latitude 48°33'14.9"N, longitude 122°41'06.9"W; a fish pen was observed over the charted light position. Detached positions were recorded on all fishpens and fishpen lights at their current locations. Delete the charted lights. Chart the fishpens and lights at the surveyed positions. *CONCUR*

The north end of Guemes Island is marked by a non-navigable rocky area. The hydrographer recommends charting a foul area extending from longitude 122°38'59.650"W eastward to longitude 122°38'25.512"W and from the north shore of Guemes Island northward to 48°35'24.671"N. The proposed limits of the foul area are drawn on the final field sheet. *Chart foul area at the above location.*

The Skyline Marina Entrance is substantially different from all charts. Revised positions of pilings and lights were recorded and observed limits of the breakwater are drawn in red on the final field sheet. *Chart according to smooth sheet. The entrance is located at lat. 48°29'25N, long. 122°40'36W.*

All other changes are depicted on the final field sheet. Annotated photographs and a list of detached positions are included in Appendix J.*

Cables, Pipelines, Ferry Routes

Two cable areas are located within the survey area. The cable originating at Sunset Beach is adequately signed and active. The cable crossing sign is located at latitude 48°30'02.540"N, longitude 122°41'29.508"W (*Pos. No. 15919, DN 041*). The cable area originating at Fidalgo Head and crossing to Burrows Island is inactive and unsigned. Chuck Mellinger in the Aids to Navigation Office of the Thirteenth Coast Guard District (206-220-7280) confirmed that the cable, which belongs to the Coast Guard, is inactive but remains in place. The Coast Guard will erect signs marking the crossing. *Retain as charted*

A ferry route is charted across the survey originating at latitude 48°30'39.056"N, longitude 122°40'24.345"W, 520 meters NE of the Anacortes ferry terminal, and continuing on a course of 291 degrees across the sheet. The route is adequately charted. *Retain as charted.*

O. ADEQUACY OF SURVEY ✓

H-10792 is a complete, navigable area hydrographic survey and is adequate to supercede all prior surveys within their common areas. *Current*

P. AIDS TO NAVIGATION ✓

The following fixed aids to navigation were positioned with static GPS positioning to third order, class 1, standards. See Horizontal Control Report, revised April 1999.

| Navigational Aid | LLN | Latitude | Longitude |
|------------------------------------|-------|------------------|-------------------|
| Shannon Point Light, Fl W 4s, Horn | 18960 | 48°30'35.24802"N | 122°41'01.48934"W |
| Light 5, Fl G 4s | 19175 | 48°33'58.52648"N | 122°40'05.70306"W |
| Light 7, Fl G 4s | 19185 | 48°36'35.01356"N | 122°39'26.21757"W |

Below is a list of aids to navigation verified with hydrographic methods in accordance with Section 4.2 of project instructions.

| Navigational Aid | LLN | Latitude | Longitude | FixNo. |
|---|-------|----------------|-----------------|--------|
| Red Lighted Bell Buoy 4 Fl R 4s | 19170 | 48°35'10.419"N | 122°40'10.784"W | 15933 |
| Red Lighted Bell Buoy 6 Fl R 4s | 19180 | 48°35'28.375"N | 122°39'08.018"W | 15935 |
| Red Buoy 8, Red Nun | 19190 | 48°36'16.215"N | 122°37'49.173"W | 15936 |
| Red Lighted Buoy 2, Fl R 2.5s | 18945 | 48°30'39.547"N | 122°41'58.387"W | 15940 |
| Skyline Marina Light 2, Fl R | 19365 | 48°29'19.999"N | 122°40'35.762"W | 18154 |
| Yellow Bluff Reef Obstruction Daybeacon NW on dol "Danger Reef" | 19165 | 48°31'55.952"N | 122°39'24.152"W | 18173 |
| Deepwater Bay S Fishpen, NE Lt. Y | 19171 | 48°33'14.969"N | 122°41'03.740"W | 18226 |
| Deepwater Bay S Fishpen, NW Lt. Y | 19171 | 48°33'15.652"N | 122°41'07.009"W | 18228 |
| Secret Harbor Fishpen, SE Lt. Y | 19172 | 48°33'24.163"N | 122°41'11.738"W | 18231 |
| Secret Harbor Fishpen, NE Lt. Y | 19172 | 48°33'25.597"N | 122°41'08.347"W | 18233 |
| Deepwater Bay N Fishpen, SE Lt. Y | 19173 | 48°33'35.974"N | 122°40'51.594"W | 18242 |
| Deepwater Bay N Fishpen, NE Lt Y | 19173 | 48°33'39.387"N | 122°40'47.019"W | 18245 |

The following light has been destroyed:

| Navigational Aid | LLN | Latitude | Longitude | DP |
|------------------------------------|-------|---------------|----------------|-------|
| Skyline Marina Light 1 - destroyed | 19360 | 48° 29 21.420 | 122° 40 38.761 | 18158 |

Q. STATISTICS ✓

| Description | Quantities |
|---------------------------|------------|
| Total Nautical Miles | 776 |
| Side Scan Sonar | 239 |
| SSS 100% | 117 |
| SSS 200% | 122 |
| MS Hydrography | 261 |
| Splits | 47 |
| Cross Lines (200% SSS) | 122 |
| Development | 224 |
| Square Nautical Miles | 13.5 |
| Square Nautical Miles SSS | 11.7 |
| Days of Acquisition | 88 |
| Total Number of Soundings | 44988 |
| Detached Positions | 153 |
| Bottom Samples | 50 |
| Dives | 7 |
| Velocity Casts | 20 |
| Tide Stations Installed | 2 |

R. MISCELLANEOUS ✓

Although not specifically recorded during the survey, tide rips and turbulent seas are often encountered at the entrance to Burrows Pass around Fidalgo Head. Since man-powered craft are frequently observed transiting the pass, an annotation of *tide rips* is particularly recommended for the small craft chart, 18423. *Concur*

Bottom samples were acquired and submitted to the Smithsonian Institution in accordance with Section 6.7 of Project Instructions.

S. RECOMMENDATIONS

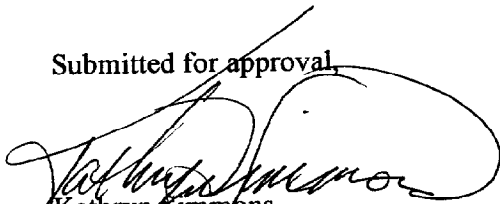
Project instructions specify full-scale shoreline verification, but limit inshore hydrography to the three-fathom curve. Unless the zero-meter curve is acquired, the hydrographer cannot define the shoreline. In some parts of this survey, the hydrographer can recommend shoreline compilation changes with confidence; but in others, it is not possible. If digital shoreline derived from modern photogrammetry is not available for a project area, either inshore limits of hydrography should extend to the zero curve, or shoreline verification should not be included in project instructions.

The use of Mapinfo as a supplemental processing tool, for data analysis and for data presentation needs to be re-evaluated. Although as a planning tool it works very well, as a cartographic tool, it is clumsy and inadequate. And it cannot be utilized for final processing or in chart compilation. Perhaps, development of a CAD-based alternative should be initiated.

T. REFERRAL TO REPORTS ✓


| Title | Date |
|---|-----------|
| Horizontal Control Report OPR-N368-PHP | June 1997 |
| Horizontal Control Report Addendum | July 1997 |
| Horizontal Control Report Addendum 2 | To follow |
| Coast Pilot Report | To follow |

Submitted for approval,



Kathryn Simmons
Survey Technician

Approved and forwarded,



James M. Crocker
LT, NOAA, Chief of Party

NOAA FORM 76-40
(6-74)

Replaces C&GS Form 567.

NONFLOATING AIDS OR LANDMARKS FOR CHARTS

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

ORIGINATING ACTIVITY

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

REPORTING UNIT
(Field Party, Ship or Office)
Pacific Hydrographic Party
Washington

LOCALITY
North Puget Sound
Bellingham Channel

DATE
4-06-1999

STATE
Washington

DATUM
NAD 83

CHARTING NAME
OPR-N368-PHP

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

DELETED
The following objects HAVE BEEN INSPECTED FROM SEAWARD TO DETERMINE THEIR VALUE AS LANDMARKS.

