

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic
Field No. PHP-10-2-95
Office No..... H-10626

LOCALITY

State Washington
General Locality Strait of Georgia
Locality Cherry Point and Vicinity

19 95

CHIEF OF PARTY
LT Richard A. Fletcher, NOAA

LIBRARY & ARCHIVES

DATE AUG 13 1996

H10626

HYDROGRAPHIC TITLE SHEET

H-10626

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-10-2-95

State Washington

General locality Strait of Georgia

Locality Cherry Point and Vicinity

Scale 1:10,000 Date of survey June 19 to September 29, 1995

Instructions dated February 14, 1995 Project No. OPR-N247-PHP

Vessel Jensen Launch 1101 (EDP 0651), SeaArk Launch 1102 (EDP 0652)

Chief of party LT Richard A. Fletcher, NOAA

Surveyed by LT Fletcher, LT Johnson, LTJG Berkowitz, ST Adams, ST Simmons, ET Wernicke

Soundings taken by echo sounder, hand lead, pole Raytheon DSF-6000, Innerspace 448
MOD-III Divers Least Depth Gage

Graphic record scaled by PHP Personnel

Graphic record checked by PHP Personnel

Evaluation by: I. Almacén Automated plot by HP Design Jet 650C Plotter

Verification by D. Doles, J. Stringham, I. Almacén

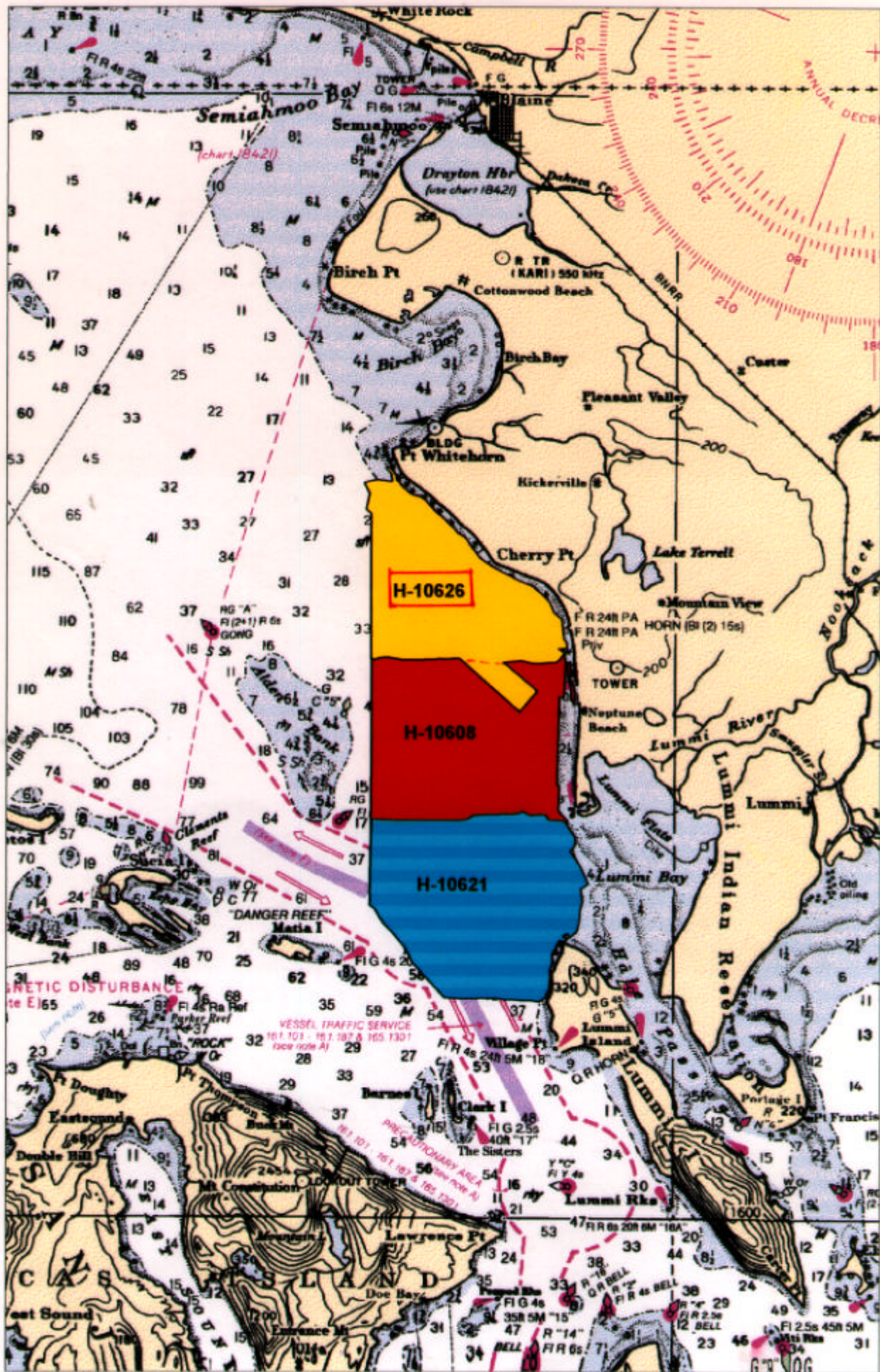
Soundings in Fathoms and tenths
~~feet~~ at ~~MLLW~~ MLLW

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

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

DSC 8-13-96

AWD/SURF ✓ 8/20/96 by MRA



Descriptive Report to Accompany Hydrographic Survey H-10626

Field Number PHP-10-2-95
Scale 1:10,000
1995

Pacific Hydrographic Party
Chief of Party: LT Richard A. Fletcher

A. PROJECT

A navigable area survey was accomplished in accordance with project instructions OPR-N247-PHP Point Migley to Cherry Point, Washington dated February 14, 1995. ✓

