

DIAGRAM 6460-3

Charts

HYDROGRAPHIC TITLE SHEET

H-10667

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-10-2-96

State Washington

General locality Southern Puget Sound

Locality Wyckoff Shoal to Balch Passage

Scale 1:10,000 Date of survey March 27 - June 6, 1996

Instructions dated November 1, 1995 Project No. OPR-N210-PHP

Vessel Jensen Launch 1101 (EDP 0561), MonArk Launch 1102 (EDP 0652)

Chief of party LT Richard A. Fletcher, NOAA

Surveyed by Pacific Hydrographic Parties Personnel

Soundings taken by echo sounder, ~~hand lead~~, pole side scan sonar, DSF6000, Innerspace 448,
EG&G Model 260

Graphic record scaled by PHP Personnel

Graphic record checked by PHP Personnel

Evaluation by: L. Deodato Automated plot by HP Design Jet 650C

Produced by J. Stringham, D. Doles, R. Mayor, L. Deodato

Verification by J. Stringham, D. Doles, R. Mayor, L. Deodato

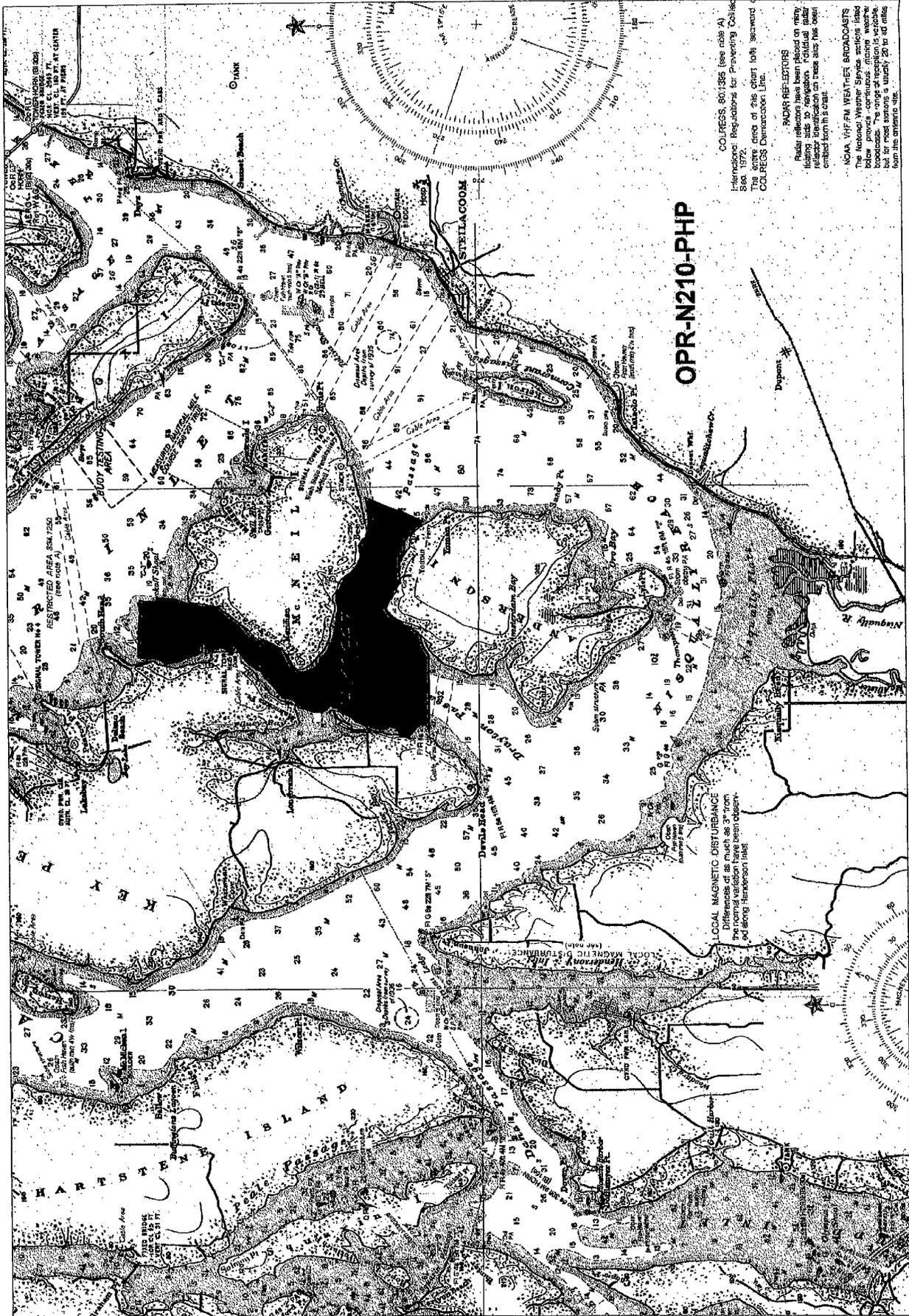
Soundings in fathoms ~~feet~~ at MLLW ~~MLW~~ and tenths

REMARKS: All times are 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.

BA-11-99

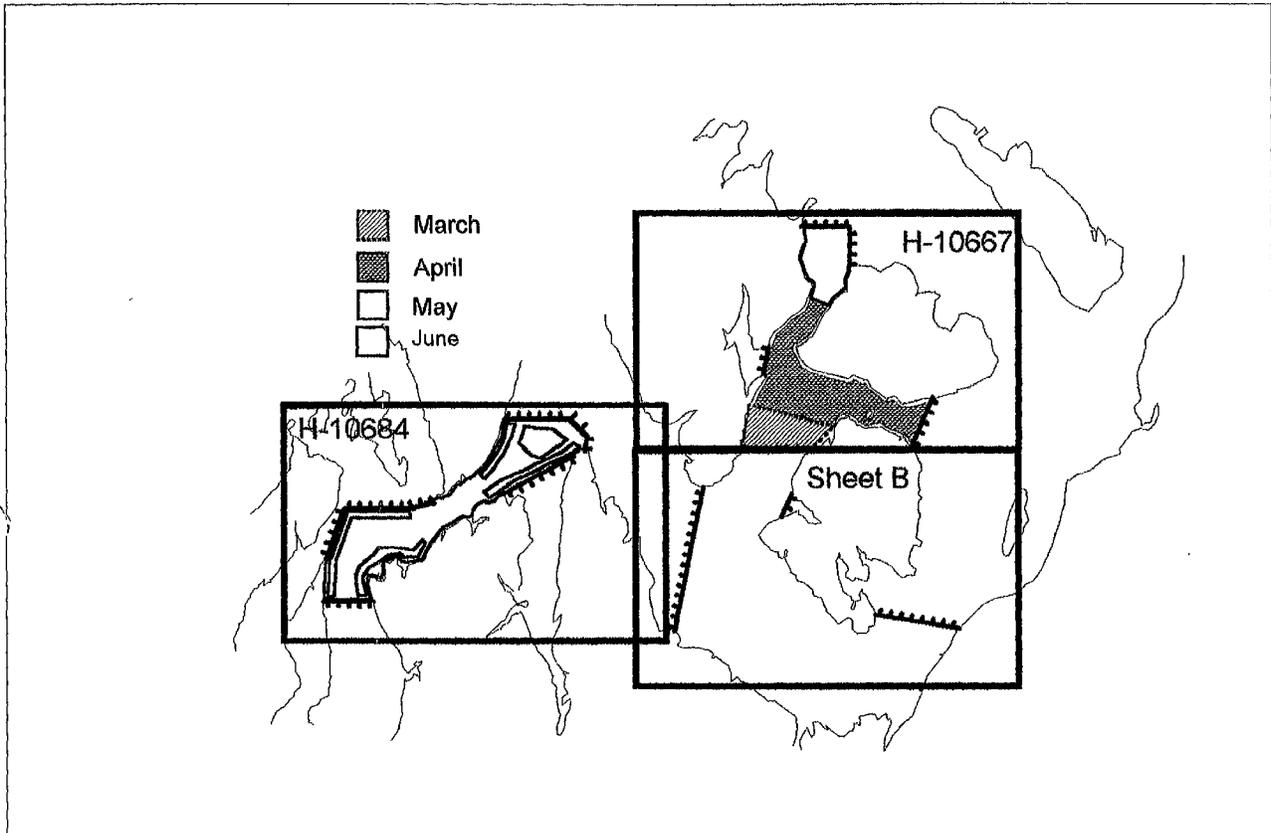
SURF & AWDIS V 4/7/97 by MBH



Pacific Hydrographic Party
 LT Richard Fletcher
 Chief

Sheets A, B & C
 South Puget Sound

Progress Sketch



Days lost by	March	April	May	June
Weather	0	0	0	
Mechanical	0	0	0	
Electronic	1	0	0	3

Type	March	April	May	June
LN.M. Hydro	30.0	94.4	219.9	36.5
LN.M. SSS	0.0	35.3	20.6	35.5
SQ. NM	1.0	3.1	6.4	2.1
D.P.	0.0	0.0	60.0	3.0
Dives	2.0	2.0	0.0	0.0
B.S.	0.0	0.0	19.0	0.0
AWOIS	0.0	0.0	0.0	0.0
Control Stations	4.0	0.0	0.0	0.0
SV Casts	1.0	2.0	2.0	2.0
Tide Gauge	1.0	1.0	0.0	0.0

Registry #	Started	Est Completion	Completed	Submitted
H-10667	03/27/96	6/6/96	6/6/96	7/19/96
Sheet B				
H-10684	04/14/96	7/15/96		

Descriptive Report to Accompany Hydrographic Survey H-10667

Field Number PHP 10-2-96
Scale 1:10,000
1996

Pacific Hydrographic Party
Chief: LT Richard A Fletcher

A. PROJECT ✓

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-N210-PHP, Southern Puget Sound, Washington, issued November 1, 1995.

