H11316

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey **HYDROGRAPHIC**

Field No. **RA-20-01-04**

Registry No. **H-11316**

LOCALITY

State **Washington**

General Locality **Approaches to Puget Sound**

Sublocality **Vicinity of Hein Bank**

2004

CHIEF OF PARTY

CDR John W. Humphrey, NOAA

LIBRARY & ARCHIVES

DATE

NOAA FORM 77-28 (11-72)

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

REGISTER NO.

HYDROGRAPHIC TITLE SHEET

H11316

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.
RA-20-01-04

State **Washington**

General Locality **Approaches to Puget Sound**

Sublocality **Vicinity of Hein Bank**

Scale **1:20,000** Date of Survey **4/07/2004 - 4/14/2004**

Instructions Date **3/23/2004** Project No. **OPR-N372-RA-04**

Vessel **Rainier Launches (1006), (1015), (1016), (1021)**

Chief of Party **CDR John W. Humphrey**

Surveyed by **RAINIER Personnel**

Soundings taken by echo sounder, hand lead, pole **Elac 1080, 1180; Seabat 8101**

Graphic record scaled by **RAINIER Personnel**

Graphic record checked by **RAINIER Personnel**

Evaluation by **R.Shipley** Automated plot by **HP Designjet 1050C**

Verification by **R.Shipley**

Soundings in **Fathoms** at **MLLW**

REMARKS: **All times are recorded in UTC**

UTM Zone 10

Revisions and annotations appearing as endnotes were generated during office processing.

All seperates are filed with the hydrographic data

As a result, page numbering may be interrupted or non-sequential

Descriptive Report to Accompany Hydrographic Survey H11316

Project OPR-N372-RA-04
Approaches to Puget Sound, Washington
Scale 1:20,000
April 2004
NOAA Ship RAINIER
Chief of Party: Commander John W. Humphrey, NOAA

A. AREA SURVEYED

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions OPR-N372-RA-04, dated March 9, 2004, Standing Project Instructions dated March 23, 2003, and NOS Hydrographic Specifications and Deliverables dated March 2003. The survey area is in the vicinity of Hein Bank, Puget Sound, Washington. This survey corresponds to sheet "A" in the sheet layout provided with the Letter Instructions.

One hundred percent shallow-water multibeam (SWMB) was obtained throughout the entire project area.

Data acquisition was conducted from April 7 to April 14, 2004 (DN 098 to 105).