| CHARTING NAME | JOB NUMBER | SURVEY NUMBER | POSITION | | LONGITUDE | METHOD AND DATE OF LOCATION (See instructions on reverse side) | | CHARTS AFFECTED |
|---------------|-------------|---------------|----------|-----------|-----------|---|----------|---|
| | | | LATITUDE | LONGITUDE | | OFFICE | FIELD | |
| LLN 19171 | PHP-10-1-98 | H-10792 | 48° 33' | 122° 41' | 03.740 W | | F-DGPS-L | 18421 18423 18424 18429 18430 |
| LLN 19171 | | | 48° 33' | 122° 41' | 07.001 W | | F-DGPS-L | 18421 18423 18424 18430 |
| LLN 19172 | | | 48° 33' | 122° 41' | 11.738 W | | F-DGPS-L | 18421 18423 18424 18430 |
| LLN 19172 | | | 48° 33' | 122° 41' | 08.387 W | | F-DGPS-L | 18421 18423 18424 18430 |
| LLN 19173 | | | 48° 33' | 122° 40' | 51.594 W | | F-DGPS-L | 18421 18423 18424 18430 |
| LLN 19173 | | | 48° 33' | 122° 40' | 47.019 W | | F-DGPS-L | 18421 18423 18424 18430 |
| LLN 19365 | | | 48° 29' | 122° 40' | 35.762 W | | F-DGPS-L | 18421 18423 18424 18430 |
| LLN 19360 | | | 48° 29' | 122° 40' | 38.761 W | | F-Vis | 18421 18423 18429 |

| RESPONSIBLE PERSONNEL | |
|--|--|
| TYPE OF ACTION | NAME |
| OBJECTS INSPECTED FROM SEAWARD | |
| POSITIONS DETERMINED AND/OR VERIFIED | LT James M Crocker, Chief Pacific Hydrographic Party |
| FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES | |
| INSTRUCTIONS FOR ENTRIES UNDER 'METHOD AND DATE OF LOCATION' <small>(Consult Photogrammetric Instructions No. 64.)</small> | |
| OFFICE I. OFFICE IDENTIFIED AND LOCATED OBJECTS Enter the number and date (including month, day, and year) of the photograph used to identify and locate the object. EXAMPLE: 75E(C)6042 8-12-75 | FIELD (Cont'd) B. Photogrammetric field positions** require entry of method of location or verification, date of field work and number of the photograph used to locate or identify the object. EXAMPLE: P-8-V 8-12-75 74L(C)2982 |
| FIELD I. NEW POSITION DETERMINED OR VERIFIED Enter the applicable data by symbols as follows: F - Field L - Located V - Verified 1 - Triangulation 2 - Traverse 3 - Intersection 4 - Resection 5 - Field Identified 6 - Theodolite 7 - Planetable 8 - Sextant A. Field positions* require entry of method of location and date of field work. EXAMPLE: F-2-6-L 8-12-75 *FIELD POSITIONS are determined by field observations based entirely upon ground survey methods. | II. TRIANGULATION STATION RECOVERED When a landmark or aid which is also a triangulation station is recovered, enter 'Triang. Rec.' with date of recovery. EXAMPLE: Triang. Rec. 8-12-75 III. POSITION VERIFIED VISUALLY ON PHOTOGRAPH Enter 'V-Vis.' and date. EXAMPLE: V-Vis. 8-12-75 **PHOTOGAMMATIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods. |

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: AWOIS 52376
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°31'42.0"N
longitude 122°40'45.0"W
Datum: NAD83
Reported Depth: NA
Type of Feature: Disposal Area

DESCRIPTION and SOURCE: Disposal Area

SURVEY REQUIREMENTS: Information

METHOD OF INVESTIGATION: 200% Side scan coverage, echosounder with 75-meter line spacing and 150-meter spaced crosslines. Echosounder development of contacts.

RESULTS OF INVESTIGATION: Almost all contacts were found in the north^hwest portion of the disposal area. A least depth of 14.7 fathoms/27.0 meters was acquired within the radius of the disposal area at latitude 48°31'42.998"N, longitude 122°40'57.672"W (*Pos. No. 50527, DN 280*).
+1

COMPARISON WITH PRIOR SURVEYS: Charted depths are from Prior H08332, 1955.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Depths ranging from 18 to 23 fathoms are charted within the disposal area. Chart the soundings from this survey.
C/C/cur

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: 52581
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°31'44.97"N
longitude 122°41'14.83"W
Datum: NAD27
Reported Depth: 13 fathoms
Type of Feature: Charted wire drag hang

DESCRIPTION and SOURCE: H-09283WD/72—Hang occurred at 83 feet (13.8 fathoms) and was cleared by 78 feet (13 fathoms).

SURVEY REQUIREMENTS: Full investigation with echosounder to 150-meter radius.

METHOD OF INVESTIGATION: Side scan sonar coverage (200%), dual-frequency echosounder development.

RESULTS OF INVESTIGATION: A total of 21 contacts were located within the 150-meter radius. The largest of these were developed; however, the least depth acquired on the contacts was 16.8 fathoms (Pos. Nos. 50203, 50509) at latitude 48°31'43.64"N, longitude 122°41'09.70"W. Within the 150-meter search radius, preliminary hydrography located a sounding of 14.7 fathoms (Pos. No. 35740) at latitude 48°31'44.553"N, longitude 122°41'17.128"W. On follow-up investigation, the large mound at this location was fully developed to 5-meter line spacing. Least depth located was 14.5 fathoms (Pos. No. 90257/1) at latitude 48°31'43.975_{4.09}"N, longitude 122°41'18.237₆₈"W.

COMPARISON WITH PRIOR SURVEYS: H-09283WD is the source of the charted soundings.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: The wire hang depth is not charted on Chart 18427 or Chart 18430, the largest scale charts of the area, both of which depict the wire drag cleared area with green tint. Green tint is not charted on Chart 18421; however, the wire drag hang at 13 fathoms is charted. Delete all green tint and the wire drag hang at latitude 48°31'44.97"N, longitude 122°41'14.83"W. Chart the soundings from this survey.. *Concur*

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 1
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°36'14.472"N
longitude 122°37'20.424"W
Datum: NAD83
Reported Depth: 4fm, 1ft
Type of Feature: Shoal

DESCRIPTION and SOURCE: Charted shoal centered at above position

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: 200% Side Scan Sonar, Echosounder Development

RESULTS OF INVESTIGATION: Two shoal soundings of ^{4.1}~~3.7~~ fathoms/^{7.6}~~6.8~~ meters were located at latitude 48°36'13.661"N, longitude 122°37'24.818"W (*Fix 31367, DN202*), and at latitude 48°36'10.572"N, longitude 122°37'23.039"W (*Fix 31365, DN202*) **4.2 FATHOMS**

COMPARISON WITH PRIOR SURVEYS: Prior H08318 depicts two soundings of 4.3 fathoms/7.8 meters, one at latitude 48°36'16.812"N, longitude 122°37'16.709"W, and the other at latitude 48°36'18.403"N, longitude 122°37'14.549"W.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Chart 18424 is the largest scale chart of the area and depicts a shoal centered at latitude 48°36'14.472"N, longitude 122°37'20.424"W, with a least depth of 4fathoms, 1foot. Delete the charted depths and chart the soundings from this survey. *CMCWA*

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 2
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°36'35.791"N
longitude 122°36'58.435"W
Datum: NAD83
Reported Depth: 6 fathoms
Type of Feature: Charted sounding

DESCRIPTION and SOURCE: Charted sounding not confirmed with mainscheme hydrography

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: Echosounder development

RESULTS OF INVESTIGATION: The sounding is charted on a steep slope with surveyed depths ranging from 21.3 fathoms/38.9 meters to 39.6 fathoms/72.4 meters plotted over the charted sounding. A 5.7⁴-fathom/10.4⁴-meter sounding was located 87 meters shoreward of the charted sounding at latitude 48°36'36.70855"N, longitude 122°36'54.3115"W, (*Fix 76233, DN 021/99*); however, a shoaler depth of 2.8⁸ fathoms/5.1⁸ meters was located 15 meters from the 5.7 fathoms at latitude 48°36'37.16188^{4/8}"N, longitude 122°36'54.34801³⁰³"W (*Fix No. 76289, DN 021/99*).
76196/1

COMPARISON WITH PRIOR SURVEYS: Prior survey H08318 depicts 27-fathom soundings at the location of the charted 6-fathom depth and a 5.2 fathom depth at latitude 48°36'37.8036"N, longitude 122°36'49.8564"W. The least depth of 2.8⁸ fathoms from the current survey plots over the prior's 5.2-fathom sounding.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Delete the 6-fathom sounding charted at latitude 48°36'35.791"N, longitude 122°36'58.435"W; chart the soundings from this survey.

COM cur

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 3
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°36'22.148"N
longitude 122°39'48.005"W
Datum: NAD83
Reported Depth: NA
Type of Feature: Shoal

DESCRIPTION and SOURCE: Shoal observed on side scan sonagram: Contacts 22471.0s, 22525.6s (DN 140) and 33226.4s (DN 230)

SURVEY REQUIREMENTS: Develop fully

METHOD OF INVESTIGATION: Echosounder Development - orthogonal 10-meter line spacing (Fixes 50037-50082, DN 189).

RESULTS OF INVESTIGATION: The high point of the shoal, 12.0 fathoms/22.0 meters, was located at latitude 48°36'22.011"N, longitude 122°39'48.728"W (Fix No. 50060, DN 189).

COMPARISON WITH PRIOR SURVEYS: Prior survey H08318 depicts soundings of 15 fathoms in the vicinity of the shoal.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Chart 18424 does not depict a shoal. A depth of 11 fathoms is charted 100 meters inshore of the the surveyed least depth. Delete the charted soundings and chart the soundings from this survey.