The project was authorized in response to requests from the Puget Sound Pilots and the Thirteenth Coast Guard District. The objective is to update the charted hydrography which dates from 1935 and 1986 surveys.

The project area includes Shilshole Bay through which the Lake Washington Ship Canal in Seattle is entered (H-10665). The southern portion of the project includes restricted and critical traffic routes to the port of Olympia, the Washington State Capitol, which lies to the south of the project area.

This is the second survey for the project and the first of the southern portion. It covers Pitt Passage and Balch Passage and includes most of Wyckoff Shoal. The sheet letter is "A" as specified by the project instructions; registry number is H-10667; designation: Wyckoff Shoal to Balch Passage, Southern Puget Sound, Washington.

B. AREA SURVEYED *See Eval Report, Section B*

The area surveyed for H-10667 extends eastward from longitude 122°45'00"W, to longitude 122°40'10"W. North limit is latitude 47°14'30"N; south limit is latitude 47°10'40"N. The northeast survey limit is defined by a line extending from latitude 47°14'30"N, longitude 122°42'18"W southward to McNeil Island at latitude 47°13'52"N, longitude 122°42'15"W; the southeast limit extends from the south shore of McNeil Island at latitude 47°11'35"N, longitude 122°40'10"W southwestward to the north shore of Anderson Island at latitude 47°10'40"N, longitude 122°40'45"W. The inshore sounding limit is the 5-meter* depth curve. The plotter sheet skew is 0° with overall sheet limits measuring 76 cm by 80 cm.

* The present survey acquired depths inshore of the one fathom depth curve. The zero curve was partially sounded throughout the survey area.
Data acquisition was conducted from March 27, 1996, (DN 087) through June 6, 1996 (DN 158).

C. SURVEY VESSELS ✓

NOAA Launch 1101 (EDP No. 0651), a 29-foot Jensen was used for side scan sonar operations, detached positions, bottom samples and mainscheme and development hydrography. NOAA Launch 1102 (EDP No. 0652), a 21-foot SeaArk, was used for side scan sonar operations, detached positions, and for mainscheme and development hydrography. 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. HYPNOAA and HSDUTILS, programs written by Hydrographic Surveys Division, Systems Support Branch, N/CS3, were used to convert HYPACK data to HDAPS format; and the standard NOS HDAPS software suite was used for post-processing. Program names and versions are listed in Appendix VI.*

The following non-HDAPS computer programs were used in field work for data supporting this survey:

<u>Program Name</u>	<u>Version</u>	<u>Date</u>	<u>Usage</u>
HYPACK	5.90	1996	Data Acquisition
VELOCITY	2.11	1994	Sound Velocity Corrections
NADCON	1.01	1989	NAD83 to NAD27
INVERS3D	1.00	1991	Horizontal Control
MONITOR	2.00	1994	DGPS beacon check
GEOID93	2.00	1993	GPS ellipsoidal elevation
CAT	2.00	1994	Velocity casts

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 following sonar equipment was used throughout the survey:

<u>Type</u>	<u>S/N</u>
272-T Towfish	015598
260 Recorder	015602 (DN 087-158)

* Filed with the hydrographic data.

The towfish was operated on the 100 kHz frequency and was configured with a 20° beam depression. On both vessels 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 50 meters, the maximum deployable. Markings were 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, 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, and 150 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 sonagram trace is adequate for identification of any significant contacts. Two hundred percent side scan coverage was acquired from the 5-meter curve to the 20-meter curve in accordance with Section 7.2 of the project instructions. (Concur) (2.1 FMS) (10.8 FMS)

Side scan track lines were oriented along the contours with 75-meter line spacing. Even-numbered lines represent 100% coverage; odd-numbered lines represent 200% coverage. Position numbers used: 10,000-12361.

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 sonagram assure acceptable SSS recorder tuning and served as confidence checks during operations.

Following guidelines in Section 7.3.2 of Project Instructions, sonagrams were manually scanned for significant contacts; these were labeled and entered into two HDAPS contact tables. Where contacts appeared in a cluster on the sonagram, 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 HDAPS Side Scan Utility Program and all recorded contacts were plotted.

The HDAPS "group" function was used to identify duplicate contacts within a 15-meter radius. The "sift" function was then employed to identify contacts requiring further investigation; i.e., significance determined by comparison with surrounding sounding data. The program logic is based on the guidelines for developing groups of contacts as specified in Section 7.2.2 of the Project Instructions. User input parameters include navigational hazardous depth threshold and radius for sounding comparisons.

The hydrographer sifted the contacts using a threshold depth of 20 meters and a chartable radius for single-digit depths of 2.6mm at chart scale. The single-digit depth radius was selected because the chart is published in fathoms and depths up to 18 meters convert to

single digits in fathoms. Chart 18445 is the largest-scale chart of the area and is published at 1:20,000; thus, a radius of 52 meters was selected for sifting.

The sonargram was reviewed together with the sifting printout. Contacts were selected for development based on the following factors: calculated significance, computed height, offset from towfish, and sonargram review; the review process included comparison of duplicate contacts. Twenty-seven contacts were developed.

Contact tables and final sifting printouts are included in Separate V. *

F. SOUNDING EQUIPMENT ✓

Innerspace Model 448 (INN-448) single frequency echosounder, Serial Number 239, modified with custom EPROMS, was used on Vessel No. 0652 from DN 124 to DN 135.

Raytheon, dual-frequency, Digital Sounding Fathometer (DSF) 6000N, Serial Number A221N, was used on Vessel No. 0651 from DN 087 to DN 158. 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 was analyzed during office processing and found to contain no significant problems.*

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 -2.4 meters (Pos. No. 6084, DN 129) to 62.5 meters (Pos. No. 1146, DN 093) at MLLW based on raw tide data from the Yoman Point gauge. *Depths plotted on the smooth sheet range from -0.8 to 33 fathoms based on approved tides.*

Metric leadlines were used for depth comparisons with the echosounder. PHP fabricated the leadlines following Hydrographic Survey Guideline (HSG) 69. Each lead line is 1/4-inch steering tiller rope. Shrink tubing, secured with epoxy, 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. Lead line calibration forms are included in Separate IV (Sounding Equipment Calibration and Corrections). *

A sounding pole was used for measuring the depth of submerged obstructions. The pole is 3.3 meters long and was made by PHP using commercial surveyor's level-rod tape. The self-stick, pre-printed tape is calibrated in centimeter intervals. It is laminated with clear epoxy to two-inch diameter wooden rods finished with white marine epoxy paint.

** Filed with the hydrographic data.*

G. CORRECTIONS TO SOUNDINGS ✓

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. SBE Model 19-03. 335M, S/N 1912344-1892 was used for all casts. The recorder was initialized using program CAT v.2.0 and the VELOCITY program was used to determine the speed of sound correctors. Data from the following casts were used to determine the velocity correctors:

HDAPS Table	DN	DN Range	Extrapolated Depth	Cast Position	
				Latitude	Longitude
1	085	085-098	74.2m	47°10'43"N	122°44'06"W
2	099	099-119	78.8m	47°11'06"N	122°43'54"W
3	120	120-128	72.8m	47°11'20"N	122°43'50"W
4	129	129-144	22.7m	47°11'00"N	122°43'24"W
5	145	145-158	68.8m	47°11'38"N	122°43'35"W

Separate IV^{*} contains copies of all velocity cast data and HDAPS Velocity Corrector Tables.

The SEACAT instrument was calibrated by Northwest Regional Calibration Center on November 20, 1995. A copy of the calibration report is included in Separate IV^{*}.