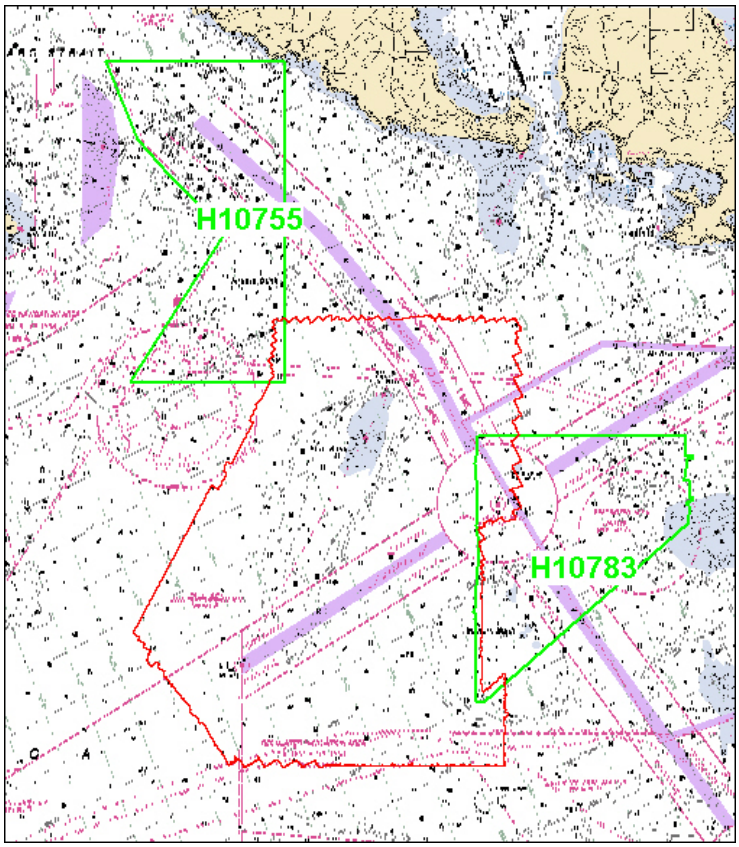


Figure 1. H11316 Survey Limits and Junctions

B. DATA ACQUISTION AND PROCESSING

A complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods can be found in the *OPR-N372-RA-04 Data Acquisition and Processing Report* (DAPR)[1], submitted under separate cover. Items specific to this survey, and any deviations from the aforementioned report are discussed in the following sections.

B1. Equipment and Vessels

Data were acquired by RAINIER survey launches 1021, 1016, 1006, and 1015. Vessels 1021, 1016, 1006, and 1015 were used to acquire shallow-water multibeam (SWMB) soundings and sound velocity profiles. 1021 and 1006 were used in water shoaler than 60 fathoms to conduct Reson8101 survey work while 1016 and 1015 were used in depths greater than 40 fathoms to conduct ELAC survey work.

No unusual vessel configurations were used for data acquisition.

B2. Quality Control

Crosslines

Shallow-water multibeam (SWMB) crosslines totaled 65.15 nautical miles, comprising 8.87% of SWMB hydrography. The mainscheme bathymetry was manually compared to the crossline nadir beams in CARIS subset mode and agreed well with differences averaging approximately 0.5 meter.

A statistical Quality Control Report has been conducted on representative data collected with each system used on this survey and is included in the *OPR-N372-RA-04 DAPR*.

Accuracy standards for this survey, determined through manual examination and statistical analysis of the data, have been met.[2]

Junctions

The following contemporary survey junctions with H11316 (see Figure 1):

Registry #	Scale	Date	Junction side
H10755	1:10,000	1997	Northwest
H10783	1:10,000	1998	East

At the time of this report, no bathymetry for these junctions was available for comparison to H11316. No comparisons of the junctions with this survey will be discussed in the Descriptive Report for H11316.

Final comparisons will be made at the Pacific Hydrographic Branch (PHB) after the application of smooth tides.[3]

Data Quality Factors

After correction for sound velocity in HDCS, many lines still exhibited the characteristic "smiles" and "frowns" indicative of inaccurate sound velocity corrections. Specifically, inaccurate sound velocity was observed for data collected on DN 101-2004 with launch 1006-RESON. Redirecting CARIS HIPS software to apply the sound velocity file for points "nearest in distance" to the position of the cast appears to have resolved the problem for that particular set of data.[4] Though some sound velocity issues are still evident none are as severe as before the change to "nearest in distance" and should not affect the overall accuracy of the data. All other data has sound velocity files applied "previous in time" (refer to separates: *SV Casts for SWMB Hydrography*).[5]

After converting data collected on DN 100 with launch 1006-RESON into HDCS data in CARIS HIPS software, it was noticed that the time on the data was one hour off the actual acquisition time. Allen Greenberg from HSTP provided a program (rewtime.exe), which allowed time increments to be added to the header of all packets in an extended triton format (.xtf) file. This increment can be positive or negative, and is specified in hours, minutes, and floating-point seconds. This program adjusted the time stamps for this data, resolving some of the SVP and tidal offset discrepancies.

After applying unverified observed tides using zone correctors in HDCS, significant vertical discrepancies still existed between lines of data. Lines collected in similar geographical areas at separate times of the day displayed these large vertical discrepancies. Discrepancies ranged between 0.2 meters to over 2.0 meters and occurred randomly throughout the survey area. Originally, zoning for H11316 was primarily based on Friday Harbor reference station, which caused offsets with data based on Port Angeles reference station during extreme tides. April 9, 2004 (DN 100) was the end of the tidal cycle for both gauges, which accounted for the large discrepancies between the two tidal curves (*see figure 2*). In addition, data was collected at the transition between Port Angeles and Friday Harbor tidal zones. This combination of events resulted in the vertical offsets between lines of data and was rectified through a request to CO-OPS in Silver Spring, MD for a revised zone file. A revised zone file was provided (N372RA2004CORPS_rev.zdf) such that the majority of the data collected for sheet "A" was based on Port Angeles reference station. Applying this revised zoned tides file brought offsets down to a maximum of about 0.5-meter.[6]

