

H110621

NOAA FORM 78-35A

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

DESCRIPTIVE REPORT

Type of Survey ..... Navigable Area  
Field No. .... PHP-10-3-95  
Registry No. .... H-10621

LOCALITY

State ..... Washington  
General Locality ..... Strait of Georgia  
Sublocality ..... Sandy Point to Point Migley

.....  
1995-96  
.....  
CHIEF OF PARTY  
LT Richard A. Fletcher, NOAA

LIBRARY & ARCHIVES

DATE ..... AUG 10 1996

**HYDROGRAPHIC TITLE SHEET**

H-10621

**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-10-3-95

State Washington

General locality Strait of Georgia

Locality Sandy Point to Point Migley

Scale 1:10,000 Date of survey 1/11/96 to 1/12/96  
8/1/95 to 11/2/95

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 R.Fletcher, LTJG E.Berkowitz, ST K.Simmons, ST R.Adams, ET E.Wernicke

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

Graphic record scaled by PHP Personnel

Graphic record checked by PHP Personnel

Evaluation by: I. Almacen

Produced by I. Almacen Automated plot by HP Design Jet 650C Plotter

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

Soundings in Fathoms and tenths  
~~fathoms~~ ~~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

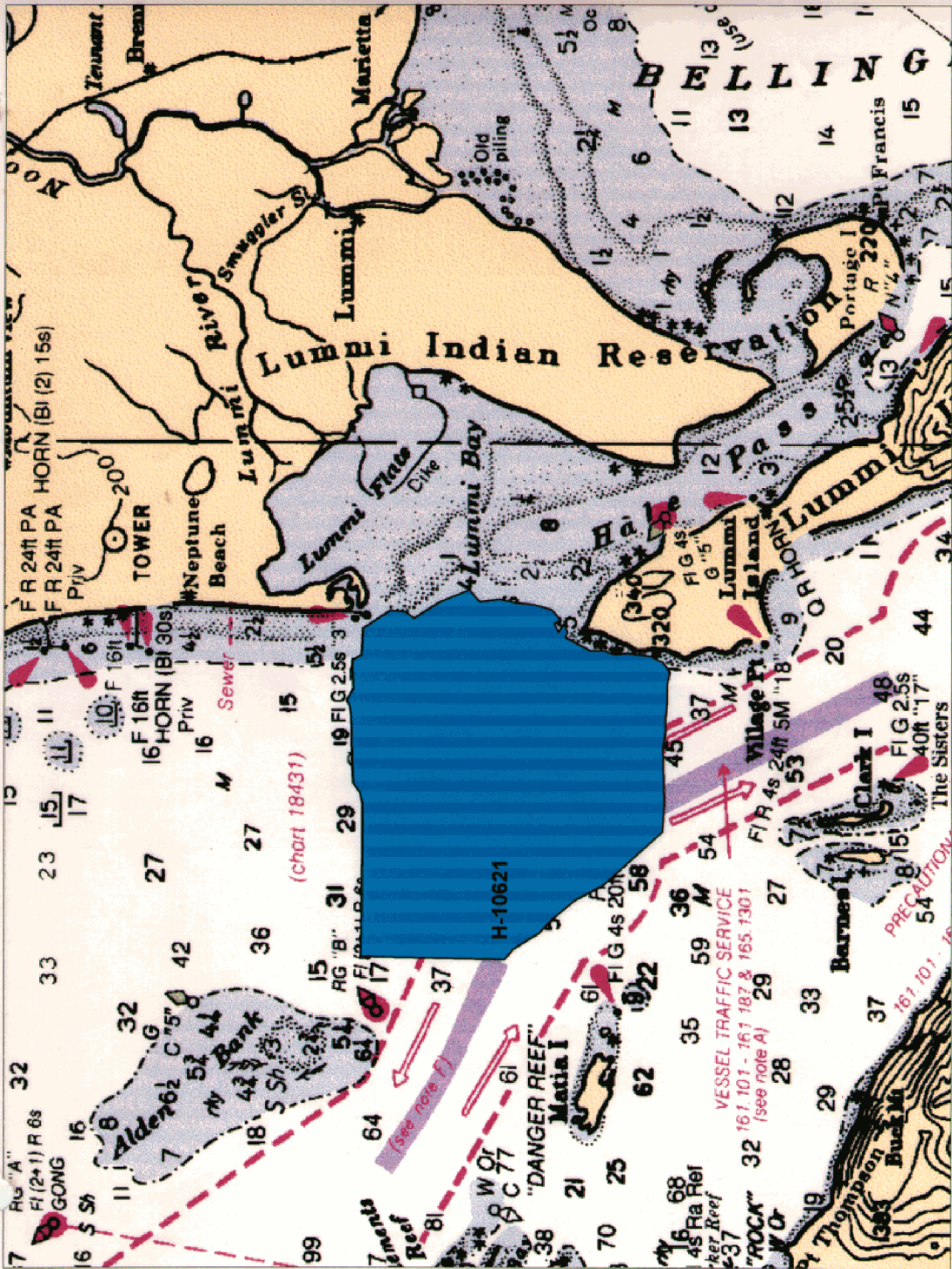
or non-sequential.

All depths listed in this report are referenced to mean lower low

water unless otherwise noted.

*DSC 8-13-96*

*AWAIS/SURF ✓ 8/20/96 by MDA*



## Descriptive Report to Accompany Hydrographic Survey H-10621

Field Number PHP 10-3-95  
Scale 1:10,000  
1995

Pacific Hydrographic Party  
Chief: LT Richard A Fletcher

### A. PROJECT ✓

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-N247-PHP, Cherry Point, Washington, issued ~~October 14, 1994~~  
*February*

The project was authorized in response to requests from the Puget Sound Pilots, the Thirteenth Coast Guard District and the NOS Office of Ocean and Coastal Resource Management. The objective is to update the charted hydrography which dates from 1953 and 1960 surveys and to supercede the charted wire drag clearance depths dating from 1972.

A portion of the project area is a bight occupied by three large piers: a TOSCO Northwest Refinery pier, a pier serving ARCO Petroleum and a pier owned by Intalco Aluminum Corporation. These commercial facilities are used for receipt of crude oil, aluminum and liquefied petroleum gas, shipment of petroleum products, and bunkering vessels. They host tankers with standard drafts of 56 feet.

The project area encompasses an anchorage as well as routes for approaches to and departures from the bight; it also includes a turning basin and traffic lanes for vessels transiting the area. The project area is environmentally sensitive and has a high volume of cargo and traffic.

This is the third survey for the project and it covers the south third of the project area from Sandy Point southward to Fern Point on Lummi Island. It includes most of precautionary area "CA," a circular area of 2,500 yards radius centered at latitude 48°45'19"N, longitude 122°46'26"W. The sheet letter is "C" as specified by the project instructions; registry number is H-10621; designation: Sandy Point to Point Migley, Strait of Georgia, Washington.

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

The area surveyed for H-10621 extends from longitude 122°48'00.0"W, east to longitude 122°42'35"W. North limit is latitude 48°47'10"N; south limit is latitude 48°43'56"N. Hydrographic limit on the west side extends due south from the northwest corner to latitude 48°45'37"N then turns SE ending at latitude 48°43'56"N, longitude 122°46'00"W. The east hydrographic limit extends SSW from the northeast corner to Point Migley, then follows the shoreline to the south sheet limit. The plotter sheet skew is 0° with overall sheet limits measuring 58.5 cm by 80 cm.

