

10430

10430

Diagram No. 8553-2

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-10-5-92
Registry No. H-10430

LOCALITY

State Alaska
General Locality Cook Inlet
Sublocality Southern Approach to Knik Arm

19 92

CHIEF OF PARTY
CAPT T.W. Richards

LIBRARY & ARCHIVES

DATE January 3, 1994

☆U.S. GOV. PRINTING OFFICE: 1987-758-980

16.25
0.2
16660

HYDROGRAPHIC TITLE SHEET

H-10430

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-10-5-92

State Alaska

General locality Cook Inlet

Locality Southern Approach to Knik Arm

Scale 1:10,000 Date of survey June 9 - August 4, 1992

Instructions dated April 14, 1992* Project No. OPR-P319-RA

Vessel RAINIER

Chief of party CAPT Thomas W. Richards, NOAA

Surveyed by LT Brown, LTJG Nelson, LTJG Lenke, ENS Klay, ENS Ramos, ENS Pitts, CH Lawson and SST Fleischmann

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

Graphic record scaled by RAINIER Personnel

Graphic record checked by RAINIER Personnel

Verification by: B. Brown and S. Otsubo Automated plot by PHS Kynetics Plotter

Evaluation by: J. Green

Soundings in ~~stations~~ meters ~~feet~~ at MLW MLLW and decimeters

REMARKS: Time in UTC. Revisions and marginal notes in black were generated during office processing. Separates are filed with the hydrographic data.