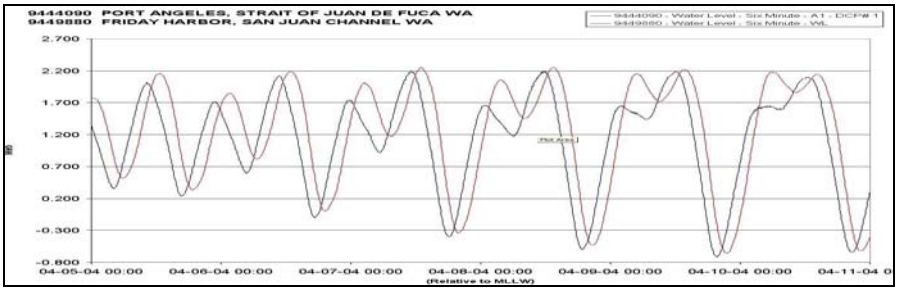


Figure 2. Tidal Data for April 9, 2004

B3. Data Reduction

Data reduction procedures for survey H11316 conform to those detailed in the *OPR-N372-RA-04 DAPR.*

C. VERTICAL AND HORIZONTAL CONTROL

A complete description of vertical and horizontal control for survey H11316 can be found in the *OPR-N372-RA-04 Horizontal and Vertical Control Report*,[7] submitted under separate cover. A summary of horizontal and vertical control for this survey follows.

Horizontal Control

The horizontal datum for this project is the North American Datum of 1983 (NAD83). Differential GPS (DGPS) was the sole method of positioning. Differential corrections from U.S. Coast Guard beacon at Whidbey Island (302 kHz) were utilized during this survey. Launch-to-launch DGPS performance checks using U.S. Coast Guard beacon at Fort Stevens (287 kHz) as the check station were performed in accordance with Section 3.2 of the FPM. Copies of the performance checks are included in the *OPR-N372-RA-04 Horizontal and Vertical Control Report.*

Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The operating National Water Level Observation Network (NWLON) primary tide station at Friday Harbor, WA (944-9880), and Port Angeles, WA (944-4090) served as control for datum determination and as the primary source for water level reducers for survey H11316.

No tertiary gauges were required.

All data were reduced to MLLW using unverified observed tides from station Friday Harbor, WA, and Port Angeles, WA using the tide file 9449880.tid, 9444090.tid, and time and height correctors using the zone corrector file N372RA2004CORP_rev.zdf.

The Pacific Hydrographic Branch will apply final approved (smooth) tides to the survey data during final processing. A request for delivery of final approved (smooth) tides for survey H11316 was forwarded to N/OPS1 on April 19, 2004. A copy of the request is included in Appendix IV.[8]

D. RESULTS AND RECOMMENDATIONS

D.1 Automated Wreck and Obstruction Information System (AWOIS) Investigations

No AWOIS items were present within the survey limits for H11316.[9]

D.2 Chart Comparison

Survey H11316 was compared with chart 18465 (35th Ed.; Dec. 2002, 1:80,000).

Chart 18465

Depths from survey H11316 agreed with charted depths for chart 18465 within one fathom with occasional differences up to three fathoms. Charted soundings were found to disagree by significant margins in two locations. At 48° 18' 31.17" N, 122° 59' 24.79" W, the charted 57-fathom sounding was found to be 17-fathoms shoaler than the 74-fathom sounding generated from H11316 HDCS data. At 48° 21' 39.55" N, 122° 59' 42.40" W the H11316 HDCS data showed an 84-fathom sounding that was six-fathoms shoaler than the charted 90-fathom sounding. In many instances, this survey found shoaler soundings between charted soundings even though agreement at the position of the charted depths was good. This can be attributed to increased bottom coverage using SWMB methods.[10]

Data accuracy standards and bottom coverage requirements have been met and survey data are adequate to supersede charted data in their common areas.[11]

Final chart comparisons will be made at the Pacific Hydrographic Branch after the application of smooth tides.[12]