This survey (H-10626) responds to requests from the Puget Sound Pilot Association, the Thirteenth Coast Guard District, and the NOS Office of Ocean and Coastal Resource Management. The primary concern is to update the charted hydrography, which dates from 1953 to 1960, and to supersede the charted wire drag clearance depths dating from 1972. A portion of the project area is in the shape of a bight with a general anchorage off of Cherry Point. The piers of two large oil refineries (TOSCO Ferndale Refinery and ARCO Products Co.) and one aluminum smelter (INTALCO Aluminum Corporation) are located in the bight. These commercial facilities are used for receipt of crude oil, shipment of petroleum products, bunkering vessels, and receipt of alumina and liquefied petroleum gas. The Puget Sound Pilots have indicated that routes for approaches and departures of standard tanker drafts of 56 feet occur throughout the area. This area has a high volume of cargo and traffic and is an environmentally sensitive area. ✓

This survey's sheet letter is "A". The field sheet number is PHP-10-2-95, HDAPS table #4. This sheet is the second survey for project OPR-N247-PHP. ✓

B. AREA SURVEYED (*See EVAL RPT., Sec. B*)

The area surveyed for H-10626 extends from latitude ^{50 00} ~~48°06'15"~~ ^{53 50} 48°06'15" N, north to latitude ^{53 50} 48°06'15" N, and from longitude ^{2 28 00} ~~127°22'16"~~ ^{2 28 00} 127°28'00" W. Hydrography for H-10626 are within the limits required by the Hydrographic Manual (Section 1.2.3), and the project instructions. Data acquisition began June ✓

19, 1995 (DN 170) and continued through to September 29, 1995 (DN 272). ✓

In addition two 1:5,000 scale insets were required at two cargo pier facilities within the limits of Sheet A per Section 6.3 of the Project Instructions. These two insets were surveyed at a scale of 1:5,000 using 1:10,000 scale positioning requirements. ✓

C. SOUNDING VESSELS ✓

NOAA VN 1101 (EDP No. 0651), a 29-foot Jensen, and NOAA VN 1102 (EDP No. 0652), a 21-foot SeaArk, were used for all hydrography and velocity casts. A field assembled backpack unit was also used to acquire positions on lights. ✓

No unusual vessel configurations were used. *Cont.*

D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

Survey data acquisition were accomplished using HDAPS & HYPACK software. HDAPS was used on VN 1101 on DN 170. HYPACK Hydrographic Data Acquisition System software was used for the remainder of this survey, June 21, 1995 (DN 172) to September 29, 1995 (DN 272). The HDAPS program was used for post-processing procedures. Data collected with HYPACK was converted to HDAPS format using conversion programs written by Hydrographic Surveys Division, Systems Support Branch, N/CS3. HDAPS Program names and versions are listed in appendix VI.* ✓

The following non-HDAPS computer programs were used:

<u>Program Name</u>	<u>Date</u>	<u>Version</u>
PC-DAS	1994	5.01
VELOCITY	1994	2.21
NADCON	1989	1.01
MONITOR	1994	3.00
GEOID93	1993	1.00
SMLGAUGE	1994	2.20
DAILYDQA	1994	2.20
HYPACK	1995	5.20
SVP	1994	2.30
INVERS3D	1991	1.00

 ✓

* Filed with the survey records.

Raw data files were collected on plotter sheet 4. Data were plotted on sheet 4 (1:10,000) & plotter sheets 5 & 6 (1:5,000). ✓

There were no nonstandard acquisition or processing methods used. *CONFIRM*. ✓

E. SONAR EQUIPMENT ✓

Side scan sonar (SSS) operations were conducted using an EG&G model 260 slant-range corrected 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>
Towfish	015598
260 Recorder	015602

 ✓

The SSS towfish was towed with a 55 meter EG&G lightweight towcable. The towfish was deployed from a Superwinch Winch Model W115 from an adjustable davit arm on the starboard quarter of the launch. The length of towcable deployed was determined by measured markings on the towfish cable. The SSS towfish was maintained at a height off the bottom of 8 to 20 percent of the range scale. The measured towpoint is found in the offset tables. Four range scales were used 75-, 100-, 150-, and 200-meters. SSS operations were conducted at or less than the maximum speed of five knots while operating with the 75-, or 100-meter range scales and four knots while operating with the 150- and 200-meter range scale. ✓

The inshore limit of SSS collection was the 9-meter curve, the safe navigation with a SSS towfish, or the limit of collecting acceptable sonargrams. The recorder gain setting was set for the best return for the most prevalent bottom material. Contacts or identifiable features, such as a change in bottom texture, or moored vessels, were seen in the outer portion of the usable sonargram and are an indication of proper SSS recorder tuning and were periodically marked as confidence checks. Degraded sonargrams were rejected and rerun, or the acceptable swath width was adjusted. Two 1:10,000 scale swath plots (A & B) depicting adjusted SSS bottom coverage indicate that 200% coverage was completed. ✓

The survey area has a high concentration of fish. Schools of fish were observed on most of the sonargrams. The schools of fish appear as dark spots with soft edges, some with, & some without shadows, the ones with shadows are usually detached shadows. Schools of fish were occasionally annotated to differentiate from real contacts. ✓

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 highest contacts were entered. PHP entered 176 contacts into 7 contact tables in confile 1. ✓

PHP used the sifter and grouper programs to help determine which contacts appeared to be significant and may need further investigation. A threshold depth of 20.1 meters (66.0 feet) and a radius of 65 meters, based on 2.6mm at the scale of the largest scale chart (18431), were used with the sifter program. A total of 38 significant contacts were developed by echosounder or dive investigation. Contacts remaining significant on the sifter printout are discussed on the printout itself and can be found in Separate V of this report. * ✓

F. SOUNDING EQUIPMENT ✓

The following sounding equipment was used throughout this survey:

<u>Vessel #</u>	<u>Model</u>	<u>Serial #</u>	<u>Day #'s</u>
1101	DSF-6000N	A121N	170-272
1102	IN-448	236	172-174
1102	IN-448	239	213-243

 ✓

Digitized soundings displayed on line were compared in the field with the analog trace to ensure reasonable agreement. No on-line calibration adjustments can be performed on the IN-448 or DSF-6000N. ✓

Soundings were recorded in meters with an assumed speed-of-sound through water of 1500 m/sec. Depths encountered in the survey area ranged from 69.5 meters (fix number 3748) to 0.0 meters (fix number 30019) based on predicted tides. *The smooth sheet is plotted in Fathoms based on actual tides. Depths range from 0 to 37 Fathoms.* ✓
The IN-448 had extreme difficulty tracking and correctly digitizing in the deeper portions of this sheet. PHP has found the IN-448 to be inadequate in depths greater than 40 meters, see ✓

* *Filed with the survey records.*

memo in appendix VI. (memo attached)

The DSF-6000N performed well during the course of this survey.