Data acquisition was conducted from August 1, 1995, (DN 213) through January 12, 1996 (DN 011).

### C. SURVEY VESSELS ✓

NOAA Launch 1101 (EDP No. 0651), a 29-foot Jensen was used for side scan sonar operations, crosslines, detached positions, bottom samples and development hydrography. NOAA Launch 1102 (EDP No. 0652), a 21-foot SeaArk, was used for development hydrography. No changes to the standard vessel sounding configuration were necessary for either vessel.

### D. AUTOMATED DATA ACQUISITION AND PROCESSING ✓

Version 5.20 of the Hydrographic Data Acquisition System (HYPACK) software was used for all data acquisition. HYPNOAA. A program written by Hydrographic Surveys Division, Systems Support Branch, N/CS3, was 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	5.20	1995	Data Acquisition
VELOCITY	2.21	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	1.00	1993	GPS ellipsoidal elevation
SVP	2.30	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

The towfish was operated on the 100 kHz frequency and was configured with a 20° beam depression. It was deployed from the aft starboard quarter using a Kevlar cable passed through a block and powered by a Superwinch Model W115. Block and winch were mounted to a swing-arm davit. The Kevlar cable was connected to the EG&G recorder cabling with a slip-ring assembly cable. Tape markings at measured intervals indicated length of cable deployed from the block up to 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 a range scale of 100 meters. At higher range scales the speed was maintained at 4 knots or slower. Range scales of 75, 100, 150 and 200 meters were used. The SSS towfish was maintained at a height off the bottom equivalent to 8 to 20 percent of the range scale except where depths exceeded the limits of the cable or when depths shoaled quickly. In such cases, the hydrographer believes the resolution of the sonargram is adequate for identification of any significant contacts. Inshore limit of SSS data collection was the 5-fathom/9-meter curve. The 20-fathom/36-meter curve was the limit of 200% SSS coverage; 100% coverage was extended to the 30-fathom/55-meter curve. ✓

Track lines for 100% coverage were oriented across the contours at 54° with 150-meter line spacing. Lines for 200% coverage were oriented perpendicular to the 100% lines. An exception to the pattern occurs in the NE corner of the survey where lines representing 100% coverage were oriented N/S with 200-meter line spacing. To facilitate cross-referencing of contacts, fix numbers for 100% coverage begin at 5,000; fix numbers for 200% coverage begin at 10,000. ✓

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

Following guidelines in Section 7.3.2 of Project Instructions, sonargrams were manually scanned for significant contacts; these were labeled and entered into twelve HDAPS contact tables. Where contacts appeared in a cluster on the sonargram, only the most significant was entered. Apparent significance was determined with the PHP-developed Contact-O-Meter, a scale proportioned for shadow length and fish height. Contact heights and raw depths were derived using the HDAPS Side Scan Utility Program and all contacts with heights  $\geq 1.0$  meter were plotted. ✓

The HDAPS "group" function was used to identify duplicate contacts within a 15-meter radius and to evaluate all contacts within a 30-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 navigationally 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 18431 is the largest-scale chart of the area and is published at 1:25,000; thus, a radius of 65 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. More than 75 contacts were developed. ✓

At the completion of contact development, contacts were resifted. At chart scale five contacts were flagged "\*SIG-O." One of these (6746.60P) was inshore of the survey limits. The remaining four appeared on the sonargrams representing the along-contour 200% coverage: 11104.8P, 11380.9P, 11540.6S and 11700.5S. Offsets were less than 20 meters: 19, 15, 16, and 5 meters, respectively; and none had an identifiable match in the 100% coverage. Twenty contacts were flagged "#SIG-I." Of these, fourteen had been developed with surveyed heights substantially less than computed heights (see annotations on sifting printouts in Separate V); and three were duplicates of the developed contacts. The three remaining contacts were re-evaluated: (1) Contact 11103.9P (computed height 2.0 meters, offset 18 meters) was cross-referenced with contact 6576.87P (computed height 1.5 meters, offset 29 meters). The two contacts are 4.9 meters apart and the latter was flagged "NS-D" indicating a more significant depth within 65 meters. Given the offset and the cross-contour orientation of the latter contact, the hydrographer believes its computed height is the more accurate and, therefore, accepts its disposition for both contacts. (2) Contact 11253.3S (computed height 2.3 meters, offset 10 meters) had no match within a 30-meter radius. A review of the sonargrams covering this radius supports the conclusion that the height was exaggerated due to the combination of offset and line orientation. (3) Contact 6576.40S (computed height 1.6 meters, offset 72 meters) had no match within a 15-meter radius; however, it is 19 meters from contact 11102.3P (computed height 1.5 meters) which was developed. The hydrographer is satisfied that all significant contacts have been satisfactorily resolved. ✓

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

## F. SOUNDING EQUIPMENT ✓

Innerspace Model 448 (IN-448) single frequency echosounder, Serial Number 239, modified with custom EPROMS for HDAPS, was used on Vessel No. 0652 from DN 292 to DN 012.

\* *Filed with the Survey records.*

Raytheon, dual-frequency, Digital Sounding Fathometer (DSF) 6000N, Serial Number A221N, was used on Vessel No. 0651 from DN 213 to DN 306. 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.

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 -1.1 meters (Pos. No. 20019, DN 306) to 110.3 meters (Pos. No. 552, DN 213) based on predicted tides. *The smooth sheet is plotted in Fathoms based on actual 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.

## G. CORRECTIONS TO SOUNDINGS ✓

### Velocity of Sound

Corrections for the speed of sound through the water column were computed from data obtained with sound velocity probes. The Applied Microsystems Laboratories (AML) Velocity of Sound Profiler S/N 03042 was used for all casts. The VELOCITY Program was used to determine the speed of sound correctors. Data from the following casts were used to determine the velocity correctors: *Velocity Tables 6 and 7 plot outside the survey limits.*

HDAPS Table	DN	DN Range	Extrapolated Depth	Cast Position	
				Latitude	Longitude
6	208	213-218	115.0m	48°49'12"N	122°48'12"W
7	219	219-234	135.9m	48°45'06"N	122°48'00"W
8	235	235-243	133.5m	48°44'48"N	122°46'48"W
9	244	244-256	117.4m	48°45'26"N	122°46'24"W
10	257	257-276	118.7m	48°45'15"N	122°46'47"W
11	277	277-292	117.1m	48°45'18"N	122°46'54"W
12	293	293-306	116.0m	48°45'15"N	122°47'15"W
15	011	011-012	30.2m	48°45'35"N	122°45'00"W

\* *Filed with the survey records.*



Separate IV<sup>\*</sup> contains copies of all velocity cast data and HDAPS Velocity Corrector Tables.

The AML instruments were calibrated by Northwest Regional Calibration Center on April 15, 1994 (DN 105). Copies of these calibration reports are 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 March 20, 1995 (DN 102). First, the depth of the transducer face from a reference mark on the hull was measured. Next, with the launch in the water (fuel tanks half full and two 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 May 3, 1994, (DN 123) using a method similar to above.

#### Dynamic Draft ✓

Settlement and squat measurements for VN 0652 were conducted on April 5, 1994, (DN 095) in Guemes Channel at Pier 1 in Anacortes, WA. Settlement and squat measurements for VN 0651 were conducted on March 20, 1995, (DN 080) in Port Angeles Harbor.