D.3 Shoreline

Shoreline verification was not required for survey H11316.[13]

D.4 Dangers to Navigation

No dangers to navigation (DTONs) were present in survey H11316.[14]

D.5 Aids to Navigation

Survey H11316 included two[15] aids to navigation (ATONs). Each of the ATONs was found to serve its intended purpose.[16]

E. APPROVAL

As Chief of Party, I have ensured that standard field surveying and processing procedures were followed in producing this survey in accordance with the Hydrographic Manual, Fourth Edition, Hydrographic Survey Guidelines, Field Procedures Manual and the NOS Hydrographic Surveys Specifications and Deliverables, as updated for 2004.

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.

Survey H11316 is complete and adequate to supersede charted soundings[17] in their common areas. No additional work is required for this survey.[18]

Listed below are supplemental reports submitted separately that contain additional information relevant to this survey:

Title	Date Sent	Office
Data Acquisition and Processing Report for OPR-N372-RA-04	11/12/2004	N/CS34
Tides and Water Levels Package for OPR-N372-RA-04	4/19/2004	N/OPS1

Approved and Forwarded:

John W. Humphrey
Commander, NOAA
Commanding Officer

In addition, the following individuals were also responsible for overseeing data acquisition and processing of this survey:

Survey Sheet Manager:

Brent Pounds
ENS, NOAA

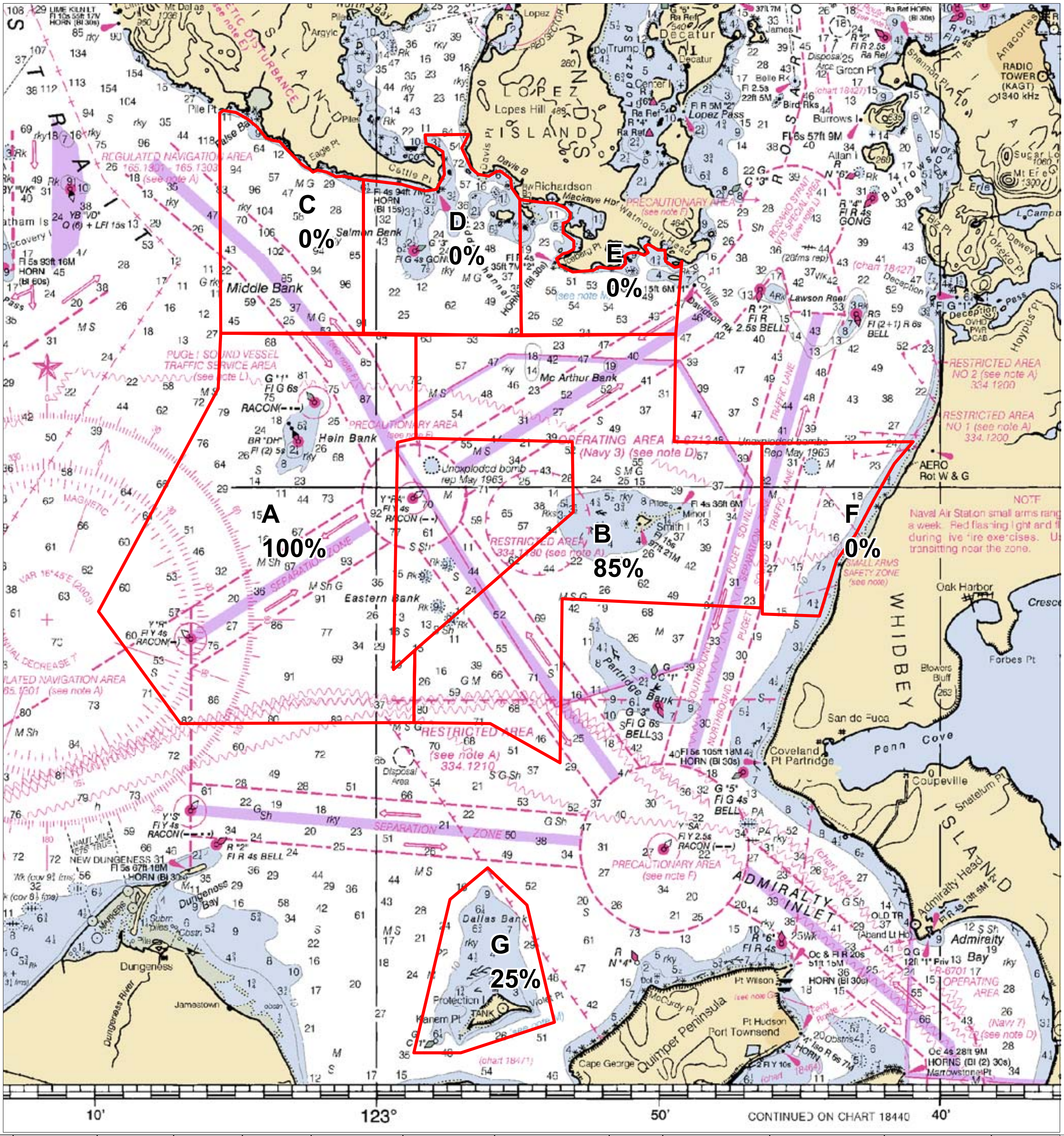
Field Operations Officer:

Kevin Slover
Lieutenant, NOAA

Revisions Compiled During Office Processing and Certification

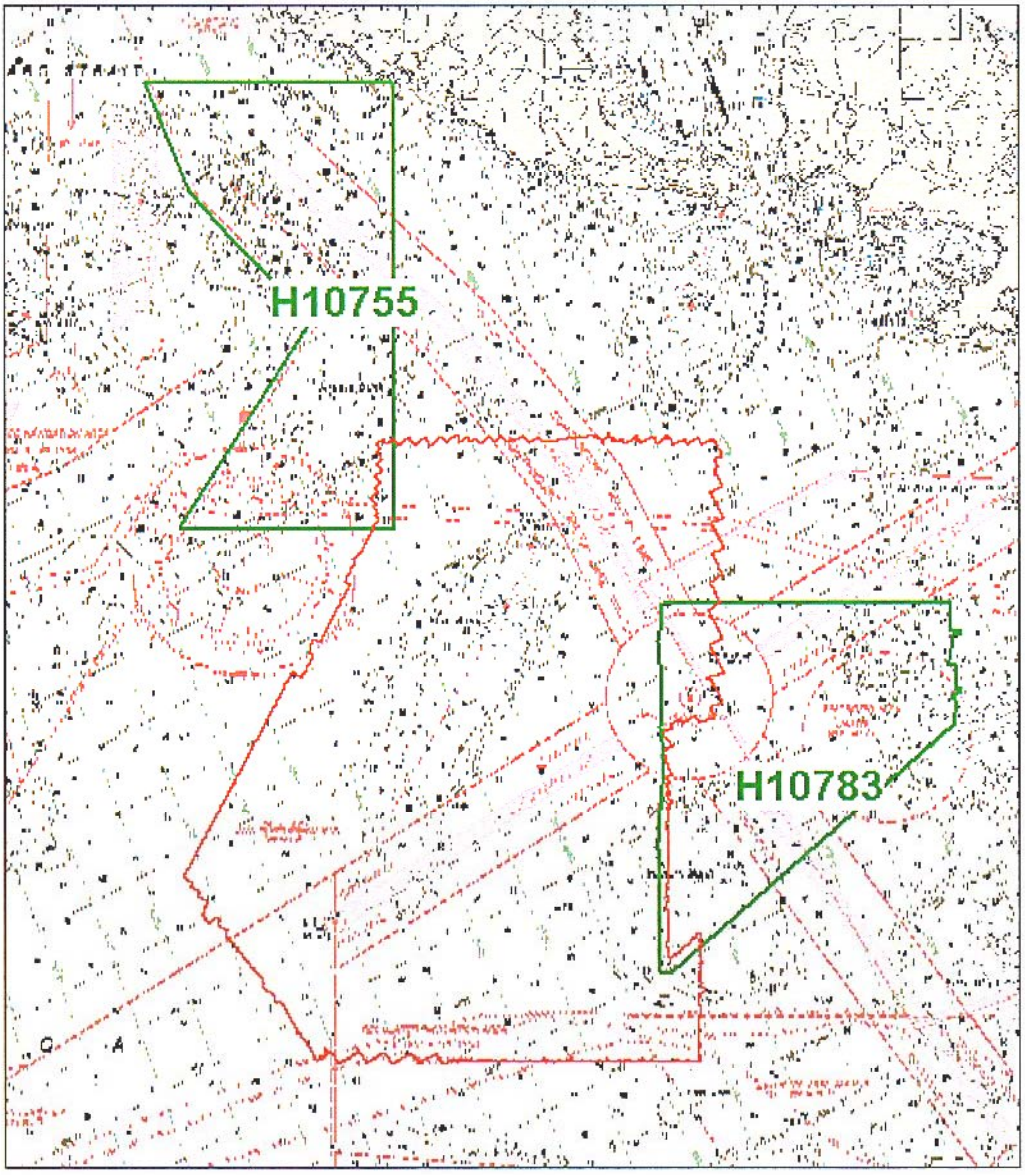
[1] Filed with the Project Records.
[2] Concur.
[3] Comparisons with H10755 and H10783 were made during office processing with good agreement.
[4] Concur.
[5] Filed with the Hydrographic Records.
[6] Concur.
[7] Filed with the Project Records.
[8] Approved Tide Note dated August 20, 2004 is attached.
[9] Concur.
[10] Concur.
[11] Concur.
[12] During office processing, survey H11316 was compared to charts 18471 (10th Ed; Nov 21 2006, 1:40,000) and 18465 37th Ed; Nov 21 2006, 1:80,000) with good agreement.
[13] Concur.
[14] Concur.
[15] PHB Revision--Strikethrough ~~two~~ and add four.
[16] Chart with latest ATONIS information.
[17] and features
[18] Concur.