The hydrographer does not consider occasional breaks in the continuity of the echogram significant unless greater than 6 mm at 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. ✓

A MOD III Divers Least Depth Gauge (S/N 68335) was used on DN 208 and DN 235. The gauge was operated in accordance with section 7.2.2.1 of the Field Procedures Manual. ✓

Metric lead lines were used for depth comparisons with the echosounder. PHP fabricated the lead lines following Hydrographic Survey Guideline (HSG) 69, calibration forms are included in Separate IV of this Descriptive Report. * ✓

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) Velocity of Sound Profiler, S/N 3042. VELOCITY was used to determine sounding correctors which were applied to all high and low frequency soundings. ✓

The following casts were used: *Casts 3, 4, and 6-10 plot outside the survey limits.*

Cast	Extrapolated		DN Range	HDAPS Tables	Cast Position	
	DN	Depth			Latitude	Longitude
3	158	80.0	158-171	3	48°48'54"N	122°46'56"W
4	172	100.7	172-198	4	48°49'05"N	122°48'04"W
5	199	80.5	199-207	5	47°51'36"N	122°44'50"W
6	208	98.5	208-218	6	48°49'12"N	122°48'12"W
7	219	135.9	219-234	7	48°45'06"N	122°48'00"W
8	235	135.6	235-243	8	48°44'48"N	122°46'48"W
9	244	124.9	244-256	9	48°45'26"N	122°46'24"W
10	257	130.8	257-276	10	48°45'15"N	122°46'47"W

 ✓

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

The AML instrument (S/N 3042) was calibrated by Northwest Regional Calibration Center on April 15, 1994 (DN 105). A copy of this

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calibration report is included in Separate IV of this Descriptive Report. *

Velocity of sound correctors were applied to both high and low frequency soundings. ✓

Lead line Comparisons ✓

Lead line comparisons were periodically conducted to confirm proper digitization of echosounder depths. These are annotated on the echograms.

Static Draft ✓

Static draft for VN 1102 was determined on 4/12/94. 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 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 3/20/95 (DN 179), using a method similar to the one above.

Supporting data are included in Separate IV. *

Dynamic Draft ✓

Settlement and squat correctors are applied on line to all survey data. Settlement and squat correctors are reapplied during field processing using the REAPPLY program in HDAPS.

VN 1101 settlement and squat measurements conducted on 3/20/95 were applied using Offset Table 1*(DN 170-272).

VN 1102 settlement and squat measurements conducted on 5/5/94 and measurements for SSS offsets were recorded and applied throughout the survey using Offset Table 2*(DN 172-265).

Supporting field records are included in Separate IV of this Descriptive Report. *

Tide Correctors ✓

In compliance with Section 5.9 of the Project Instructions, predicted tide correctors from the existing Primary station at Cherry Point, 944-9424, were applied to soundings during field processing. One tidal zone was established for this survey. Final correctors will be applied from data collected by this

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station. All times and heights for this tidal zone were direct.
Approved tide note dated December 9, 1995 is attached.

H. CONTROL STATIONS *(See EVAL RPT., Sec. H)*

Horizontal Datum ✓

The horizontal 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~~ *Appendix III* (List of Horizontal Control Stations). A separate Horizontal Control Report OPR-N247-PHP, Point Migley to Cherry Point, was submitted to PHS in July of 1995.

Two DGPS fixed point performance stations were positioned at the USCG pier at Bellingham and at Sandy Point Light 3 (LLN 19886) to third order class 1 standards.

I. HYDROGRAPHIC POSITION CONTROL *See Eval Rpt., section I*

Position Control

Differential GPS (DGPS) was used for position control throughout this survey. The following beacons were used during hydrographic operations: *as reference stations:*

<u>Location</u>	<u>Frequency</u>
<i>(100)</i> Pt. Atkinson, Vancouver, B.C.	320 kHz
<i>(101)</i> Race Rocks, Victoria, B.C.	309 kHz
<i>(102)</i> USCG Beacon, Whidbey Is., WA	302 kHz

MONITOR results for these stations are found in Separate III.*

An Ashtech Sensor GPS Receiver with a Communications Systems International Inc. (CSI) GPS corrector receiver linked to the acquisition system was used for positioning. DGPS positioning was accomplished in accordance with the FPM, section 3.4. When the beacon signal was lost for more than 30 seconds, the survey line was broken by the HDAPS system and the line was rerun where control had been unacceptable. ✓

The HYPACK system does not record data if the signal is lost. The operator can easily determine the signal integrity by monitoring the echosounder and SSS traces for fix annotations. The operator can also monitor the GPS with an on screen window ✓

* *Filed with the survey records.*

which shows the HDOP and the number of satellites used. Survey lines were rerun where control was unacceptable. ✓

On DN 191 incorrect geodetic position parameters were initialized into the HYPACK survey program and the data collected was incorrect. This data was rejected and rerun. ✓

The accuracy requirements as stated in section 3.4 of the Field Procedures Manual were met during the course of this survey. *CORRECT*

GPS Performance Checks ✓

DGPS performance checks using the fixed point method were obtained per FPM Section 3.4.4.1, using the sites established at the USCG pier at Bellingham and at Sandy Point Light 3. Performance check forms are included with the data files.

