

10534

10534

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.	PHP-10-2-94
Registry No.	H-10534
LOCALITY	
State	Washington
General Locality	Rosario Straits
Sublocality	Guemes Channel
19 94	
CHIEF OF PARTY	
LT. G.T. Noll	
LIBRARY & ARCHIVES	
DATE	October 6, 1994

HYDROGRAPHIC TITLE SHEET

H-10534

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-10-2-94

State Washington

General locality Rosario Strait

Locality Guemes Channel

Scale 1:10,000 Date of survey April 12 - July 19, 1994

Instructions dated March 10, 1994 Project No. OPR-N264-PHP

Vessel VN 0651 and VN 0652

Chief of party LT Guy T. Noll, NOAA

Surveyed by LT. G. Noll, LT. R. Fletcher, ET E. Wernicke, ST R. Adams, ST K. Simmons

Soundings taken by echo sounder, ~~hand lead, pole~~ IN-448, DSF 6000N

Graphic record scaled by Pacific Hydrographic Party Personnel

Graphic record checked by Pacific Hydrographic Party Personnel

Verification by: J. Stringham Automated plot by PHS Xynetics Plotter

~~Plotted by~~ J. Stringham

Evaluation by: D. Hill

~~Unification by~~

Soundings in ~~fathoms~~ ~~feet~~ ~~at~~ ~~MLLW~~ Meters and Decimeters at MLLW

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

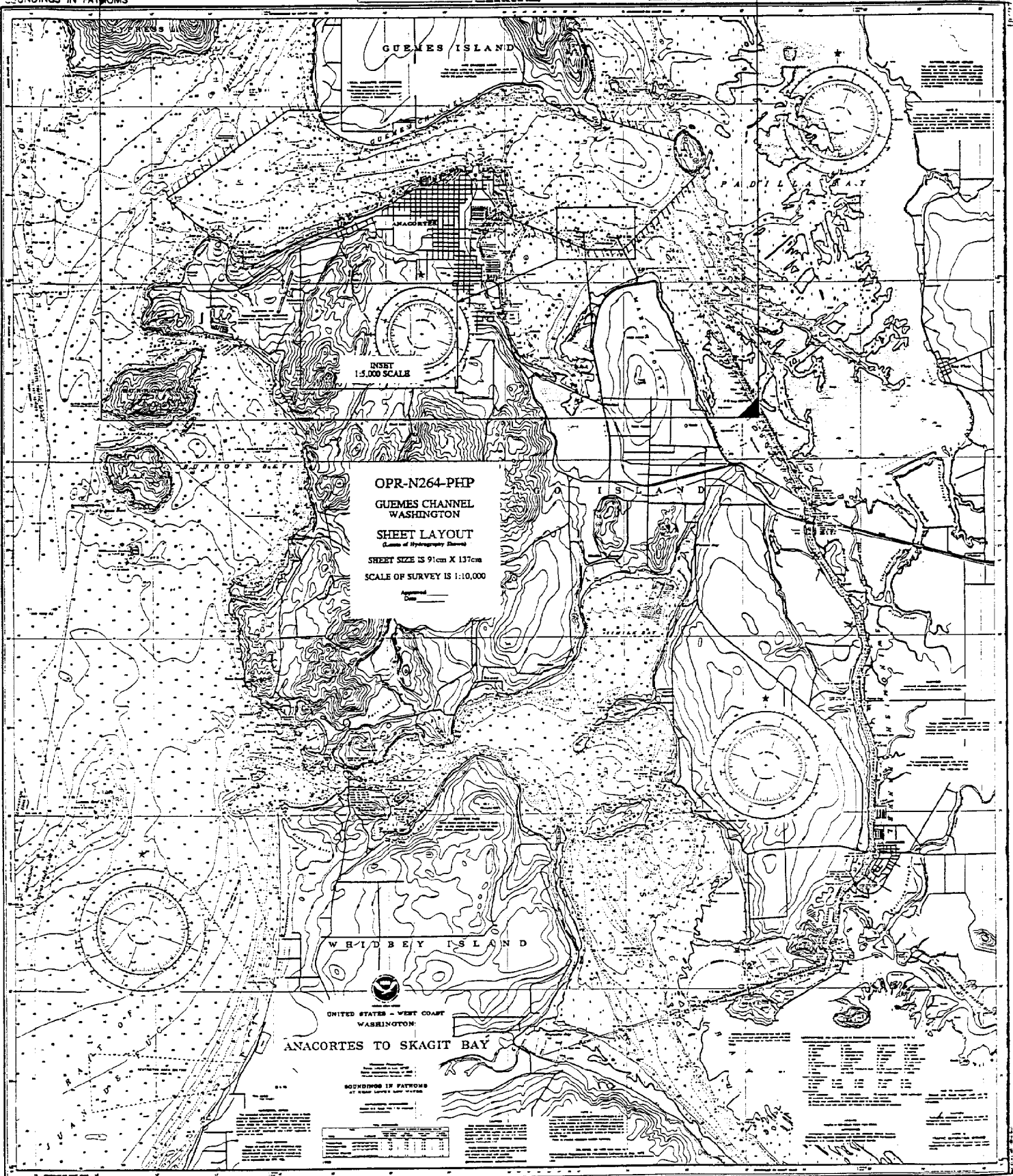
All depths listed in this report are referenced to mean lower low
water unless otherwise noted.

12-19-94AWOIS/SUPV by MBH
10-25-94

H-10534

SOUNDINGS IN FATHOMS

UNCLASSIFIED
DATE 01-11-2011 BY 60322 UCBAW/DK/STP



Descriptive Report to Accompany Hydrographic Survey H-10534

Field Number PHP-10-2-94
Scale 1:10,000
1994

Pacific Hydrographic Party
Chief of Party: LT Guy T. Noll

A. PROJECT

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-N264-PHP, Guemes Channel, Washington, dated March 10, 1994, as amended by CHANGE No. 1 dated April 29, 1994. *See E.R. Sect. 1*

This hydrographic survey, registry number H-10534, was conducted to obtain modern data for the maintenance of existing nautical charts. The project responds to concerns expressed by the Puget Sound Pilots and endorsed by Congressman Norm Dicks and Al Swift of Washington State.

The area is frequented by deep draft tankers. The main concern is to have the charted wire drag cleared depths superseded by modern hydrography. Additionally, the project area is an environmentally sensitive area that would suffer a significant negative impact if an oil spill from a tanker grounding occurred.

This survey's sheet letter is "A" as specified by the amended project instructions. This survey is the first 1:10,000 scale survey for project OPR-N264-PHP. PHP-10-2-94 is the field number assigned to this survey.

B. AREA SURVEYED

The area surveyed is Guemes Channel, WA, between longitudes $122^{\circ}37'53''$ W and $122^{\circ}41'56''$ W, and bounded by Guemes Island on the north and Fidalgo Island on the south. Plotter sheet 50 was skewed to 0° with overall sheet limits measuring 58 cm by 116 cm. The inshore hydrographic limit for H-10534 was the 5-meter depth curve as specified in section 1.8 of project instructions OPR-N264-PHP.

The area surrounding the oil terminal piers, the inset (plotter sheet 10), was surveyed at 1:5000 scale ~~standards~~, but at 1:10,000 scale position control requirements as specified in section 6.3 of the project instructions. Plotter sheet 10, the was skewed 0° with sheet limits measuring 30 cm by 48 cm. PHP does not have the capability to plot the inset on the same plot as the final field sheet at the specified scales. The inset was submitted for verification as a separate plot. The oil terminal area can be plotted as an inset on the final smooth sheet produced by the Pacific Hydrographic Section.

Data acquisition was conducted from April 12, 1994, (DN 102) through July 19, 1994 (DN 200).

C. SOUNDING VESSELS

NOAA Launch 1101 (EDP No. 0651), a 29-foot Jensen, and NOAA Launch 1102 (EDP No. 0652), a 21-foot SeaArk, were used for all hydrography, velocity casts, bottom samples, and developments. No changes to the standard vessel sounding configuration were necessary.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

The standard HDAPS software suite was used throughout this survey, except for modifications made to CONTACT (see the sifting function described in section E. Sonar Equipment), ZOOMEDIT, EXCESS, and BLKEDIT. Program names and versions are listed in Appendix VI.

The following non-HDAPS computer programs were used:

<u>Program Name</u>	<u>Version</u>	<u>Date</u>
VELOCITY	2.10	1994
NADCON	1.01	1989
INVERS3D	1.00	1991
MONITOR	1.31	1993
GEOID (NGS Geoid 90 model)	1.00	1990

Vessel 1102 used the PC-DAS SURVEY Program version 5.01 for data acquisition throughout the project.