Progress Sketch OPR-N372-RA
November, 2004
Chart 18400



Project	Month	LNM_Hydr	LNM_MB	SV_Casts	Bottom_Sam	AWOIS_Item	Tide_Guage_Inst	DAS	DTime_equip_H	DTime_Weather_	D_Time_other_I	Inport_H
N327	April	698.31	698.31	46.00	0.00	0.00	0.00	10.00	6.75	0.00	0.00	24.00
N327	November	726.10	684.25	47.00	0.00	0.00	0.00	12.00	7.25	1.50	1.25	0.00

Project	Sheet_Letter	H_num	HQ_Est_SNM	CumlPercCompPrev	CumlPercCompCur	SNM_CompCurM	CumSNMcom
OPR-N372	C		15	0	0	0	0
OPR-N372	D		14	0	0	0	0
OPR-N372	E		8	0	0	0	0
OPR-N372	A	H11316	53	100	100	0	53
OPR-N372	F		9	0	0	0	0
0PR-N372	G	H11317	9	0	25	2	2
OPR-N372	B	H11371	45	0	85	38	38


H10755
H10783

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: August 20, 2004

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-N372-RA-2004
HYDROGRAPHIC SHEET: H11316

LOCALITY: Hein Bank, Puget Sound, WA
TIME PERIOD: April 7 - 14, 2004

TIDE STATION USED: 944-4090 Port Angeles, WA
Lat. 48° 07.5'N Lon. 123° 26.4'W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.987 meters

REMARKS: RECOMMENDED ZONING
Use zone(s) identified as: PS75, PS76, PS86, PS87 & PS88

Refer to attachments for zoning information.

Note 1: Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the **new 1983-2001 National Tidal Datum Epoch (NTDE).**

Thomas A. Mero 8/30/04

CHIEF, REQUIREMENTS AND DEVELOPMENT DIVISION

Final tide zone node point locations for OPR-N372-RA-2004, H11316

Format: Tide Station (in recommended order of use)
Average Time Correction (in minutes)
Range Correction
Longitude in decimal degrees (negative value denotes Longitude West),
Latitude in decimal degrees