Positioning Equipment ✓

The unique numbers for all equipment serial numbers are annotated on the daily echograms.* Antenna offsets for each vessel are listed in the corresponding offset tables.* Supporting data is included in Separate III.*

The following sensors were used throughout the survey:

	<u>Device</u>	<u>Serial Number</u>
Launch 1101	Ashtech Sensor CSI Receiver	B1042 x1112
Launch 1102	Ashtech Sensor CSI Receiver	B1043 x1212
Backpack	Ashtech Sensor CSI Receiver	B1044 x1394

J. SHORELINE (*See EVAL RPT., Sec. J*)

No photogrammetric source document was submitted for this project as noted in Section 4.1.1. of the Project Instructions. Shoreline for field sheets were taken from NOS charts 18421 and 18431, shown in brown, for orientation purposes only. Photography for this area has been flown under project DM-9304. Compilation of the photogrammetric data is not expected until early 1996. Positions for wrecks, ruins, piles, shoals, and *Shoreline data was not yet available during office compilation of the smooth sheet.* ✓

* Filed with the survey records.

rocks were verified or disproved as required by the Project Instructions. Shoreline was compared to the charted shoreline for any gross discrepancies using a 1:10,000 scale enlargement of chart 18421 (not the largest scale chart of the area) provided by Hydrographic Surveys Division. ✓

The following minor discrepancies were found:

A sewer line south of the Intalco Aluminum Corporation pier charted at latitude 48°50'22.00"N, longitude 122°43'00.00"W was located by visual inspection while conducting shoreline verification on DN 223. A position on the offshore end of this item was inaccessible due to kelp beds in the vicinity. *Retain as charted. Sewer line has been shown on the smooth sheet in brown.*

There is an uncharted conveyor belt ending offshore on a dolphin. A position (Fix number 20048) was taken offshore of the dolphin on DN 270 at latitude 48°51'18.56"N, longitude 122°43'51.42"W. ✓ Upon comparison with a chart enlargement of Chart 18421, PHP noticed a charted pier in the vicinity of this item at latitude 048°51'18.00"N, longitude 122°43'57.00"W. ✓ No pier or similar structure is charted on the large scale chart 18431. No evidence of any structure was seen at the charted position. Although a disproval D.P. was not taken PHP believes the structure positioned is the same structure charted on the small scale chart 18421 and recommends deleting the pier charted at latitude 048°51'18.00"N, longitude 122°43'57.00"W and chart a pier/conveyor belt as shown in red on the field sheet. *Concat.*

An uncharted anchored fish pen was positioned at latitude 48°51'06.04"N, longitude 122°43'44.49"W, fix number 20049. ✓

Mooring buoys 'A', 'B', 'C', & 'D' in the vicinity of the ARCO Products pier were verified by positions taken on DN 270. ✓

Mooring buoys 'N', & 'S' in the vicinity of the Intalco Aluminum Corporation pier were verified by positions taken on DN 270. ✓

Verification of charted rocks was conducted on DN 223. PHP used reference #'s where applicable to verify charted objects. Positions were taken if any discrepancies were found. No disprovals were found and a few uncharted rocks were positioned and are shown on the field sheet. All reference #'s and new positions can be found in the raw data files on DN 223. *Charted inshore rocks should be retained. (See ENAC APT., Sec M) The presently* ✓

PHP conducted a foul area buffer line just to the west of areas foul with kelp, kelp beds, and rocks. This buffer line was accomplished on DN 236 from fix # 32063-32138. The area south of the end of this foul area (fix # 32138) had been verified on DN 223. *The areas defined by the hydrographer have been noted as Foul with kelp and rocks on the smooth sheet.* ✓

K. CROSSLINES ✓

Crosslines were run in accordance with Section 1.4.2 of the 4th Edition of the Hydrographic Manual. On the western end of this sheet the crosslines were run perpendicular to the SSS (mainscheme) hydrography. On the remainder of the sheet the crosslines were run 43° to the SSS (mainscheme) hydrography. Nautical miles of crossline total 13.12 nm, representing approximately 6% of the mainscheme hydrography on H-10626. There was good agreement between the SSS (mainscheme) and crossline hydrography.

L. JUNCTIONS (See EVAL RPT., Sec 4)

The south end of H-10626 (1:10,000) adjoins the northern boundary of contemporary survey H-10608 (1:10,000). Comparison between the two showed good agreement. *Five mainscheme survey lines overlap with H-10608 from 800 to 600 meters. These survey lines were run beyond the required sheet limits and extends from lat. 48/49/00N to lat. 48/50/00N and long. 122/44/00W to long. 122/45/00W.*

M. COMPARISON WITH PRIOR SURVEYS (See EVAL RPT., Sec. M)

PHB will conduct a comparison with prior surveys after smooth tides are applied to the raw data.

A 1:10,000 scale plot in fathoms, and one in feet was made to facilitate cursory comparisons of hydrographic soundings to prior surveys. ✓

Comparison were made between H-10626 and the following prior surveys:

<u>Registry</u> <u>Number</u>	<u>Survey</u> <u>Scale</u>	<u>Survey</u> <u>Date</u>
H-7962	1:10,000	1953
H-8518	1:10,000	1960
H-8481	1:10,000	1953
H-9291/WD	1:20,000	1972

A cursory comparison with H-7962 shows a majority of the current hydrography is 1'-3' shallower than the prior soundings. *CONCUR.* ✓

A cursory comparison with H-8518 indicates current hydrographic contours and soundings are in good agreement with the prior survey. *CONCUR.* ✓

N. ITEM INVESTIGATION REPORTS

The following AWOIS Reports are included in ~~Separate VI~~ ^{this report}. All four AWOIS items originated from chart compilation errors (misrepresentation) of wire drag clearance depths brought through to the smaller scale chart as obstruction depths. The larger scale chart 18431 correctly shows the wire drag clearance depths. For additional details see the individual AWOIS reports. ✓

N1	52184	Sounding
N2	52185	Sounding
N3	52186	Sounding
N4	52187	Sounding

O. COMPARISON WITH THE CHART (See EVAL RPT., Sec. O)

PHS will conduct a sounding comparison with the chart after smooth tides are applied.