E. SONAR EQUIPMENT

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 towfish was operated on the 100 kHz frequency and was configured with a 20° beam depression. The following sonar equipment was used throughout the survey:

<u>Type</u>	<u>S/N</u>
272-T Towfish	015598
260 Recorder	015602

The SSS towfish was towed with a 43-meter EG&G lightweight tow cable. The towfish was deployed with an electric winch through a block mounted to a swing-arm davit on the starboard quarter of launch 1101. The length of tow cable deployed was determined by

measured markings on the towfish cable. The SSS towfish was maintained at a height off the bottom between 8% and 20% of the range scale. Three range scales were used 75-, 100-, and 150-meters. SSS operations were conducted at a maximum speed of 5 knots while operating with the 75- or 100-meter range scales and 4 knots while operating with the 150-meter range scale. SSS line spacing and orientation was varied due to the extreme currents and bottom topography.

The inshore limit of SSS collection was the 5-meter curve or the limit of prudent surveying with SSS. Obtaining acceptable side scan sonargrams was exceptionally difficult in shallow sloping areas less than 5 fathoms (10 meters) due to jet wash, currents, surface return, and thermoclines. Degraded sonargrams were rejected and rerun, or the acceptable swath width was adjusted. The offshore limit of SSS coverage was the 45-meter curve. Two swath plots depicting adjusted SSS bottom coverage indicate the required 200% SSS coverage was completed except around the $9\frac{3}{4}$ -fathom shoal at latitude $48^{\circ}30'59''N$ longitude $122^{\circ}41'36''W$, which was covered with 100% SSS and 100% echosounder.

The SSS recorder gain setting was set for the best return for the most prevalent bottom material. Due to varied and continually changing water conditions continual tuning of the SSS recorder was required; hence daily confidence checks were meaningless and not performed. Contacts or identifiable features seen in the outer portion of the side scan sonargram are an indication of proper SSS recorder tuning and were periodically marked as confidence checks.

SSS operations were conducted by Launch 1101 on day numbers 139, 147, 151-152, 159-161, 166-168, 179, 181, 194-195. On day number 194 the fish height was not recorded in the digital data and was manually measured from the sonargram and entered into the digital data with a modified BLKEDIT program in HDAPS.

Side scan sonargrams were manually scanned for significant contacts in accordance with section 7.3.2 of the project instructions and entered into HDAPS contact tables. In areas of numerous contacts only the contacts with the largest computed heights were entered. PHP entered 715 contacts into 25 contact tables. Tables 1 through 14 contain contacts found during the first 100% coverage and tables 15 through 25 contain contacts found during the 200% coverage.

SSS lines were necessarily oriented along the channel (along the contours); hence computed contact heights were often in error, usually larger than actually found, due to the distortion from SSS transducers facing up or down a significant slope and slant-range-correction distortion.

Contacts lie primarily along the south shore of Guemes Island and across the bar from Yellow Bluff to Shannon Point. PHP developed contacts that were conveniently grouped with 5- to 10-meter line spacing with the DSF-6000N dual frequency transducer obtaining 100% low frequency coverage. At times during these developments the speed limitation as specified in section 7.2.3 of the FPM was exceeded. PHP found that this type of development was not sufficient to locate all significant contacts of concern. Contacts found by PHP were generally small point features, 1- to 2-meter diameter boulders. PHP found the most efficient manner of developing contacts was conducting drift/star pattern point searches with VN 1102 and the IN-448 high frequency echosounder. VN 0651 could not be used in this manner due to echosounder interference from the wash caused by the jet propulsion system.

At the thought of the daunting task of individually developing all 715 contacts PHP developed a computer program for HDAPS that, with user input parameters, would "sift" through the contacts. This function specifies which contacts are significant by comparing the contacts to the sounding data collected. The logic is based on the parameters for developing groups of contacts as specified in section 7.3.2 of the project instructions. This method of selection ensures the most significant contacts will be flagged for consideration of further development. A description of the program and its use is included in appendix VI.

All contacts that the sifting program identified for consideration of possible development, based on a threshold depth of 18 meters and chartable separation between soundings of 2.6 mm at the scale of the chart (65 meters), were investigated and found. The contact tables and two sifting printouts, one at chart scale (radius = 65 m) and one at 1/2 chart scale (radius = 32.5 m), are included in Separate V.

F. SOUNDING EQUIPMENT

The following Innerspace Model 448 (IN-448) echosounder, modified with custom EPROMS for HDAPS was used on VN 1102:

<u>Echosounder</u> <u>Type</u>	<u>Vessel</u> <u>EDP No.</u>	<u>Serial No.</u>	<u>DN Used</u>
IN-448	0652	236	All Days of Hydro

The IN-448 had extreme difficulty tracking and correctly digitizing in the steep areas on the east end of the survey between Southeast Point and Hat Island. PHP attributed this difficulty to the extreme currents, debris in water column and the slope. Several methods of data collection were attempted to overcome the deficiency. These include collection at a slower speed, operating at slack tides, and running hydro lines at an

oblique angle to the contours. None of those methods proved to be fully successful. On DN 109 the IN-448 nominal gain setting was increased 40 decibels (db) and then 60 db with no significant improvement. On DN 110 the nominal gain was reset to the factory setting and hydrography in these areas was planned around tides and run at slow speeds.

PHP discovered an EPROM error on DN 187. The x.5 scale on the IN-448 was improperly printed on the fathogram; reference FAX from Innerspace in appendix VI. The digital data is correct and the fathometer trace is correct but the scale on the fathogram is offset by 1/2 or 1 meter. PHP annotated the fathogram with the correct scales. The following data were affected:

<u>DN</u>	<u>FIX</u>
144	3933+2 to 3933+7
188	4820+6 to 4823+0
	4890+6 to 4894+0
189	5587+0 to 5595+0
	5659+0 to 5662+0

Power and processor board failures with the Raytheon, dual frequency, Digital Sounding Fathometer 6000N (DSF-6000N) were a recurring problem requiring four changes in units. The following DSF-6000N echosounders were borrowed from ONCO-PMC and used:

<u>Echosounder Type</u>	<u>Vessel EDP No.</u>	<u>Serial No.</u>	<u>DN Used</u>
DSF-6000N	0651	A115N	126,130-131,137
DSF-6000N	0651	B038N	138-140,143,146 147,151,152
DSF-6000N	0651	A124N	154,157,159,160 161,164,165
DSF-6000N	0651	B038N	166,167,168,179
DSF-6000N	0651	A124N	181,186,188,192 193-196,199,200

The high frequency was the primary frequency used throughout the survey. Low frequency was occasionally used when the high frequency did not track the bottom or a more significant depth was acquired with the low frequency.

Soundings were recorded in meters with an assumed speed-of-sound through water of 1500 m/sec. Depths encountered in the survey area range from -0.1 meters to 87.8 meters based on predicted tides.

Occasional breaks in the continuity of the echogram occurred when rapid changes in range scale were required. The hydrographer does not consider these breaks significant unless greater than 6 mm at the survey scale (Section 1.4.6, Hydrographic Manual) or if they occurred over a shoaling trend (potential missed peak), in which cases the section or line was resurveyed.

No on-line calibration adjustments were required for the IN-448 or DSF-6000N on either vessel.

Sounding poles were made by PHP using commercial surveyor's level-rod tape. These self-stick, pre-printed tapes are calibrated in centimeter intervals. They were laminated with clear epoxy to two-inch diameter wooden rods finished with white marine epoxy paint. The sounding poles are 3.3 meters long. No further calibrations are required. The sounding poles were used for verifying depths where echosounder data were unreliable and for determining depths of rocks submerged during data collection.

PHP fabricated the leadlines following Hydrographic Survey Guideline (HSG) 69. Each leadline is 1/4-inch steering tiller rope. Shrink tubing, secured with epoxy glue, marks one-meter intervals from one to thirty. With the line under six pounds of constant tension, markings were calibrated with a steel surveyor's tape. The throwing end is a standard six-pound lead weight shackled to a stainless steel thimble bent to the bitter end. Leadlines were used for depth comparisons with the echosounder. Leadline calibration forms are included in Separate IV (Sounding Equipment Calibration and Corrections). *No depths originating from sounding pole techniques were included with field data.*

G. CORRECTIONS TO SOUNDINGS

Velocity of Sound

Corrections for the speed of sound through the water column were computed from data obtained with an Applied Microsystems Laboratories (AML) sound velocity profiler (S/N 03004). The VELOCITY program was used to determine the speed of sound correctors. On April 19 (DN 109) three AML casts were conducted, one on the west end of Guemes Channel a second on the east end of Guemes Channel (Padilla Bay) and a third by Vendovi Island. The three casts indicated that there were no significant differences in water characteristics among the three areas. All subsequent casts were performed in the vicinity of the deep hole southeast of Southeast Point.

The following casts were used to determine the velocity correctors:

<u>HDAPS</u> <u>Table</u>	<u>DN</u>	<u>Depth*</u>	<u>DN</u> <u>Range</u>	<u>Cast</u> <u>Latitude</u>	<u>Position</u> <u>Longitude</u>
1	109	110.2	102-116	48°31'29"N	122°34'00"W
2	119	109.6	126-130	48°31'29"N	122°34'01"W
3	131	79.9	131-139	48°31'35"N	122°34'00"W
4	140	101.7	140-147	48°33'00"N	122°34'30"W
5	151	102.2	151-160	48°31'30"N	122°34'00"W
6	161	100.7	161-171	48°31'40"N	122°34'00"W
7	172	65.0	178-188	48°32'31"N	122°33'50"W
8	189	99.4	189-200	48°32'10"N	122°33'40"W

*Extrapolated depth.