Vessel 0652 was configured for side scan sonar operations on January 8, 1996, (DN 008) and settlement and squat corrections were recalculated base 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<sup>\*</sup> corresponds to VN 0651; Offset Table 2<sup>\*</sup> corresponds to VN 0652. Offset Table 3<sup>\*</sup> corresponds to VN 0652 equipped with side scan sonar. Settlement and squat correctors are reapplied during field processing using the REAPPLY program in HDAPS.

#### Corrections to Echosoundings ✓

Problems with misdigitization occurred repeatedly with the Innerspace 448 echosounder, primarily because of suspended particles in deep water but also where bottom topography was both very steep and very deep. Where the echogram trace was adequate and unambiguous, the digital record was corrected to reflect the analog trace. The DSF 6000 occasionally produced a discontinuous bottom trace when echosounding over features with abrupt changes in height. Where this occurred, the sonargram was reviewed along with the supplemental

*\* Filed with the survey records.*

digital data available in Graphic Edit. If sufficient information was available to support insertion of a selected sounding, that sounding was inserted. If not, it was deselected. *Data was analyzed during survey processing and found to contain no significant problems.*

#### Tide Correctors ✓

In compliance with Section 5.9 of Project Instructions, the existing primary tide station at Cherry Point, Washington, (944-9424) was used as the reference station for predicted tides. Predicted tides were adjusted with a time correction of -12 minutes and a range ratio of 0.92 and applied to soundings during field processing.

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

#### Horizontal Datum ✓

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). A copy of the HDAPS Control Station Table is included in <sup>*this report*</sup> Appendix III (List of Horizontal Control Stations). A separate Horizontal Control Report OPR-N247-PHP, Point Migley to Cherry Point, was submitted to PHB in July 1995. \*

Two DGPS performance check stations were established to Third Order, Class 1, standards: (1) the USCG pier at Bellingham and (2) Sandy Point Light 3 (LLN 19886).

### I. HYDROGRAPHIC POSITION CONTROL ✓

#### Position Control ✓

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The following beacons were used during hydrographic operations:

<u>Reference Station</u>	<u>Frequency</u>
Pt. Atkinson, Vancouver, B.C.	320 kHz
Race Rocks, Victoria, B.C.	309 kHz
USCG Beacon, Whidbey Island, WA	302 kHz

Per FPM, Section 3.4.6.3, the reference sites were 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). \*

*\* Filed with the survey records.*

DGPS Performance Checks ✓

DGPS performance checks were obtained per FPM, Section 3.4.4.1, using the sites established at the USCG pier at Bellingham and at Sandy Point Light. All DGPS performance checks were successful; check forms are located in Separate III. \*

Positioning Equipment ✓

The following GPS equipment was used:

<u>Equipment Location</u>	<u>Type of Receiver/Antenna</u>	<u>Receiver Serial No.</u>	<u>Antenna Serial No.</u>
VN 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.\*

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

Although photogrammetry of the project area has been flown under project DM-9304, compilation of the data will not be available until early 1996 according to Section 4.1.1 of the Project Instructions. NOS Chart 18431 (1:25,000) was assigned as shoreline source for this survey. To facilitate verification in the field, PHP created an electronic shoreline document based on Chart 18431. The chart was scanned and imported into Mapinfo; a trace of the shoreline was created on the cosmetic layer, saved as a DXF file and imported into HYPACK. ✓  
A laptop computer with a CDROM drive was set up adjacent to the data acquisition system (DAS). The Ashtech DGPS data cable was split and both the DAS and the laptop received the same signal via a "black box" designed by PMC EED. As the launch moved along the shoreline its position was displayed over a raster image of the chart. Correctly charted features were easily verified and uncharted features or items requiring disapproval were also readily apparent.

Two charted rocks with depths unknown were positioned and heights were measured with sounding pole (DP 20018 and DP 20019). <sup>Two (2)</sup> One uncharted rock was also positioned: DP 20019 & 20020. ✓  
*Pos. # 20018 - 48/44/39.12 N, 122/43/02.60 W; Pos # 20019 - 48/44/35.66 N, 122/43/04.42 W;  
Pos # 20020 - 48/44/23.31 N, 122/43/11.60 W; Pos # 20020 - 48/44/14.64 N, 122/43/12.82 W.*

No kelp was visible along shore within the survey area and all kelp symbols should be removed. *Concur.*

\* Filed with the survey records.

## K. **CROSSLINES** ✓

The 200% side scan sonar coverage was run perpendicular to 100% coverage and represents 53.78 nautical miles of crossline. An additional 7.23 nautical miles of crosslines were run over echosounder hydrography. Total crossline mileage is 61.01 or 39% of the mainscheme hydrography on H-10621. Agreement is excellent.

## L. **JUNCTIONS** (See EVAL RPT., Sec. L)

H-10621 joins H-106<sup>08</sup>20 at the north end. Sheet limits as drawn by HSB included generous overlap and data was initially collected to the limits indicated on the chart blowup. When it became apparent that this overlap was excessive and could not be accommodated on a 24" plotter, the northern limit of the hydrography was reduced. Agreement is good. *Concur.*

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

A cursory comparison of soundings with H-8323 and H-8322 (1956), and ~~H-5711(1934)~~ indicates contours are relatively unchanged. A more rigorous comparison will be performed by Pacific Hydrographic Branch following the application of smooth tides.

## N. **ITEM INVESTIGATION REPORTS** (See Eval Rpt., Section N.)

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

N1	AWOIS Item 52176
N2	AWOIS Item 52177
N3	AWOIS Item 52178
N4	AWOIS Item 52179
N5	AWOIS Item 52180
N6	AWOIS Item 52181
N7	AWOIS Item 52182
N8	20.2-meter sounding

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

This survey was compared to a 1:10,000-scale enlargement of Chart No. 18421, 1:80,000, 38th Edition, October 29, 1992. In addition, soundings were plotted at 1:25,000 for comparison with Chart 18431. The Pacific Hydrographic Branch will perform a follow-up comparison after smooth tides have been applied.

### Dangers to Navigation ✓

One danger to navigation was identified within the limits of this survey: An obstruction rising four meters from the bottom was observed at latitude 48°45'37.064"N, longitude 122°45'04.507"W (Pos. No. 11787+1, DN 264). Least depth of the obstruction is 20.1 meters/11 fathoms. Surrounding soundings from H-8323 are 13, 14 and 15 fathoms (23.7, 25.6, and 27.4 meters). *Additional investigation of this feature was conducted on DN 011; see Item Investigation Report N8. (See EML RPT., Sec. N)*

### Comparison of Soundings ✓

Inshore of the danger to navigation detailed above, a second, small shoal area was located 240 meters to the east. Anchored by a 20.3-meter/11-fathom sounding located at latitude 48°45'33.615"N, longitude 122°44'52.608"W (Pos No. 15834+2), the shoal forms a triangle extending 50 meters NE to a 21.5-meter/11.7-fathom sounding at latitude 48°45'34.829"N, longitude 122°44'51.002"W (Pos. No. 15764+1) and 60 meters NNW to a 21.4-meter/11.7-fathom sounding at latitude 48°45'35.551"N, longitude 122°44'52.794"W (Pos. No. 15787+1).