COMCUM

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 4
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°36'26.835"N
longitude 122°40'14.496"W
Datum: NAD83
Reported Depth: NA
Type of Feature: Shoal

DESCRIPTION and SOURCE: Shoal observed on side scan sonagram: Contacts 33277.8p (DN 231), 34378.4s (DN 296), 24456.0p (DN 296).

SURVEY REQUIREMENTS: Develop fully.

METHOD OF INVESTIGATION: Echosounder development

RESULTS OF INVESTIGATION: The least depth of the shoal, 10.³~~4~~ fathoms/^{18.8}~~19.0~~ meters, was located at latitude 48°36'26.922"N, longitude 122°40'14.412"W (Fix No. 78461, DN 041/99)

COMPARISON WITH PRIOR SURVEYS: Depths from Prior H08318 are illegible.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: The shoal is not charted on Chart 18430. The 10-fathom curve is charted 50 meters shoreward of the surveyed least depth. Delete the charted soundings; chart the soundings from this survey.

Concur

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 5
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°35'46.297"N
longitude 122°41'12.452"W
Datum: NAD83
Reported Depth: 2 fathoms, 2 feet
Type of Feature: Charted shoal

DESCRIPTION and SOURCE: Shoal depicted on Chart 18430 and observed on side scan sonargram: Contacts 22585.0S and 22746.9s (DN 142), contact 33859.3s (DN 236)

SURVEY REQUIREMENTS: Develop fully

METHOD OF INVESTIGATION: Echosounder development, 5-meter line spacing.

RESULTS OF INVESTIGATION: Least depth of 1.²/₄ fathoms/2.³/₆ meters was located at latitude 48°35'47.146"N, longitude 122°41'13.049"W (Fix No. 71261, DN 350).

COMPARISON WITH PRIOR SURVEYS: Prior H08318 depicts a sounding of 2 fathoms, 4 feet, 30 meters south of the surveyed least depth.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Delete the charted 2 fm, 2 ft, sounding. Chart the shoal with a least depth of 1.²/₄ fathoms at latitude 48°35'47.146"N, longitude 122°41'13.049"W.

COMNAV

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 6
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°35'32.434"N
longitude 122°40'49.675"W
Datum: NAD83
Reported Depth: 1 fathom, 2 feet
Type of Feature: Shoal

DESCRIPTION and SOURCE: Charted shoal observed on side scan sonargram:
Contacts 33627.4s, 33653.2s (DN 231) and 24238.1p (DN 198).

SURVEY REQUIREMENTS: Develop fully

METHOD OF INVESTIGATION: Echosounder, 5-meter line spacing

RESULTS OF INVESTIGATION: Least depth of 0.⁸/₈ fathoms/1.⁶/₇ meters was acquired
on DN 303 at latitude 48°35'33.31545"N, longitude 122°40'50.37435"W (Fix No. 52468)+l

COMPARISON WITH PRIOR SURVEYS: Prior survey H08318 located a depth of 1
fathom, 3 feet, at latitude 48°35'33.241"N, longitude 122°40'45.016"W, 30 meters south of
the surveyed least depth.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Delete
the 1fm, 3ft, sounding charted at latitude 48°35'33.241"N, longitude 122°40'45.016"W.
Chart 0.⁸/₈ fathoms at latitude 48°35'33.31545"N, longitude 122°40'50.37435"W.

Concur

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 7
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°33'26.794"N
longitude 122°40'44.079"W
Datum: NAD83
Reported Depth: 5 fathoms, 3 feet
Type of Feature: Shoal

DESCRIPTION and SOURCE: Charted shoal, Chart 18430

SURVEY REQUIREMENTS: Develop

METHOD OF INVESTIGATION: Echosounder development with 5-meter line spacing over high point.

RESULTS OF INVESTIGATION: The shoal generally trends in a NE/SW direction but the high point is marked by a ridge approximately 120 meters long trending in an east-west direction, 106 degrees. Least depths of 5.1 fathoms/9.4 meters were acquired 11 meters apart with the offshoremost located at latitude 48°33'27.443"N, longitude 122°40'46.525"W (Fix No. 75165,⁺DN 013/99).

COMPARISON WITH PRIOR SURVEYS: H08332 depicts the least depth of the shoal as 5.5 fathoms.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Delete charted soundings; chart soundings from this survey.

concur

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 8
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°33'26.06"N
longitude 122°40'49.11"W
Datum: NAD83
Reported Depth: NA
Type of Feature: Side scan feature, possibly manmade

DESCRIPTION and SOURCE: Square object with no shadow on side scan sonargram:
Contacts 20512.4s (DN 070) and 32227.3s, 32210.4s (DN 211)

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: Dive investigation

RESULTS OF INVESTIGATION: Metal frame, submerged fish pen, approximately 40 feet square, was found centered at latitude 48°33'26.13676"N, longitude 122°40'49.03203"W (Pos. No, 15916, DN 352), resting on sandy bottom amid dynamic sand waves. Height from base to top is 2.5 feet/0.76 meters; depth is 7.2 fathoms/13.2 meters. See attached dive report.

COMPARISON WITH PRIOR SURVEYS: No object appears on Prior H08332.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: The sunken fish pen lies on top of the sand shoal charted in Deepwater Bay. There are shoaler soundings in the vicinity of the sunken fishpen; however, since boats attempting to anchor over the obstruction could become entangled in the pen, a submerged obstruction should be charted at at latitude 48°33'26.13676"N, longitude 122°40'49.03203"W with a least depth of 7.2 fathoms
chart 7, obstn

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 9
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°31'48.650"N
longitude 122°40'12.462"W
Datum: NAD83
Reported Depth: 9.1 fathoms
Type of Feature: Five-meter spike on echogram

DESCRIPTION and SOURCE: Five-meter spike observed on echogram during development of sss contacts (*Fix No. 75005, DN 012/99*).

SURVEY REQUIREMENTS: Full development

METHOD OF INVESTIGATION: SSS, echosounder, dive

RESULTS OF INVESTIGATION: An apparent wreck observed on the sonargram (*contacts 75418.0S, 75418.7s, 75419.3s*) was confirmed by dive investigation. A wooden fishing vessel with no identifying markings and indications of scuttling was found at the contact location. The wreck had not been seen on the 200% side scan coverage which was completed on DN 194; however, no report of a sunken vessel had been received by the U. S. Coast Guard, since that date for that area. The wreck was estimated to be 130 feet long and 20 feet wide. Least depth, recorded at the top of the vessel's mast with the diver's least depth gauge was measured at ~~3.9~~^{4.2} fathoms, ~~7.2~~^{7.7} meters. The Detached Position function of HYPACK was not working on the day of the dive; therefore, the high point of the wreck previously obtained by echosounder on DN 015 (*Pos. No. 75005*) was edited to reflect the depth computed by the dive gauge and coded as a detached position (*Pos. No. ~~15919~~¹⁵⁹⁴⁷*) located at latitude 48°31'48.271"N, longitude 122°40'11.996"W. A Danger to Navigation report was issued; see *Appendix A. attached danger letter, dated 1/19/99*

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Chart a submerged wreck with a least depth of ~~3.9~~^{4.2} fathoms at latitude 48°31'48.²⁷¹650"N, longitude 122°40'12.⁴⁶²462"W.

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 10
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°29'57.494"N
longitude 122°42'20.142"W
Datum: NAD83
Reported Depth: 9 fathoms
Type of Feature: charted sounding

DESCRIPTION and SOURCE: Charted sounding; source is H06607.

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: Side scan sonar coverage (200%), echosounder development - 5-meter line spacing with crosslines.

RESULTS OF INVESTIGATION: No indication of a shoal or other submerged feature was observed on the sonargram and echosounder development recorded depths ranging from 11.7 fathoms to 12.8 fathoms over the charted sounding

COMPARISON WITH PRIOR SURVEYS: H06607 is the source of the charted sounding.

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Delete the 9-fathom sounding charted at latitude 48°29'57.494"N, longitude 122°42'20.142"W; chart the soundings from the current survey. *Concur*

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 11
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°29'27.081"N
longitude 122°42'06.792"W
Datum: NAD83
Reported Depth: 2.5 fathoms
Type of Feature: Charted sounding

DESCRIPTION and SOURCE: Charts 18427 depicts a sounding of 2.5 fathoms; on Chart 18429, the charted depth is 2 fathoms, four feet.

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: 200% SSS coverage, echosounder development

RESULTS OF INVESTIGATION: The shoal was observed on the sonargram (*contact 24302.5p, DN 296*) and developed. A submerged point sloping approximately 15 degrees and trending 213° extends approximately 220 meters offshore. Depths range from 15.2 fathoms/27.5 meters located at 48°29'24.297"N, longitude 122°42'10.407"W (*Pos. No. 175, DN 030*), to 2.2 fathoms/4.0 meters located 70 meters inshore of the charted sounding at latitude 48°29'29.196"N, longitude 122°42'05.288"W (*Pos. No. 200, DN 030*).