Lead line Comparisons ✓

Periodic leadline comparisons confirmed proper digitization of the echosounder depth.

Static Draft ✓

Static draft for VN 0652 was determined on May 15, 1996, (DN 136). 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 crewmen 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.

A static draft of 0.5 meters was determined for VN 0651 on June 7, 1996, (DN 159) using a method similar to above.

Dynamic Draft ✓

Settlement and squat measurements for VN 0651 were conducted on March 20, 1995, (DN 080) in Port Angeles Harbor. Data from these measurements are included in Offset Table 1.^{*}

On June 7, 1996, (DN 159) following haulout for maintenance of VN 0651, settlement and squat were remeasured at the office location in Budd Inlet. Offset Table 3* includes data from these measurements and was applied to data collected after haulout; i.e., from DN 145 to DN 158.

Vessel 0652 was configured for side scan sonar operations on January 8, 1996, (DN 008) and settlement and squat corrections were calculated based on measurements conducted on DN January 12, 1996, (DN 012) at Navy Pier "D" in Port Gardner, WA. Field records are included in Separate IV. *

Offset Table 1* corresponds to VN 0651; Offset Table 2* corresponds to VN 0652. Offset Table 3* corresponds to VN 0651 following haulout. Settlement and squat correctors are reapplied during field processing using the REAPPLY program in HDAPS.

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 sounding(s) was deselected or rejected; in those cases where the resulting sounding interval was greater than 5 mm at the scale of the survey, the line was resurveyed. *Data was analyzed during office processing and found to contain no significant problems.*

Tide Correctors ✓

In compliance with Section 5.9 of Project Instructions, a tide station was established at the historical site at Yoman Point, Anderson Island (944-6705), and a real time portable acoustic gauge was installed. Unprocessed data from this gauge (raw water levels above mean lower low water) were acquired, adjusted with the appropriate time and height corrections and applied to soundings during field processing. *Tide Note dated Sept. 19, 1996 is attached to this report.*

Three tide zones were established on Sheet A as specified by project instructions:

Tide Zone	Polygon Longitude, Latitude	Time Corrector	Height Corrector
18	-122.690629W, 47.281425N -122.755402W, 47.298794N -122.778536W, 47.261877N -122.739209W, 47.214749N -122.718389W, 47.203752N -122.699883W, 47.217907N -122.690629W, 47.281425N	+42 mins	x1.18

** Filed with the hydrographic data.*

Tide Zone	Polygon Longitude, Latitude	Time Corrector	Height Corrector
28	-122.767176W, 47.196850N -122.754974W, 47.178746N -122.713932W, 47.159132N -122.679063W, 47.177046N -122.767176W, 47.196850N	+42 mins	x1.21
29	-122.739209W, 47.214749N -122.755402W, 47.232029N -122.767176W, 47.196850N -122.679063W, 47.177046N -122.642049W, 47.201396N -122.699883W, 47.217907N -122.718389W, 47.203752N -122.739209W, 47.214749N	+42	x1.19

H. CONTROL STATIONS ✓ See Eval Rpt., Section H.

Horizontal Datum

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). A separate Horizontal Control Report OPR-N210-PHP, Southern Puget Sound, Washington, was submitted to PHB in March 1996.

Two DGPS performance check stations were established to Third Order, Class 1, standards: (1) a piling at Zittel's Marina and (2) a piling at Boston Harbor Marina.

I. HYDROGRAPHIC POSITION CONTROL ✓ See Eval Rpt., Section I

Position Control ✓

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The U. S. Coast Guard beacon on Point Robinson, Vashon Island, WA, frequency 323 kHz, was used during all hydrographic operations: See MONITOR Results for this use beacon which includes positional information (attached).

Per FPM, Section 3.4.6.3, the reference site was confirmed using the program MONITOR. A copy of the scatter plot and the outlier.sum files are included in Separate III (Horizontal Position Control and Corrections to Position Data) and attached to this report.

* Filed with the hydrographic data.

DGPS Performance Checks ✓

DGPS performance checks were obtained per FPM, Section 3.4.4.1, using the sites established at Zittel's Marina and at Boston Harbor. All DGPS performance checks were successful; check forms are located in Separate III. *Filed with the hydrographic data.*

Positioning Equipment ✓

The following GPS equipment was used:

Equipment Location	Type of Receiver/Antenna	Receiver Serial No.	Antenna Serial No.
VN 0651	Ashtech (v.1E08D) CSI Beacon Rcvr MBX1	700417B1042 X-1112	700378A0272
VN 0652	Ashtech (v.1E08D) CSI Beacon Rcvr MBX1	700417B1043 X-1212	700378B0402

The unique serial numbers for all equipment are annotated on the daily master printout. *Daily master printouts are filed with the hydrographic data.*

J. SHORELINE ✓ *See Eval Report Section J.*

Digital shoreline derived from photogrammetric source data was not a component of this project. NOS Charts 18445, 18557, 18448 and 18456 were assigned as shoreline source for the project. To facilitate verification in the field for this survey, PHP created a digital shoreline document based on a BSB electronic Chart 18445, 25th Edition, produced by Blue Marble Geographics. The chart was 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 readily apparent. (The 26th edition of Chart 18445 was available in electronic version for comparison during final processing.)

A number of the charted shoreline features are AWOIS items and their disposition will be discussed in Section N, Item Investigations. ^(concur) All the rest were confirmed with the exception of the signal tower on Pitt Island which should be removed from the chart, and four charted rocks for which disapproval DP's were recorded. Several uncharted features were located and are plotted on the DP plot. *In addition, several charted features were not investigated and should be retained. ***

** Copies attached to this report.*

*** See Eval Report Section O ***

K. CROSSLINES ✓

Side scan sonar coverage was run perpendicular to mainscheme coverage and, together with buffer lines, represents 60.07 nautical miles of crosslines or 38% of the mainscheme hydrography on H-10667. Agreement is excellent.

L. JUNCTIONS ✓ *See Eval Report Section L.*

H-10667 joins Sheet B at the south end. Data collection on Sheet B has not begun; comparison of the junction will be made following completion of that survey. Sheet B has been assigned registry number H-10714.

M. COMPARISON WITH PRIOR SURVEYS ✓ *See Eval Report Section M.*

A cursory comparison of soundings with prior surveys H-6103 and H-6103 (1935) indicate only minor changes in contours. A more rigorous comparison will be performed by Pacific Hydrographic Branch following the application of smooth tides.

N. ITEM INVESTIGATION REPORTS ✓

Item Investigation Reports for the following AWOIS items are included in *this report,* ~~Separate VI-~~

N1	AWOIS Item 52250
N2	AWOIS Item 52251
N3	AWOIS Item 52252
N4	AWOIS Item 52253
N5	AWOIS Item 52254
N6	AWOIS Item 52255
N7	AWOIS Item 52256
N8	AWOIS Item 52257
N9	AWOIS Item 52258

O. COMPARISON WITH THE CHART ✓ *See Eval Report Section O.*

This survey was compared to a 1:10,000-scale enlargement of Chart No. 18445, 1:20,000, 25th Edition, January 2, 1993, and to a 1:10,000 enlargement of Chart No. 18448, 1:80,000, 27th Edition, October 30, 1993. It was also compared to a digital version of the 26th Edition of Chart No. 18445 issued in June 1995. The Pacific Hydrographic Branch will perform a follow-up comparison after smooth tides have been applied.