All other soundings and contours are in excellent agreement with the chart. *Concur.*

### Comparison of non-Sounding Features ✓

With the exception of two floating navigational aids described in Section Q and the rocks along shore discussed in Section J, no non-sounding features were observed during this survey. The area is remarkable, however, for strong and variable currents. Current lines were observed throughout the survey and the sandy bottom areas are distinguished by large sand waves. *(See note on the smooth sheet)*

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

This survey is a complete navigable area hydrographic survey and is adequate to supercede all prior surveys within their common areas. Two hundred percent side scan sonar coverage from the 5-fathom/9-meter curve to the 20-fathom/36.6-meter curve and 100% coverage extended to the 30-fathom/55 meter curve <sup>was conducted to search for</sup> ~~ensure that no unknown hazards exist~~ within these area. With the acquisition of side scan sonar coverage, this survey is also adequate to supercede all wire drag clearances within its limits as they appear on Charts 18431 and 18421. *Concur.*

## Q. AIDS TO NAVIGATION ✓

Two floating aids to navigation were verified in accordance with Section 4.2.3:

Navigational Aid	Latitude	Longitude
Point Migley Lighted Buoy LLN 19315 (Pos. No. 20026)	48°45'16.294"N	122°43'27.907"W
Traffic Lane Separation Lighted Buoy "CA" LLN 19535 (Pos. No. 20022)	48°45'21.638"N	122°46'33.157"W

The "CA" separation buoy is equipped with Racon; signal M(-) This is recorded on the Light List but is not indicated on the chart. The Racon was confirmed during hydrography and should be annotated on the chart. *Concur.*

## R. STATISTICS

<u>Description</u>	<u>Quantities</u>
Total Positions	11886
Total Detached Positions	4
Total Nautical Miles Hydrography	260
Nautical Miles Side Scan Hydrography	122
Square Nautical Miles Hydrography	8
Velocity Casts	7
Days of Production	24
Bottom Samples	13
Tide Stations	0

## S. MISCELLANEOUS ✓

Bottom samples were acquired 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. \*

\* *Filed with the survey records.*

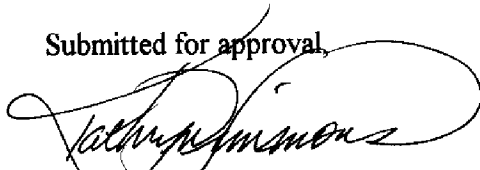
**T. RECOMMENDATIONS** ✓

The combination of having no digital shoreline and having a chart blowup of the smallest-scale chart of the area complicated shoreline verification as well as sounding comparisons. The hydrographer recommends that chart blowups be provided at the largest-scale chart of the area whenever possible and, especially, when current digital shoreline is not available, *Concur*

**U. REFERRAL TO REPORTS**

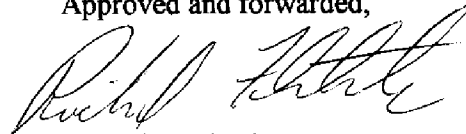
<u>Title</u>	<u>Date</u>
Horizontal Control Report OPR-N247-PHP	July 1995
Coast Pilot Report	To follow

Submitted for approval,



Kathryn Simmons  
Survey Technician

Approved and forwarded,



Richard A. Fletcher  
Lieutenant, NOAA  
Chief of Party

## ITEM INVESTIGATION REPORT

<b>ITEM NO.:</b>	N1 AWOIS Item #52176 ✓	<b>CHART NO.:</b>	18431 (1:25,000)
<b>SURVEY:</b>	H-10621	<b>EDITION:</b>	3rd Edition
		<b>CHART DATE:</b>	July 31, 1993

**DESCRIPTION:** Wire drag hang on bottom at 72 feet (21.9 meters); cleared by 61 feet (18.6 meters). Charted as a 10.5-fathom (19.2-meter) sounding.

**SOURCE OF ITEM:** H9282/72WD, OPR-412-DA-72-WD.

**SOURCE POSITION:** latitude 48°45'08.38"N  
longitude 122°44'15.16"W

**SURVEY REQUIREMENTS:** Full investigation in normal course of side scan sonar and echosounder coverage/development.

**METHOD OF INVESTIGATION:** 200% Side Scan Sonar, Pos. Nos. 5180-5185, 5215-5220 (DN 222); Pos Nos. 5880-5885 (DN 244); Pos Nos. 11525-11530, 11600-11605, 11693-11698 (DN 264). Echosounder development, Pos Nos. 15873-15930 (DN 277), 17342-17380 (DN 297)

**RESULTS OF INVESTIGATION:** A number of small contacts were located in the general vicinity of the target. The nearest, at a distance of 85 meters, was 5181.60P which was developed on DN 277 (Pos. Nos. 15873-15930). A least depth of 20.3 meters/11.1 fathoms at MLLW was located at latitude 48°45'09.225"N 122°44'11.040"W (Pos. No. 15918+1).

**COMPARISON WITH PRIOR SURVEYS:** H9282 indicates a bottom hang at 72 feet (21.9 meters/12 fathoms), a cleared depth of 61 feet (10.1 fathoms/18.6 meters), and an actual depth of 65 feet (10.8 fathoms/19.8 meters). The soundings acquired with H8323 are consistent with those obtained with this current survey.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:** Chart 18431 depicts a wire drag clearance of 10.2 fathoms at the AWOIS location. Chart 18421 depicts the cleared depth as an obstruction with a known depth of 10.5 fathoms. Remove the wire drag clearances from Chart 18431. Delete the obstruction charted at latitude 48°45'08.38"N, longitude 122°44'15.16"W on 18421. Chart the soundings from this survey. *Concur.*



## ITEM INVESTIGATION REPORT

**ITEM NO.:** N2  
AWOIS Item #52177 ✓  
**SURVEY:** H-10621

**CHART NO.:** 18421 (1:80,000)  
**EDITION:** 38th Edition  
**CHART DATE:** October 31, 1992

**DESCRIPTION:** Wire drag grounding at 97 feet (29.6 meters). Cleared by 71 feet (21.6 meters). Charted as a 12-fathom wire drag clearance.

**SOURCE OF ITEM:** H9282/72WD, OPR-412-DA-72-WD

**SOURCE POSITION:** latitude 48°45'39.60"N  
longitude 122°45'20.52"W

**SURVEY REQUIREMENTS:** Full investigation. Resolve in normal course of side scan sonar coverage and echosounder coverage/development.

**METHOD OF INVESTIGATION:** 200% Side Scan Sonar, Pos. Nos. 6037-6042, 6045-6050, 6202, 6207 (DN 248) and Pos. Nos. 11790-11795, 11814-11819 (DN 264). Echosounder development, Pos. Nos. 15141-15241 (DN 277).

**RESULTS OF INVESTIGATION:** Three contacts were located in the vicinity of the target: Contact 6048.49P with a computed height of 3.6 meters and a calculated position 18.8 meters from the target was developed on DN 277, Pos. Nos. 15141-15217. A 2-meter feature with a top depth of 30.9 meters was located on a slope (Pos. No. 15149). Contact 6050.13, 104 meters ENE from the target was also developed on DN 277, Pos. Nos. 15218-15241. A 1.3-meter feature with a least depth of 26.3 meters was located at latitude 48°45'41.041"N, longitude 122°45'16.124"W, Pos. No. 15240.0. Contact 11817.5S with a computed height of 3.2 meters and a calculated position 17 meters from 6048.49P was not developed separately. Contacts and AWOIS item are located on a steep slope rising from 45 meters to 26 meters over 150 meters.