COMPARISON WITH PRIOR SURVEYS: H06607 is apparently the source of the charted depth with a sounding of 2 fathoms, 4 feet, plotted at latitude 48°29'27.992"N, 122°42'01.130"W

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Delete the 2.5 fathom sounding charted at latitude 48°29'27.081"N, longitude 122°42'06.792"W. Chart depths acquired during this survey. *Concur*

ITEM INVESTIGATION REPORT

AREA OF INVESTIGATION

AWOIS/Reference No.: Item 12
State and Locality: Washington/Bellingham Channel
Reported Position: latitude 48°30'31.944"N
longitude 122°41'21.202"W
Datum: NAD83
Reported Depth: NA
Type of Feature: Submerged Crib

DESCRIPTION and SOURCE: Charted feature centered at latitude 48°30'31.944"N, longitude 122°41'21.202"W on Chart 18427.

SURVEY REQUIREMENTS: NA

METHOD OF INVESTIGATION: Dive investigation

RESULTS OF INVESTIGATION: On DN 352, divers searched without success for the submerged crib at the charted location and recorded a disapproval position (*Pos. No. 15917*). Additional information was acquired regarding the charted crib; Shannon Point Marine Center was contacted for a more precise location; and on DN 048 a second dive was conducted. The water intake system was located and positions were recorded for the Southwest Intake at latitude 48°30'32.493"N, longitude 122°41'09.582"W (*Pos. No. 15930*) and for the Northeast Intake at latitude 48°30'33.010"N, longitude 122°41'09.343"W (*Pos. 15929*). See attached dive report.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH CHART AND CHARTING RECOMMENDATIONS: Delete the submerged crib centered at latitude 48°30'31.944"N, longitude 122°41'21.202"W; chart a submerged obstruction centered over the intakes as surveyed and as depicted on the final field sheet..

CMAN
chart of obstn (Intake) at
lat. 48/30/32.939, long. 122/41/09.582

ADVANCE
INFORMATION

Pacific Hydrographic Party
P. O. Box 189
Anacortes, Wa 98221
Phone: (360) 293-5171
Fax: (360) 293-8456

January 19, 1999

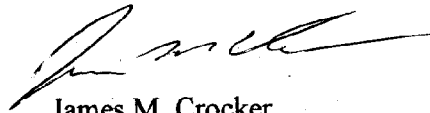
Commander
Thirteenth Coast Guard District (OAN)
Federal Building, Room 3410
915 Second Avenue
Seattle, WA 98174-1067

Dear Sir:

The NOAA Pacific Hydrographic Party has discovered a potential danger to navigation while conducting survey operations in Northern Puget Sound. A Danger to Navigation Report is enclosed along with a chartlet showing the affected portion of Chart 18427, the largest-scale chart of the area.

I recommend this Danger to Navigation Report be included in the next Local Notice to Mariners.

Sincerely,



James M. Crocker
Lieutenant, NOAA

Enclosures

cc: NIMA
N/CS26
N/CS34

**DANGER TO NAVIGATION REPORT
DGR-01-99-PHP**

SURVEY REGISTRY NUMBER: H-10792
STATE: Washington
GENERAL LOCALITY: Bellingham Channel
SUBLOCALITY: Burrows Island to Sinclair Island
PROJECT NUMBER: OPR-N368-PHP

The following item which is a potential danger to navigation was discovered during hydrographic survey operations by the NOAA Pacific Hydrographic Party.

Object Discovered: Submerged wreck: wood fishing boat, approximately 100 feet long and 25 feet wide, tilted approximately 30° onto its starboard side with bow oriented toward 323°. No markings or other identification were found on the vessel. Using a diver's least depth gauge, divers recorded a depth of 9.94 meters at the top of the boat's steel mast. The depth was corrected to 7.2 meters (*23.1 feet, 3.9 fathoms*) at MLLW based on preliminary real tides. The least depth of the wreck is located at latitude 48°31'48.407"N, longitude 122°40'12.327"W.

Charts Affected: 18400, 18421, 18423, 18427, 18429, 18430

Questions concerning this report should be directed to NOAA, Pacific Hydrographic Branch, N/CS34, 7600 Sand Point Way NE, Bin C25700, Seattle, WA 98115-0070, telephone number (206) 526-6853.



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

April 7, 1999

APPROVAL SHEET

for

SURVEY H-10792

Standard field surveying and processing procedures were followed in producing this survey in accordance with the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; and the Field Procedures Manual, as updated for 1998. 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.

Approved and forwarded,

A handwritten signature in black ink, appearing to read "J. M. Crocker", is written over a faint circular stamp.

LT James M. Crocker, NOAA
Chief
Pacific Hydrographic Party



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: June 17, 1999

HYDROGRAPHIC BRANCH: Pacific

HYDROGRAPHIC PROJECT: OPR-N368-PHP

HYDROGRAPHIC SHEET: H-10792

LOCALITY: Bellingham Channel, Burrows Island to Sinclair Island,
WA

TIME PERIOD: January 28, 1998 - March 16, 1999

TIDE STATION USED: 944-9932 Armitage Island, WA
Lat. 48° 32.1'N Lon. 122° 47.8'W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.194 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: NPS70, NPS71, NPS72, NPS73, NPS74,
NPS75, NPS76, NPS77 & NPS78

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 V. Meyer 6/25/99

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION



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Final tide zone node point locations for OPR N368-PHP-98,
Sheet H-10792.

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 NPS70 | | | | |
| -122.632316 | 48.539284 | 944-9932 | +24 | 1.05 |
| -122.579184 | 48.538285 | | | |
| -122.558712 | 48.535392 | | | |
| -122.554573 | 48.578031 | | | |
| -122.610103 | 48.611323 | | | |
| -122.646296 | 48.585732 | | | |
| -122.632316 | 48.539284 | | | |
| Zone NPS71 | | | | |
| -122.703318 | 48.593215 | 944-9932 | +30 | 1.06 |
| -122.716476 | 48.606516 | | | |
| -122.690254 | 48.622077 | | | |
| -122.622261 | 48.656703 | | | |
| -122.609823 | 48.640495 | | | |
| -122.610103 | 48.611323 | | | |
| -122.646296 | 48.585732 | | | |
| -122.703318 | 48.593215 | | | |
| Zone NPS72 | | | | |
| -122.640645 | 48.568 | 944-9932 | +18 | 1.05 |
| -122.646296 | 48.585732 | | | |
| -122.703318 | 48.593215 | | | |
| -122.702092 | 48.567446 | | | |
| -122.640645 | 48.568 | | | |
| Zone NPS73 | | | | |
| -122.685774 | 48.545179 | 944-9932 | +12 | 1.02 |
| -122.700813 | 48.549756 | | | |
| -122.702092 | 48.567446 | | | |
| -122.670395 | 48.567446 | | | |
| -122.640645 | 48.568 | | | |
| -122.632316 | 48.539284 | | | |
| -122.651768 | 48.541233 | | | |
| -122.685774 | 48.545179 | | | |
| Zone NPS74 | | | | |
| -122.579184 | 48.538285 | 944-9932 | 0 | 1.03 |

-122.632316 48.539284
-122.651768 48.541233
-122.683188 48.505214
-122.67857 48.500428
-122.614226 48.513812
-122.607088 48.51808
-122.59845 48.512369
-122.579184 48.538285

Zone NPS75

| | | | |
|-----------------------|----------|---|------|
| -122.683188 48.505214 | 944-9932 | 0 | 0.99 |
| -122.718775 48.541049 | | | |
| -122.700813 48.549756 | | | |
| -122.685774 48.545179 | | | |
| -122.651768 48.541233 | | | |
| -122.683188 48.505214 | | | |

Zone NPS76

| | | | |
|-----------------------|----------|----|------|
| -122.760635 48.521305 | 944-9932 | -6 | 0.99 |
| -122.718775 48.541049 | | | |
| -122.683188 48.505214 | | | |
| -122.698309 48.49543 | | | |
| -122.70111 48.492067 | | | |
| -122.760635 48.521305 | | | |

Zone NPS77

| | | | |
|-----------------------|----------|-----|------|
| -122.760635 48.521305 | 944-9932 | -12 | 0.98 |
| -122.70111 48.492067 | | | |
| -122.712721 48.477934 | | | |
| -122.76358 48.484537 | | | |
| -122.792715 48.507316 | | | |
| -122.760635 48.521305 | | | |

Zone NPS78

| | | | |
|-----------------------|----------|-----|------|
| -122.70111 48.492067 | 944-9932 | -30 | 0.99 |
| -122.712721 48.477934 | | | |
| -122.703949 48.465433 | | | |
| -122.668234 48.43083 | | | |
| -122.646301 48.462098 | | | |
| -122.669485 48.493764 | | | |
| -122.70111 48.492067 | | | |



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: June 7, 2000

HYDROGRAPHIC BRANCH: Pacific

HYDROGRAPHIC PROJECT: OPR-N368-NRT3

HYDROGRAPHIC SHEET: H-10792 AWOIS Item 52581

LOCALITY: Bellingham Channel, North Puget Sound, WA

TIME PERIOD: April 17 - 26, 2000

TIDE STATION USED: 944-9932 Armitage Island, WA

Lat. 48° 32.1'N Lon. 122° 47.8'W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.194 meters

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: PS215.