Soundings from an enlargement of chart 18421 (1:80,000) provided by Hydrographic Surveys Division were compared to H-10626 soundings. ✓

A cursory comparison with current hydrographic soundings and an 1:10,000 scale enlargement of Chart 18421 showed good agreement except for the following areas: ✓

Hydrography from H-10626 indicates some shoaling and the 20-fathom contour has moved west approximately 150 meters in the vicinity of latitude $048^{\circ}51'24.00''N$, longitude $122^{\circ}46'38.00''W$. *concur.*

The charted 20-fathom contour in the vicinity of latitude $048^{\circ}51'54.00''N$, longitude $122^{\circ}46'54.00''W$ was drawn around the incorrectly charted obstruction depth. Hydrography from H-10626 matches well with the prior survey in this vicinity. PHP recommends charting the 20-fathom contour in this area to match the contemporary hydrography. *Concur. Chart the area based on the present survey.*

Contact 1905.00S, a side scan sonar contact observed on DN 194, is an anchor block for a mooring buoy at latitude $048^{\circ}50'29.549''N$, longitude $122^{\circ}43'30.534''W$ (DP taken on DN 208) *Fix #4537*. The sounding plot revealed a least depth of ~~12.7~~ ^{12.9} meters (3.9- *based on actual tides.* fathoms). PHP recommends charting a 7-fathom sounding, least depth known by diver, at latitude $048^{\circ}50'29.549''N$, longitude $122^{\circ}43'30.534''W$. *Do not concur. Chart feature as obstruction. 7th Obstr (Anchor Block)*

Sounding comparisons ✓

Comparison of sounding data and charted soundings were made throughout the survey in accordance with section 6.11. of the Project Instructions and sections 4.5.15. and 5.3.4. of the Hydrographic Manual. Sounding comparisons showed excellent agreement. *Concur.*

Danger To Navigation ✓

No Dangers to Navigation were found during the course of this survey. *Concur.*

P. ADEQUACY OF SURVEY (*See EVAL RPT., Sec. P*)

This survey is complete and adequate to supersede prior surveys within their common areas. In addition the 200% SSS coverage completed supersedes prior wire drag clearances and PHP recommends elimination of wire-drag green tint from the charts within the common area. *Concur.*

Q. AIDS TO NAVIGATION (*See EVAL RPT., Sec. Q*)

All aids to navigation, private aids and landmarks within the limits of H-10626 were positioned as specified in Section 4.2 of the project instructions.

Four privately maintained pier lights were positioned in response to the USCG request (QM1 Brent Buching) to update the light positions. Hydrographic positions for two privately maintained lights at the Intalco Aluminum Corporation pier were attained on DN 264, and two privately maintained lights at the Atlantic Richfield Products pier were attained on DN 265. Final positions were acquired by averaging the two positions taken for each light (position & check position). See the corresponding records in the raw data files for the inverse results between each light's position. *The first position taken for each of the light was used during office processing.*

<u>LLN</u>	<u>DESCRIPTION</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>
19895	Intalco North Lt	048°50'31. ³⁸ 440"N	122°43'19. ¹⁶ 485"W
19895	Intalco South Lt	048°50'22.442"N	122°43'15.501"W
19900	ARCO Light A	048°51'36.992"N	122°45'21.906"W
19905	ARCO Light B	048°51'42.888"N	122°45'33.855"W

R. STATISTICS ✓

<u>Description</u>	<u>Quantities</u>
Total Positions	12190
Total Number of Selected Soundings	12775
Total Detached Positions	34
Total Bottom Samples	12
Total Nautical Miles 200% SSS	164.73
Total Nautical Miles Hydrography	252.04
Square Nautical Miles Hydrography	6.0
Velocity Casts	8
Days of Production	40

S. MISCELLANEOUS ✓

Bottom samples were obtained in accordance with Section 6.7 of the Project instructions, sections 1.6.3 and 4.7.1 of the Hydrographic Manual. No differences in charted bottom characteristics were noticed. As stated in Section 6.7. of the Project Instructions the Smithsonian Institution does not desire submission of bottom samples.

No unusual magnetic variations, tidal conditions or submarine features were observed during the course of this survey.

T. RECOMMENDATIONS ✓

Current diver technology is significantly more accurate than past wire drag methods. PHP recommends establishing a separate chart symbol to differentiate dive investigation depths and wire drag clearance depths. *Concur.*

U. REFERRAL TO REPORTS ✓

Coast Pilot Report

TBA

Horizontal Control Report

July, 1995

Submitted for approval,

Reginald W. Adams, Jr.

Reginald W. Adams, Jr.
Survey Technician
Survey, OIC

Approved and forwarded,

Richard A. Fletcher

Richard A. Fletcher
Lieutenant, NOAA
Chief of Party

NOAA FORM 76-40 (8-74) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NONFLOATING AIDS OR LANDMARKS FOR CHARTS

Replaces C&GS Form 567.

TO BE CHARTED (Field Party, Ship or Office)
 TO BE REVISED
 TO BE DELETED

HAVE BEEN INSPECTED FROM SEAWARD TO DETERMINE THEIR VALUE AS LANDMARKS.
 HAVE NOT

REPORTING UNIT: PACIFIC HYDRO PARTY
 STATE: WA
 LOCALITY: CHERRY POINT
 DATE: 12/Oct/1995

JOB NUMBER: PHP-10-2-95
 SURVEY NUMBER: H-10626

OPR PROJECT NO.: OPR-N247-PHP
 DATUM: NAD 83

CHARTING NAME	DESCRIPTION (Record reason for deletion of landmark or aid to navigation. Show triangulation station names, where applicable, in parentheses)	POSITION				METHOD AND DATE OF LOCATION (See instructions on reverse side)		CHARTS AFFECTED
		LATITUDE		LONGITUDE		OFFICE	FIELD	
		D.M. Meters	° ' "	D.M. Meters	° ' "			
FIR 28 ft Private aid	ATLANTIC RICHFIELD LIGHT A CHART 18421, 18431, CHART REVISION, LLN 19900	36.992	48 51	122 45	21.900		F-DGPS-L 1995	18421 18431
FIR 28 ft Private aid	ATLANTIC RICHFIELD LIGHT B CHART 18421, 18431, CHART REVISION, LLN 19906	42.854	48 51	122 45	33.593		F-DGP-L 1995	18421 18431
FIR 24 ft Private aid	INTALCO SOUTH LIGHT CHART 18421, 18431, CHART REVISION, LLN 19895	22.442	48 50	122 43	15.501		F-DGPS-L 1995	18421 18431
FIR 24 ft Private aid	INTALCO NORTH LIGHT CHART 18421, 18431, CHART REVISION, LLN 19895	31.446	48 50	122 43	19.489		F-DGPS-L 1995	18421 18431

ORIGINATING ACTIVITY

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

AWOIS INVESTIGATION-N1 ✓

ITEM # 52184

DN: 194,205,228,237

CHART # 18421, 18431

VN: 0651

DESCRIPTION: Sounding (Hang at 12 fms cleared @ 11-fms).