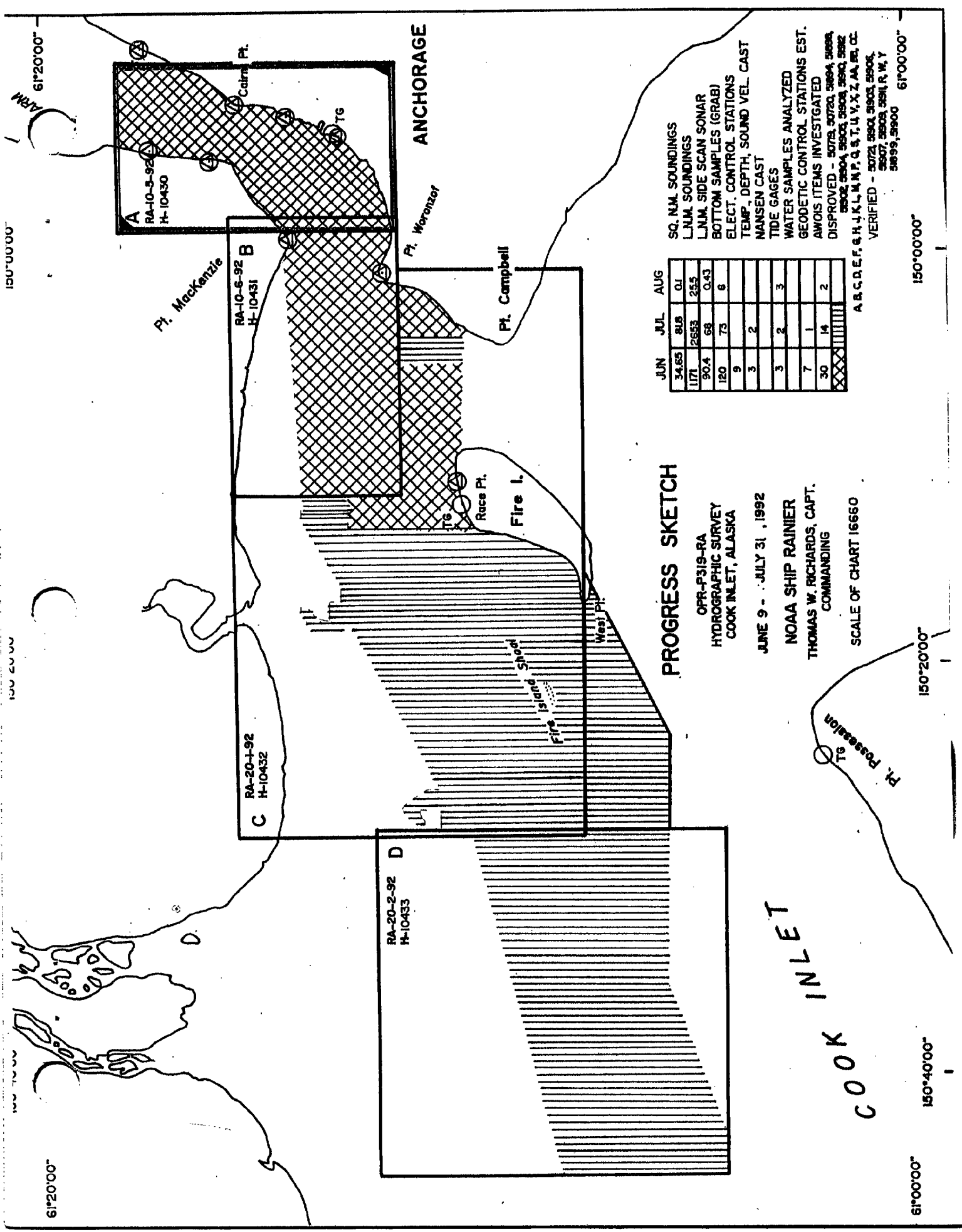
* Change No. 1 May 8, 1992

Change No. 2 May 27, 1992

Change No. 3 August 18, 1992

*X.W.W. 1-5-97
1/27/94*

AWOIS and SURE 1/94 RW



	JUN	JUL	AUG
SQ. N.M. SOUNDINGS	34.65	81.5	0.1
L.N.M. SOUNDINGS	1171	2653	255
L.N.M. SIDE SCAN SONAR	90.4	68	0.43
BOTTOM SAMPLES (GRAB)	120	73	6
ELECT. CONTROL STATIONS	9		
TEMP., DEPTH, SOUND VEL. CAST	3	2	
NANSEN CAST	3	2	3
TIDE GAGES	7	1	
WATER SAMPLES ANALYZED	30	14	2
GEODETIC CONTROL STATIONS EST.			
AWOIS ITEMS INVESTIGATED			
DISPROVED - 5078, 5079, 5084, 5089, 5092, 5094, 5095, 5098, 5099, 5092			
VERIFIED - 5072, 5091, 5093, 5095, 5097, 5098, 5099, R, W, Y			

PROGRESS SKETCH

OPR-PS19-RA
HYDROGRAPHIC SURVEY
COOK INLET, ALASKA

JUNE 9 - JULY 31, 1992

NOAA SHIP RAINIER
THOMAS W. RICHARDS, CAPT.
COMMANDING

SCALE OF CHART 16650

SQ. N.M. SOUNDINGS
L.N.M. SOUNDINGS
L.N.M. SIDE SCAN SONAR
BOTTOM SAMPLES (GRAB)
ELECT. CONTROL STATIONS
TEMP., DEPTH, SOUND VEL. CAST
NANSEN CAST
TIDE GAGES
WATER SAMPLES ANALYZED
GEODETIC CONTROL STATIONS EST.
AWOIS ITEMS INVESTIGATED
DISPROVED - 5078, 5079, 5084, 5089, 5092, 5094, 5095, 5098, 5099, 5092
VERIFIED - 5072, 5091, 5093, 5095, 5097, 5098, 5099, R, W, Y
5099, 5090

Pt. Possession
Tg

COOK INLET

61°20'00" 150°00'00" 150°40'00" 150°20'00" 61°00'00"

**Descriptive Report to Accompany Hydrographic Survey H-10430
Cook Inlet, Alaska
Southern Approach to Knik Arm**

Field Number RA-10-5-92
Scale 1:10,000
August 1992

NOAA Ship RAINIER
Chief of Party: Captain Thomas W. Richards, NOAA

A. PROJECT ✓

This survey was conducted in Northern Cook Inlet, Alaska, as specified by Project Instructions OPR-P319-RA dated April 14, 1992, Change Number One dated May 8, 1992, Change Number ~~Two~~² dated May 27, 1992, and Change Number ~~Three~~³ dated August 18, 1992. ✓

Survey H-10430 is designated "Sheet A" on the sheet layout dated May 5, 1992. ✓

This survey is one in a series that will identify all dangers to navigation that exist in the navigable approaches to the Port of Anchorage. The survey was conducted as a response to requests from a U.S. Senator, Corps of Engineers (COE), Southwest Alaska Pilots Association, Totem Ocean Trailer Express, Inc. (TOTE), Defense Mapping Agency (DMA), Port Commission, and the Port of Anchorage. Data will be used by the U.S. Coast Guard (USCG) to select the best deep draft approach route to the Port of Anchorage and determine if modification of aids to navigation are required in the approaches. ✓

B. AREA SURVEYED See Eval Rpt, Sect 1

The survey is entirely within the Anchorage vicinity, from Knik Arm south to the approaches to Anchorage. The survey's northern limit is $61^{\circ}18'17''N$, while its southern limit is $61^{\circ}41'43''N$. The western survey limit is $149^{\circ}59'12''W$, extending east to the mainland. Data acquisition was conducted from June 9 through August 4, 1992 (DN 161 to 217). ✓

C. SOUNDING VESSELS ✓

The following survey launches were used during the course of this survey:

<u>Vessel</u>	<u>EDP NO</u>	<u>Operation</u>	
RA-3	2123	Hydrography Shoreline Verification Velocity Cast Side Scan Sonar	✓
RA-4	2124	Hydrography Shoreline Verification	✓
RA-5	2125	Hydrography Bottom Samples Side Scan Sonar	✓