	Tide Station Order	AVG Time Correction	Range Correction
Zone PS75	944-4090	+36	0.95
-123.196178 48.264366			
-123.168315 48.285688			
-123.14443 48.313573			
-123.127369 48.340873			
-123.123963 48.356885			
-123.100066 48.347695			
-123.083166 48.335712			
-123.075975 48.323007			
-123.073098 48.310299			
-123.075934 48.291108			
-123.083994 48.263941			
-123.093986 48.24378			
-123.131633 48.228165			
-123.192784 48.209796			
-123.19335 48.246388			
-123.196178 48.264366			
Zone PS76	944-4090	+36	0.98
-123.182306 48.150058			
-123.196505 48.148558			
-123.192764 48.208941			
-123.192784 48.209796			
-123.131633 48.228165			
-123.093986 48.24378			
-123.10213 48.227338			
-123.134698 48.174579			
-123.145338 48.175607			
-123.154523 48.171305			
-123.174675 48.158095			
-123.182306 48.150058			
Zone PS86	944-4090	+54	0.96
-123.143413 48.389709			
-123.16949 48.40446			

-123.06433 48.410114
-123.015062 48.405622
-122.96714 48.396292
-122.938279 48.3792
-122.929746 48.368462
-122.930221 48.350455
-122.948235 48.326751
-122.990425 48.294496
-123.035217 48.269084
-123.022734 48.292453
-123.01548 48.32686
-123.030086 48.356299
-123.064723 48.377249
-123.143413 48.389709

Zone PS87	944-4090	+48	0.95

-123.093986 48.24378
-123.035217 48.269084
-123.022734 48.292453
-123.01548 48.32686
-123.030086 48.356299
-123.064723 48.377249
-123.143413 48.389709
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-123.123963 48.356885
-123.100066 48.347695
-123.083166 48.335712
-123.075975 48.323007
-123.073098 48.310299
-123.075934 48.291108
-123.083994 48.263941
-123.093986 48.24378