SOURCE: H-9281/72WD--OPR-412-DA-72-WD

GEOGRAPHIC POSITION

	LATITUDE	LONGITUDE	POSITION #
CHARTED:	048°50'25.44"N ✓	122°44'49.92"W ✓	(Chart 18421)
OBSERVED:	N/A		

POSITIONED BY: DGPS

METHOD OF INVESTIGATION: 200% Side Scan Sonar coverage.

FINDINGS: No side scan sonar contact was seen in the vicinity of the charted position. The surrounding depths within the search radius are 11-12 fathoms (20-22 meters) ✓, the same depth as the hang. Chart 18431 correctly charts the clearance depth of 11 fathoms. Chart 18421 incorrectly depicts this as an obstruction with a known depth of 11-fathoms. ✓

DIVING INVESTIGATION

None.

CHARTING RECOMMENDATIONS: "Delete charted 11-fathom obstruction with depth known by wire drag at latitude 048°50'25.44"N, longitude 122°44'49.92"W." *Concur. Chart the area based on the present survey.*

.....COMPILATION USE ONLY

CHART

APPLIED

AWOIS INVESTIGATION-N2 ✓

ITEM # 52185

DN: 179,227,237

CHART # 18421, 18431

VN: 0651

DESCRIPTION: Sounding (Hang at 16 1/2-fms cleared @ 15-fms).

SOURCE: H-9281/72WD--OPR-412-DA-72-WD

GEOGRAPHIC POSITION

	LATITUDE	LONGITUDE	POSITION #
CHARTED:	048°50'29.76"N ✓	122°45'53.64"W ✓	(Chart 18421)

OBSERVED: N/A.

POSITIONED BY: DGPS

METHOD OF INVESTIGATION: 200% Side Scan Sonar coverage.

FINDINGS: No side scan sonar contact was seen in the vicinity of the charted position. The surrounding depths within the search radius are 16-17 fathoms (29-31 meters), the same depth as the hang. Chart 18431 correctly shows this area as cleared by wire drag clearance at 15-fathoms. Chart 18421 incorrectly depicts this as a sunken danger with depth cleared by wire drag at 15-fathoms.

DIVING INVESTIGATION

NONE.

CHARTING RECOMMENDATIONS: "Delete charted clearance depth of 15 fathoms at latitude 048°50'29.76"N, longitude 122°45'53.64"W". *Concur. Chart the area based on the present survey.*

.....COMPILATION USE ONLY

CHART

APPLIED

AWOIS INVESTIGATION-N3 ✓

ITEM # 52186

DN: 194,198

CHART # 18468

VN: 0651

DESCRIPTION: Sounding(Hang at 15-fms cleared @ 11-fms).

SOURCE: H-9281/72WD--OPR-412-DA-72-WD

GEOGRAPHIC POSITION

	LATITUDE	LONGITUDE	POSITION #
CHARTED:	048°51'00.72"N ✓	122°44'29.40"W ✓	(Chart 18421)
OBSERVED:	N/A		

POSITIONED BY: DGPS

METHOD OF INVESTIGATION: 200% Side Scan Sonar coverage.

FINDINGS: No side scan sonar contact was seen in the vicinity of the charted position. The surrounding depths are 15-16 ✓ fathoms (27-29 meters) ✓, the same depth as the hang. Chart 18431 correctly depicts the area as cleared to 11-fathoms. The 11-fathom clearance depth was incorrectly charted on Chart 18421 as an obstruction with a known depth of 11-fathoms.

DIVING INVESTIGATION

None.

CHARTING RECOMMENDATIONS: "Delete charted dangerous obstruction of known 11-fathoms depth located at latitude 048°51'00.72"N, longitude 122°44'29.40"W." *Concur. Chart the area based on the present survey.*

.....COMPILATION USE ONLY

CHART

APPLIED

AWOIS INVESTIGATION-N4

ITEM # 52187

DN: 216,221

CHART # 18421, 18431

VN: 0652,0651

DESCRIPTION: Sounding(15-fathom clearance depth).

SOURCE: CNM51/79(Notice # 1124)--12/21/79, H-9281/72WD--OPR-412-DA-72-WD

GEOGRAPHIC POSITION

	LATITUDE	LONGITUDE	POSITION #
CHARTED:	048°52'00.12"N ✓	122°46'48.36"W ✓	(Chart 18421)
OBSERVED:	N/A		
POSITIONED BY:	DGPS		

METHOD OF INVESTIGATION: 200% Side Scan Sonar coverage.

FINDINGS: No side scan sonar contact was seen in the vicinity of the charted position. The surrounding depths within the search radius are 20-21 fathoms(36.5-38.5 meters) ✓. Chart 18431 and Prior Survey H-9281 correctly shows the area as cleared by wire drag at 15-fathoms. Chart 18421 incorrectly charts this item as a sunken danger with depth cleared by wire drag at 15-fathoms.

DIVING INVESTIGATION

None.

CHARTING RECOMMENDATIONS: "Delete sounding of 15 fathoms charted at latitude 048°52'00.12"N, longitude 122°46'48.36"W." *Concur. Chart the area based on the present survey.*

.....COMPILATION USE ONLY

CHART

APPLIED

July 24, 1995

MEMORANDUM FOR: CDR Kathy Timmons, NOAA
Chief, Pacific Hydrographic Branch

Sent e-mail

FROM: LT Richard Fletcher, NOAA
Chief, Pacific Hydrographic Party

SUBJECT: Replacement echosounder

The Innerspace 448 (INN448) echosounder has been a good shallow water echosounder, but has limited abilities in depths greater than 40 meters. I request replacement of the INN448 echosounder with a dual frequency fully digital echosounder capable of recording depths to 300 meters.

The Pacific Hydrographic Party (PHP) began hydrographic operations in the Puget Sound region in April, 1994. The deep water limitations of the Innerspace 448 were immediately apparent and were mentioned in every Descriptive Report to date. Until PHP's current project at Cherry Point the bathymetry has necessitated enough work suited to each platform for fairly efficient operations.