Separate IV contains copies of all velocity cast data and HDAPS Velocity Corrector Tables. Sounding correctors apply to both narrow (high frequency) and wide (low frequency) beams on the IN-448 and DSF-6000N echosounders.

The AML instrument was calibrated by Northwest Regional Calibration Center on April 15, 1994 (DN 105). A copy of this calibration report is included in Separate IV.

Leadline Comparisons

Leadline comparisons were taken on several days of hydrography to confirm proper digitization of the echosounder depth. These are annotated on the echograms; no systematic drift or error was observed.

Static Draft

Static draft for VN 1102 was determined on April 12, 1994 (DN 102). 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 personnel aboard) the depth from this reference mark to the launch's waterline was measured. Combining the two measurements, a static draft of 0.4 meters was calculated. A static draft of 0.5 meters was determined for VN 1101 on May 3, 1994, (DN 123) using a method similar to above.

Dynamic Draft

Settlement and squat measurements for VN 1102 were conducted on April 5, 1994, (DN 095) in Guemes Channel, Washington. Settlement and squat measurements for VN 1101 were conducted on May 04, 1994, (DN 124) at the same location. Field records are included in Separate IV.

Settlement and squat correctors are applied on line to all survey data via the HDAPS offset tables. Offset table 1 corresponds to VN 1101; offset table 2 corresponds to VN 1102. Settlement and squat correctors are reapplied during field processing using the REAPPLY program in HDAPS.

Corrections to Echosoundings

Digitized soundings displayed on line were compared in real time with the analog trace to ensure reasonable agreement.

Tide Correctors

Tide correctors were applied in compliance with Sections 5.8.4 and 5.9 of Project Instructions OPR-N264-PHP and were adequate. The following tidal zone correctors, based on data for reference station Friday Harbor, WA, were used for survey H-10534:

<u>Tide Zone</u>	<u>Time Correction</u>	<u>Range Ratio</u>	<u>Table No.</u>	<u>Month</u>
entire sheet	direct(θ)	1.08	4-7	April-July

H. CONTROL STATIONS

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). A copy of the HDAPS Control Station Table is included in Appendix III (List of Horizontal Control Stations). A separate Horizontal Control Report OPR-N264-PHP, Guemes Channel, was submitted to N/CG245 on April 22, 1994.

I. HYDROGRAPHIC POSITION CONTROL

Differential GPS (DGPS) was used for position control throughout this survey. Accuracy requirements were met as specified in the section 3.4 of the Field Procedures Manual.

The following two Canadian Coast Guard DGPS beacons were used throughout this project:

<u>Reference Station</u>	<u>Latitude</u>	<u>Longitude</u>	<u>El. Ht</u>
Race Rocks	48°17'52.2582"N	123°31'54.7474"W	-6.031 m
Point Atkinson *			
(DN 102-126)	49°19'48.7252"N	123°15'52.9669"W	7.860 m
(DN 130-200)	49°19'49.4018"N	123°15'52.4445"W	22.050 m

* Point Atkinson reference station was relocated on May 10, 1994 (DN 130). Reference letter in Appendix VI.

Reference sites were confirmed using program MONITOR per FPM section 3.4.6.3. Copies of scatter plots and outlier.sum files are included in Separate III (Horizontal Position Control and Corrections to Position Data).

DGPS fixed point performance checks were obtained per FPM, Section 3.4.4.1 on a periodic basis throughout the project. A point on pier "C" was positioned to Third Order, Class I standards (see Horizontal Control Report) for use with performance checks. All DGPS performance checks were successful; performance check forms are located in separate III.

The following GPS equipment was used:

<u>Equipment Location</u>	<u>Type of Receiver/Antenna</u>	<u>Receiver Serial No.</u>	<u>Antenna Serial No.</u>
VN 1101	Ashtech (v.1E08D)	700417B1046	700378A0272
VN 1101	CSI Beacon Rcvr.(MDL MBX1)	X-1212	none
VN 1102	Ashtech (v.1E08D)	700417B1139	700378B0402
VN 1102	CSI Beacon Rcvr.(MDL MBX1)	X-1211	none

The unique serial numbers for all equipment are annotated on the daily master printout. Offset and layback correctors for the GPS antennas and tow-point for the SSS towfish are included in the offset tables for each launch.

J. SHORELINE *See E.R. sect. 2*

High-water shoreline detail shown on the field sheet was transferred by hand from 1:10,000-scale enlargements of T-11228 and T-11229. Shoreline was applied to the field sheet in brown and recommended changes to shoreline details were drawn in red. Hydrography was not conducted extensively inside of the 5-meter depth curve where most non-sounding features are located. Shoreline maps to be compiled from recent aerial photography conducted by NOS should be consulted for the purpose of updating this inshore area.

All features seaward of the 5-meter curve were verified or positioned on DN's 133 and 144. Field notes from shoreline verification can be found on the echograms and on the DP plot. A Detached Position Listing created by the HDAPS DP Program is included with the data files.

K. CROSSLINES

SSS and buffer lines were used as crosslines for sounding comparisons. Nautical miles of crosslines total 215, representing 57% of the mainscheme hydrography on H-10534. Agreement is generally good and well within limits defined in Section 4.6.1 of the Hydrographic Manual.

L. JUNCTIONS

The northeast end of survey H-10534 junctions with contemporary survey H-10535 (sheet "B") a 1:10,000 scale survey. The common area surveyed was approximately 200 meters wide and from the west shore of Hat Island to Southeast Point on Guemes Island. The soundings from the two surveys showed excellent agreement, generally no difference. The largest discrepancy is 1 meter in 47 meters of water or approximately 2% of the water depth.

M. COMPARISON WITH PRIOR SURVEYS *See E.R., Sect. 6*

PHP conducted a cursory prior survey comparison with Hydrographic Surveys H-1814, H-4736, H-4737, H-8331, H-8332, and H-8431WD. A more rigorous comparison will be performed by Pacific Hydrographic Section, N/CG245 after smooth tides are applied to the data.

Comparison of Non-Sounding Features

Comparison of non-sounding features showed fair agreement with hydrographic detached positions taken on this survey. As discussed in section J. changes to shoreline details were drawn on the field sheet in red. Shoreline maps to be compiled from recent aerial photography should be consulted for the purpose of updating this inshore area.

Comparison of Soundings

Sounding comparisons generally showed good agreement except with survey H-8431WD. The few soundings on H-8431WD were generally 0.8 fathoms shoaler than found in this survey. The clearance depths shown on survey H-8431WD are not representative of bottom depths in Guemes Channel.

N. ITEM INVESTIGATION REPORTS

There were seven AWOIS items within the limits of H-10534. Item investigation reports are included in Separate VI:

N1	AWOIS	52035
N2	AWOIS	52036
N3	AWOIS	52037
N4	AWOIS	52038
N5	AWOIS	52039
N6	AWOIS	52040*
N7	AWOIS	52041*
N8	AWOIS	52042
N9	AWOIS	52043

** AWOIS items not investigated.
(Information items)*

O. COMPARISON WITH THE CHART

PHP conducted frequent comparisons with a stable-based 1:10,000-scale enlargement of Chart No. 18427, 1:25,000, 15th Edition, July 25, 1992. A more rigorous comparison will be performed by Pacific Hydrographic Section, N/CG245 after application of smooth tides.

Comparison of Soundings

A sounding plot in fathoms was produced to facilitate sounding comparison with NOS chart 18427. The comparison showed excellent agreement except for the following soundings which were AWOIS Items: #52037, #52038, #52042, and #52043.

Comparison of Non-Sounding Features

Much of the charted non-sounding data on the chart originates from the previously mentioned shoreline maps. These maps are based on aerial photography of 1952 and as a result the depiction of much of the charted shoreline area is obsolete. See Section M, Comparison with Prior Surveys, and Section J, Shoreline, for more discussion.

The charted, privately maintained buoy at the City of Seattle Rock was not found. Delete charted buoy, W Or "Rock" Priv, at latitude 48°30'58"N, longitude 122°38'09"W. *Do not concur. Absence of buoy may have been temporary.*

The charted green tint designating areas cleared to specific depths by wire drag should be removed from the chart in all areas common to 200 percent SSS coverage. The SSS investigations together with the echosounder developments conclusively indicate the least depths to be found in these areas. *Concur. See E.R. Sect. 1 and 6*

Danger to Navigation

No dangers to navigation were found. Further review after smooth tides are applied may indicate dangerous depths within developments.

P. ADEQUACY OF SURVEY

This survey is a complete navigable area hydrographic survey and is adequate to supersede all prior surveys within their common areas.