Zone PS88	944-4090	+54	0.98

-123.093986 48.24378
-123.10213 48.227338
-123.134698 48.174579
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-122.899968 48.261473
-122.893765 48.285462
-122.887292 48.331774
-122.893736 48.365136
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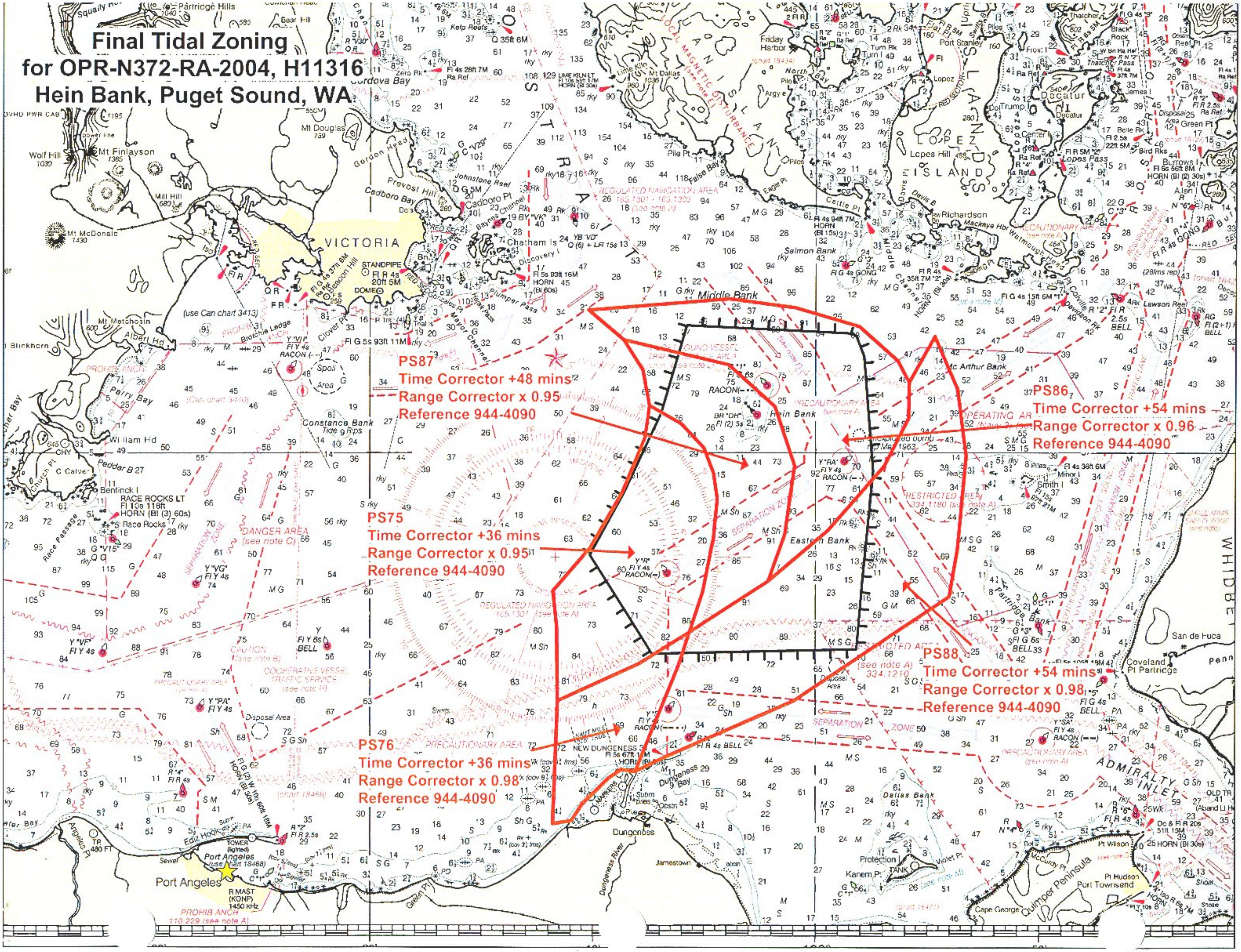
Final Tidal Zoning
for OPR-N372-RA-2004, H11316
Hein Bank, Puget Sound, WA
PS87
Time Corrector +48 mins
Range Corrector x 0.95
Reference 944-4090
PS86
Time Corrector +54 mins
Range Corrector x 0.96
Reference 944-4090
PS75
Time Corrector +36 mins
Range Corrector x 0.95
Reference 944-4090
PS88
Time Corrector +54 mins
Range Corrector x 0.98
Reference 944-4090
PS76
Time Corrector +36 mins
Range Corrector x 0.98
Reference 944-4090
VICTORIA
Port Angeles
Middle Bank
Hein Bank
Eastern Bank
Partridge Bank
Dallas Bank
Constance Bank
Dungeness
ADMIRALTY INLET
LOPEZ ISLAND
Quimper Peninsula
Port Townsend
Salmon Bank
Race Rocks
Cadboro Bay
Friday Harbor
Mt Douglas
Mt Finlayson
Mt McDonald
Mt Matchosin
Wolf Hill
Mill Hill
Gordon Head
Prevost Hill
Protection I
Jamestown
Dungeness River
Cape George
Pt Wilson
Pt Hudson
Coveland
Pt Partridge
San de Fuca
REGULATED NAVIGATION AREA
PRECAUTIONARY AREA
SEPARATION ZONE
DANGER AREA (see note C)
LOCAL MAGNETIC DISTURBANCE (see note E)
RESTRICTED AREA 334.1180 (see note A)
PROHIB ANCH 110.229 (see note A)

APPROVAL SHEET
H11316

Initial Approvals:

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

Gary L. Nelson Date: 26 Dec 2006

Gary Nelson
Chief, Cartographic Team
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 Descriptive Report.

, CDR/NOAA Date: 8 JAN 2007

Donald W. Haines
CDR, NOAA
Chief, Pacific Hydrographic Branch

Kyle R. Ward

Digitally signed by Kyle R. Ward
DN: cn=Kyle R. Ward, c=US, ou=HSD, email=Kyle.Ward@NOAA.GOV
Reason: AWOIS and Surf Check Completed
Date: 2007.01.31 09:59:27 -05'00'

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-11316

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
18471	11/30/06	R. Shipley	Full ~~Part Before~~ After Marine Center Approval Signed Via FULL APPLICATION
			Drawing No. of soundings, CURVES AND features
			from the smooth sheet.
18465	12/5/06	R. Shipley	Full ~~Part Before~~ After Marine Center Approval Signed Via FULL APPLICATION
			Drawing No. of sounding, CURVES AND features
			from the smooth sheet.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
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			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.