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 S. Mero 6/7/00

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION



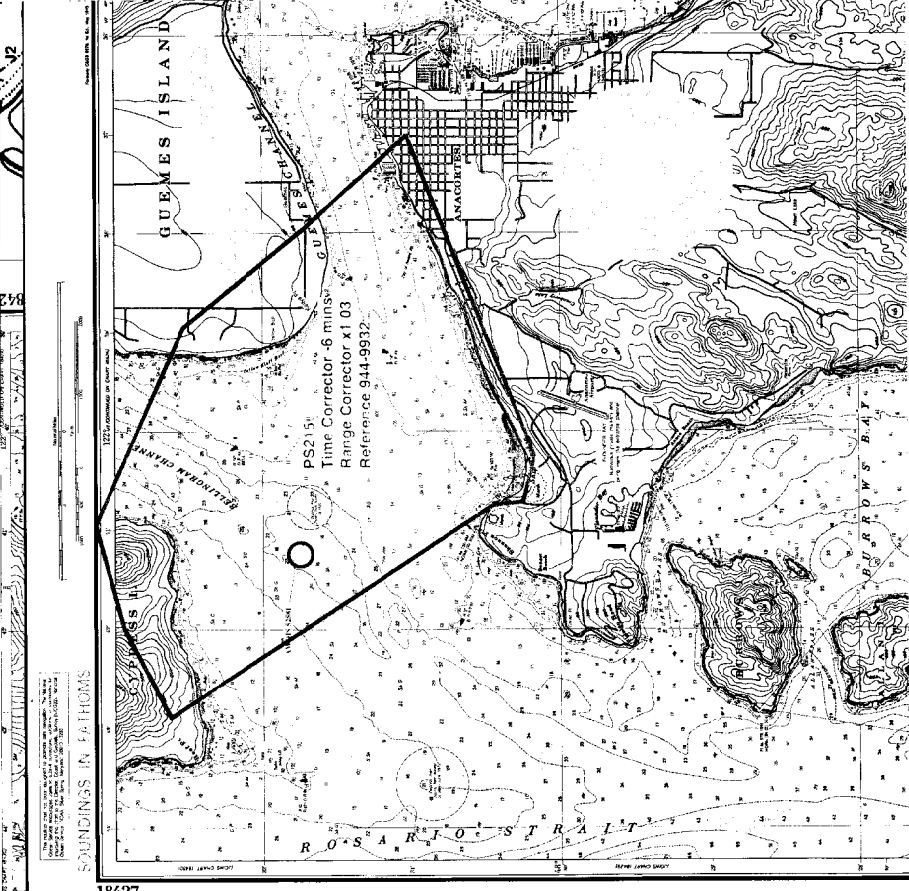
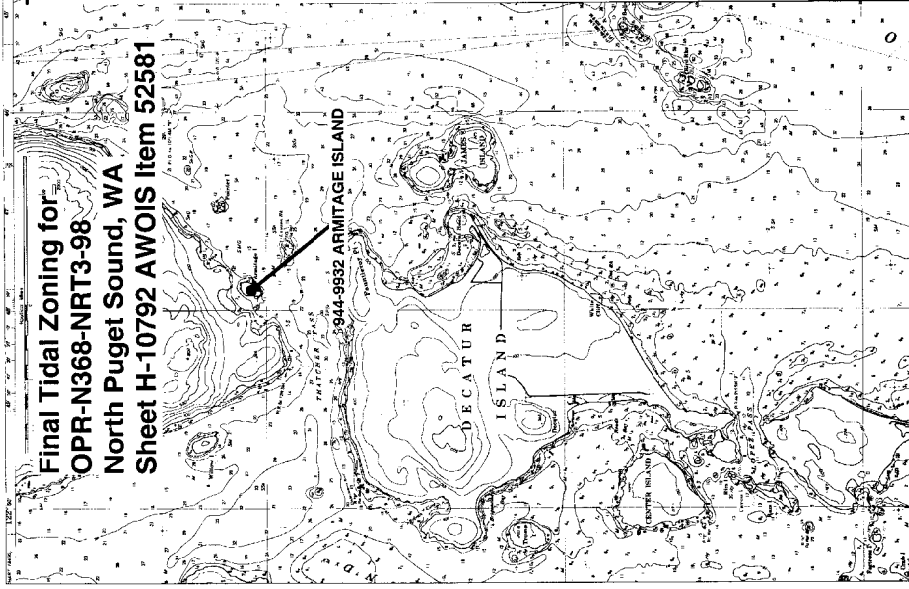
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Final tide zone node point locations for OPR-N368-NRT3-98,
 Sheet H-10792 AWOIS Item 52581.

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 PS215 | | | |
| -122.688094 48.516558 | 944-9932 | -6 | 1.03 |
| -122.714804 48.543637 | | | |
| -122.699677 48.548828 | | | |
| -122.682459 48.551959 | | | |
| -122.649363 48.542167 | | | |
| -122.632649 48.528674 | | | |
| -122.616918 48.517136 | | | |
| -122.670959 48.502849 | | | |
| -122.67863 48.504124 | | | |
| -122.679153 48.507487 | | | |
| -122.688094 48.516558 | | | |



GEOGRAPHIC NAMES

H-10792

Name on Survey

Page 1 of 2

A ON CHART NO. 18424, 18427
B ON PREVIOUS SURVEY NO.
C ON U.S. QUADRANGLE MAPS
D FROM LOCAL INFORMATION
E ON LOCAL MAPS
F P.O. GUIDE OR MAP
G GRAND McNALLY ATLAS
H U.S. LIGHT LIST
K

| | A | B | C | D | E | F | G | H | K |
|----------------------|---|---|---|---|---|---|---|---|----|
| BELLINGHAM CHANNEL | X | | X | | | | | | 1 |
| BURROWS ISLAND | X | | X | | | | | | 2 |
| BURROWS PASS | X | | X | | | | | | 3 |
| CLARK POINT | X | | X | | | | | | 4 |
| CONE ISLANDS | X | | X | | | | | | 5 |
| CYPRESS HEAD | X | | | | | | | | 6 |
| CYPRESS ISLAND | X | | X | | | | | | 7 |
| DEEPWATER BAY | X | | X | | | | | | 8 |
| EAGLE HARBOR | X | | X | | | | | | 9 |
| FIDALGO HEAD | X | | X | | | | | | 10 |
| FIDALGO ISLAND | X | | X | | | | | | 11 |
| FLOUNDER BAY | X | | X | | | | | | 12 |
| GREEN POINT | X | | X | | | | | | 13 |
| GUEMES CHANNEL | X | | X | | | | | | 14 |
| GUEMES ISLAND | X | | X | | | | | | 15 |
| INDIAN VILLAGE (pp1) | X | | X | | | | | | 16 |
| JACK ISLAND | X | | X | | | | | | 17 |
| KELLYS POINT | X | | X | | | | | | 18 |
| PELICAN BEACH | X | | | | | | | | 19 |
| SECRET HARBOR | X | | X | | | | | | 20 |
| SHANNON POINT | X | | X | | | | | | 21 |
| SHIP HARBOR | X | | X | | | | | | 22 |
| SINCLAIR ISLAND | X | | X | | | | | | 23 |
| SUNSET BEACH | X | | X | | | | | | 24 |
| TOWHEAD ISLAND | X | | X | | | | | | 25 |

GEOGRAPHIC NAMES

H-10792

Name on Survey
Page 2 of 2

A ON CHART NO. 18424, 18427
B ON PREVIOUS SURVEY NO.
C ON U.S. QUADRANGLE MAPS
D FROM LOCAL INFORMATION
E ON LOCAL MAPS
F P.O. GUIDE OR MAP
G GRAND MCNALLY ATLAS
H U.S. LIGHT LIST
K

| Name on Survey | A | B | C | D | E | F | G | H | K |
|--------------------|---|---|---|---|---|---|---|---|----|
| VENDOVI ISLAND | X | | X | | | | | | 1 |
| WASHINGTON (title) | X | | X | | | | | | 2 |
| YELLOW BLUFF | X | | X | | | | | | 3 |
| YELLOW BLUFF REEF | X | | | | | | | | 4 |
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| | | | | | | | | | 25 |