~~Side Scan Sonar~~

RA-6

2126

Hydrography
Shoreline Verification
Bottom Samples

In addition to the survey vessels listed above, a 17-foot Boston Whaler (RA-8) was used for shoreline verification on DN 183.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Data acquisition and processing were conducted using the following HDAPS programs:

<u>Program Name</u>	<u>Version</u>	<u>Date Installed</u>
AUTOST	2.00	4/14/92
BACKOLD	1.12	4/14/92
BACKUP	2.00	4/14/92
BASELINE	1.12	4/14/92
BIGABST	2.00	4/14/92
CARTO	2.02	4/14/92
CONVERT	3.02	4/14/92
DAS SURV	6.21	4/14/92
DAS SURV	6.23	7/2/92
DIAGNOSTIC	3.00	4/14/92
DISC UTIL	1.00	4/14/92
DP	2.11	7/2/92
DP	2.00	4/14/92
EXCESS	3.04	4/14/92
FILESYS	2.16	4/14/92
GLOBAL	1.12	4/14/92
INVERSE	1.51	4/14/92
LISTAWOIS	2.01	4/14/92
LOADNEW	1.50	4/14/92
MAKEFIX	1.02	4/14/92
MANU DATA	1.12	4/14/92
NEWCONT	1.17	4/14/92
PLOTALL	2.02	4/14/92
POSTSUR	5.21	4/14/92
PREDICT	1.11	4/14/92
PRINTOUT	3.00	4/14/92
QUICK	1.20	4/14/92
RAMSAVER	1.00	4/14/92
READPROJS	1.08	4/14/92
REAPPLY	1.33	4/14/92
REJECT	1.05	4/14/92
SOFTCHECK	1.13	4/14/92
SURVEY	6.11	4/14/92
SYMBOLS	1.00	4/14/92
ZOOMEDIT	1.10	4/14/92

Velocity corrections were determined using the program VELOCITY, Version 1.11, installed on March 9, 1990.

E. SONAR EQUIPMENT

Side scan sonar operations were performed from survey launches RA-3 and RA-5. Both systems used were EG&G Model 260, 100 kHz side scan sonars equipped with Time Varied Gain (TVG).

<u>Serial Number</u>	<u>Platform</u>	<u>Days used</u>
Recorder 015602 Fish 015598	RA-3	162-181
Recorder 61475 Fish 0011904 Fish 015598 Fish 0011902	RA-5	164-169 170 176-182

Operations

The side scan units were operated in either the 100-meter or 150-meter range scale with a corresponding line spacing of either 170 meters or 270 meters. Water depths for these operations ranged from approximately 15 to 30 meters. Confidence checks were performed at least once per day by towing the side scan past known objects such as pier faces or anchor chains.

Two types of side scan coverage areas were defined in the Project Instructions: 1) areas requiring 100% coverage, and 2) tracklines to be covered with one swath.

The side scan fish were towed from the center stern bit on the launch. The cable was paid out to the appropriate length by hand and then secured to a bit using a stopper made of cotton line.

Due to high currents and nonexistent water visibility in the area, dives were not performed on any features or obstructions. Any contacts that were flagged for further development were investigated using echo sounder development techniques.

*See Eval Rpt
sect 3*

Problems

While surveying on sheet A, the initial towfish (SN 0011904) used on the launch RA-5 failed on DN 169 when the port channel return faded. A confidence check revealed that the return from the port channel was virtually non-existent. All data acquired back to the point of failure were rejected and re-run.

Occasionally, when the door to the recorder (SN 61475) used on launch RA-5 was opened for annotating the records, the unit would momentarily switch to the 25 meter range scale. These periods would last from two to four seconds, during which time the swath would be "pinched in" to 25 meters. In featureless areas with regular bottom topography these sections of line were not re-run. In areas with boulders or other features evident, the areas where this occurred were re-run to ensure that no significant features were missed. The problem was isolated to a defective ribbon

cable connecting the door to the recorder and was fixed.

When recorder (SN 61475) on RA-5 was operated on the 150 meter range scale, the sonagram exhibited narrow (3-5 mm) light or dark stripes near the center of the record. These do not obscure contacts on the record. The exact cause of the stripes was not determined, although they appear to have been caused by the recorder printer. *The hydrographer never mentions if this problem was resolved. This does not affect the quality of this survey.*

The recorder (SN 015602) on RA-3 initially did not interface properly with the HDAPS in the launch. Speed information was being received by the recorder, but after a varying amount of time the speed readout on the recorder would freeze. At this point, the recorder would not accept any input from the HDAPS, including event marks. The unit was infrequently used for data acquisition until the problem was corrected on DN 193. The quality of the data acquired while the problem existed is unaffected, as any lines run had to be terminated as soon as the event marks stopped.