Dangers to Navigation

Two dangers to navigation were encountered within the limits of this survey. Pitt Passage North Shoal Daybeacon 4 was positioned 160 meters from its charted position. It is charted at latitude $47^{\circ}13'33.954''N$, longitude $122^{\circ}42'47.706''W$ on Chart 18445. (The 25th edition included a "PA" annotation, but the 26th edition does not; nor does Chart 18448. The aid was surveyed at latitude $47^{\circ}13'28.738''N$, longitude $122^{\circ}42'48.659''W$ (Pos. No. 25002, DN 128). The check position (Pos. No. 25053, DN130), was 3.3 meters from this position. *Per phone conversation with Mr. Herb Metzger, 15th Coast Guard District (206) 220-7270, Pitt Passage North Shoal Daybeacon 4 is scheduled to be moved to recommended location as stated in danger to navigation letter dated July 10, 1996.* The Pitt Passage Rocks Daybeacon, Light List Number 17298, was originally charted as a marker on a pile at latitude $47^{\circ}13'22.805''N$, longitude $122^{\circ}43'00.708''W$. No aid was found at this location (disproval Pos. No. 25033, DN 129). A special purpose white buoy with a red stripe at top and bottom and marked "DANGER SHOAL" was located at latitude $47^{\circ}13'05.636''N$, longitude $122^{\circ}42'58.204''W$ (Pos. No. 25003, DN 128). The 26th edition of Chart 18445 depicts a marker on a pile at this location which is 140 meters SE of the shoal the aid is intended to mark. The Coast Guard, when asked about the purpose of this buoy, reported that the original marker had been knocked down and the buoy was intended to be a temporary replacement. The hydrographer recommended that the buoy be repositioned at latitude $47^{\circ}13'09.6''N$, longitude $122^{\circ}43'01.3''W$, the south limit of the rocky shoal; the Coast Guard has scheduled this relocation for late July and will submit the appropriate notification of final positioning at that time. *Per phone conversation with Mr. Herb Metzger, 15th Coast Guard District (206) 220-7270, the buoy has been moved as recommended by the hydrographer.*

Comparison of Soundings

The soundings and contours are, in general, in excellent agreement with the chart. There are a few minor changes in contours. South of Pitt Island, neither the islet charted at latitude $47^{\circ}13'15''N$, longitude $122^{\circ}42'58''W$ nor the rock charted at latitude $47^{\circ}13'09''N$, longitude $122^{\circ}43'02''W$, was observed exposed at tide levels at or above mean lower low water. In a photograph taken on DN 156 at -2.6 feet tide level, (photo #18) several small shoals are visible just above the waterline. A least depth of 0.4 ^{fathom} meters was acquired in the vicinity of the charted islet at latitude $47^{\circ}13'14.097''N$, longitude $122^{\circ}42'58.540''W$ (Pos. No. 6180+1, DN 158); and on DN 142 a least depth of 0.8 ^{fathom} meters was acquired near the position of the charted rock at latitude $47^{\circ}13'09.643''N$, longitude $122^{\circ}43'01.293''W$.

* The feature shown on Chart 18445 is not an islet but rather an area that uncovers at MLLW. This feature was essentially verified as discussed above. The charted rock is likely the remaining foundation of an old pre-existing transmission tower and should be retained as charted. Some erosion of Wyckoff Shoal has occurred as evidenced by the shrinking of its one and three-fathom contours. Several of the charted rocks were located with depths just above MLLW (photo #19); however, because the shoal is very shallow and strewn with small boulders, none of which is greater than one meter in height, it was difficult to identify each particular charted rock. The hydrographer recommends retaining the rocks as charted. *concur* Several rocks originating from prior survey H-6103 (1935) have been transferred to the present survey. These rocks are the source for the charted information. The McNeil Island shore along Pitt Passage also shows signs of erosion as the contours have shifted slightly to the east. The contours of the Pitt Passage Shoal have also skewed a bit eastward and slight accretion has occurred on the west shore of the passage.

The two lobes of the Balch Passage Shoal have undergone mild erosion, particularly on their west slopes. This erosion is most likely attributable to the swirling currents and tide rips encountered in this passage. *Concur*

Comparison of non-Sounding Features

The chart depicts kelp in a number of places within the survey area. None was observed that would impede safe navigation; a few samples were recovered during bottom sampling on Wyckoff Shoal but not in sufficient quantities to warrant charting. The hydrographer recommends removing all kelp symbols from the chart. *concur*

The narrow, converging channels and the sharp relief of the topography in combination result in swirling currents and tide rips as charted. *concur Retain notes as charted.*

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. Two hundred percent side scan sonar coverage from the 5-meter curve to the 20-meter curve, ~~ensure that no unknown hazards exist within this area.~~ *do not concur Several prior survey reefs have been brought forward to the present survey along the shoreline and in the area of Wyckoff Shoal. With the addition of these features, 14-10667 is adequate to supersede the prior surveys within the common areas.*

Q. AIDS TO NAVIGATION ✓

Two fixed aids and five floating aids to navigation were verified in accordance with Section 4.2.3 of the project instructions:

Navigational Aid	LLN	Latitude	Longitude	Pos. No.
Wyckoff Shoal Green Buoy #1	17295	47°14'29.758"N	122°42'53.067"W	25000
Wyckoff Shoal Green Buoy #3	17296	47°14'19.009"N	122°42'57.099"W	25001
Pitt Passage North Shoal Red Daybeacon #4	17297	47°13'28.738"N	122°42'48.659"W	25002
Pitt Passage White Buoy	17298	47°13'05.636"N	122°42'58.204"W	25003
Pitt Passage Red Buoy #6	17299	47°13'05.494"N	122°43'04.378"W	25004
Eagle Island Reef Lighted Buoy #9	17275	47°11'25.994"N	122°42'00.461"W	25012
Eagle Island Red Sector Light	17270	47°11'19.599"N	122°41'43.731"W	25016

The charted position of the Pitt Passage North Shoal Daybeacon #4 is in error and the Pitt Passage White Buoy is charted as a daybeacon (see Section O, Danger to Navigation).

R. STATISTICS ✓

Description	Quantities
Total Positions	11323
Total Detached Positions	42
Total Nautical Miles Hydrography	245
Nautical Miles Side Scan Hydrography	60
Square Nautical Miles Hydrography	4
Velocity Casts	5
Days of Production	23
Bottom Samples	34
Tide Stations	1

S. MISCELLANEOUS ✓

Mainscheme data was assigned position numbers 1 to 9,999; Side Scan data 10,000 to 19,999; development data 20,000 to 24,999 and detached positions 25000 and up.

Bottom samples were acquired and forwarded to the Smithsonian Institute in accordance with Section 6.7 of project instructions. Positions and descriptions of the samples are plotted on the detached position plot. A copy of Oceanographic Log Sheet-M, Bottom Sediment Data (NOAA Form 75-44) is included in Separate II. *

T. RECOMMENDATIONS ✓

Shoreline verification instructions are often a source of confusion in the field. Section 4.1.2.1 instructs, "Establish, verify, or disprove the location of all features within the *project* limits...." Section 1.8 instructs, "Locate, verify or disprove, where required, all features *seaward of the 5.0-meter depth curve.*" So, the question arises as to how much effort should be devoted to shoreline verification for a navigable area survey. Should features shoreward of the 5-meter curve be verified? With the acquisition of HYPACK software which is capable of displaying digital shoreline in the field, systematic verification of all shoreline features is a much simpler operation, regardless of whether the shoreline source is photogrammetry or a digitized chart. And, in practice, it is much less confusing for the hydrographer as it may also be for the cartographers as well. What about the shoreline itself? When the hydrographic limit is the 5-meter curve, changes in the 0-meter curve are not always apparent. On the West Coast, particularly, shorelines are usually quite steep and very little extra effort is required to extend hydrography to the 0-meter curve. The evaluator recommends that the Hydrographic Surveys Division review this recommendation for future project planning.
* Filed with the hydrographic data.

U. REFERRAL TO REPORTS ✓

Title

Date

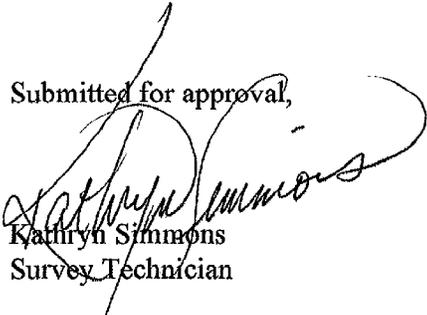
Horizontal Control Report
OPR-N210-PHP

March 1996

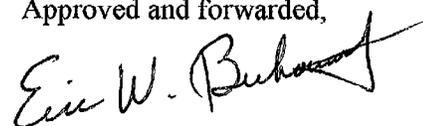
Coast Pilot Report

To follow

Submitted for approval,


Kathryn Simmons
Survey Technician

Approved and forwarded,


for Richard A. Fletcher
Lieutenant, NOAA
Chief of Party



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Coast and Geodetic Survey
Seattle, Washington 98115-0070

Pacific Hydrographic Party
900 47th Avenue
Olympia, WA 98506
Phone: (360) 956-7079
Fax: (360) 956-7183

**ADVANCE
INFORMATION**

July 10, 1996

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 Southern Puget Sound. A Danger to Navigation Report is enclosed along with a chartlet as well as a sounding plot in fathoms showing the affected portions of Chart 18445SC.