**COMPARISON WITH PRIOR SURVEYS:** On H-9282 the position of the charted sounding lies within the overlap of the 71-foot (11.8-fathom/21.6-meter) clearance drag and the 89-foot (14.8-fathom/27.1-meter) clearance drag. The soundings acquired by prior survey H-8323 are consistent with those obtained by this current survey.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:** Chart 18431 depicts a wire drag clearance of 11.5 fathoms in a narrow gap between a 16-fathom clearance drag and a 14.5-fathom drag. Chart 18421 depicts the cleared depth as an obstruction with a known depth of 12 fathoms. Remove the wire drag clearances from Chart 18431; delete the obstruction charted at latitude 48°45'39.60"N, longitude 122°45'20.52"W on 18421. Chart the soundings from this survey. *Cover.*

## ITEM INVESTIGATION REPORT

**ITEM NO.:** N3  
AWOIS Item #52178 ✓  
**SURVEY:** H-10621

**CHART NO.:** 18421 (1:80,000)  
**EDITION:** 38th Edition  
**CHART DATE:** October 31, 1992

**DESCRIPTION:** Wire drag grounding at 107 feet (32.6 meters). Cleared by 89 feet (27.1 meters). Charted as a 15-fathom wire drag clearance.

**SOURCE OF ITEM:** H9282/72WD, OPR-412-DA-72-WD

**SOURCE POSITION:** latitude 48°45'49.32"N  
longitude 122°45'30.60"W

**SURVEY REQUIREMENTS:** Full investigation. Resolve in normal course of side scan sonar coverage and echosounder coverage/development.

**METHOD OF INVESTIGATION:** 200% Side Scan Sonar, Pos. Nos. 6213-6218, 6372-6377, 6387-6392 (DN 248) and Pos. Nos. 11797-11802, 11806-11812, 11825-11830 (DN 264). Echosounder development, Pos. Nos. 15242-15339, (DN 277).

**RESULTS OF INVESTIGATION:** Five contacts were located in the vicinity of the target: Contact 11826.9P with a computed height of 2.9 meters was developed on DN 277, Pos. Nos. 15242-15276. A one-meter feature with a top depth of 31.3 was located (Pos No. 15249+1); however, a shoaler depth of 28.9 meters/15.8 fathoms was located at latitude 48°45'48.076"N, longitude 122°45'31.831"W, (Pos. No. 15321+1) during development over the reported AWOIS position on DN 277.

**COMPARISON WITH PRIOR SURVEYS:** H-9282 depicts a wire drag with clearance depth of 89 feet (14.8 fathoms/27.1 meters). The soundings acquired by prior survey H-8323 are consistent with those obtained by this current survey.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:** Chart 18431 depicts a wire drag with a cleared depth of 14.5-fathoms. Chart 18421 depicts the cleared depth as an obstruction with a known depth of 15 fathoms. Remove the wire drag clearances from Chart 18431 and delete the obstruction charted at latitude 48°45'49.32"N, longitude 122°45'30.60"W on Chart 18421. Chart the soundings from this survey. *Concur.*

## ITEM INVESTIGATION REPORT

**ITEM NO.:** N4  
AWOIS Item #52179 ✓  
**SURVEY:** H-10621

**CHART NO.:** 18421 (1:80,000)  
**EDITION:** 38th Edition  
**CHART DATE:** October 31, 1992

**DESCRIPTION:** Wire drag grounding at 71 feet (21.6 meters/11.8 fathoms). Cleared by 60 feet (18.2 meters/10.0 fathoms). Charted as a 10-fathom wire drag clearance.

**SOURCE OF ITEM:** H9282/72WD, OPR-412-DA-72-WD.

**SOURCE POSITION:** latitude  $48^{\circ}45'49.32''N$   
longitude  $122^{\circ}45'30.60''W$

**SURVEY REQUIREMENTS:** Full investigation in normal course of side scan sonar and echosounder coverage/development.

**METHOD OF INVESTIGATION:** 200% Side Scan Sonar, Pos. Nos. 6057-6063, 6188-6193 (DN 248), 11461-11465, 11490-11500, 11632-11637 (DN 264). Echosounder development, Pos Nos. 15340-15486 (DN 277), Pos Nos. 17796-17869 (DN 303).

**RESULTS OF INVESTIGATION:** A number of contacts were located in the general vicinity of the AWOIS item. The two with the highest computed heights were developed: 6191.87S, computed height 2.2 meters, was developed on DN 277 (Pos. Nos. 15340-15395). A 1.5-meter feature with a top depth of 21.2 meters (Pos. No. 15346+1) was located at latitude  $48^{\circ}44'54.880''N$ , longitude  $122^{\circ}44'58.931''W$ . Contact 6193.42, computed height 2.2 meters, was also developed on DN 277 (Pos. Nos. 15396-15420). A 1.5-meter feature with a top depth of 20.8 meters/11.4 fathoms was located at latitude  $48^{\circ}45'51.571''N$ , longitude  $122^{\circ}44'59.008''W$  (Pos No. 15419+1).

**COMPARISON WITH PRIOR SURVEYS:** H-9282 depicts a wire drag with a clearance of 60 ~~meters~~ <sup>feet</sup> (10 fathoms/18.3 meters) at the target location. The soundings acquired by prior survey H-8323 are consistent with those obtained by this current survey.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:** Chart 18431 depicts a wire drag clearance depth of 10 fathoms. Chart 18421 depicts the cleared depth as an obstruction with a known depth of 10 fathoms. Remove the wire drag clearances from Chart 18431; delete the obstruction charted at latitude  $48^{\circ}45'49.32''N$ , longitude  $122^{\circ}45'30.60''W$  on 18421. Chart the soundings from this survey. *Concl.*

## ITEM INVESTIGATION REPORT

**ITEM NO.:** N5  
AWOIS Item #52180 ✓  
**SURVEY:** H-10621

**CHART NO.:** 18421 (1:80,000)  
**EDITION:** 38th Edition  
**CHART DATE:** October 31, 1992

**DESCRIPTION:** Wire drag grounding at 90 feet (27.4 meters). Cleared by 70 feet (21.3 meters). Charted as an 11-fathom wire drag clearance.

**SOURCE OF ITEM:** H-9181/72WD and H9282/72WD, OPR-412-DA-72-WD

**SOURCE POSITION:** latitude 48°46'06.60"N  
longitude 122°45'01.80"W

**SURVEY REQUIREMENTS:** Full investigation. Resolve in normal course of side scan sonar coverage and echosounder coverage/development.

**METHOD OF INVESTIGATION:** 200% Side Scan Sonar, Pos. Nos. 6355-6365, 6400-6410 (DN 248); Pos. Nos. 6960-6970 (DN 263); and Pos. Nos. 11317-11322, 11485-11492 (DN 264). Echosounder development, Pos. Nos. 15581-15618 (DN 277).

**RESULTS OF INVESTIGATION:** No contacts were observed in the vicinity of the target. In the course of target development, a least depth of 29.2 meters was located 42 meters SE of the target at latitude 48°46'05.900"N, longitude 122°45'00.012"W (Pos. No. 15605). However, 134 meters SE of the target, a shallower depth of 26.9 meters was located in conjunction with SSS coverage at latitude 48°46'03.640"N, longitude 122°44'56.955"W (Pos. No. 11466).

**COMPARISON WITH PRIOR SURVEYS:** H-9281 indicates "bottom hung" at 90 feet (27.4 meters/15 fathoms); cleared at 72 feet. H-9282 depicts a wire drag clearance of 71 feet (11.8 fathoms/21.6 meters). The soundings acquired by prior survey H-8323 are consistent with those obtained by this current survey.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:** Chart 18431 depicts a wire drag clearance of 11.4 fathoms. Chart 18421 depicts the cleared depth as an obstruction with a known depth of 11 fathoms. Remove the wire drag clearances from 18431; delete the obstruction charted at latitude 48°46'06.60"N, longitude 122°45'01.80"W on 18421. Chart the soundings from this survey. *Concur*.