Processing

The following outlines the procedures used by RAINIER for side scan sonar processing:

During Acquisition:

- Annotate sonagrams with pertinent data:
 - Vessel speed
 - Cable length
 - Conditions affecting record; e.g. seas, wakes, etc.
- Note apparent contacts with an arrow
 - If time permits, compute heights on-line and note

During scanning:

- Note additional contacts or remove on-line contacts that are doubtful on reexamination
- Compute heights for all noted contacts
- Compare contact heights with corrected depths in area to determine significance:
 - Depth ≤ 20 m, contact height ≥ 1 m
 - Depth > 20 m, contact height $\geq 10\%$ of depth
- Name contacts on sonagram and enter data into Contact Log form

During processing:

- Edit data and perform rejections, smoothing, etc.
- Enter contact information from Log form
- Plot swaths using "Selected Data" option
- Plot contacts
- Examine swaths for overlap and "pinching"
 - If swath is pinched, examine records to determine cause (fish too low, wrong range scale, software problem, etc.)
 - If coverage looks good, possibly edit side scan information using the Edit Position function to correct the swath plot
- Examine contact relative to plotted, corrected data in the area
 - Determine if contacts are still significant
 - Examine proximity of contacts to one another. Use criteria in Field

Procedures Manual (FPM), Section 7.3.3 to determine if some contacts may be eliminated due to their proximity to a more significant feature. ✓

-Evaluate remaining contacts for further development, etc.

Additional information is contained in the "Separates to be Included with Survey Data, V. Side Scan Sonar Data." *Filed with the survey records.*

F. SOUNDING EQUIPMENT

All survey launches were equipped with the Raytheon DSF-6000N echo sounders shown below. The echo sounders were operated in the HIGH + LOW (HIGH DIGITIZED) function, using manual gain controls on both high and low frequencies to obtain the best analog trace. Soundings were recorded in meters and tenths of meters. Six-meter bar checks were conducted and recorded daily, using both the LOW and the HIGH + LOW (HIGH DIGITIZED) functions. The echo sounders were operated in accordance with the Provisional Instructions "Raytheon DSF-6000N Echo-Sounder Operating and Processing Instructions", dated July 5, 1983, and the FPM. ✓

Raytheon DSF-6000N Echo Sounders

<u>Vessel</u>	<u>Serial Number</u>	<u>DN</u>
2123	B044N	162-217
2124	A103N	164-214
2125	B048N	162-216
2126	A117N	176-203

The echo sounders were continuously monitored during data acquisition. All sounding data were scanned at least two times, to ensure all significant peaks were inserted, and to verify the digitized depths. ✓

G. CORRECTIONS TO ECHO SOUNDINGS

Corrections to echo soundings were determined for static draft, velocity of sound through water, settlement and squat. Predicted tides were used for all plots. Sounding correctors apply to both narrow and wide beams of the DSF-6000N echo sounder. Supporting data and computations for all corrections to echo soundings are included in the "Summer 1992 Corrections to Echo Sounding Data Package for OPR-P319-RA." ✓

Sound Velocity

Correctors for the velocity of sound through water were determined from the casts listed below: ✓

<u>Velocity Table No.</u>	<u>Cast No.</u>	<u>Deepest Depth (m)</u>	<u>Applicable DN</u>	<u>Cast Position</u>	<u>Day</u>
1	2*	49.9	160-171	61°13'07"N 149°59'10"W	162
2	3	49.6	174-184	61°15'38"N 149°54'01"W	176
4	5	49.0	188-207	61°15'30"N 149°54'00"W	203
5	7*	46.7	208-218	61°13'10"N 149°59'29"W	215

* Casts 2, 7 Fall outside the survey limits

Sound velocity casts were acquired with a SBE SEACAT Profiler, S/N 811, which was calibrated at the Northwest Regional Calibration Center on March 3, 1992.

Velocity correctors were computed using the PC program VELOCITY in accordance with Hydrographic Survey Guideline (HSG) #69. A printout of the Sound Velocity Corrector Tables used in the HDAPS Post Survey program are included in the "Summer 1992 Corrections to Echo Sounding Data Package for OPR-P319-RA."

Static Draft

For all launches, the distance from the transducer face to the gunwale was measured with a large metal square. Static draft measurements were then determined by dropping a lead line from the gunwale to the water and subtracting this distance from the distance measured with the square. The measurements from the gunwale to the waterline were conducted with the fuel tanks averaging 3/4 full and three people aboard. A transducer depth of 0.6 meter was determined for launches 2123, 2124, 2125, and 2126 on March 21-23 1992.

A draft of 0.66 meters was erroneously entered for launch 2123, which was rounded to 0.7 meters by HDAPS. This error was detected after the final field sheets had been plotted. The final field sheets were not replotted to correct this error but the digital file was corrected prior to submitting the data to the Pacific Hydrographic Section.