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

Sincerely,

for Richard A Fletcher
Lieutenant, NOAA

Enclosures

cc: DMAHTC
N/CG221
N/CG245



DANGER TO NAVIGATION REPORT

SURVEY REGISTRY NUMBER: H-10667
STATE: Washington
GENERAL LOCALITY: Southern Puget Sound
SUBLOCALITY: Wyckoff Shoal to Balch Passage
PROJECT NUMBER: OPR-N210-PHP

OBJECTS DISCOVERED:

- The Pitt Passage North Shoal Daybeacon 4, Light List Number 17297, has been positioned 169 meters SSW of the charted position. Correct the charted position of this navigational aid to: latitude 47°13'28.738"N, longitude 122°42'48.659"W:

Charted Position: Latitude 47°13'34.176"N
Longitude 122°42'47.52"W

Surveyed Position: Latitude 47°13'28.738"N ✓
Longitude 122°42'48.659"W

The 25th Edition of Chart 18445 indicates the position of this navaid is approximate; the 26th Edition does not, nor does Chart 18448. *(In the event this daybeacon is relocated in the future, PHP recommends that it be placed at latitude 47°13'30.933"N, longitude 122°42'47.791"W, the northern extent of the one-fathom curve.)* Concur

- The Pitt Passage Rocks Daybeacon, Light List Number 17298, is charted as a marker on a pile. This navigational aid is a white buoy with a red stripe at top and bottom and marked "DANGER SHOAL." The surveyed position is consistent with the 26th Edition of Chart 18445; however, Chart 18448 should be corrected to depict this navigational aid at: latitude 47°13'05.636"N, longitude 122°42'58.204"W. *(This position is 140 meters SE of the shoal the aid is marking. PHP recommends relocating the buoy to latitude 47°13'09.643"N, longitude 122°43'01.293"W, which is the south limit of the rocky shoal.)* Concur

Charts Affected: 18445, 18448

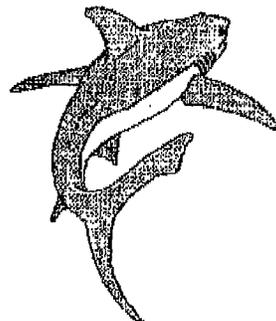
RESPONSIBLE PERSONNEL		ORIGINATOR
TYPE OF ACTION	NAME	
OBJECTS INSPECTED FROM SEAWARD	<i>Kathryn Simmons, Survey Technician LT Richard A Fletcher, Chief of Party</i>	<input type="checkbox"/> PHOTO FIELD PARTY <input checked="" type="checkbox"/> HYDROGRAPHIC PARTY <input type="checkbox"/> GEODETIC PARTY <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		<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 ACTIVITY REPRESENTATIVE OFFICE ACTIVITY REPRESENTATIVE <input type="checkbox"/> REVIEWER <input type="checkbox"/> QUALITY CONTROL AND REVIEW GROUP REPRESENTATIVE
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 **PHOTOGRAMMETRIC FIELD POSITIONS are dependent entirely, or in part, upon control established by photogrammetric methods.	

ORIGINAL

TO: *Jim Stringham*

10667

Fax Cover Sheet Date: / / 1996
Phone (360) 956-7079 Fax (360) 956-7138
PACIFIC HYDROGRAPHIC PARTY, NOAA
900 47TH AVE. N.E.
OLYMPIA, WA. 98506



NUMBER OF PAGES(INCLUDING COVER SHEET):

REMARKS:

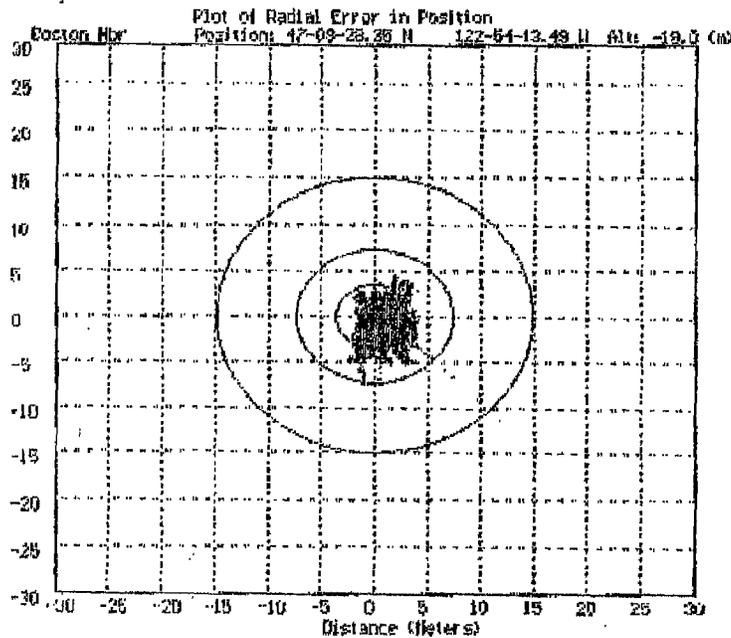
*Attached is position for
USCG Beacon @ Robinson Point*

*— the only station
used in this survey*

STATION
001

MONITOR Results
for
USCG Beacon Point Robinson, WA
323 kHz, 100bps
March 26, 1996

Using program MONITOR 3.0, PHP conducted a beacon integrity test. Vessel 1102 was moored within 5 meters from a 3rd order station. A forward computation to the vessel GPS antenna was made to acquire a position for use in program MONITOR. The position of the Coast Guard beacon is: 47°23'15.004" N, 122°22'29.101"W. The results are shown below and on the following pages.
1994



03/25/1996
21:12:45

Error Statistics:

Total Records:	86852
Samples used:	86852
Bad Records:	0
Num. Outliers:	0
GPS availability:	100.000
Mean Radial Error:	1.501
Radial Std Dev:	0.869
Mean East Error:	0.767
East Std Dev:	0.981
Mean North Error:	-0.640
North Std Dev:	1.284
Average HDOP:	1.240
Min SVs/Max SVs:	6 / 8
Min hdop/Max hdop:	0.9 / 2.9

SBX Message Data:

UTC Time:	212017.00
Latitude:	4708.47150 N
Longitude:	12254.22430 W
HDOP:	1.00
Num of SVs:	7
DGPS Flag:	2
Age Corr:	1

Errors: 1.9

Error/HDOP: 1.9

ITEM INVESTIGATION REPORT

ITEM NO.: N1

AWOIS Item: #52250 ✓

SURVEY: H-10667

CHART NO: 18445

EDITION: 26th Edition

CHART DATE: June 3, 1995

DESCRIPTION: USACE permit 071-OYB-1-007439 to Washington State Department of Natural Resources (1984) established an area of aquaculture nets and buoys for the growing of red seaweed and for the assessment of its economic potential. Subsequent letter from DNR dated 10/17/95 indicates structures have been completely removed. Item is considered completed.

SOURCE OF ITEM: CL228/84--USACE, T-6262 (1934)

SOURCE POSITION: latitude 47°14'23.00"N
longitude 122°42'26.00"W
(Scaled center of charted position)

SURVEY REQUIREMENTS: Information

METHOD OF INVESTIGATION: Visual, echosounder during regular data collection.

RESULTS OF INVESTIGATION: Confirmation that all nets and buoys have been removed.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

Delete the nets and floats charted at latitude 47°14'23.00"N, longitude 122°42'26.00"W. *concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N2
AWOIS Item: #52251 ✓
SURVEY: H-10667

CHART NO: 18445
EDITION: 26th Edition
CHART DATE: June 3, 1995

DESCRIPTION: USACE permit 071-OYB-1-005543 to Washington State Department of Natural Resources (1984) established an area of aquaculture nets and buoys for the growing of red seaweed and for the assessment of its economic potential. Subsequent letter from DNR dated 10/19/95 indicates structures have been completely removed. Item is considered completed.

SOURCE OF ITEM: CL239/82--USACE

SOURCE POSITION: latitude 47°14'18.00"N
longitude 122°42'33.00"W
(Scaled center of charted item)

SURVEY REQUIREMENTS: Information

METHOD OF INVESTIGATION: Visual, echosounder, side scan sonar during the course of regular data collection.

RESULTS OF INVESTIGATION: Confirmation that all nets and buoys have been removed.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

Delete the submerged structures charted at latitude 47°14'18.00"N, longitude 122°42'33.00"W *concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N3

AWOIS Item: #52252 ✓

SURVEY: H-10667

CHART NO: 18445

EDITION: 26th Edition

CHART DATE: June 3, 1995

DESCRIPTION: USACE permit 071-OYB-1-004466 to Washington State Department of Natural Resources (1984) established an area of aquaculture nets and buoys for the growing of red seaweed and for the assessment of its economic potential. Subsequent letter from DNR dated 10/17/95 indicates structures have been completely removed. Item is considered completed.

SOURCE OF ITEM: CL300/80--USACE

SOURCE POSITION: latitude 47°14'13.50"N
longitude 122°42'30.00"W
(Scaled center of charted item.)

SURVEY REQUIREMENTS: Information

METHOD OF INVESTIGATION: Visual, echosounder, side scan sonar during the course of regular data collection.