In areas with fairly good water clarity the INN448 digitizes and produces an acceptable analog trace to approximately 60 meters. Recent hydrography conducted in Elliot Bay was not completed to the desired depths due to the INN448 inability to digitize or print an acceptable bottom trace below 40 meters in the turbid water discharged from the Duwamish River. I foresee a similar problem with the upcoming project in Everett at the mouth of the Snohomish River.

The lack of near shore development and lack of contacts to development has limited the usefulness of the INN448 on the Cherry Point project. A dual frequency echosounder that could digitize depths to 300 meters would greatly enhance the usefulness of a second survey platform.

An analog echosounder takes up an inordinate proportion of space on a small vessel such as a SeaArk. Possible space savings of a fully digital echosounder should be taken into consideration when selecting a replacement echosounder.

APPROVAL SHEET

for

SURVEY H-10626

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 1995. 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,

DATE: October 24, 1995



Richard A. Fletcher
Lieutenant, NOAA
Chief, Pacific Hydrographic Party



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: December 8, 1995

MARINE CENTER: Pacific

HYDROGRAPHIC PROJECT: OPR-N247-PHP

HYDROGRAPHIC SHEET: H-10626

LOCALITY: Washington, SW of Cherry Point, Strait of
Georgia

TIME PERIOD: June 19 - September 29, 1995

TIDE STATION USED: 944-9424 Cherry Point, Wa.
Lat. 48° 51.8'N Lon. 122° 45.4'W

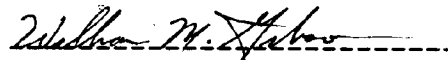
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 6.25 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 8.3 ft.

REMARKS: RECOMMENDED ZONING

Times and heights are direct using Cherry Point, Wa. (944-9424).

Notes: Times are tabulated in Greenwich Mean Time.
The data for Cherry Point, Wa. (944-9424) is stored in
Next Generation Water Level Measurement System temporary
file #744-9424.


CHIEF, DATUMS SECTION



GEOGRAPHIC NAMES

Name on Survey	A CHART NO. 18431, 18421 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 RAND McNALLY ATLAS H U.S. LIGHT LIST K											
	CHERRY POINT	X		X								
GEORGIA, STRAIT OF	X		X									2
WASHINGTON (title)	X		X									3
WHITEHORN, POINT	X		X									4
												5
												6
												7
												8
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												25

Approved:

Chris C. Long

Chief Geographer

APR 30 1996

HYDROGRAPHIC SURVEY STATISTICS

H-10626

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	4				
ENVELOPES					
VOLUMES					
CAHIERS					
BOXES					

SHORELINE DATA	
SHORELINE MAPS (List):	None
PHOTOBATHYMETRIC MAPS (List):	N/A
NOTES TO THE HYDROGRAPHER (List):	None
SPECIAL REPORTS (List):	None
NAUTICAL CHARTS (List):	18431, 31st Ed., July 31, 1993; 18421, 39th Ed., July 22, 1995

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			12190	
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	151.5		151.5	
COMPARISON WITH PRIOR SURVEYS AND CHARTS				
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		19.0	19.0	
GEOGRAPHIC NAMES				
OTHER*				
*USE OTHER SIDE OF FORM FOR REMARKS	TOTALS	151.5	19.0	170.5

Pre-processing Examination by LT P. Haines	Beginning Date 10/25/95	Ending Date 10/25/95
Verification of Field Data by I. Almacen, D. Doles, J. Stringham	Time (Hours) 170.5	Ending Date 5/10/96
Verification Check by B. Olmstead	Time (Hours) 2	Ending Date 6/6/96
Evaluation and Analysis by I. Almacen	Time (Hours) 19.0	Ending Date 5/28/96
Inspection by B. Olmstead	Time (Hours) 17	Ending Date 7/2/96

EVALUATION REPORT

H-10626

A. PROJECT

Project information is discussed in the hydrographer's report.

B. AREA SURVEYED

This navigable area survey was conducted in the state of Washington. It covers the area off Cherry Point including the vicinity of ARCO and INTALCO terminal piers. A small section of this survey shown on the progress sketch included in this report overlaps the northern portion of the adjoining area of survey H-10608. The coast is generally comprised of rocks scattered along the nearshore area. The bottom is mainly composed of sand and mud mixed with shells. Depths range from 0.0 to 37.0 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.

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, created with .dbf (extension) and enhanced using the AutoCad system, is filed both in the AutoCad drawing format, i.e., .dwg (extension); and in the more universally recognized graphics transfer format, .dxf (extension). Copies of these files will be retained at PHS 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 the Hydrographic Survey Guideline No. 75.

The field sheet parameters have been revised to center the hydrography on the office plot. 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-10626. Refer to section E of the hydrographer's report concerning set-up, operation and method of processing of survey data. A new Sifting Function in the Contact Program was utilized during field processing to simplify the process of determining the significance of contacts based upon the surrounding selected sounding data.

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 actual tide, dynamic draft, and sound velocity. These reducers have been reviewed and are consistent with present NOS specifications. Actual tide reduction is derived from Cherry Point, Washington gage (944-9424). Refer to the approved tide note attached to this report concerning recommended tidal zoning.

H. CONTROL STATIONS

The use of Differential Global Positioning System (DGPS) is discussed in the hydrographer's report and a list of DGPS reference stations used during this survey is attached to this report.

The positions of DGPS reference stations used during hydrographic operations are field values based on NAD 83. The geographic positions of all survey data are also based on NAD 83. The AutoCAD generated smooth sheet is annotated with an NAD27 adjustment tick based on values determined with NGS program NADCON.

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

Latitude: -0.608 seconds (-18.793 meters)
Longitude: 4.649 seconds (94.770 meters)

I. HYDROGRAPHIC POSITION CONTROL

Differential GPS (DGPS) was used to control this survey. NAD83 is used as the horizontal datum for plotting and position computations. A horizontal dilution of precision (HDOP) limits of 3.75 was computed for survey operations. The maximum allowable HDOP limit

has not been exceeded and the quality of the data obtained during this survey is considered good. The reference site confirmation test using the program MONITOR and the daily DGPS performance checks conducted in the field were adequate.