Settlement and Squat

Settlement and squat correctors were determined in Shilshole Bay, WA, for launch 2123 on March 11, 2124 on March 16 and 2125 and 2126 on March 18, 1992. Tests were conducted over a hard bottom in depths well exceeding 7 times the vessels' drafts. Both sea and wind were calm.

Observations were made through a Zeiss Ni2 leveling instrument to a rod held vertically on deck, directly over the transducer. Correctors were computed in accordance with Hydrographic Manual 4.9.4.2., using FPM Fig. 2.2 and 2.3, and are included in the "Summer 1992 Corrections to Echo Sounding Data Package for OPR-P319-RA."

Offset Tables

<u>Vessel</u>	<u>Offset Table</u>
2123	3
2124	4
2125	5
2126	6

Heave

Data acquired during significant sea action were check scanned to remove any errors introduced into the digital data by vessel heave.

Bar Check and Lead Lines

Bar check and lead lines were calibrated by RAINIER personnel on February 19, 1992 at PMC. Calibration forms are included in the "Summer 1992 Corrections to Echo Sounding Data Package for OPR-P319-RA."

Tide Correctors

Tidal zoning and correctors applicable to predicted tides for the Anchorage, Alaska, reference station (945-5920) were provided in the Project Instructions. Times are direct for sheet A in tidal zone X, and a x0.98 range ratio corrector was applied to the heights. Times and heights are direct in tide zone XI for sheet A.

HDAPS listings of the data used in generating tide corrector tables are included in Appendix V of this report, *Filed with the survey records.*

The station descriptions, field tide records, and Field Tide Notes have been forwarded to N/OES212 in accordance with HSG #50 and FPM 4.3. Requests for approved tides have been forwarded to N/OES2. Copies of the Field Tide Notes and the request for approved tides are included in Appendix V, *Filed with the survey records.*
Approved tide note dated January 27, 1992 is attached.

H. CONTROL STATIONS *See Eval Rpt, sect 2*

Geographic positions for all control stations are based on the North American Datum of 1983 (NAD83) and the Geodetic Reference System 1980 Ellipsoid.

A listing of the geodetic stations used to control this survey is ^{*attached.*} ~~included in Appendix III.~~

Positions for all existing stations are from the NGS data base. All existing stations were recovered in accordance with methods stated in FPM 5.2.4. New stations were positioned via traverse methods to meet third-order class I standards. Further information can be found in the "Summer 1992 Horizontal Control Report for OPR-P319-RA."

I. HYDROGRAPHIC POSITION CONTROL ✓

Method of Position Control

Soundings, bottom samples, and detached positions were positioned using either Ashtech Differential GPS, or Motorola Mini Ranger Falcon 484 microwave system. ✓

Falcon 484

Accuracy requirements specified in the Hydrographic Manual and in FPM 3.1.3.1 were met. When maximum residuals exceeded the specified limits, the launch was held at a constant speed and course while the station(s) causing the problem was deselected and hydrography was continued. These data were reviewed, and any off track data were smoothed (T&C'd) between good positions. No editing was done when the maximum Error Circle Radius (ECR) value was exceeded for one or two soundings, the data plotted on track, and was bracketed by good positioning information. If the data plotted off track but was still bracketed by good positions, it was smoothed between the good positions during processing. ✓

Ashtech GPS

Accuracy requirements as stated in the FPM were met. Occasionally, the data from the Ashtech was interrupted due to extreme corrector age. The HDAPS dead reckons the launch position during short periods of data interruption. The data were retained if the interruption lasted for only one or two soundings and was bracketed by good positions. No editing was performed if the soundings plotted on line. If they plotted off line, they were smoothed during processing. ✓

Serial numbers for Falcon R/T units, RPU's and Ashtech equipment are annotated on the data printouts. Lists of all positioning equipment serial numbers are included in the "Summer 1992 Electronic Control Data Package." ✓

Calibrations & Systems Check Methods

Falcon 484

Baseline calibrations were conducted in accordance with FPM 3.1.2.1 and 3.1.3.2. Calibrations were performed May 21-28, 1992 (DN 142-149) at the MATTHEWS PARK BEACH BASELINE. Calibration data and a description of the baseline is included in the "Summer 1992 Electronic Control Data Package." ✓

In accordance with FPM 3.1.3.3, formal system checks were not documented for multiple LOP hydrography. Data acquired with two LOP's were always bracketed by multiple LOP data acquired with ECR and maximum residuals within acceptable limits, which served as critical system checks. ✓

Ashtech GPS

A VHF Differential shore station was established at station WOR 7. Once established, a remote sensor was directly connected to the MXII shore station and its antenna was collocated with that of the shore station. The computed position was transmitted back to the ship via VHF radio modem link. The difference between the ✓

computed location and the station's published position were recorded by the MONITOR program on a PC. Data from a 24-hour period were recorded and examined for signs of multi-path signal reflection, which was not evident. ✓