RESULTS OF INVESTIGATION: Confirmation that all nets and buoys have been removed.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

Delete the obstruction PA charted at latitude 47°14'13.50"N, longitude 122°42'30.00"W. *Concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N4
AWOIS Item: #52253✓
SURVEY: H-10667

CHART NO: 18445
EDITION: 26th Edition
CHART DATE: June 3, 1995

DESCRIPTION: pile, no height noted

SOURCE OF ITEM: H6106/35--USC&GS Ship EXPLORER

SOURCE POSITION: latitude 47°12'34.50"N
longitude 122°43'17.50"W

SURVEY REQUIREMENTS: If visible at lower low water, verify position and describe.

METHOD OF INVESTIGATION: Visual.

RESULTS OF INVESTIGATION: A detached position was recorded in -0.5 meters/-0.3 fathoms MLLW corrected depth, approximately 6 meters seaward of a pile ruin on shore and 27 meters seaward of the AWOIS target (Pos. No. 25036, DN 129). This disproval DP was recorded at latitude 47°12'35.360"N, longitude 122°43'17.731"W. A second 8-inch pile stub was observed shoreward of Position No. 25035 at latitude 47°12'34.183"N, longitude 122°43'21.519"W. Neither pile ruin represents a hazard to navigation.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:
Delete the pile charted at latitude 47°12'34.50"N, longitude 122°43'17.50"W. *concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N5

AWOIS Item: #52254 ✓

SURVEY: H-10667

CHART NO: 18445

EDITION: 26th Edition

CHART DATE: June 3, 1995

DESCRIPTION: Piles extending approximately 45 feet into channel; appears to be part of an incomplete dock structure: 8 pilings in 4 pairs.

SOURCE OF ITEM: CL1586/81--USCG Auxiliary, Max H. Bice

SOURCE POSITION: latitude 47°12'28.34"N
longitude 122°44'18.47"W

SURVEY REQUIREMENTS: If visible at lower low water, verify position and describe.

METHOD OF INVESTIGATION: Visual

RESULTS OF INVESTIGATION: Pier ruins are visible and consist of five pairs of pilings with a platform on top (see photo #12 taken on DN 130 at 19:53:21 GMT at a tide level of 7.7 feet). A detached position (Pos. No. 25032, DN 129) was recorded at the center of the offshore end of the structure at latitude 47°12'29.857"N, longitude 122°44'16.747"W. The chart shows this area with a pile and platform symbology and notation Piles. The present survey found a linear pier ruin feature approximately 100 meters northeast of the charted item.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:
~~Retain~~ the charted ~~pile~~ ^{Delete} ruins; ^{Piles} chart the ^{Pier ruins} offshore end at the surveyed position: latitude 47°12'29.857"N, longitude 122°44'16.747"W.

ITEM INVESTIGATION REPORT

ITEM NO.: N6

AWOIS Item: #52255 ✓

SURVEY: H-10667

CHART NO: 18445

EDITION: 26th Edition

CHART DATE: June 3, 1995

DESCRIPTION: Five piles in a group; no height noted. 1981 report claimed piles no longer exist; chart revised to submerged piles. AWOIS position is offshore more pile.

SOURCE OF ITEM: H6106/35--USCG Ship EXPLORER; CL1586/81--USCG Auxiliary, Max H. Bice.

SOURCE POSITION: latitude 47°11'49.50"N
longitude 122°41'56.00"W

SURVEY REQUIREMENTS: If visible at lower low water, verify position and describe.

METHOD OF INVESTIGATION: Visual

RESULTS OF INVESTIGATION: With the survey launch in one meter of water and positioned at the AWOIS target, no piles or pile ruins were visible either on shore or in the water (Pos. No. 25038, DN 129).

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:

Delete the submerged piles charted at latitude 47°11'49.50"N, longitude 122°41'56.00"W. *concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N7

AWOIS Item: #52256 ✓

SURVEY: H-10667

CHART NO: 18445

EDITION: 26th Edition

CHART DATE: June 3, 1995

DESCRIPTION: Obstruction. Two log storage/boom areas established in 1950. Drawing of area shows piles spaced 140 feet apart along the low water line to which chained buoys 760 feet offshore were attached. Drawing does not show any offshore piles. Chart letter issued in 1980 reports log booms no longer exist and have not existed for at least 8 years. Chart changed to submerged piling. AWOIS position is on northeastern corner.

SOURCE OF ITEM: CL735/50--USC&GS Northwestern District Headquarters;
CL1503/80--1980 NANJI & USPS, Dwight M.

SOURCE POSITION: latitude 47°11'40.00"N
longitude 122°44'20.00"W

SURVEY REQUIREMENTS: Full investigation. Conduct search so that the coverage extends 150 meters on each side and parallel to the charted rows of submerged pilings. Visually inspect the low water line at low water for remaining piles; if visible, position and describe. NOTE: All of this item is charted on Charts 18445 and 18448. However, there is a discrepancy between the two charts in regard to the shoreline and the placement of this item and AWOIS item 52257. The item as shown on Chart 18445 is believed to be the correct representation.

METHOD OF INVESTIGATION: Visual, 200% side scan sonar coverage [Pos. Nos. 10065-10095 (DN 099); 10980-10990, 11020-11030 (DN 120)] and echosounder..

RESULTS OF INVESTIGATION: No evidence of submerged pilings was detected on the sonagram nor on the echogram covering this area. A number of negative tides occurred during the course of the survey and no piles or pile ruins were visible at any time either on shore or in shallow water.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:
Delete the submerged pilings, ^{and limit lines} whose northeast corner is charted at latitude 47°11'40.00"N, longitude 122°44'20.00"W. ^{concur}

ITEM INVESTIGATION REPORT

ITEM NO.: N8

AWOIS Item: #52257 ✓

SURVEY: H-10667

CHART NO: 18445

EDITION: 26th Edition

CHART DATE: June 3, 1995

DESCRIPTION: Obstruction. Two log storage/boom areas established in 1950. Drawing of area shows piles spaced 140 feet apart along the low water line to which chained buoys 760 feet offshore were attached. Drawing does not show any offshore piles. Chart letter issued in 1980 reports log booms no longer exist and have not existed for at least 8 years. Chart changed to submerged piling. AWOIS position is on northeastern corner of the south boom area.

SOURCE OF ITEM: CL735/50--USC&GS Northwestern District Headquarters;
CL1503/80--1980 NANCI & USPS, Dwight M.

SOURCE POSITION: latitude 47°11'16.50"N
longitude 122°44'50.00"W

SURVEY REQUIREMENTS: Full investigation. Conduct search so that the coverage extends 150 meters on each side and parallel to the charted rows of submerged pilings. Visually inspect the low water line at low water for remaining piles; if visible, position and describe. NOTE: All of this item is charted on Charts 18445 and 18448. However, there is a discrepancy between the two charts in regard to the shoreline and the placement of this item and AWOIS item 52257. The item as shown on Chart 18445 is believed to be the correct representation.

METHOD OF INVESTIGATION: Visual, 200% side scan sonar coverage [Pos. Nos. 10065-10095 (DN 099); 10980-10990, 11020-11030 (DN 120)] and echosounder..

RESULTS OF INVESTIGATION: No evidence of submerged pilings was detected on the sonagram or on the echogram covering this area. However, 1054 meters south of the AWOIS position, a row of three uncharted dolphins was located (photo # 16). The offshoremost was positioned at latitude 47°10'51.237"N, longitude 122°44'53.720"W (Pos. No. 25043, DN 129). The inshoremost dolphin is a one-foot high ruin on shore.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:
Delete the submerged pilings whose northeast corner is charted at latitude 47°11'16.50"N, longitude 122°44'20.00"W. Chart the row of dolphins with the offshoremost located at latitude 47°10'51.237"N, longitude 122°44'53.720"W. *concur*

ITEM INVESTIGATION REPORT

ITEM NO.: N9
AWOIS Item: #52258 ✓
SURVEY: H-10667

CHART NO: 18445
EDITION: 26th Edition
CHART DATE: June 3, 1995

DESCRIPTION: Dolphins. Two 5-pile dolphins approximately 13 feet apart and 20 feet high. Dolphins were originally encased in concrete to near the top but concrete remains to only the mid-high tide level. AWOIS position is scaled from the chart.

SOURCE OF ITEM: CL1184/86--USPS, Elton G.

SOURCE POSITION: latitude 47°13'15.00"N
longitude 122°43'14.50"W
(scaled from the chart)

latitude 47°13'15.00"N
longitude 122°43'10.00"W
(chart letter position)

SURVEY REQUIREMENTS: If visible at lower low water, verify position and describe.