Q. AIDS TO NAVIGATION

All aids to navigation seaward of the 5-meter curve were positioned. All positions showed good agreement with the charted positions with the exception of some privately maintained aids. Confirmed positions are listed on the DP printout located with the data. Discrepancies are noted on NOAA form 76-40 which is included in Appendix II.

R. STATISTICS

<u>Description</u>	<u>Quantities</u>
Total Positions (selected soundings)	31004
Total Detached Positions	69 54
Total Nautical Miles Hydrography	1263
Square Nautical Miles Hydrography	4
Velocity Casts	10 8
Days of Production	49
Bottom Samples	9 6
Tide Stations	1

S. MISCELLANEOUS

Bottom samples were acquired in accordance with the project instructions. Bottom sample positions and descriptions are plotted on the detached position plot. Copies of Oceanographic Log Sheet-M, Bottom Sediment Data, (NOAA Form 75-44) are included in Separate II. Bottom samples and SSS indicate that bottom characteristics are adequate with the following changes to NOS chart 18427:

<u>Action</u>	<u>Carto Code</u>	<u>Symbol</u>	<u>Latitude</u>	<u>Longitude</u>
*Chart	548	rkv	48°31'18"N	122°39'00"W
Chart	548	rkv blds	48°31' 47 ^{53.4} "N	122°36' 09 ³³ "W
*Delete	559	G	48°31'44"N	122°36'11"W

** Do not concur. No new bottom characteristics were provided.*

Magnetic anomalies were observed near shore in the vicinity of Southeast Point, Hat Island, and Cap Sante.

Strong tidal currents, up to 5 knots, were observed but no anomalous tidal conditions were noted.

T. RECOMMENDATIONS

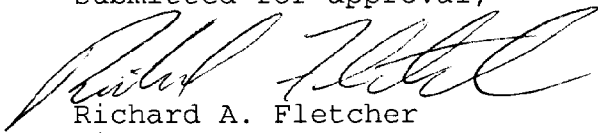
The hydrographer recommends that full bottom coverage with Side Scan Sonar be limited to depths less than or equal to 150% of the projected draft of vessels transiting the surveyed area. Full ensonification of the bottom in depths well below vessel draft required several more days of production and did not produce significant SSS contacts.

PHS recommends that consideration be given this Proposal only in areas w/o prior wire drag coverage.

U. REFERRAL TO REPORTS

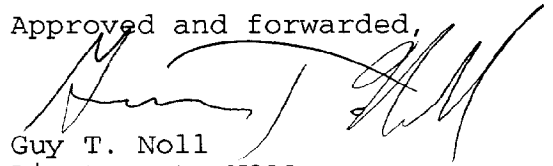
<u>Title</u>	<u>Date</u>
1994 Horizontal Control Report OPR-N264-PHP	April 21, 1994
Coast Pilot Update	TBA

Submitted for approval,



Richard A. Fletcher
Lieutenant, NOAA
Assistant Chief of Party

Approved and forwarded,



Guy T. Noll
Lieutenant, NOAA
Chief of Party

ITEM INVESTIGATION REPORT

ITEM NO.: N1
AWOIS 52035

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM:

Unknown; CL1734/71 -- USPS; Noted a wreck, status or identity not provided.

SOURCE POSITION: latitude 48°30'44.00" N
longitude 122°38'47.00" W (NAD83)

SURVEY REQUIREMENTS: S2, ES, DI, VS, or SD
(100 m search radius)

METHOD OF INVESTIGATION: Visual

RESULTS OF INVESTIGATION: A wood hull approximately 150 feet in length and 35 feet in width was visually located at latitude 48°30'42.3"N, longitude 122°38'49.3"W; position derived by forward computation from DP #3952. The computed position is 70 meters from the AWOIS position. The hull is above MHW and is part of a breakwater; See sketch on fathogram and picture for DP# 3952.

COMPARISON WITH PRIOR SURVEYS: In comparison with prior surveys there was no indication of a wreck.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

Chart 18427 shows a hulk on top of the breakwater in the position located and charts a wreck symbol off the end of the breakwater. PHP believes the wreck was moved so that it could be incorporated into the breakwater. There is a wharf built out to the AWOIS position and this wharf is regularly used by large, approximately 150 feet, fishing vessels.

Delete charted wreck symbol at latitude 48°30'44.00"N, longitude 122°38'47.00"W.

Concur

ITEM INVESTIGATION REPORT

ITEM NO.: N2
AWOIS 52036

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM:

Unknown; CL1734/71 -- USPS; Noted a wreck status or identity not provided.

SOURCE POSITION: latitude 48°30'46"N
longitude 122°38'40"W (NAD83)

SURVEY REQUIREMENTS: S2, ES, DI, VS, or SD
(100 meter search radius)

METHOD OF INVESTIGATION: Visual

RESULTS OF INVESTIGATION: DP #111 at the end of a pier indicates the pier has been built over the AWOIS position. PHP did observe an old steel ship approximately 200 feet in length and 40 feet width that was tied up to the pier and sitting on the bottom. The location of the ship is latitude 48°30'46.7"N, Longitude 122°38'39.2"W; position derived by forward computation from DP #111. The computed position is 27 meters from the AWOIS position. See sketch on fathogram for DP # 111.

COMPARISON WITH PRIOR SURVEYS: No prior surveys had any indication of a wreck in the area.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

Comparison with the chart indicates that a pier has been built at that location and two dolphins were positioned just offshore of the pier. If the charted wreck is other than the steel ship, cultural features have been built over the wreck.

Delete charted wreck symbol at latitude 48°30'46"N, longitude 122°38'40"W.

Concur

ITEM INVESTIGATION REPORT

ITEM NO.: N3
AWOIS 52037

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM:

7 fathom sounding; source unknown

SOURCE POSITION: latitude 48°31'10"N
longitude 122°39'03"W (NAD83)

SURVEY REQUIREMENTS: S4, ES, DI

(100 meter search radius)

METHOD OF INVESTIGATION: The search area was covered with 200% side scan sonar coverage (Fix's 1649-1650, 1662-1664, 2239-2240, 3141-3142, 3183-3184, 3194-3195) and 100% low frequency echosounder coverage; 50-meter lines in a N-S direction and 10-meter lines in a E-W direction. A drift search was conducted on contact #1663.14P found within the search radius.

RESULTS OF INVESTIGATION: 1663.14P was the largest contact 100 meters from the AWOIS position. The least depth found was 15.5² meters (8.5 fm) at fix 3052+7 based on ~~predicted~~ ^{actual} tides. A 14.6³ meter (8 fm) sounding was found 160 meters west of the AWOIS position at fix 3052+3, near buoy number "4", and was the shoalest sounding in the same path along the channel as the AWOIS item. *See E.R. sect. 1*

COMPARISON WITH PRIOR SURVEYS: H-10534 showed good agreement with prior surveys in the common area.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

There are no other charted soundings within the search radius to compare.

Delete the 7 fathom sounding at latitude 48°31'10"N longitude 122°39'03"W and replace with soundings from this survey. *Concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N4
AWOIS 52038

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM:

6-fathom sounding; source unknown

SOURCE POSITION: latitude 48°31'11"N
longitude 122°38'17"W (NAD83)

SURVEY REQUIREMENTS: S4, ES, DI
(100 meter search radius)

METHOD OF INVESTIGATION: The search area was covered with 200% side scan sonar coverage (Fix's 1626-1628, 1647-1648, 2223-2225, 3181-3183, 7399-7401) and 100% low frequency echosounder coverage; 50-meter lines in a N-S direction and 10-meter lines in a E-W direction.

RESULTS OF INVESTIGATION: No contacts were found in the search radius. The SSS of the area showed a sloping featureless bottom in the search area. The sounding found nearest the center of the search area was fix 2341+6, 16.6 meters (9.1 fm). The shoalest sounding found in the search area is fix 3057+2, 13.8 meters (7.8 fm) approximately 85 meters south, up-slope, of the AWOIS position.

COMPARISON WITH PRIOR SURVEYS: H-10534 showed good agreement with prior surveys in the common area.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS: There are no other charted soundings within the search radius to compare.

Delete the 6 fathom sounding at latitude 48°31'11"N longitude 122°38'17"W and replace with soundings from this survey. *Concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N5
AWOIS 52039

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM: 1.6 fm (3.0 m) sounding; CL72/62,
grounding reported

SOURCE POSITION: latitude 48°31'02.00"N
longitude 122°37'51.00"W (NAD83)

SURVEY REQUIREMENTS: S2, ES, DI
(100 meter search radius)

METHOD OF INVESTIGATION: Echosounder; The search was begun with 5-meter lines. A shoal was found in the center of the search radius and developed with echosounder. The offshore portion of the search area drops off to deeper water and was not developed.

RESULTS OF INVESTIGATION: Verified; A least depth, fix 6036+3, of 3.1 meters (1.7 fm) was found at latitude 48°31'01.405"N, longitude 122°37'50.818"W, based on ~~predicted~~ *actual* tides.