Dennis R. Rasmussen
Chief Hydrographer
JUN 28 1999

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

| RECORD DESCRIPTION | AMOUNT | RECORD DESCRIPTION | AMOUNT |
|--------------------|--------|------------------------------------|--------|
| SMOOTH SHEET | 1 | SMOOTH OVERLAYS: POS., ARC, EXCESS | |
| DESCRIPTIVE REPORT | 1 | FIELD SHEETS AND OTHER OVERLAYS | 2 |

| DESCRIP-TION | DEPTH/POS RECORDS | HORIZ. CONT. RECORDS | SONAR-GRAMS | PRINTOUTS | ABSTRACTS/SOURCE DOCUMENTS |
|-----------------|-------------------|----------------------|-------------|-----------|----------------------------|
| ACCORDION FILES | 4 | | | | |
| 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 | | | |
| POSITIONS REVISED | | | |
| SOUNDINGS 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 | 157 | | 157 |
| COMPARISON WITH PRIOR SURVEYS AND CHARTS | | | |
| EVALUATION OF SIDE SCAN SONAR RECORDS | | | |
| EVALUATION OF WIRE DRAGS AND SWEEPS | | | |
| EVALUATION REPORT | | 38 | 38 |
| GEOGRAPHIC NAMES | | | |
| OTHER* (Chart Compilation) | | 70 | 70 |
| *USE OTHER SIDE OF FORM FOR REMARKS | TOTALS | 157 | 108 |
| | | | 265 |

| | | |
|---|---------------------------|-------------------------------|
| Pre-processing Examination by M. Bigelow | Beginning Date 4/23/99 | Ending Date 5/7/99 |
| Verification of Field Data by R. Davies, R. Mayor, M. Bigelow | Time (Hours) 157 | Ending Date 7/21/00 |
| Verification Check by D. Hill | Time (Hours) 2 | Ending Date 7-25-00 |
| Evaluation and Analysis by R. Davies | Time (Hours) 38 | Ending Date 7/21/00 |
| Inspection by D. Hill | Time (Hours) 10 | Ending Date 7-25-00 |

EVALUATION REPORT H10792

A. PROJECT

The hydrographer's report contains a complete discussion of the project information.

B. AREA SURVEYED

The survey area is adequately described in the hydrographer's report.

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. A page-size plot of the charted area depicting the specific limits of supersession accompanies this report as Attachment 1.

The bottom consists mainly of sand, broken shells and gravel. Depths range from zero to 67 fathoms.

C. SURVEY VESSELS

Survey vessels are adequately discussed in the hydrographer's report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

HYPACK software was used for all data acquisition. Survey data was then processed in the field using HP tools and the Hydrographic Processing System (HPS). Office processing utilized the same HPS as in the field, and MicroStation 95.

Processed digital data for this survey exists in the standard HPS format, a database format using the .dbf extension. In addition, the smooth sheet drawing is filed in the MicroStation format, i.e., dgn extension. Copies of these files have been forwarded to the Hydrographic Surveys Division and a backup copy retained at PHB. Database records forwarded are in the Internal Data Format (IDF) and are in compliance with specifications in existence at the time of survey processing.

The drawing files necessarily contain information that is not part of the HPS data set such as geographic names text, line-type data, and minor symbolization. In addition, those soundings deleted from the drawing for clarity purposes remain unrevised in the HPS digital files to preserve the integrity of the original hydrographic data set. Cartographic codes used to describe the digital data are those authorized by Hydrographic Survey Guideline No. 35 and No. 75.

The data is plotted using a Modified Transverse Mercator (MTM) projection and are depicted on a single 1:10,000 scale sheet.

E. SONAR EQUIPMENT

Side scan sonar equipment was used during survey H10792. Refer to section E of the hydrographer's report concerning set-up, operation and method of processing of side scan data used in the field.

F. SOUNDING EQUIPMENT

Sounding equipment has been adequately addressed in the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

Soundings and elevations have been reduced to Mean Lower Low Water (MLLW) or Mean High Water (MHW) as appropriate with verified tide correctors obtained from CO-OPS. The correctors are zoned direct from station 944-9932, Armitage Island, WA.

Other sounding reducers include corrections for static draft, dynamic draft and sound velocity. These reducers have been reviewed and are consistent with NOS specifications.

H. CONTROL STATIONS

Section H of the hydrographer's report contains adequate discussions of horizontal control and hydrographic positioning.

The positions of horizontal control stations used during hydrographic operations are published values based on NAD 83.

The geographic positions of all survey data are based on NAD 83. The smooth sheet is annotated with an NAD 27 adjustment tick based on values determined with the NGS program NADCON. Geographic positions based on NAD 27 may be plotted on the smooth sheet utilizing the NAD 83 projection by applying the following corrections.

Latitude: -0.624 seconds (-19.284 meters)
Longitude: 4.630 seconds (94.935 meters)

I. HYDROGRAPHIC POSITION CONTROL

Differential GPS (DGPS) was used to control this survey. A horizontal dilution of precision (HDOP) not to exceed 3.75 for this survey has not been exceeded and the quality of data obtained is good. DGPS performance checks were conducted in the field and found adequate.

Additional information concerning specific control system type, calibrations and system checks can be found in the hydrographer's report and in the separates related to horizontal position control and corrections to position data.

J. SHORELINE

There are no contemporary photogrammetric data available for this survey. The shoreline in brown on the smooth sheet is for orientation only, and originates with the chart 18424, 25th edition, dated July 12, 1997 and chart 18427 19th edition, dated March 27, 1999. The shoreline data and the hydrographic data were merged in MicroStation during the compilation of the smooth sheet.

There were numerous MHW revisions throughout the survey area. These revisions have been depicted in dashed red on the smooth sheet and are adequate to supersede information from charted from prior photogrammetric shoreline maps

K. CROSSLINES

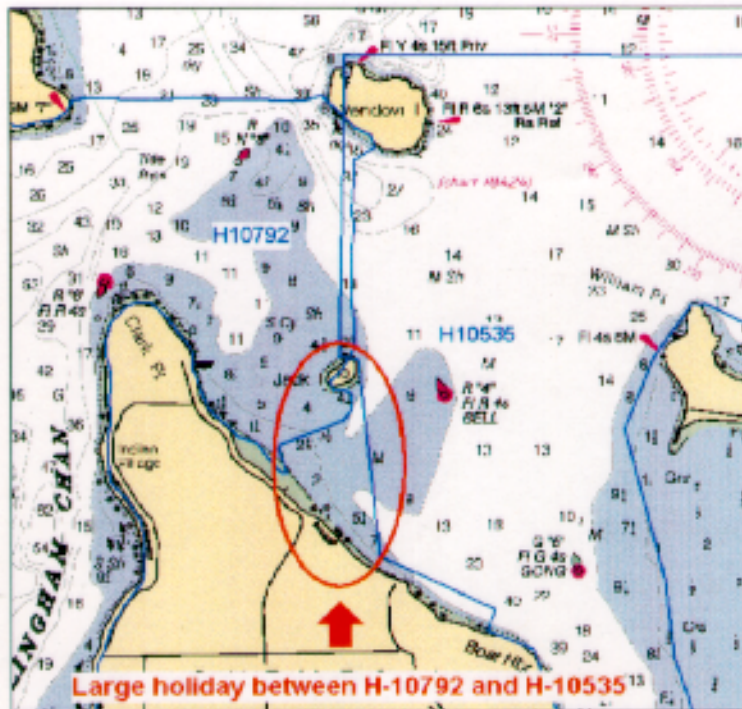
Crosslines are discussed in the hydrographer's report.

L. JUNCTIONS

Survey H10792 junctions with the following surveys:

| <u>Survey</u> | <u>Year</u> | <u>Scale</u> | <u>Area</u> |
|---------------|-------------|--------------|------------------|
| H10534 | 1994 | 1:10,000 | Southeast Limits |
| H10535 | 1994 | 1:10,000 | Northeast Limit |
| H10766 | 1997-98 | 1:10,000 | Northwest |
| H10887 | 1999 | 1:10,000 | North |
| H10911 | 1999 | 1:10,000 | Southwest |

The junction with survey H10887 is complete. A "Joins" note has been added to the smooth sheet. The junction with surveys H10534, H10535 and H10766 were not formally completed since these surveys were processed previously. However, depths are in good agreement within the common area. An "Adjoins" note has been added to the smooth sheet. A few soundings from the junction surveys have been transferred within the common areas of H10792 to better delineate the bottom configuration. The junction with H10911 was not formally completed since this survey is in preliminary office processing. The junction with survey H10792 will be addressed in the evaluation report for survey H10911. There is a large holiday between survey H10792 and H10535, centered at latitude 48/36/51N, longitude 122/36/51W which should be addressed during future survey work.



M. COMPARISON WITH PRIOR SURVEYS

| Survey | Year | Scale | Datum |
|--------|---------|----------|-------|
| H6607 | 1939/40 | 1:10,000 | NAD27 |
| H8318 | 1956 | 1:10,000 | NAD27 |
| H8332 | 1955 | 1:10,000 | NAD27 |

Prior surveys H6607, H8318 and H8332 cover the entire area of the present survey area. The present survey was compared to digital copies of the above prior surveys. The registration of these prior surveys to the present survey was good. The legibility of the digital copies was good.