METHOD OF INVESTIGATION: Visual

RESULTS OF INVESTIGATION: The two 20-foot dolphins were observed ten meters shoreward of detached position No. 25005 recorded at latitude 47°13'14.551"N, longitude 122°43'11.178"W (DN 129). The concrete which formerly encased the dolphins has fallen away; the concrete still fills the center space up to six feet from the bottom. See photo #1.

COMPARISON WITH PRIOR SURVEYS: NA

COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:
Chart ~~the two~~ dolphins at the surveyed position: latitude 47°13'14.551"N, longitude 122°43'11.178"W. Delete the "PA" designation. *concur*

APPROVAL SHEET

for

SURVEY H-10667

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 1996. 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,



LTjg Eric Berkowitz, NOAA
Assistant Chief
Pacific Hydrographic Party

GEOGRAPHIC NAMES

H-10667

Name on Survey	A ON CHART NO. 18445 + 18448		B ON PREVIOUS SURVEY		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	
ANDERSON ISLAND	X		X															1
BALCH PASSAGE	X		X															2
DRAYTON PASSAGE	X		X															3
EAGLE ISLAND	X		X															4
FILUCY BAY	X		X															5
FLOYD COVE	X		X															6
MAHNCKES POINT	X		X															7
MCDERMOTT POINT	X		X															8
MCNEIL ISLAND	X		X															9
OTSO POINT	X		X															10
PITT ISLAND	X		X															11
PITT PASSAGE	X		X															12
PUGET SOUND (title)	X		X															13
WASHINGTON (title)	X		X															14
WYCKOFF SHOAL	X																	15
Additional Geo-Names added from charts listed above.																		
KEY PENINSULA	X																	17
MERIDIAN	X																	18
																		19
																		20
																		21
																		22
																		23
																		24
																		25

Approved

Christie E. Long
Chief Geographer

AUG 14 1996



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Office of Ocean and Earth Sciences
Rockville, Maryland 20852

TIDE NOTE FOR HYDROGRAPHIC SURVEY

ORIGINAL

DATE: September 19, 1996

HYDROGRAPHIC BRANCH: Pacific

HYDROGRAPHIC PROJECT: OPR-N210-PHP

HYDROGRAPHIC SHEET: H-10667

LOCALITY: Southern Puget Sound, Wyckoff Shoal to Balch Passage,
Washington

TIME PERIOD: March 27 - June 6, 1996

TIDE STATION USED: 941-6705 Yoman Point, Anderson Island, Wa.
Lat. 47° 10.8'N Lon. 122° 40.5'W

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

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 3.821 meters

REMARKS: RECOMMENDED ZONING

Zone 17 - bounded by the polygon points:

LONGITUDE (W)	LATITUDE (N)
-122.607349	47.221828
-122.573806	47.206145
-122.573806	47.180267
-122.642049	47.201396
-122.699883	47.217907
-122.668653	47.272799
-122.629326	47.2579
-122.607349	47.221828

Times are direct, and apply a X0.99 range ratio to heights using
Yoman Point, WA (944-6705).



Zone 18 - bounded by the polygon points:

LONGITUDE (W)	LATITUDE (N)
-122.690629	47.281425
-122.755402	47.298794
-122.778536	47.261877
-122.739209	47.214749
-122.718389	47.203752
-122.699883	47.217907
-122.668653	47.272799
-122.690629	47.281425

Times and heights are direct using Yoman Point, WA (944-6705).

Zone 23 - bounded by the polygon points:

LONGITUDE (W)	LATITUDE (N)
-122.573806	47.180267
-122.671782	47.091993
-122.720588	47.141027
-122.678126	47.1778
-122.642049	47.201396
-122.573806	47.180267

Times and heights are direct using Yoman Point, WA (944-6705).

Zone 28 - bounded by the polygon points:

LONGITUDE (W)	LATITUDE (N)
-122.767176	47.19685
-122.754974	47.178746
-122.713932	47.159132
-122.679063	47.177046
-122.767176	47.19685

Times are direct, and apply a X1.02 range ratio to heights using Yoman Point, WA (944-6705).

Zone 29 - bounded by the polygon points:

LONGITUDE (W)	LATITUDE (N)
-122.739209	47.214749
-122.755402	47.232029
-122.767176	47.19685
-122.679063	47.177046
-122.642049	47.201396
-122.699883	47.217907
-122.718389	47.203752
-122.739209	47.214749

Times and heights are direct using Yoman Point, WA (944-6705).

Note: Times are tabulated in Greenwich Mean Time.



CHIEF, Tidal Analysis Branch

**Final Zoning for OPR N210-PHP
Southern Puget Sound, WA**

Zone 18
Time Correction is Direct
Range Correction is Direct
Reference 9446705

Zone 17
Time Correction is Direct
Range Corrector X 0.99
Reference 9446705

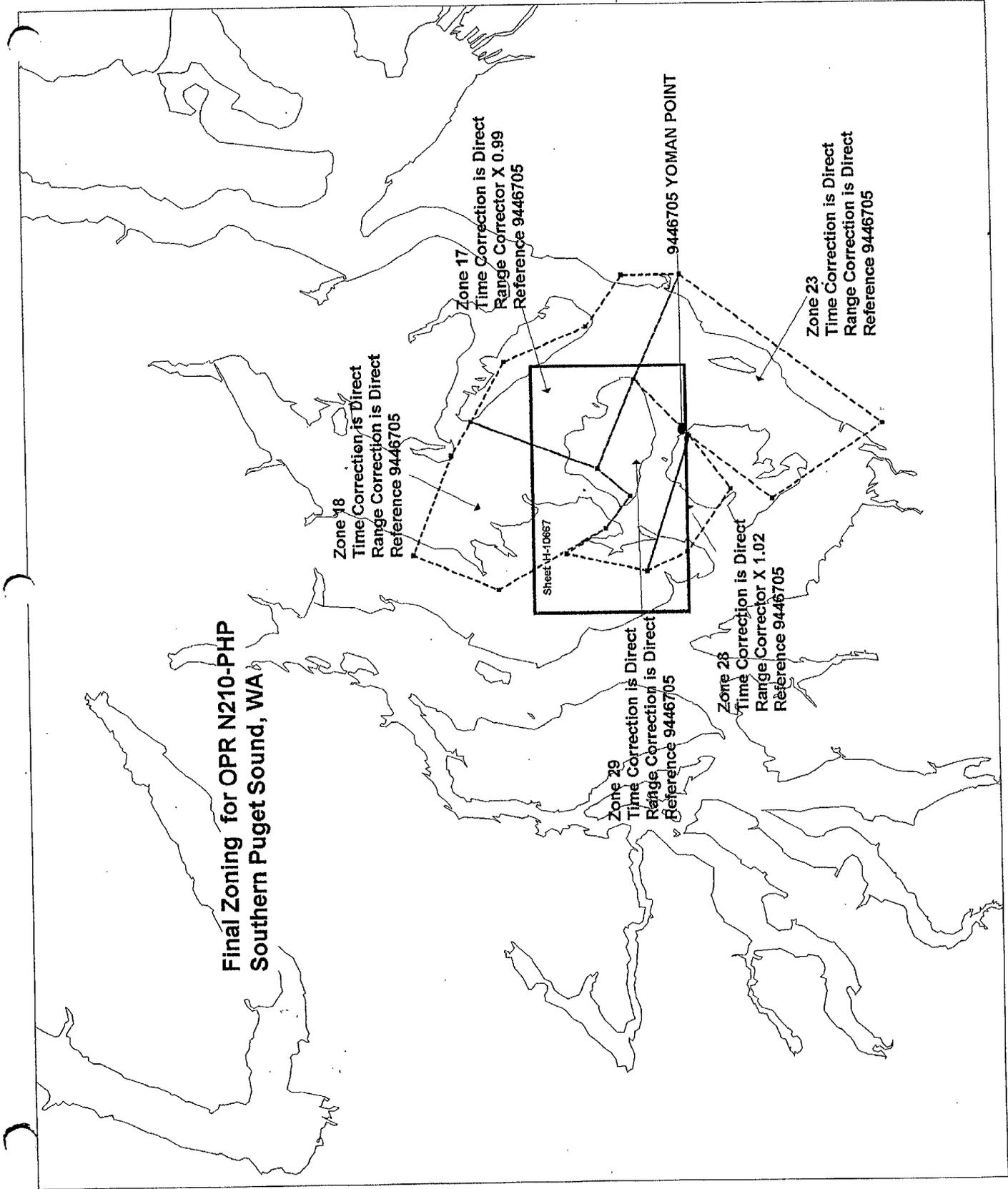
Sheet 11-10657

Zone 29
Time Correction is Direct
Range Correction is Direct
Reference 9446705

Zone 26
Time Correction is Direct
Range Corrector X 1.02
Reference 9446705

9446705 YOMAN POINT

Zone 23
Time Correction is Direct
Range Correction is Direct
Reference 9446705



HYDROGRAPHIC SURVEY STATISTICS

H-10667

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

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION		AMOUNT
SMOOTH SHEET		1	SMOOTH OVERLAYS: POS., ARC, EXCESS		NA
DESCRIPTIVE REPORT		1	FIELD SHEETS AND OTHER OVERLAYS		NA
DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDION FILES	3				
ENVELOPES					
VOLUMES					
CAHIERS					
BOXES					