J SHORELINE

There are no photogrammetric source data available for this survey. The shoreline shown in brown on the smooth sheet were taken from the latest editions of NOS charts 18421 and 18431 for orientation purposes only.

Some changes and new features in the area were noted during this survey. A few more rocks were found situated further offshore of the already charted rocks. The existence of the presently charted rocks were adequately verified in the field. The changes in the present configuration of the ARCO and INTALCO piers including a newly located small pier were shown in red on the smooth sheet. These features have been adequately depicted on the AutoCad generated smooth sheet based on the latest survey information. Further discussions concerning shoreline changes noted during this survey is included in the hydrographer's report.

K CROSSLINES

Crosslines are discussed in the hydrographer's report.

L JUNCTIONS

Survey H-10626 junctions with the following surveys.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H-10608	1995	1:10,000	South

The junctions with survey H-10608 is complete. The depth curves and soundings within the junction area are in satisfactory agreement.

M COMPARISON WITH PRIOR SURVEYS

Survey H-10626 was compared with the following prior surveys.

H-7962 (1953), scale 1:10,000
H-8481 (1959), scale 1:10,000
H-8518 (1960), scale 1:10,000
H-9281WD (1972), scale 1:20,000

Comparisons with prior surveys H-7962, H-8481 and H-8518 are considered good. There

has been only minor changes within the common area. The soundings generally agree within 0.3 fathom. The present survey was accomplished with more accurate positioning and depths determination supplemented by sonar investigation. No significant changes in the bottom configuration of the area were noted during this survey.

The prior wire drag surveys H-9281WD is common to the area of hydrography and side scan sonar investigation conducted during this survey. Survey H-9281WD is recommended for supersession based on the adequacy of the recent sonar coverage to supplement the basic hydrography within the common area.

The above prior surveys cover the entire area of the present survey. However, the present survey specification defines the inshore limit of soundings to be the 5-fathom (9-meter) depth curve. With the exception of the few rocks located during this survey, the soundings and features within the area of the exclusion zone between the present hydrography and the high water line are assumed not to be superseded.

H-10626 is adequate to supersede the prior surveys within the common area.

N. ITEM INVESTIGATIONS

AWOIS items 52184, 52185, 52186, and 52187 were investigated during this survey. Discussion and disposition of these items are included in the hydrographer's report.

O. COMPARISON WITH CHART

Survey H-10626 was compared with the following charts.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>	<u>Datum</u>
18421	39th	July 22, 1995	1:80,000	NAD83
18431	3rd	July 31, 1993	1:25,000	NAD83

a. Hydrography

Charted hydrography originates with the previously mentioned prior surveys and miscellaneous sources and requires no further discussion.

The sewer line charted at latitude 48/50/22N, longitude 122/43/00W, was found during shoreline verification, however, no positional information was obtained in the field. The area was inaccessible due to thick concentration of kelp around the offshore end of the sewer line. It is recommended that it be retained as charted.

The charted pier at latitude 48/51/18N, longitude 122/43/57W, was not found during this survey and no evidence of such structure was observed around the charted position of the

feature. However, a pier with conveyor belt in ruins connected to a dolphin at its offshore end was located in the vicinity of the presently charted pier. It is recommended that the charted pier be deleted and the newly located pier with a dolphin be charted as shown on the smooth sheet.

The adequacy of the side scan sonar and echo-sounding coverages accomplished during this survey resulted in the recommended supersession of the presently charted wire drag information and deletion of the charted green tint, denoting wire drag coverage, within the common area.

Survey H-10626 is adequate to supersede charted hydrography within the common area of coverage.

P. ADEQUACY OF SURVEY

The hydrography on survey H-10626 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.

An adequate side scan sonar (SSS) coverage was undertaken during this survey to supplement the basic hydrography and supersede the presently charted wire drag information within the area.

Hydrography on survey H-10626 was acquired in the field in meters while the AutoCAD generated smooth sheet was compiled in fathoms to conform to the sounding units of the existing charts of the area.

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 Procedure Manual, April 1994 Edition.

Survey H-10626 adequately complies with the project instructions.

Q. AIDS TO NAVIGATION

There are four (4) existing pier lights and six (6) mooring buoys privately maintained by ARCO and INTALCO located within the survey area. These aids were located using DGPS positioning system. They were found in good condition and adequately serve their intended

purpose.

<u>Name of Aid</u>	<u>Lt. List#</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>	<u>NAD83</u>
INTALCO North Light	19895	48/50/31.38	122/43/19.46	
INTALCO South Light	19895	48/50/22.44	122/43/15.47	
ARCO Light A	19900	48/51/36.99	122/45/21.90	
ARCO Light B	19905	48/51/42.88	122/45/33.74	
ARCO Mooring Buoy A		48/51/43.18	122/45/36.58	
ARCO Mooring Buoy B		48/51/34.98	122/45/33.11	
ARCO Mooring Buoy C		48/51/35.01	122/45/20.58	
ARCO Mooring Buoy D		48/51/41.09	122/45/19.21	
INTALCO Mooring Buoy N		48/50/30.48	122/43/26.07	
INTALCO Mooring Buoy S		48/50/24.32	122/43/23.28	

R. STATISTICS

Statistics are itemized in the hydrographer's report.

S. MISCELLANEOUS

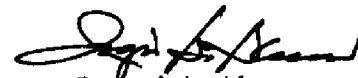
Miscellaneous information concerning this survey is discussed in the hydrographer's report. There were no additional miscellaneous items noted during office processing.

T. RECOMMENDATIONS

Survey H-10626 is a good hydrographic survey and no additional field work is required.

U. REFERRAL TO REPORTS

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



Isagani A. Almacén
Cartographer

APPROVAL SHEET
H-10626

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

Bruce A. Olmstead Date: July 2, 1996
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 Timmons Date: July 10, 1996
Kathy Timmons
Commander, NOAA
Chief, Pacific Hydrographic Branch

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Final Approval

Approved:

Andrew A. Armstrong III Date: Aug 22, 1996
Andrew A. Armstrong III
Captain, NOAA
Chief, Hydrographic Surveys Division