There has been little change to the area since the prior surveys were completed. Only one area is noteworthy, the entrance to the Flounder Bay. The entrance has been enlarged and has moved approximately 50 meters to the west. Sounding agreement is good with the present survey depths shoaler by 1 to 2 fathoms. These differences can be attributed to greater sounding coverage, improved positioning and sounding methods, relative accuracy of the data acquisition techniques and natural forces. Prior survey rocks, kelp and ledges were carried forward throughout the present survey. These features are identified by color and are labeled on the smooth sheet. With the inclusion of these features, the present survey is adequate to supersede the prior surveys within the common area.

| | | | |
|---------|------|----------|-------|
| H9283WD | 1972 | 1:20,000 | NAD27 |
|---------|------|----------|-------|

The above wire-drag survey covers the entire area of the present survey south of latitude 48/35/00N. Adequate sounding and 200% side scan sonar development was accomplished in all areas of common coverage. The present survey is adequate to supersede this prior survey within the common area.

N. ITEM INVESTIGATIONS

There were no AWOIS items assigned to this survey. However, there are twelve (12) item investigations conducted within the survey area. Discussion and disposition of these items are included in the hydrographer's report, section M, and the item investigation reports (attached).

O. COMPARISON WITH CHART

Survey H10792 was compared with the following charts:

| <u>Chart</u> | <u>Edition</u> | <u>Date</u> | <u>Scale</u> |
|--------------|------------------|------------------|--------------|
| 18424 | 25th | July 12, 1997 | 1:40,000 |
| 18427 | 19 th | March 27, 1999 | 1:25,000 |
| 18429 | 8 th | July 3, 1999 | 1:25,000 |
| 18430 | 6 th | November 2, 1996 | 1:25,000 |

a. Hydrography

Charted hydrography originates with the previously discussed prior surveys and miscellaneous source data. The prior surveys have been adequately addressed in section M and require no further discussion.

All charted disposal areas should be retained.

The application of this survey to charts of a scale less than 1:40,000 may require the generalization of features such as ledges, and reefs. The recommended charting disposition of specific ledges or reefs is their depiction as isolated rocks. The application of this survey to charts of a scale greater than 1:40,000 may be accomplished without generalization of features. The areas containing features that might be subject to generalizations are described as: the west shoreline of Cypress Island, opposite the Cone Islands; the Cone islands, and the shoreline in the vicinity of Green Point. The three dolphins located at latitude 48/32/34.97N, longitude 122/41/13.03W are generalized as one dolphin and noted as *dols* on the smooth sheet and charts. The proximity of the three dolphins warrants only one dolphin being symbolized.

The charted green tint represents wire-drag areas from a 1972 survey. The evaluator recommends removing the charted green tint, in all areas that are common to the present survey, on charts 18427, 18429 and 18430, based on full bottom coverage and adequate hydrographic development during the present survey.

Survey H10792 is adequate to supersede charted hydrography within the charted area.

b. Dangers To Navigation

One danger to navigation was discovered during survey operations and reported to the USCG on January 19, 1999. A copy of this report is attached. No additional dangers to navigation were found during office processing

P. ADEQUACY OF SURVEY

The hydrography contained on survey H10792 is adequate to:

- Delineate the bottom configuration, determine least depths, and draw the required depth curves;
- Reveal there are no significant discrepancies or anomalies requiring further investigation; and
- Show the survey was properly controlled and soundings are correctly plotted.

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, the Field Procedures Manual, April 1994 Edition, and the NOS Hydrographic Surveys Specifications and Deliverables, dated April 23, 1999.

Q. AIDS TO NAVIGATION

All aids to navigation were identified, described and serve their intended purpose with the exception of Skyline Marina Light 1, which was destroyed. See the hydrographer's report section P for a list of all aids to navigation within the survey area.

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

R. STATISTICS

Statistics are adequately itemized in the hydrographer's report.

S. MISCELLANEOUS

Miscellaneous information is adequately discussed in the hydrographer's report. No additional miscellaneous items were noted during office processing.

T. RECOMMENDATIONS

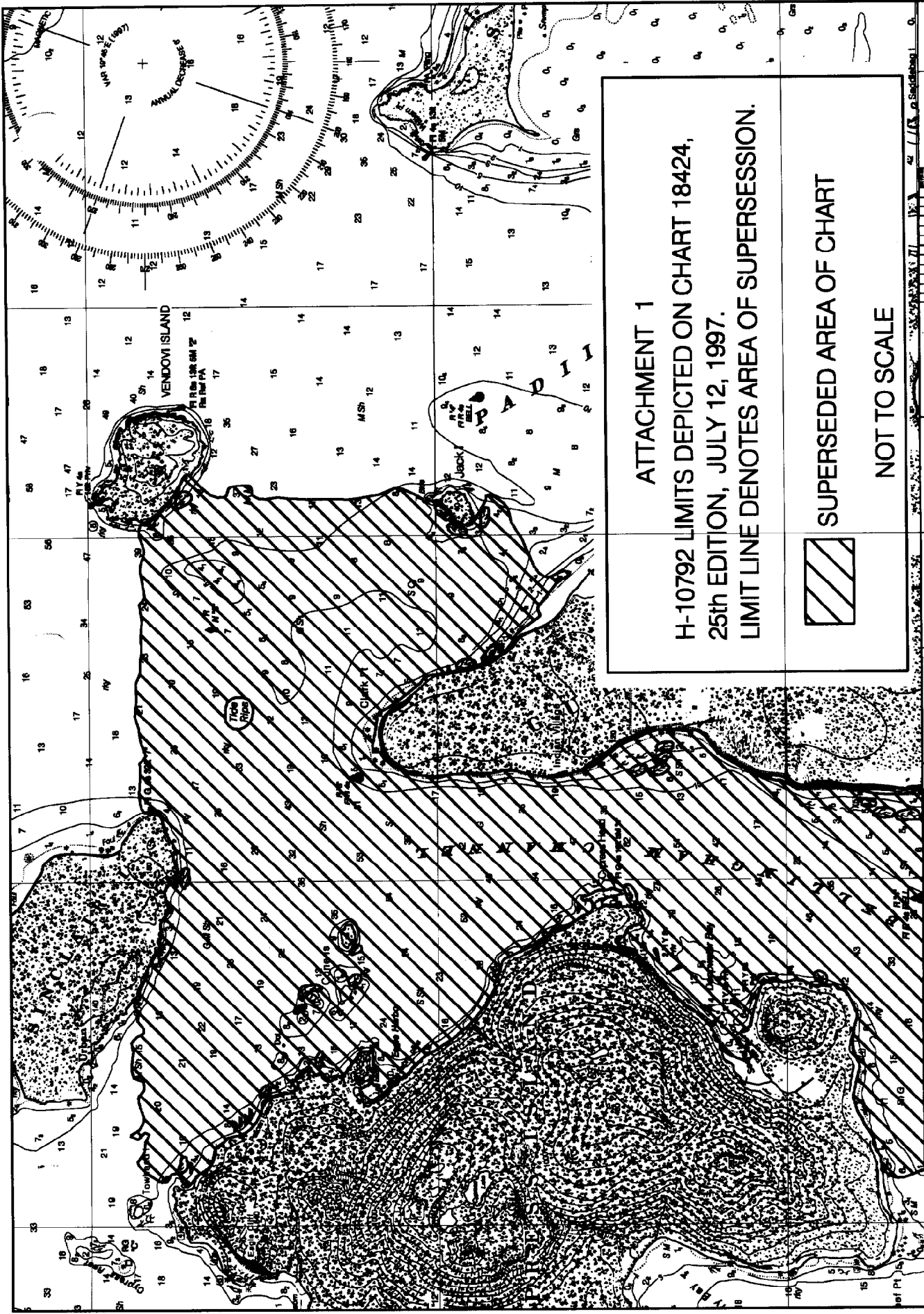
This is an adequate hydrographic survey. Additional fieldwork is recommended on a low priority basis to complete the holiday between the junction of survey H10535 and H10792, see section K of the evaluation report and the attached graphic.

U. REFERRAL TO REPORTS


Referral to reports is adequately discussed in the hydrographer's report.



Russ Davies
Cartographer



ATTACHMENT 1
 H-10792 LIMITS DEPICTED ON CHART 18424,
 25th EDITION, JULY 12, 1997.
 LIMIT LINE DENOTES AREA OF SUPERSESSON.

 SUPERSEDED AREA OF CHART

NOT TO SCALE

(CONTINUED ON CHART 18427)

677

CAUTION
 This chart has been corrected from the Notice to Mariners published weekly by the National Imagery and Mapping Agency and the Local Notice to Mariners issued periodically by each U.S. Coast Guard district to the data shown in the lower left hand corner.

SOUNDINGS IN FATHOMS
 (FATHOMS AND FEET TO 11 FATHOMS)

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


HORIZONTAL DATUM
 The horizontal reference datum of this chart is North American Datum of 1983 (NAD 83), which for charting purposes is considered equivalent to the World Geodetic System 1984 (WGS 84). Geographic positions referred to the North American Datum of 1987 must be corrected an average of 0.500" southward and 4.000" westward to agree with this chart.