Launch system checks were performed by a direct comparison of the Falcon position with the GPS position. HDAPS Survey Screen Two was used for this comparison, and was dumped to the system printer to record the results. Three such dumps were made for each system check. System checks were normally performed each day, and days with no system checks are always bracketed by days with good checks. ✓

Problems

The Falcon system exhibited erratic range jumps in several geographic areas within the project area. These jumps were persistent enough to cause the HDAPS positioning algorithm to lose track of the vessel's true position. ✓

The problem appears to be due to some type of external interference. Further research revealed that the problem was encountered on previous surveys in the area. The U.S. Army Corps of Engineers had studied the problem and attributed it to an unknown source of interference. GPS was used to survey in the areas where the Falcon coverage was interrupted. ✓

Initially the GPS was not functioning properly. The system would output positions for several minutes, and then at random intervals would stop computing positions. The problem was traced to the VHF radio link and the shore station broadcast rate. The differential correctors were being broadcast at approximately seven second intervals. The various other delays built into the system combined with this update rate caused the correctors to exceed the allowed age of 30 seconds. The final solution was to increase the transmit rate and shorten the radio modem packet length which has the effect of decreasing the age of the correctors. The GPS system performed without fault once this was done. ✓

Offset

The launch GPS antenna is mounted on the same mast as the Falcon R/T unit. Antenna offsets, and the side scan sonar tow point are stored in the HDAPS Offset Tables as listed in Section G. Copies of the Offset Tables are included in the "Separates to be Included with Survey Data, III. Horizontal Position Control and Corrections to Position Data." ✓

J. SHORELINE

See Eval Rpt, sect 2

The shoreline shown on the final field sheet was transferred from 1:10,000 scale enlargements of Chart 16665, Second Edition, May 1990, scale 1:50,000. The shoreline is shown in brown for orientation purposes. ✓

Offshore rocks were verified by detached position or disproved by hydrographic developments and detached positions at minus tide. Field notes for all detached positions are located on the daily data printouts.* ✓

The zero meter curve has changed significantly throughout the survey area and its new location has been defined by hydrography. *Concur* ✓

* Filed with the survey records.

The project instructions stated that formal verification of the foreshore features and mean high water line was not necessary. Rocks charted in the foreshore area were checked in the field for major changes. RAINIER used sequential numbers to track the checking of foreshore charted rocks. Sequential numbers and associated notes are recorded in the sounding volumes included with the survey. The foreshore rocks on this survey fall into three categories: as charted, not found or new feature. ✓

Many of the rocks in the offshore area have either moved or the elevations have changed. These can be attributed to several factors: scouring away of sand underneath the rocks, and the movement of ice through the winter months. The hydrographer recommends changing the chart depiction to reflect the final field sheet. *Concur* smooth ✓

Several changes to shoreline features were identified during this survey:

The two rocks, in the vicinity of 61°16'58"N, 149°50'58"W and 61°16'55"N, 149°51'06"W, were not found. A detached position, Position Number 1419, was taken at this location on DN 214. The average depth was 1.4 meters with a -1.0 meter tide corrector. The area was visually investigated for approximately 15 minutes and no rocks or shoaling were evident. The hydrographer recommends replacing the charted rocks symbols with survey depths for the area. *Do not concur. D.P. 35.0 meters from rocks, and no soundings in area of rocks. Retain as charted.*

The rock located in the vicinity of 61°12'54"N, 149°54'48"W was not observed. Detached position number 2643 was taken after a 10 minute visual investigation in an area with exposed mud flats. No rock was evident on DN 218 with a tide corrector of -0.7 meters. The hydrographer recommends removing the rock symbol from the chart and using the survey depths for the area. *Concur, except no depths on survey for the area.*

The rock located in the vicinity of 61°12'27"N, 149°57'09"W was not visually verified. A 5-meter line spacing development within a 25-meter search radius was conducted at this position with the shoalest depth being 0.2 meter. The hydrographer recommends retaining the charted rock. *Concur. Carried forward to the smooth sheet from H-2441 (1974)*

The charted rocks south of Cairn Pt in the vicinity of 61°15'09"N, 149°53'02"W are bounded by a charted shoal area. The rocks in this area were verified as charted. In addition, numerous gravel shoals were observed at minus stages of tide. The hydrographer recommends retaining the foul area as charted. *These rocks originate from H-2440 (1974). See Eval Rpt, rect 6.*

The charted rocks west of Cairn Pt. in the vicinity of 61°15'45"N, 149°55'15"W are part of a charted shoal area. The rocks in this area were verified as charted. The hydrographer recommends retaining the foul area as charted. *These rocks originate from H-2440 (1974). See Eval Rpt, rect 6.*

The rocks in the charted foul area east of Pt MacKenzie in the vicinity of 61°14'59"N, 149°57'30"W were verified as charted. The hydrographer recommends retaining the foul area as charted. *These rocks originate from H-2441 (1974). See Eval Rpt, rect 6.*