SHORELINE DATA	
SHORELINE MAPS (List):	NA
PHOTOBATHYMETRIC MAPS (List)	NA
NOTES TO THE HYDROGRAPHER (List):	
SPECIAL REPORTS (List):	
NAUTICAL CHARTS (List):	18445SC, 26th Ed., June 3, 1995; 18447, 28th Ed., June 29, 1996

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			11323	
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	106		106	
COMPARISON WITH PRIOR SURVEYS AND CHARTS		24	24	
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		22	22	
GEOGRAPHIC NAMES				
OTHER*				
*USE OTHER SIDE OF FORM FOR REMARKS	TOTALS	106	46	152
Pre-processing Examination by J. Stringham	Beginning Date 6/22/96	Ending Date 6/24/96		
Verification of Field Data by J. Stringham, D. Doles, R. Mayor, L. Deodato	Time (Hours) 106	Ending Date 11/1/96		
Verification Check by B. Olmstead	Time (Hours) 2	Ending Date 12/2/96		
Evaluation and Analysis by L. Deodato	Time (Hours) 46	Ending Date 11/1/96		
Inspection by B. Olmstead	Time (Hours) 8	Ending Date 12/6/96		

EVALUATION REPORT

H-10667

A. PROJECT

Project information is discussed in the hydrographer's report.

B. AREA SURVEYED

A description of the survey limits is adequately discussed in the hydrographer's report. The bottom consists mainly of sand, mud and gravel. Depths range from -0.8 to 33 fathoms.

C. SURVEY VESSELS

Survey vessel information is found in the hydrographer's report.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Survey data were processed using the same Hydrographic Data Acquisition/Processing System (HDAPS) software used by the hydrographer, the Hydrographic Processing System (HPS) and AutoCad, Version 12.0.

At the time of the survey certification the format for transmission of digital data had not been formally 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 was created with .dbf (extension) and enhanced using the AutoCad system, are filed both in the AutoCad drawing format, .dwg (extension); and in the more universally recognized graphics transfer format, .dxf (extension). Copies of these files will be retained at PHB until data transfer protocols are developed and improved.

The drawing files necessarily contain information which 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 field sheet parameters have been revised to center the hydrography on the office plot. The data is plotted using a Modified Transverse Mercator projection and are depicted on a single sheet.

E. SONAR EQUIPMENT

Side scan sonar was used on survey H-10667 and has been adequately discussed in the hydrographer's report.

F. SOUNDING EQUIPMENT

Sounding equipment is discussed in the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

The sounding data have been reduced to Mean Lower Low Water (MLLW). The reducers include corrections for an actual tide, dynamic draft, and sound velocity. These reducers have been reviewed and are consistent with NOS specifications. Actual tide reduction is derived from the Yoman Point, Anderson, Washington, gage 941-6705.

H. CONTROL STATIONS

Control stations are discussed in the hydrographer's report and separates. 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.

Data based on NAD 27 may be referenced to this survey by applying the following corrections:

Latitude: -0.653 seconds (-20.157 meters)
Longitude: 4.472 seconds (94.102 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 was computed for survey operations. The quality of several positions exceeds limits in terms of horizontal dilution of precision (HDOP). These positions are isolated and occur randomly throughout the survey area. A review of the data, however, suggests that none of these fixes are used to position dangers to navigation. The features or soundings located by these fixes are consistent with the surrounding information. These fixes are considered acceptable. Daily DGPS performance checks were conducted in the field and found adequate.

J. SHORELINE

There are no photogrammetric source data for this survey. The shoreline shown in brown on the smooth sheet was taken from the raster of charts 18445SC and 18448 and is for orientation only.

K. CROSSLINES

Crosslines are discussed in the hydrographer's report.

L. JUNCTIONS

Survey H-10667 junctions with the following survey.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H-10714	1996	1:10,000	South

A formal junction could not be made with survey H-10714 as this survey is in a preliminary stage of processing. Discussion of these junctional surveys will be made in the Evaluation Report for H-10714. An "ADJOINS" note has been added to the present survey.

M. COMPARISON WITH PRIOR SURVEYS

H-6103 (1935) 1:10,000
H-6106 (1935) 1:10,000

Survey H-6103 (1935) and H-6106 (1935) cover the entire area of the present survey. Sounding agreement is good, with the present survey depths shoaler or deeper between 0 and 2 fathoms. Differences can be largely attributed to increased bottom coverage and less accurate positioning and sounding methods available in 1935. Additional information regarding specific area of change can be found in the hydrographer's report, section O.

The present survey's specification of terminating hydrography at the 5-meter depth curve, has resulted in an exclusion zone between the present hydrography and the high waterline. In these areas, several rocks originating from the prior surveys listed above have been transferred to the present survey.

With the transfer of those prior survey features brought forward to the present survey, H-10667 is adequate to supersede the prior surveys within the common area.

N. ITEM INVESTIGATIONS

There were nine AWOIS items assigned to this survey. These items are adequately addressed in the hydrographer's report, section N.

O. COMPARISON WITH CHART

Survey H-10667 was compared with the following charts.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>	<u>Datum</u>
18445SC	26th	June 3, 1995	1: ² 80,000	NAD83
18448	28th	June 29, 1996	1:80,000	NAD83

a. Hydrography

Charted hydrography originates with the prior surveys mentioned in section M and requires no further discussion. Charted prior and miscellaneous source data were adequately addressed with the following exceptions.

Based on the chart mark-ups for 18445 SC and 18448, the two rocks charted in the vicinity of Lat. 47/11/58N, Lon. 122/44/25W, originate from prior survey H-6106 (1935). The position of the southernmost rock shown on chart 18448 has likely been displaced for charting scale.

The piles charted on 18448 Lat. 47/12/²43N, Lon. 122/44/23W, appear to be part of AWOIS item 52254 and have been depicted further offshore for charting scale. Refer to item investigation, AWOIS 52254 attached to the hydrographer's report.

The evaluator concurs with the hydrographer's recommendation to delete the charted Signal Tower No.5 on Pitt Island at Lat. 47/13/23N, Lon. 122/42/56W.

The following items were not addressed by the hydrographer and should be retained on the chart.

<u>Feature</u>	<u>Latitude N</u>	<u>Longitude W</u>
Cable Area	47/13/24	122/43/09
Ferry Dock	47/11/28	122/40/54
Pier	47/11/28	122/44/46
Pier	47/11/14	122/42/07

With the exceptions noted above, survey H-10667 is adequate to supersede charted hydrography within the common area.

b. Dangers to navigation

Two dangers to navigation were reported to the USCG, DMAHTC, and N/CS 261 on July 10, 1996. A copy of the report is attached. No additional dangers to navigation were found during office processing.

P. ADEQUACY OF SURVEY

Hydrography contained on survey H-10667 is adequate to:

- a. delineate the bottom configuration, determine least depths, and draw the required 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.

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

Q. AIDS TO NAVIGATION

There are two fixed and five floating aids to navigation within the survey area. These features were located and adequately serve their intended purpose except for Pitt Passage North Shoal Daybeacon 4 and Pitt Passage Rocks Daybeacon. See hydrographer's report, Section O, Dangers to Navigation, regarding these aids.

The three charted mooring buoys located in the vicinity of Eagle Island were found and located during survey operations.

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

S. MISCELLANEOUS

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

T. RECOMMENDATIONS

This is a good hydrographic survey. No additional work is recommended.

U. REFERRAL TO REPORTS

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

Leonardo T. Deodato
Leonardo T. Deodato
Cartographer

APPROVAL SHEET
H-10667

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.

Bruce A. Olmstead Date: 12/9/96
Bruce A. Olmstead
Senior Cartographer, Cartographic Section
Pacific Hydrographic Branch

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

Kathy Simmons Date: 12/13/96
Kathy Simmons
Commander, NOAA
Chief, Pacific Hydrographic Branch

Final Approval

Approved:

Andrew A. Armstrong III Date: April 11, 1997
Andrew A. Armstrong III
Captain, NOAA
Chief, Hydrographic Surveys Division