COMPARISON WITH PRIOR SURVEYS: Prior survey H-8331 showed a 0.8 fathom sounding at that location and was correctly charted as a 3/4 fathom shoal. Surrounding depths agreed fairly well but no depths as shoal as 0.8 fathoms were found.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS: The chart correctly charted a 3/4-fm shoal found on prior survey H-8331. No evidence of a 3/4-fm shoal sounding was found.

Delete 3/4 fathom sounding charted at latitude 48°31'02"N, longitude 122°37'51"W.

Replace with contemporary hydrography from this survey.

Concur

ITEM INVESTIGATION REPORT

ITEM NO.: N6
AWOIS 52040

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM: Sewer outfall

SOURCE POSITION: latitude 48°30'50.37"N
longitude 122°38'04.62"W (NAD83)

SURVEY REQUIREMENTS: Information only

METHOD OF INVESTIGATION: not investigated

RESULTS OF INVESTIGATION:

COMPARISON WITH PRIOR SURVEYS:

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

ITEM INVESTIGATION REPORT

ITEM NO.: N7
AWOIS 52041

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM: sewer outfall

SOURCE POSITION: latitude 48°31'22.37"N
longitude 122°36'37.61"W (NAD83)

SURVEY REQUIREMENTS: Information only

METHOD OF INVESTIGATION: Not investigated

RESULTS OF INVESTIGATION:

COMPARISON WITH PRIOR SURVEYS:

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

ITEM INVESTIGATION REPORT

ITEM NO.: N8
AWOIS 52042

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM:

6.7-fm (12.3 m) sounding

SOURCE POSITION: latitude 48°30'36.00"N
longitude 122°34'29.00"W (NAD83)

SURVEY REQUIREMENTS: S4, ES, DI
(75m search radius)

METHOD OF INVESTIGATION: 400% SSS coverage over the area was attempted but due to degraded side scan sonargrams 375% SSS coverage was obtained over the search area, Fix numbers 2106-2108, 2151-2152, 2175-2177, 2199-2200, 3298-3300, and 3352-3354. In addition the area was covered with 50-meter lines in a N-S direction and 25-meter in an E-W direction.

RESULTS OF INVESTIGATION: Disproved; No significant contacts were found in the search radius. SSS showed a sloping featureless bottom in the search area. A 16.2-meter (8.9 fm) sounding was found near the center of the search radius. A 15.7-meter (8.6 fm) sounding was found 75 meters up-slope on the edge of the search radius.

COMPARISON WITH PRIOR SURVEYS: Comparison with prior surveys shows good agreement with the exception of H-8431WD. Depths from H-8431WD were generally 0.8 fathoms (1.5 m) shoaler than found on this survey.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS: This survey agrees with charted soundings with the exception of those that originated with the WD survey.

Delete 6³/₄ fathom sounding charted at 48°30'36.00"N longitude 122°34'29.00"W and replace with soundings from this survey.

Concur

ITEM INVESTIGATION REPORT

ITEM NO.: N9
AWOIS 52043

CHART NO.: 18427 (1:25,000)
EDITION: 15th Edition
CHART DATE: July 25, 1994

SURVEY: H-10534

DESCRIPTION AND SOURCE OF ITEM:

6.7-fm (12.3 m) sounding

SOURCE POSITION: latitude 48°30'35.00"N
longitude 122°34'23.00"W (NAD83)

SURVEY REQUIREMENTS: S4, ES, DI

(75m search radius)

METHOD OF INVESTIGATION: 400% SSS coverage over the area was attempted but due to degraded side scan sonargrams 325% of good SSS coverage was obtained over the search area, fix's 2151-2152, 2156-2157, 2176-2177, 3298-3299, 3333-3334, and 3352-3354. In addition the area was covered with 50 m lines in a N-S direction and 25 m in an E-W direction.

RESULTS OF INVESTIGATION: Disproved; No significant contacts were found in the search radius. SSS showed a sloping featureless bottom in the search area. A 16.9-meter (9.2 fm) sounding, fix ~~5353~~¹⁰⁸⁷+0, was found near the center of the search radius. A 15.5-meter (8.5 fm) sounding, fix 5410+3, was found 95 meters up-slope on the edge of the search radius.

COMPARISON WITH PRIOR SURVEYS: Comparison with prior H-8431WD shows poor agreement. Depths from prior were generally 0.8 fm shoaler than found on this survey and FE-114.

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS: This survey agrees with charted soundings with the exception of those that originated with the WD survey.

Delete 6³/₄ fathom sounding charted at 48°30'35.00"N longitude 122°34'23.00"W and replace with soundings from this survey.

Concur

CONTROL STATIONS as of 26 May 1994

No	Type	Latitude	Longitude	H	Cart	Freq	Vel	Code	MM/DD/YY	Station Name
1		048:31:15.939	122:36:49.860	-14	250	0.0	0.0		04/04/94	DGPS BASE, RAILROAD AND O AVE.
2		048:30:47.711	122:35:56.312	39	139	0.0	0.0		04/04/94	CAP SANTE HEAD
3		048:30:38.734	122:36:23.102	-18	139	0.0	0.0		04/04/94	SOUTH HARBOR POINT
4		048:30:38.702	122:36:30.226	-17	139	0.0	0.0		04/04/94	CAP SANTE MARINA PIER A
5		049:19:49.402	123:15:52.445	-11	250	0.0	0.0		05/26/94	PT ATKINSON, BC (VANCOUVER)
6		048:17:52.258	123:31:54.747	-6	250	0.0	0.0		04/11/94	RACE ROCKS, BC (VICTORIA)
7		048:30:45.594	122:36:29.916	0	139	0.0	0.0		04/15/94	FIXED POINT PERFORMANCE CHECK
8		048:31:02.764	122:36:22.480	-17	139	0.0	0.0		04/20/94	T6ST
9		048:30:54.081	122:36:33.887	-17	139	0.0	0.0		04/20/94	R9ST
10		048:30:54.423	122:36:29.105	0	139	0.0	0.0		04/22/94	ENDG
11		048:30:45.730	122:36:21.355	0	139	0.0	0.0		04/22/94	ENDC
12		048:30:51.740	122:36:26.280	0	139	0.0	0.0		04/22/94	ENDK
13		048:30:48.166	122:36:14.590	0	139	0.0	0.0		04/22/94	ENDQ

VANCOUVER
AS OF 5-26-94

7

*

RESPONSIBLE PERSONNEL	
TYPE OF ACTION	NAME
OBJECTS INSPECTED FROM SEAWARD	ORIGINATOR <input type="checkbox"/> PHOTO FIELD PARTY <input type="checkbox"/> HYDROGRAPHIC PARTY <input type="checkbox"/> GEODETIC PARTY <input type="checkbox"/> OTHER (Specify)
POSITIONS DETERMINED AND/OR VERIFIED	FIELD ACTIVITY REPRESENTATIVE
FORMS ORIGINATED BY QUALITY CONTROL AND REVIEW GROUP AND FINAL REVIEW ACTIVITIES	OFFICE ACTIVITY REPRESENTATIVE <input type="checkbox"/> REVIEWER <input type="checkbox"/> QUALITY CONTROL AND REVIEW GROUP REPRESENTATIVE
INSTRUCTIONS FOR ENTRIES UNDER 'METHOD AND DATE OF LOCATION' (Consult Photogrammetric Instructions No. 64.)	
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 **PHOTOGAMMETRIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Ocean and Earth Sciences
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

ORIGINAL

DATE: August 4, 1994

MARINE CENTER: Pacific

HYDROGRAPHIC PROJECT: OPR-N264-PHP

HYDROGRAPHIC SHEET: H-10534

LOCALITY: Washington, Guemes Channel, Puget Sound

TIME PERIOD: April 12 - July 19, 1994

TIDE STATION USED: 944-8794 Anacortes, Fidalgo Island, Wa.
Lat. $48^{\circ} 31.2'N$ Lon. $122^{\circ} 36.8'W$

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 9.81 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 7.4 ft.

REMARKS: RECOMMENDED ZONING

1. East of $122^{\circ} 39.0'W$, times and heights are direct on Anacortes, Wa. (944-8794).
2. West of $122^{\circ} 39.0'W$, apply a -0 hr 18 min time correction and a X0.92 range ratio to Anacortes, Wa. (944-8794).

Note: Times are tabulated in Greenwich Mean Time.