## ITEM INVESTIGATION REPORT

**ITEM NO.:** N6  
AWOIS Item #52181 ✓  
**SURVEY:** H-10621

**CHART NO.:** 18421 (1:80,000)  
**EDITION:** 38th Edition  
**CHART DATE:** October 31, 1992

**DESCRIPTION:** Wire drag grounding at 90 feet (27.4 meters/15 fathoms). Cleared by 72 feet (21.9 meters/12 fathoms). Charted as a 12-fathom wire drag clearance.

**SOURCE OF ITEM:** H9282/72WD, OPR-412-DA-72-WD.

**SOURCE POSITION:** latitude 48°46'12.36"N  
longitude 122°44'19.32"W

**SURVEY REQUIREMENTS:** Full investigation in normal course of side scan sonar and echosounder coverage/development.

**METHOD OF INVESTIGATION:** 200% Side Scan Sonar, Pos. Nos. 6075-6080, 6170-6175, 6245-6250 (DN 248); Pos. Nos. 10962-10967, 11038-11043 (DN 250); Pos Nos. 11860-11862 (DN 264). Echosounder development, Pos Nos. 15539-15580 (DN 277).

**RESULTS OF INVESTIGATION:** No contacts were located in the general vicinity of the AWOIS item. The least depth located during development hydrography is 28.5 meters (15.6 fathoms) at latitude 48°46'11.876"N, longitude 122°44'21.809"W (Pos. No. 15550).

**COMPARISON WITH PRIOR SURVEYS:** H-9281 indicates "bottom hung" at 90 feet (27.4 meters/15 fathoms); H-9282 depicts a wire drag with a clearance of 72 feet (12 fathoms/21.9 meters) at the target location. The soundings acquired by prior survey H-8323 are consistent with those obtained by this current survey.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:** Chart 18431 depicts a wire drag clearance of 12 fathoms. Chart 18421 depicts the cleared depth as an obstruction with a known depth of 12 fathoms. Remove the wire drag clearances from Chart 18431; delete the obstruction charted at latitude 48°46'12.36"N, longitude 122°44'19.32"W on 18421. Chart the soundings from this survey. *Concar.*

## ITEM INVESTIGATION REPORT

**ITEM NO.:** N7  
AWOIS Item #52182 ✓  
**SURVEY:** H-10621

**CHART NO.:** 18421 (1:80,000)  
**EDITION:** 38th Edition  
**CHART DATE:** October 31, 1992

**DESCRIPTION:** Wire drag grounding at 90 feet (27.4 meters). Cleared by 72 feet (21.9 meters). Charted as a 12-fathom wire drag clearance.

**SOURCE OF ITEM:** H9282/72WD, OPR-412-DA-72-WD

**SOURCE POSITION:** latitude 48°46'18.12"N  
longitude 122°44'38.76"W

**SURVEY REQUIREMENTS:** Full investigation. Resolve in normal course of side scan sonar coverage and echosounder coverage/development.

**METHOD OF INVESTIGATION:** 200% Side Scan Sonar, Pos. Nos. 6345-6350, 6415-6420 (DN 248); Pos. Nos. 11032-11037, 11158-11163 (DN 250); Pos Nos. 11852-11857 (DN 264). Echosounder development, Pos. Nos. 15487-15538 (DN 277)

**RESULTS OF INVESTIGATION:** No contacts were observed in the vicinity of the target. During the course of target development, a least depth of 29.2 meters (15.9 fathoms) was located 26 meters SE of the target at latitude 48°46'17.353"N, longitude 122°44'38.167"W (Pos. No. 15521). However, during SSS data collection, a shoaler depth of 26.0 meters (14.2 fathoms) was located 200 meters due south of the target at latitude 48°46'11.645"N, longitude 122°44'39.072"W (Pos. No. 11157, DN 250).

**COMPARISON WITH PRIOR SURVEYS:** H-9282 depicts a wire drag clearance depth of 88feet (14.6 fathoms/26.8 meters). The soundings acquired by prior survey H-8323 are consistent with those obtained by this current survey.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:** On Chart 18431 the AWOIS position is north and east of the 12-fathom wire drag; it is actually inside the 15-fathom wire drag. Chart 18421 depicts the cleared depth as an obstruction with a known depth of 12 fathoms. Remove the wire drag clearances from Chart 18431; delete the obstruction charted at latitude 48°46'18.12"N, longitude 122°44'38.76"W on Chart 18421. Chart the soundings from this survey. *Concur.*

## ITEM INVESTIGATION REPORT

**ITEM NO.:** N8 ✓  
20.1-meter sounding  
**SURVEY:** H-10621

**CHART NO.:** 18421 (1:80,000)  
**EDITION:** 38th Edition  
**CHART DATE:** October 31, 1992

**DESCRIPTION:** A 20.1-meter sounding rising <sup>4</sup>/<sub>5</sub> meters above surrounding depths.  
Reported as danger to navigation on November 29, 1995.

**SOURCE OF ITEM:** Recorded on fathometer during SSS operations conducted by PHP on DN 264.

**SOURCE POSITION:** latitude 48°45'37.064"N  
longitude 122°45'04.507"W

**SURVEY REQUIREMENTS:** Full investigation.

**METHOD OF INVESTIGATION:** On DN 011 (1996) side scan sonar development was conducted with Vessel No. 0652. Two East/West lines and two North/South lines were run at a minimum distance of 50 meters from the target (Pos. Nos. 19048-19088). Two additional East/West lines were run 25 meters from the target (Pos. Nos. 19089-19109). Development echosounder hydrography was also conducted (Pos. Nos. 19000-19047 and 19110-19253).

**RESULTS OF INVESTIGATION:** Nineteen contacts were identified and entered into Contact Table 12. No contacts were located in the immediate vicinity of the targeted sounding and none of those identified was flagged as significant. The sounding was not duplicated during echosounder development; i.e., no feature was located.

**COMPARISON WITH PRIOR SURVEYS:** NA.

**COMPARISON WITH THE CHART AND CHARTING RECOMMENDATIONS:**  
Although the fathometer trace as well as the digital data observed in the Graphic Edit program appear to indicate an obstruction; this conclusion is not supported by intensive development hydrography. Therefore, the hydrographer recommends deleting the sounding recorded at Position No. 11787+1. *Do not concur. Chart the previously reported 11 fathoms as a shoal sounding.*



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Oceanic and Atmospheric Administration**  
NATIONAL OCEAN SERVICE  
Coast and Geodetic Survey  
Seattle, Washington 98115-0070  
Pacific Hydrographic Party, N/CS342  
Tenant Activity  
2000 West Marine View Drive  
Everett, WA 98207-5000  
Phone: (206) 252-7688 Fax: 3744

November 29, 1995

Commander  
Thirteenth U. S. Coast Guard District (oan)  
Federal Building  
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 the Strait of Georgia. A Danger to Navigation Report is enclosed along with a chartlet showing the affected portion of Chart 18431.