SOUNDINGS IN FATHOMS

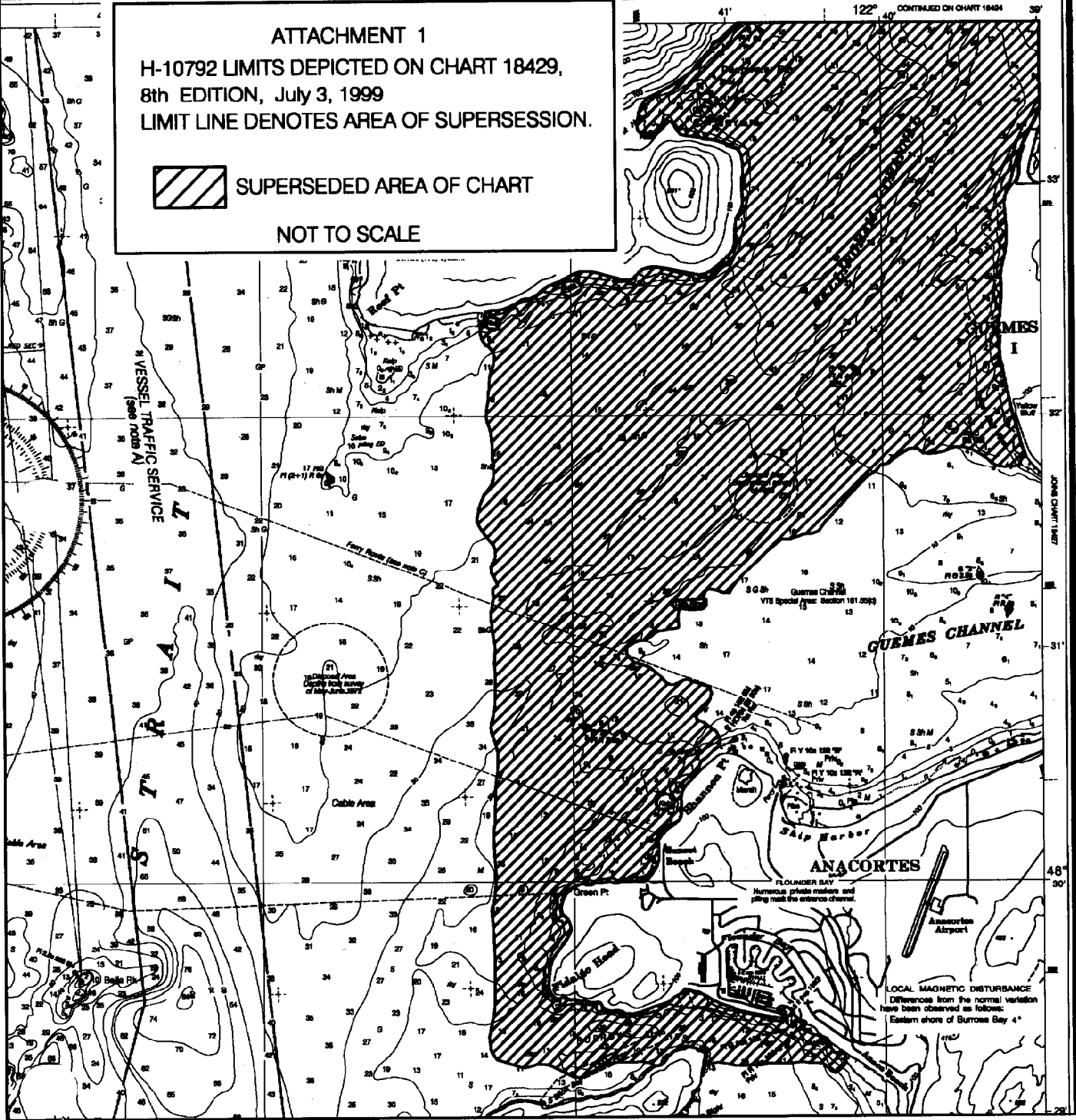
(FATHOMS AND FEET TO 11 FATHOMS)

Naval Chart Catalog No. 2, Part 8

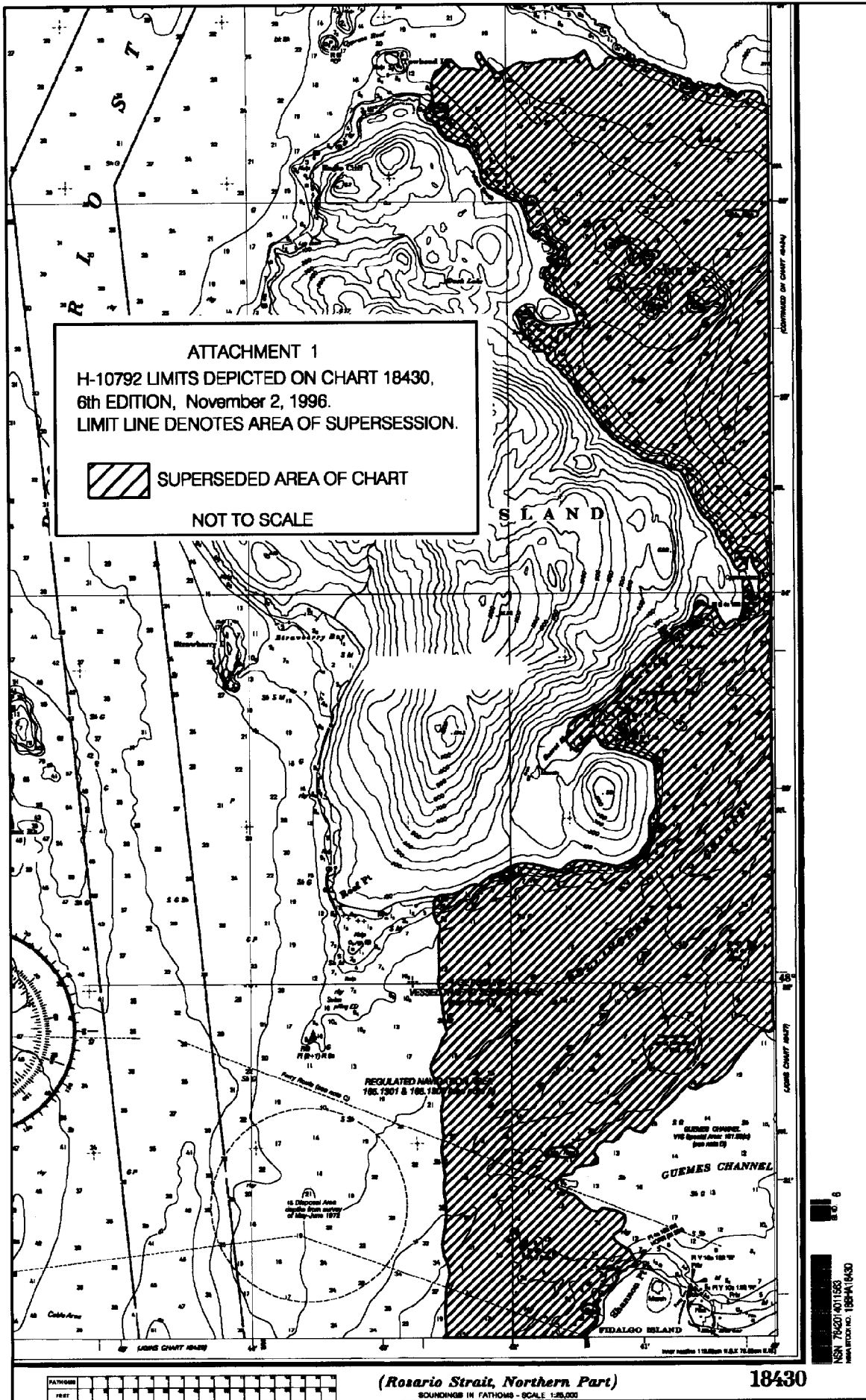
ATTACHMENT 1
 H-10792 LIMITS DEPICTED ON CHART 18429,
 8th EDITION, July 3, 1999
 LIMIT LINE DENOTES AREA OF SUPERSESION.

 SUPERSEDED AREA OF CHART

NOT TO SCALE



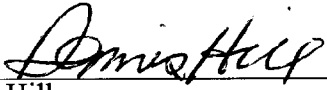
18429



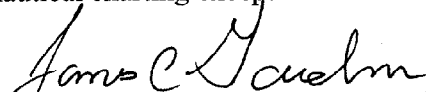
APPROVAL SHEET
H-10792

Initial Approvals:

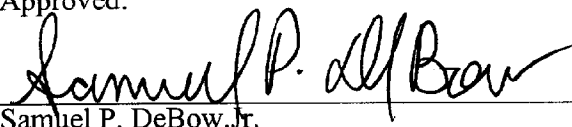
The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproof of charted data. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

 Date: 7-25-00
Dennis Hill
Chief, 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.

 Date: 8-2-00
James C. Gardner
Commander, NOAA
Chief, Pacific Hydrographic Branch

Final Approval

Approved:
 Date: October 12, 2000
Samuel P. DeBow Jr.
Captain, NOAA
Chief Hydrographic Surveys Division