CHIEF, DATUMS SECTION



ORIGINAL

NOAA FORM 76-155 (11-72)		U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION							SURVEY NUMBER	
GEOGRAPHIC NAMES		H-10534								
Name on Survey	<div style="display: flex; justify-content: space-between;"> A ON CHART NO. 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 </div>									
	ANACORTES	X								
BELLINGHAM CHANNEL	X									2
CAP SANTE	X									3
CITY OF SEATTLE ROCK	X									4
COOKS COVE			X							5
DEADMAN BAY			X							6
FIDALGO BAY	X									7
FIDALGO ISLAND	X									8
GUEMES	X		X							9
GUEMES CHANNEL	X									10
GUEMES ISLAND	X									11
HAT ISLAND	X									12
KELLYS POINT			X							13
PADILLA BAY	X		X							14
ROSARIO STRAIT (title)	X									15
SHANNON POINT	X									16
SHIP HARBOR	X									17
SOUTHEAST POINT	X									18
YELLOW BLUFF REEF	X									19
WASHINGTON (title)										20
								Approved:		21
								<i>Charles B. Harrington</i>		22
								Chief Geographer - N/CG245		23
										24
								AUG 22 1994		25

Contact Sifting Function

General

The Contact Program Sifting Function quantifies the significance of contacts compared with the corrected selected sounding data. The program allows the user to quickly enter the desired actions before it scans the contact tables and compares soundings contained in the GRAPHDATA file (made by Zoom Edit or Excess) in "batch mode" with no operator intervention. The function is designed to aid the hydrographer and the office processor in the difficult task of determining significance and the need for further development. The results of the sifting are printed out and, if the operator desires, stored in the remarks column in the contact table.

Program Access

SUBPROGRAM Sift is accessed via the Post-Survey program Contact Editor, "Group/Sift" Contacts function key.

Program Execution

The correct output of this function is predicated on the user's contact scanning accuracy and the updating of the ZOOMEDIT selected sounding array with properly corrected depths. In addition, the user must determine two values using hydrographic judgement:

- 1) The radius or grid value at the scale of the survey. Alternatively, the grid value for the chart scale may be used, but survey scale will necessarily give the user a greater resolution and is more conservative. One suggested method is to resolve contacts based on the survey scale until most areas containing contacts have been surveyed well, according to the hydrographer's judgement. Then, the grid could be increased based on the chart scale and the contacts re-sifted to decide charting significance of any remaining contacts.

- 2) The least depth of the navigable passage through the area of the contacts or the projected deepest draft of vessels transiting the area. This depth, called a threshold depth, should be considered the "safe" draft of vessels transiting the contact positions, thus basing the depth on the previously surveyed least depth of passage is a more conservative approach than using the projected deepest draft of vessels using the area. One iterative method of using the threshold depth is to use both the deepest draft and the shoalest transit sounding to give the hydrographer a "feel" for the number of contacts whose tops may be in navigable water.

Contact Sifting Function

The average of all non-detached position selected soundings within the user-entered grid radius and further than 10 m from the contact position is the base depth of the contact. The contact's base depth minus the contact height is the depth at the contact top ("Top Depth"). This function will save the contact plotting status as a "Y" if the contact meets the following criteria:

- 1) the contact height meets the NOS significant height criteria (1 meter high in 20 meters of water, 10% of the depth in depths greater than 20 meter);
- 2) the top depth is shoaler than the threshold depth by at least 0.7 meter;
- 3) the top depth is at least 0.7 meter shoaler than any selected sounding already collected within the user-defined radius;
- 4) and that the difference between the shoalest sounding and the deepest sounding within 10 meters of the contact position (if they exist) is less than or equal to 70% of the contact's computed height. It is assumed that a "Fake Height" greater than 70% of the computed contact height indicates that the contact has been found.

Note that the difference between shoalest and deepest soundings at the contact position is called the "Fake Height" because it is a bottom roughness value based on actual soundings which may not be the contact, but would give Side Scan Sonar shadow similar to the contact. Contacts which fail these criteria are "Not Significant" (NS) and therefore have their plotting flags changed to "N" if the user has chosen to save the changes. Contacts may be insignificant due to the depth comparison (NS-D) or because they are below the threshold depth (NS-T).

Side Scan contacts which do not meet the 0.7 meter shoaler criteria, but would otherwise be significant, are listed on the printout with the designation "FYI" following their name. If the contact is significant and no soundings have been collected within 10 meters of the contact, the listing will show a "*" symbol, the depth at the contact will be 99.9, the Fake Height will be +99.9, and under the File Name column heading the words "NO CONTACT" will be printed. If a significant contact has soundings within the 10 meter radius which do not meet the 70% height criterion, then the contact is marked with a "#" to indicate that further work may be necessary after review of the sounding data. The data file and data set numbers of the least depth within the grid radius and the least depth within the contact radius are printed, along with the fix number and selected "out" of the shoaler of the least depths.

Contact Sifting Function

Recommended Methodology:

After acquisition of the 100% Side Scan coverage is complete and all contacts and sounding data have been scanned, plot all the contacts, then excess the sounding data and sift the contacts based on the survey grid radius. The resulting printout will have all the contacts which should be investigated as well as some "FYI" contacts which may be significant after the 200% SSS coverage is complete. Re-plot the contact tables and label this plot and the sift printout "Sift #1" for future comparison. Note that comparison between "Sift #1" and the original contact plot should give the hydrographer a good indication of the amount of development work required for adequate navigational charting if the threshold depth is chosen correctly.

Develop all large contacts, and collect 200% SSS coverage if required, before re-sifting the contacts using the survey grid radius and an updated threshold depth (label this Sift #2). Save the plotting status to the tables, which will also save the contact significance to the remarks field. Re-plot the significant contacts; Several developments should have overlapped lesser contacts' radii, thus reducing the number of plotted contacts. Develop these contacts and sift the tables iteratively until all contacts are marked as insignificant or, more likely in a rocky, high contact environment, until most contacts have been developed and the judgement of the hydrographer says that the contacts thus far developed adequately depict the roughness of the bottom contours for charting purposes.

As an aid to the Chief-of-Party in making this decision, the contact tables should be re-sifted (and plot flag NOT saved) with the selected sounding grid radius based on the largest-scale chart of the area to decide if all chart-able contacts have been developed. As development continues, and especially if large areas are developed with 5-10 meter line spacing, some contacts originally deemed insignificant may become significant due to a decreased average depth about the contact; rocky convoluted bottoms are prone to this, and the hydrographer can use the Fake Height roughness value to decide if a contact lies within such an area. No computerized algorithm has been found which can safely find these cases without also losing significant contacts, so determination must be made by "hand."

Note that this methodology ensures that the hydrographer will first develop the largest, most significant contacts for charting and Danger to Navigation purposes.

Rick FLETCHER

3 pages

With the old Eprom there may be an error in the scale lines chart annotation on the second range in meters mode. This error would not affect the digital data which is correct even with the existing Eprom.

Our records show the following:

<u>S/N</u>	<u>Purchased</u>	<u>S/N</u>	<u>Purchased</u>
175	3/90	236	8/92
186	10/90	239	10/92
187	10/90	241	11/92
188	10/90		

I have sent one extra Eprom for your spares. Also, enclosed are field change documents, please have each person making the update return the second page for our records.

Regards,

INNERSPACE TECHNOLOGY, INC.

Stephen Holowacz
Stephen Holowacz
Vice President

SH:sa

We will send a new EPROM to
arrive your place Monday
July 11, 1994

Steve Holowacz

APPROVAL SHEET

for

SURVEY H-10534

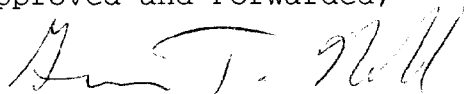
Standard field surveying and processing procedures were followed in producing this survey in accordance with the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; and the Field Procedures Manual, as updated for 1994. The data were reviewed daily during acquisition and processing.

Considerable programming was performed by myself on the new HDAPS Contact Sifting function. This function is a computerized algorithm following the contact significance principles outlined in the Project Instructions for OPR-N264-PHP. I hereby certify that the function fulfills the requirements of the project instructions to the best of my knowledge and ability to test.

The field sheets and supporting data 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/CG245, Pacific Hydrographic Section.

Approved and Forwarded,

DATE: August 11, 1994



Guy T. Noll
Lieutenant, NOAA
Chief, Pacific Hydrographic Party

HYDROGRAPHIC SURVEY STATISTICS

H-10534

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		
DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDION FILES	3				
ENVELOPES	6				
VOLUMES					
CAHIERS					
BOXES					

SHORELINE DATA	
SHORELINE MAPS (List):	T-11228 and T-4229 Chart 18427 15th Ed.
PHOTOBATHYMETRIC MAPS (List):	NA
NOTES TO THE HYDROGRAPHER (List):	NA
SPECIAL REPORTS (List):	NA
NAUTICAL CHARTS (List):	18427 15th Ed.