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

Sincerely,

Richard A. Fletcher  
Lieutenant, NOAA  
Chief

Enclosures

cc: DMAHTC  
N/CS34  
N/CS21





## REPORT OF DANGER TO NAVIGATION

**Hydrographic Survey Registry Number:** H-10621

**Survey Title:** PHP-10-3-95

**State:** WA

**General Locality:** Strait of Georgia

**Sublocality:** Sandy Point to Point Migley

**Project Number:** OPR-N247-PHP

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

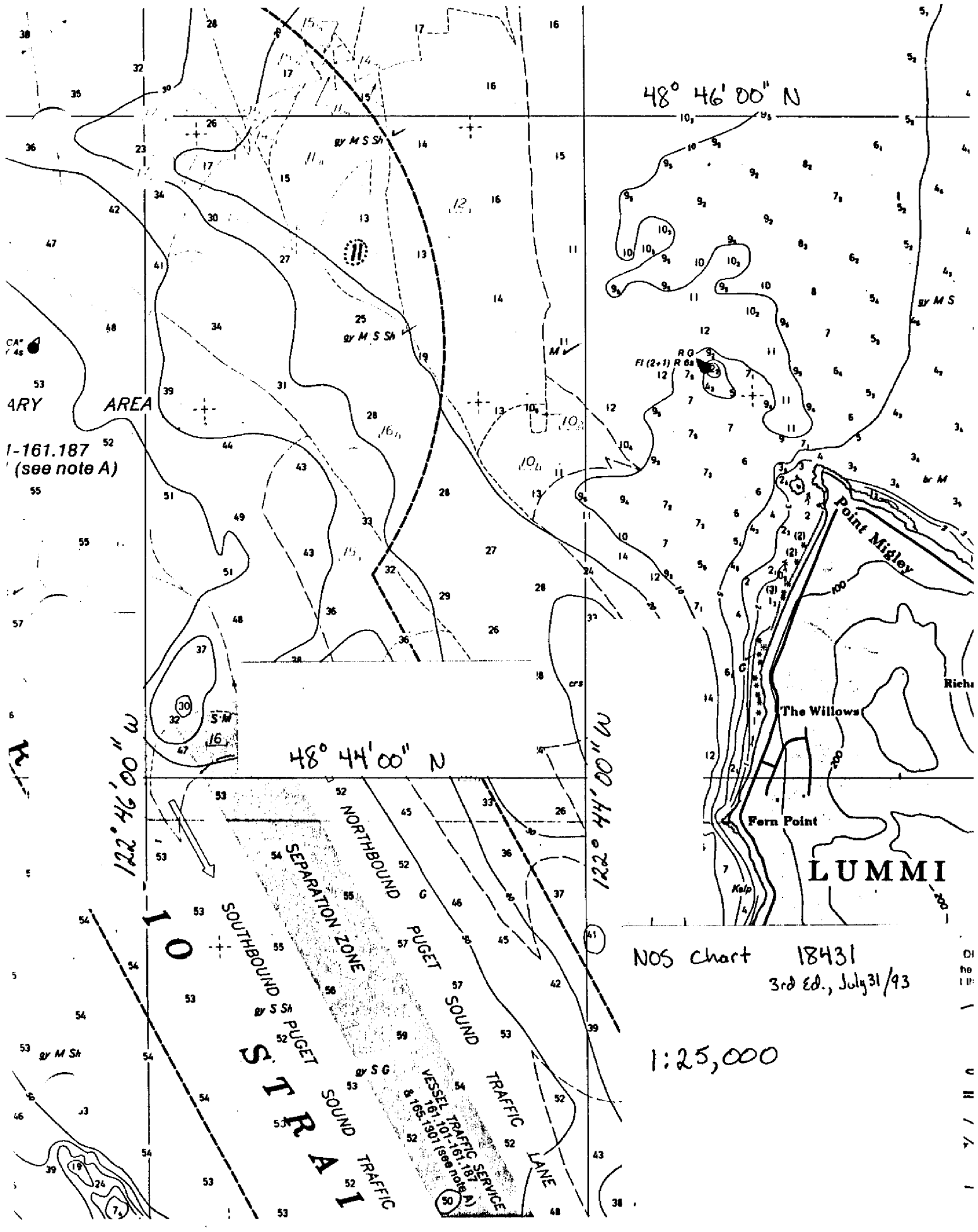
**Object Discovered:** A 4-meter (13.1-foot/2.2-fathom) obstruction was located at latitude 48°45'37.064"N, longitude 122°45'04.507"W. Least depth of this feature is 20.1 meters (66 feet/11 fathoms) at MLLW based on predicted tides.

**Affected nautical charts:**

Chart Number	Edition		Datum
	No.	Date	
18421	38th	October 31, 1992	NAD83
18431	3rd	July 31, 1993	NAD83
18423	30th	June 18, 1994	NAD83

**Charting Recommendation:** Chart an 11-fathom obstruction at latitude 48°45'37.064"N, longitude 122°45'04.507"W.

Questions concerning this report should be directed to NOAA, Pacific Hydrographic Branch, NCS34, 7600 Sand Point Way NE, Bin C15700, Seattle, WA 98115-0070, telephone number (206) 526-6853.



NOS Chart 18431  
3rd Ed., July 31/93

1:25,000

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

Pacific Hydrographic Party  
Tenant Activity  
2000 West Marine View Drive  
Everett, WA 98207-5000  
(206) 252-7688

January 30, 1995

MEMORANDUM FOR: Commander Kathy Timmons, NOAA <sup>109</sup>  
Chief, Pacific Hydrographic Branch

FROM: *Rick Fletcher*  
Lieutenant Rick Fletcher, NOAA  
Chief, Pacific Hydrographic Party

SUBJECT: H-10621

On January 11, 1996, the PHP returned to the Cherry Point area to conduct an additional investigation at the request of the Pacific Hydrographic Branch. The item to be developed appeared on the echogram to be a 4-meter obstruction with a least depth of 20.1 meters (11fm) and had been reported as a danger to navigation on November 29, 1995. This particular sounding was selected because it was the offshoremost of several 11-fathom soundings. After a thorough investigation, PHP disproved the existence of an obstruction at the reported location. However, a re-evaluation of the surrounding sounding data revealed that the reported obstruction was approximately 240 meters [1cm at the scale of the largest scale chart (1:25,000)] west of the centerline of a north-south oriented shoal which has two other 11 fm least depths marking the north and south extents. In view of the proximity of other 11 fm soundings PHP does not recommend submitting a correction through the Notice To Mariners. PHP recommends deleting the sounding recorded at position number 11787+1, latitude 48°45'37.1"N longitude 122°45'04.5"W and charting the 11 fm shoals at latitude 48°45'53"N longitude 122°44'56"W and at latitude 48°45'35"N longitude 122°44'52"W.

The supporting field data is hereby submitted for verification and addition to survey H-10621.





APPROVAL SHEET

for

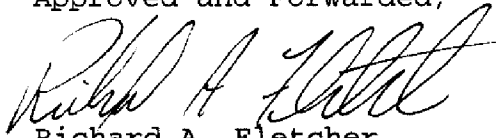
SURVEY H-10621

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: December 5, 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  
Rockville, Maryland 20852

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: April 29, 1996

ORIGINAL

MARINE CENTER: Pacific

HYDROGRAPHIC PROJECT: OPR-N247-PHP

HYDROGRAPHIC SHEET: H-10621

LOCALITY: Washington, Sandy Point to Point Migley, Strait of  
Georgia

TIME PERIOD: August 1, 1995 - January 12, 1996

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

Apply a -10 minute time correction, and a X0.95 range ratio to  
heights 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.