Three new, uncharted rocks were positioned:

Position Number	Vicinity		
	Lat. 7	Long. 8	
4343	61°15'48"N	149°55'09"W	2 ³ rk *(28)
5571	61°15'42"N	149°55'27"W	

2635⁺ (offset)

61°14'^{43.5}39"N, 149°57'³³26"W

(9th) See Eval Rpt, rect 2 11

The hydrographer recommends adding the new rocks to the chart. **Concur**

An uncharted pier (Anderson Pier) was found in the vicinity of 61°17'31"N, 149°54'58"W and was positioned on the final field sheet using a T-2 and EDM. Control station ANDY marks the southeast corner of the pier. The hydrographer recommends changing the chart depiction to reflect the final field sheet. **Concur.**
Chart as shown on the smooth sheet

The Ship Creek area has recently experienced new construction. Several changes were defined on this survey using a T-2 and EDM. ✓

The following uncharted items are included on the final field sheet:

Position #	Position	Item
1900	61°13'31"N 149°54'25"W	South corner small boat ramp
1901	61°13'33"N 149°54'23"W	North corner small boat ramp
1902	61°13'39"N 149°54'04"W	End of jetty
2611	61°13'45"N 149°54'01"W	Northwest corner of landfill
1903	61°13'34"N 149°53'42"W	Dolphin near north shore of Ship Creek
1904	61°13'34"N 149°53'37"W	Dolphin near north shore Ship Creek
1905	61°13'33"N 149°53'34"W	East end of fish processing plant

Chart these features as shown on smooth sheet

Construction plans, ~~video~~, and photographs of Ship Creek are included with the survey data. ~~The hydrographer recommends changing the chart depiction to reflect the final field sheet.~~ **Concur.** Also, current photography should be acquired to update rocks and shoreline in the vicinity of Ship Creek. **smooth**

K. CROSSLINES ✓

Both crosslines and rangelines were used for comparisons. These totaled 33.6 NM, representing 5.9% of the total hydrography, including developments. ✓

Crossline soundings agree with main scheme soundings to within 1.5 meters. The differences are attributable to predicted tides, bottom slope, or in some instances steep slopes due to sand waves. ✓

The vessels acquiring crossline data did not always acquire the corresponding mainscheme data. ✓

L. JUNCTIONS See Eval Rpt, rect 5

This survey junctions with survey H-10431 (1:10,000, 1992) to the west. The soundings along these junctions ~~agree~~ ^{agree} to within one meter. No major irregularities in contours were found at the survey junction. ✓

M. COMPARISON WITH PRIOR SURVEYS See Eval Rpt, rect 6

Seven prior surveys were provided for comparison with H-10430. Five of the seven prior surveys were superseded in their common area, with the exception of the noted AWOIS items below in surveys H-9441 and H-9438. Comparisons below were made with the two most recent surveys. The entire upper Cook Inlet area is extremely ✓

* Filed with the hydrographic records.

changeable due to the presence of high current velocities and large amounts of sand and sediments. The results of comparisons with prior surveys reveal that the bottom has changed significantly in parts of the survey area, while remaining stable in others. Detailed sounding by sounding discrepancies are not listed, as the area has changed significantly since the last surveys were performed.

H-10012 (1:20,000, 1982)

The Ship Creek channel entrance has migrated 93 meters southwest. Shoaling, approximately 2-4 meters, has occurred in the northeast. Scouring, between 5 and 25 meters, has occurred mid-channel. A shoal area in the vicinity of 61°15'30"N, 149°55'00"W has migrated approximately 100 meters southwest.

Recommendation: The hydrographer recommends that the sounding data from the present survey supersede that of H-10012 within their common area. *CONCUR*

H-9440 (1:10,000, 1974)

The shoreline soundings from this survey are approximately 2-3 meters shoaler than H-9440. A shoal in the vicinity of 61°13'27"N, 149°56'00"W remained in approximately the same position with depths 1-2 meters shoaler than the present survey. A shoal on the eastern shore in the vicinity of 61°15'30"N, 149°53'30"W migrated approximately 140 meters southwest. It is 2-3 meters shoaler than previously surveyed. The zero meter curve migrated several meters inland ~~and shore~~ throughout the survey area. Scouring has occurred mid channel. H-10430's mid-channel soundings were 26 meters deeper than this survey.

Recommendation: The hydrographer recommends that the sounding data from the present survey supersede that of H-9440. *See Final Rpt, sect 6*

at latitude 61/13/27N, longitude 149/53/29W
AWOIS Item 51904: A charted wreck in Ship Creek originating from survey H-9438, was not found. The site of the wreck was above the high water line. The item was searched for visually for 10 minutes, Position Number 8379, but was not seen.