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			31004	
POSITIONS REVISED				
SOUNDINGS REVISED			40	
CONTROL STATIONS REVISED				
	TIME-HOURS			
	VERIFICATION	EVALUATION	TOTALS	
PRE-PROCESSING EXAMINATION				
VERIFICATION OF CONTROL				
VERIFICATION OF POSITIONS	69		69	
VERIFICATION OF SOUNDINGS	93		93	
VERIFICATION OF JUNCTIONS				
APPLICATION OF PHOTOBATHYMETRY				
SHORELINE APPLICATION/VERIFICATION				
COMPILATION OF SMOOTH SHEET	40		40	
COMPARISON WITH PRIOR SURVEYS AND CHARTS		8	8	
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		24	24	
GEOGRAPHIC NAMES				
OTHER: Digitization				
*USE OTHER SIDE OF FORM FOR REMARKS	TOTALS	202	32	234

Pre-processing Examination by M. Larsen	Beginning Date 4/12/94	Ending Date 7/19/94
Compilation of Field Data by J. Stringham	Time (Hours) 202	Ending Date 9/20/94
Verification Check by	Time (Hours)	Ending Date
Evaluation and Analysis by D. Hill	Time (Hours) 32	Ending Date 9/28/94
Inspection by D. Hill	Time (Hours) 2	Ending Date 9/30/94

EVALUATION REPORT

H-10534

1. INTRODUCTION

Survey H-10534 is a navigable area hydrographic survey accomplished by the Pacific Hydrographic Party under the following Project Instructions:

OPR-N264-PHP, dated March 10, 1994

This survey was conducted in Washington state and covers the area of Guemes Channel east from the vicinity of longitude 122/42W to longitude 122/32/48W. The inshore limit of hydrography was the 5-meter depth curve however, the hydrographer extended coverage farther inshore in selected areas to develop specific features. The primary coverage throughout the area was surveyed and is depicted at a scale of 1:10,000. An inset, for the purpose of depicting conditions in the vicinity of the oil tanker terminals located near latitude 48/30/30W, longitude 122/34/30W, was surveyed at a scale of 1:10,000 but is depicted at the larger scale of 1:5,000. In addition to echo sounder coverage much of the area was surveyed using side scan sonar (SSS). The result of this intensive SSS coverage is the supersession of prior wire-drag clearances and the recommended elimination of the wire-drag green tint from charts within the common area. The SSS data was verified using recently compiled software which significantly reduced the amount of individual contact processing required to determine acceptability. This process is adequately described by the hydrographer in an attachment to his report, titled *Contact Sifting Function*, dated August 2, 1994.

Survey data indicates the bottom consists of sand, gravel and shells in the western portion of the channel. Since bottom sampling was not conducted elsewhere, characteristics are not specifically known. However, since survey results agree with the charted information it is assumed that present charted characteristics in the east portion of the channel are adequate. The bottom is configured as a glacial trough with what appears to be two significant moraines crossing the entire channel. The first is in the vicinity of longitude 122/39/15W. Depths on this feature are some of the shallowest within the main channel into the Anacortes area. Specifically, a minimum depth of 14.3 meters exists at the location of Buoy 4 while a 15.4-meter depth is located nearby along the southern edge of the channel across the shoal. The second moraine is farther east in the vicinity of longitude 122/35/54W. Depths on this feature are deeper with a minimum of 16.8 meters on the north side of the channel. Also significant is the existence of a smaller marginal moraine in the vicinity of latitude 48/31/50N, longitude 122/36/30W. Although north of the main channel this pronounced feature is as shallow as 9 meters and may contain scattered boulders. A localized, but significant, deep with a maximum depth of 86 meters exists in the general vicinity of latitude 48/31/31N, longitude 122/34/03W. Elsewhere minimum depths are less than zero meters near shorelines, but this

shallow near-shore region was not developed due to depth limitations imposed by the Project Instructions.

Survey depths clearly define a natural channel extending east from the junction of Guemes Channel with Bellingham Channel. Tanker vessels entering Guemes Channel from the west with maximum drafts of 43 feet should encounter no problems with bottom clearance until approaching the terminal piers extending north from March Point. Minimum, but localized, depths along the faces of the western and eastern piers are 13.1 meters (42.9 feet) and 14.9 meters (48.8 feet), respectively.

Predicted tides were used for the reduction of soundings during field processing. Approved hourly heights zoned from gage 944-8794 (Anacortes, Washington), were used during office processing.

The field sheet parameters have been revised to center the hydrography on the office plot and position the inset on the main 1:10,000 scale plot. Soundings have been corrected for dynamic draft, actual tides and sound velocity. Hydrographic positioning was obtained using differential GPS based on Canadian beacons. Positioning data have been verified as acceptable. An accompanying computer printout contains the parameters and the correctors. Data are plotted using a Modified Transverse Mercator projection and are depicted on a single sheet displaying both the main 1:10,000 scale coverage together with the inset at 1:5,000 scale.

Survey data were processed using the same Hydrographic Data Acquisition/Processing System (HDAPS) software suite used by the hydrographer; the Hydrographic Processing System (HPS), Release 19940714; and AutoCad, Version 12, with local modifications as performed by Custom CAD/Datagraphics under contract 43ACNC401524.

At the time of the survey certification the format for the transmission of digital data had not been finally approved. In the interim, digital data for this survey exists in the standard HPS format which is a database format using the .dbf extension. In addition, the sounding plot, created with the .dbf data and enhanced using the AutoCad system, is filed both in the AutoCad drawing format, i.e., .dwg; and in the more universally recognized graphics transfer format, .dxf. Copies of these data files will be retained at PHS until data transfer protocols are developed and approved.

The drawing files necessarily contain information which is not part of the HPS data set such as geographic name 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. 75.

2. CONTROL AND SHORELINE

Sections H and I of the hydrographer's report and the Horizontal Control Report for OPR N264-PHP, 1994, contain adequate discussions of horizontal control and hydrographic positioning.

Positions of horizontal control stations used during hydrography originate with the Hydrographic Surveys Branch memorandum, *Canadian West Coast DGPS Beacon Status*, dated March 1, 1994 and subsequent facsimile correspondence from the Canadian Coast Guard Western Region, dated May 20, 1994. The latter correspondence was necessitated by a relocation of the reference beacons in use during the survey. The successful completion of a reference site confirmation using program MONITOR and daily system calibrations provide adequate checks regarding the suitability of the beacons for use during a hydrographic survey. Although the raw data listings provided by the hydrographer incorrectly recorded the location of the latest reference beacon the monitoring of the station performance and daily calibrations confirm that the beacon was broadcasting correctly.

The final sounding plot is annotated with an NAD 27 adjustment ticks based on values determined with the NGS program, NADCON. Geographic positions based on NAD 27 may be plotted on the sounding plot using the NAD 83 projection by applying the following corrections.

Latitude: 0.63 seconds (19.4 meters)
Longitude: -4.63 seconds (-95.1 meters)

The quality of 54 positions exceeds the computed acceptable HDOP of 3.75. Only one position originates as a detached position, a dolphin at latitude 48/30/27/5N, longitude 122/40/34.4W. The plotted location of this feature is consistent with other dolphins in the vicinity and appears to be in a reasonable location relative to the ferry terminal of which it is part. The computed EPE for the fix is 1.6 mm at the scale of the survey which exceeds the allowable specification by 0.1 mm. The remaining positions are randomly scattered throughout the survey area and none locate dangers to navigation. They were generally considered to be missed positions and the HDAPS system "smoothed" the sounding line by dead reckoning between acceptable fixes.

The following shoreline maps apply to this survey.

	<u>Photo Date</u>
T-11228	1952
T-11229	1952

Originally authorized by the Project Instructions, these shoreline maps were subsequently eliminated from the project documentation. An office review disclosed that the age of the photography was not sufficiently recent to provide an accurate representation of the shoreline and attached cultural features. Authorization was granted by N/CG241 (via e-mail message

Maurice Hickson to Dennis Hill, dated August 5, 1994) to substitute nautical chart information. As a result, shoreline was digitized from chart 18427, 15th edition, July 25, 1992, and then used to construct the shoreline appearing on the final sounding plot.

The hydrographer located several changes to the charted shoreline and recorded them with detached positions and "See-Field-Sheet" positions. The changes are depicted in red on the final sounding plot. The features located without position fixes but rather as "See-Field-Sheet" positioning are itemized below. The position of these features is considered approximate:

<u>Feature</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>
ferry terminal	48/30/24.0	122/40/39.0
ferry terminal	48/31/10.5	122/37/28.5
dolphin	48/30/27.3	122/40/39.0
dolphin	48/30/27.0	122/40/38.4
dolphin	48/30/26.7	122/40/39.3
dolphin	48/30/25.2	122/40/35.7
dolphin	48/30/26.1	122/40/37.2
pier	48/30/44.4	122/38/47.1
pier	48/30/45.0	122/38/43.5
pier	48/30/43.2	122/38/40.5
pier	48/31/41.4	122/37/22.8
pier	48/31/41.4	122/38/21.0
pier	48/31/41.7	122/38/18.6
pier	48/31/41.7	122/38/16.5
pier	48/31/17.1	122/38/24.6
pier	48/31/17.9	122/38/22.5
pier	48/31/16.8	122/38/21.0
pier	48/31/18.0	122/38/19.5
breakwater	48/31/42.6	122/37/15.0

The location of the Texaco Oil Company pier extending north from March Point was not completely resolved. Although detached positions were acquired on the pier corners, or near the corners, aligning the pier with the fix on the northeast corner produces conflict with the sounding lines adjacent to the pier. The pier is depicted on the final sounding plot in dashed red to indicate that the position conflict is unresolved and the hydrographic positioning is approximate. The location of the pier on the final sounding plot is based on a best-fit with the hydrography and confirms the charted location which should remain unchanged. The actual configuration of the pier face, however is different from that depicted on the chart. Detached positions acquired on pier-end lights confirm that the extent of the pier faces and associated fender structures is longer than that which is charted. This change is depicted on the final sounding plot and should be used to revise the chart.