*William M. Huber*  
CHIEF, DATUMS SECTION



GEOGRAPHIC NAMES

H-10621

Name on Survey	A ON CHART NO. 18431, 18430, 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 GRAND McNALLY ATLAS		H U.S. LIGHT LIST		K
<del>EBRN POINT</del> GEORGIA, STRAIT OF	X	X	X	X													1
LUMMI BAY	X		X														2
LUMMI ISLAND	X		X														3
MIGLEY, POINT	X		X														4
ROSARIO STRAIT	X		X														5
<del>SANDY POINT</del> THE WILLOWS (locale)	X	X	X	X													6
WASHINGTON (title)	X		X														7
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Approved

*Chris Gibson*  
Chief Geographer

APR 30 1996

**HYDROGRAPHIC SURVEY STATISTICS**

H-10621

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

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION			AMOUNT
SMOOTH SHEET		1	SMOOTH OVERLAYS: POS. ARC, EXCESS			
DESCRIPTIVE REPORT		1	FIELD SHEETS AND OTHER OVERLAYS			
DESCRIP-TION	DEPTH POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS: SOURCE DOCUMENTS	
ACCORDION FILES	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; 18430, 5th Ed., Aug. 22, 1992

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			11886	
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	126.0		126.0	
COMPARISON WITH PRIOR SURVEYS AND CHARTS				
EVALUATION OF SIDE SCAN SONAR RECORDS				
EVALUATION OF WIRE DRAGS AND SWEEPS				
EVALUATION REPORT		23.0	23.0	
GEOGRAPHIC NAMES				
OTHER				
USE OTHER SIDE OF FORM FOR REMARKS	TOTALS	126.0	23.0	149.0
Pre-processing Examination by <b>LT G. Noll</b>	Beginning Date 12/6/95	Ending Date 12/6/95		
Verification of Field Data by <b>D. Doles, J. Stringham, I. Almacen</b>	Time (Hours) 126.0	Ending Date 5/23/96		
Verification Check by <b>B. Olmstead</b>	Time (Hours) 2	Ending Date 6/24/96		
Evaluation and Analysis by <b>I. Almacen</b>	Time (Hours) 23.0	Ending Date 6/6/96		
Inspection by <b>B. Olmstead</b>	Time (Hours) 10	Ending Date 6/27/96		



## **EVALUATION REPORT**

**H-10621**

### **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 offshore area southwest of Sandy Point and along the western side of Lummi Island from Point Migley to Fern Point. The inshore area is generally comprised of scattered rocks and reefs particularly around Point Migley. The bottom is mainly composed of sand and mud mixed with shells. Depths range from 2.4 to 59.0 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-10621. 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: -0.615 seconds (-19.000 meters)

Longitude: 4.656 seconds (95.096 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 3rd edition of NOS chart 18431 for orientation purposes only.

Some changes and new features in the area were noted during this survey. Two (2) already charted and two (2) new rocks were positioned and their respective elevations were determined on this survey. These features have been adequately depicted on the AutoCad generated smooth sheet based on the latest survey information. The existence of the remaining charted rocks were adequately verified in the field. Further discussions concerning shoreline changes noted during this survey is included in the hydrographer's report. There were no significant changes noted to the mean high water line.

#### **K. CROSSLINES**

Crosslines are discussed in the hydrographer's report.

#### **L. JUNCTIONS**

Survey H-10621 junctions with the following survey.

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

The junction 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-10621 was compared with the following prior surveys.

H-8321 (1956), scale 1:10,000  
H-8322 (1956), scale 1:10,000  
H-8323 (1956), scale 1:10,000

Comparisons with prior surveys H-8321, H-8322 and H-8323 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.

H-9281WD (1956), scale 1:20,000  
H-9282WD (1972), scale 1:20,000

The prior wire drag surveys H-9281WD and H-9282WD are common to the area of hydrography and side scan sonar investigation conducted during this survey. These wire drag surveys are recommended for supersession based on the adequacy of the recent sonar coverage to supplement the basic hydrography within the common area.

The above listed prior surveys cover the entire area of the recent 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 not superseded.

H-10621 is adequate to supersede the prior surveys within the common area.

#### **N. ITEM INVESTIGATIONS**

AWOIS items 52176, 52177, 52178, 52179, 52180, 52181 and 52182 were investigated during this survey. Discussion and disposition of these items are included in the hydrographer's report.

An additional investigation was conducted in the vicinity of the reported 11-fathom obstruction located earlier during this survey. Two (2) shoal areas with depths of 11 fathoms were found north and east of the previously reported feature. A memorandum concerning these features from the hydrographer to the Chief, Pacific Hydrographic Branch dated January 30, 1996 is included in this report. Concur with the hydrographer's recommendation that the 11-fathom shoals found during field investigation be charted, however, the previously reported 11-fathom obstruction should be charted as a shoal sounding.

#### **O. COMPARISON WITH CHART**

Survey H-10621 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
18430	5th	Aug. 22, 1995	1:25,000	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 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-10621 is adequate to supersede charted hydrography within the common area of coverage.

b. Dangers to Navigation

One (1) danger to navigation was reported to the USCG, DMAHTC, N/CS21 and N/CS34 on November 29, 1995. A copy of the report is attached. No additional dangers were found during office processing.

**P. ADEQUACY OF SURVEY**

The hydrography on survey H-10621 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-10621 was acquired in the field in metric units while the AutoCAD generated smooth sheet for this survey was compiled in fathoms to conform to the sounding units of the existing NOS 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-10621 adequately complies with the project instructions.

**Q. AIDS TO NAVIGATION**

There are two (2) existing floating aids found within the survey area. These aids were located using DGPS positioning system. They were found in good condition and adequately serve their intended purpose. No existing fixed aids to navigation were noted around the area of this survey.

**R. STATISTICS**

Statistics are itemized in the hydrographer's report.

**S. MISCELLANEOUS**

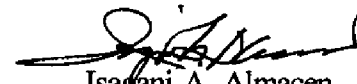
Miscellaneous information concerning this survey is discussed in the hydrographer's report. No additional miscellaneous items were noted during office processing.

**T. RECOMMENDATIONS**

Survey H-10621 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-10621

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: 6/27/96  
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: 7/5/96  
Kathy Simmons  
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

MARINE CHART BRANCH  
**RECORD OF APPLICATION TO CHARTS**

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10621

**INSTRUCTIONS**

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart.

1. Letter all information.
2. In "Remarks" column cross out words that do not apply.
3. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.

CHART	DATE	CARTOGRAPHER	REMARKS
18431	5/29/96	<i>[Signature]</i>	Full <del>Part Before</del> After Marine Center Approval Signed Via <i>Full application of</i> Drawing No. <i>soundings &amp; features from smooth sheet.</i>
<del>18435</del>	<del>4/21/96</del>	<del><i>[Signature]</i></del>	Full <del>Part Before</del> After Marine Center Approval Signed Via <i>Full application of</i> Drawing No. <i>soundings &amp; features from smooth sheet.</i>
18424	1-28-97	<i>[Signature]</i>	Full <del>Part Before</del> After Marine Center Approval Signed Via <i>H-Drawing BP-159221</i> Drawing No. <i>28</i>
18421	1-28-97	<i>[Signature]</i>	Full <del>Part Before</del> After Marine Center Approval Signed Via <i>Chart 18424 Dwg #28</i> Drawing No. <i>39</i>
			Full Part Before After Marine Center Approval Signed Via Drawing No.
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*[Handwritten note]*  
FORM  
8/21/96