The depiction of the adjacent Shell Oil Company pier is also in dashed red denoting approximate location. This major pier was located with only one detached position which is

insufficient to verify the complete configuration of the pier. The depiction is in general agreement with the chart which should remain unchanged.

3. HYDROGRAPHY

With the exception of the area inshore of the approximate location of the 5-meter depth curve hydrography is adequate to:

- a. delineate the bottom configuration, determine least depths, and draw the standard depth curves;
- b. reveal there are no significant discrepancies or anomalies requiring further investigation; and
- c. show the survey was properly controlled and soundings are correctly plotted.

4. CONDITION OF SURVEY

The hydrographic records and reports received for processing are adequate and conform to the requirements of the Hydrographic Manual, 4th Edition, revised through Change No. 3; the Hydrographic Survey Guidelines; and the 1994 Field Procedures Manual.

5. JUNCTIONS

Survey H-10534 junctions with the following survey:

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H-10535	1994	1:10,000	NE

The junction with survey H-10535 has not been formally completed since this junction survey was only recently received from the field and has not been completely processed. However, a comparison using field sheets indicates that soundings are in good agreement. No soundings have been transferred between the surveys

6. COMPARISON WITH PRIOR SURVEYS

H-4736(1927) 1:5,000
H-4737(1927) 1:5,000
FE-114(1953) 1:5,000

These surveys, although of an earlier date than the following surveys, were compared to the present survey because the subsequent surveys (listed below) were never finally approved and therefore, do not supersede these early surveys. As a result of this comparison the present survey is adequate to supersede these prior surveys within the common area.

H-8331(1955) 1:10,000
H-8332(1955) 1:10,000

These surveys are the most recent prior hydrographic surveys common to the present survey. There has been little substantial change within the common area. However, numerous soundings and features have been carried forward to the present survey in the unsurveyed area generally inside the 5-meter depth curve. As a result of this transfer and the comparison, the present survey is adequate to supersede these prior surveys within the common areas.

H-8431WD(1958) 1:10,000

This prior wire drag survey is common to the area of hydrography and side scan sonar (SSS) conducted during the present survey. Survey H-8431WD is superseded in its entirety. The basis for this unusual supersession is the completion of 200 percent side scan sonar (SSS) coverage throughout the common area. The results of the SSS, consisting of numerous significant contacts, were thoroughly investigated with echo sounders and all unexcessed soundings are depicted on the sounding plot. The charted green tint, denoting the wire drag coverage, should be removed from charts.

T-11228 (1955) 1:10,000

Although not specifically listed in the project instructions as a prior survey, T-11228 was used for comparison purposes. The illegibility of the contemporary hydrographic survey smooth sheets, which this shoreline map supports, necessitated this procedure. The shoreline has changed significantly since the compilation of this map. Although the hydrographer located some of the changes apparent along the shoreline, not all changes have been hydrographically documented. A modern revision of the shoreline using contemporary aerial photography is required to complete the job. A number of features originating with this map have been transferred to the H-10534 final sounding plot and are appropriately color coded.

All the above prior hydrographic surveys cover the area of the present survey. However, the present survey's specification of terminating hydrography at the 5-meter depth curve resulted in a significant exclusion zone between the present hydrography and the high water line. It is assumed that in this zone all soundings and features originating with prior surveys are not superseded. Rather than transfer all individual soundings from priors to the present survey to make it complete, selected soundings were transferred. Those selected for transfer are some of those used in the present compilation of chart 18427. This procedure allows the origin of charted soundings to be preserved. The transferred soundings are color coded on the sounding plot.

Visible features carried forward from prior surveys have not been revised to submerged as would normally be the case. The features are depicted as they are depicted on the prior survey for the reason that no specific investigations were conducted to verify or disprove inshore prior survey features. With the exception of piles and dolphins charted separately in the vicinity of latitude 48/32/10.5N, longitude 122/35/36.0W and latitude 48/31/16.5N, longitude 122/36/03.0W, there is insufficient evidence to assume the features now exist below MLLW. These latter features are depicted as submerged on the chart, however, the source of this revision is unknown. Accordingly, the features are depicted as visible on the sounding plot.

There are no AWOIS items originating from prior surveys.

Survey H-10534 is adequate to supersede all the prior surveys within the common area.

7. COMPARISON WITH CHART

Chart 18427, 15th edition, dated July 25, 1992, scale 1:25,000

a. Hydrography

Charted hydrography originates with surveys and miscellaneous sources. The prior surveys are discussed in section 6 and require no further discussion. Three items, originating with miscellaneous sources, were not verified or disproved and should remain as charted. These items are listed below:

<u>Feature</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>
rock awash	48/32/00.3	122/36/33.0
rock awash	48/32/11.1	122/35/53.1
rock awash	48/31/02.7	122/37/44.7

In addition, two separate groups of submerged piles and dolphins were not verified or disproved. Although these features originate with prior surveys as visible features, an unascertainable source subsequently revised the features to submerged. These features should remain as charted.

<u>Feature</u>	<u>Latitude(N)</u>	<u>Longitude(W)</u>
subm. piles	48/32/10.5	122/35/36.0
subm. dols	48/31/16.5	122/36/03.0
rock awash	48/31/02.7	122/37/44.7

With the exception of the bottom characteristics acquired in the vicinity of latitude 48/30/45N, longitude 122/35/04W; and latitude 48/31/07N, longitude 122/34/27W, bottom type was were not verified or disproved east of longitude 122/38/47W and should remain as charted. The "rky" bottom type labels charted at latitude 48/31/49.5N, longitude 122/37/48.0W; and latitude 48/31/55.5N, longitude 122/36/21.0W, originate with undetermined sources. Although neither was specifically verified or disproved there is sufficient indication on the sonargrams to assume the bottom in this general area contains scattered boulders. It is recommended that charts be revised with a "bls" note to indicate this boulder condition instead of a general rocky condition.

With the exceptions noted above, survey H-10534 is adequate to supersede charted hydrography within the common area.

b. AWOIS

AWOIS items, 52035 through 52043 originate with miscellaneous sources. The disposition of all the items is adequately discussed by the hydrographer in separates attached to his report.

c. Controlling Depths

There are no federally authorized maintained channels with controlling depths within the area of the hydrography depicted on the sounding plot.

d. Aids to Navigation

All fixed and floating aids were located and serve their intended purpose. Charted landmarks were neither verified nor disproved and should remain as charted.

In addition to the revised positions provided by the hydrographer on the attached NOAA Form 76-40 the position of the Shell Oil Company Light differs from the chart and was appended to the hydrographer's version of the NOAA Form 76-40.

e. Geographic Names

Names appearing on the smooth sheet and in the survey title have been approved by the Chief Geographer.

f. Dangers to Navigation

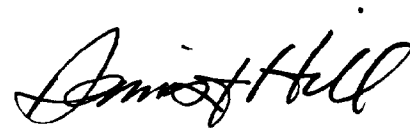
No reports of dangers to navigation were generated during the survey or office processing.

8. COMPLIANCE WITH INSTRUCTIONS

Survey H-10534 adequately complies with the project instructions.

9. ADDITIONAL FIELD WORK

This is an adequate hydrographic survey. No additional field work is recommended.

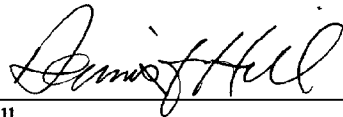


Dennis J. Hill
Chief, Hydrographic Processing Unit

APPROVAL SHEET
H-10534

Initial Approvals:

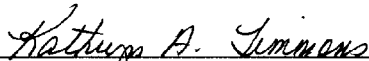
The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproval of charted data. The digital data have been completed and all revisions and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



Date: 9-30-94

Dennis J. Hill
Chief, Hydrographic Processing Unit
Pacific Hydrographic Section

I have reviewed the smooth sounding plot, 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.

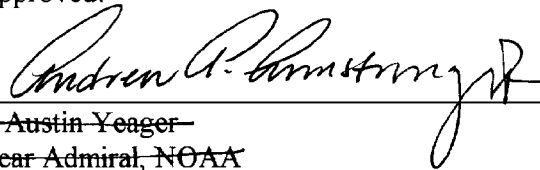


Date: 9-30-94

Commander Kathryn A. Timmons, NOAA
Chief, Pacific Hydrographic Section

Final Approval

Approved:



Date: Jan 24, 1997

~~J. Austin Yeager~~
~~Rear Admiral, NOAA~~
~~Director, Coast and Geodetic Survey~~

Andrew A. Armstrong, III
Captain, NOAA
Chief, Hydrographic Surveys Division