Recommendation: Remove the wreck from the chart. *CONCUR*

at latitude 61/13/32N, longitude 149/53/27W
AWOIS Item 51905: A charted wreck in Ship Creek originating from survey H-9438, was not found. The site of the wreck was above the high water line. The item was searched for visually for 10 minutes, Position Number 8378, but was not seen.

Recommendation: Remove the wreck from the chart. *CONCUR*

at latitude 61/13/35N, longitude 149/53/48W
AWOIS Item 51906: A charted wreck at the entrance to Ship Creek and originating from survey H-9438, was found (Position 8377). The wreck serves as a small jetty.

at latitude 61/13/35.62N, longitude 149/53/52.37W
Recommendation: Retain the wreck on the chart. *CONCUR*.

at latitude 61/13/57N, longitude 149/53/38W
AWOIS Item 51907: A charted wreck located just north of Ship Creek and originating from survey H-9438, was found (Position 5782). *at latitude 61/14/00N, longitude 149/53/40.99W*

Recommendation: Retain the wreck on the chart. *CONCUR*.

~~AWOIS Item 51902: A 28-29 foot shoal originating from survey H-9441 and carried forward to the H-10012 in the vicinity of 61°14'13"N, 149°56'43"W, was investigated using 25-meter line spacing development in a 250-meter radius around the charted location. No evidence of shoaling exists. The shoalest survey depth was 36 feet (11.0/10.8 meters).~~

Recommendation: Although the shoal was disproved, the hydrographer recommends retaining the charted shoal on any preliminary charts until the Pacific Hydrographic Section verifies the present survey. See Eval Rpt, sect 7. b.

N. COMPARISON WITH THE CHART See Eval Rpt, sect 7

This survey was compared to NOS chart 16665 (1:50,000, 2nd Edition, May 19, 1990, NAD83). All charted soundings are from prior surveys discussed in Section M.

^{BP-98365/1964}
AWOIS Item 50719: A charted, submerged dolphin reported in the vicinity of 61°13'57.6"N, 149°54'01.9"W and originating from survey H-10012, was not found. The area was investigated using 400% side scan sonar coverage with a 50-meter search radius. The area was further examined at a minus tide, and the dolphin was not seen.

Recommendation: Delete the submerged dolphin from the chart. *Concur*

^{BP-98365/1964}
AWOIS Item 50720: A charted, submerged dolphin reported in the vicinity of 61°13'43.5"N, 149°54'33.15"W and originating from survey H-10012, was not found. The area was investigated using 400% side scan sonar coverage with a 50-meter search radius. The area was further examined at a minus tide, and the dolphin was not seen.

Recommendation: Delete the submerged dolphin from the chart. *Concur*

AWOIS Item 50721: A charted, submerged wreck with 29 feet over it, reported in the vicinity of 61°15'04"N, 149°53'39"W and originating from survey H-10012, was verified. This wreck was investigated using 5-meter line spacing in a 50-meter radius search around the noted position. In addition 100% side scan sonar coverage was used. The shoalest depth was ²⁹32 feet (9.9 meters) ^Bat MLLW.

Recommendation: Retain the wreck on the chart, but show it at a ²⁹32-foot depth (9.9 meters). See Eval Rpt, sect. 6

AWOIS Item 51900: A charted sewer terminus in the vicinity of 61°12'42"N, 149°55'49"W, was not observed. This was investigated by visual inspection at low water and 5-meter line spacing development at the western edge of the terminus at high water.

Recommendation: Retain the charted sewer symbol. Blueprints obtained through Alaska Water, Waste and Utility indicate the terminus is buried but present. *concur See Eval Blueprints are included with the present survey Rpt, sect 7a*

^{LNM 26/85}
AWOIS Item 51903: A 28-29 foot shoal reported in the vicinity of 61°14'28"N, 149°56'32"W and originating from survey H-10012, was investigated by a 25-meter line spacing development in a 250-meter radius around the noted position. No evidence of shoaling exists. The shoalest depth was ²⁹32 feet (12.1 meters). ^{Position #2159/B}
^{32.1} 9.9 at latitude 61/14/29.01N
longitude 149/56/35.30W

Recommendation: Although the shoal was disproved, the hydrographer recommends retaining the charted shoal on any preliminary charts until the Pacific Hydrographic Section verifies the present survey. See Eval Rpt, sect 7. b.

AWOIS Item 51908: A 29 foot depth reported in the vicinity of 61°15'00"N, 149°53'41"W and originating from survey H-10012 was disproved. This depth was investigated by a 5-meter line spacing development in a 100-meter radius around the noted position. The shoalest depth was 3 $\frac{1}{2}$ feet (10.8 meters). Position #840713, at latitude 61/15/01.39N, longitude 149/53/47.81W.

Recommendation: Replace the ^{Charted} 29 foot depth with sounding data from the present survey. **Concur.**

AWOIS Item 51910: (not presently charted) CL 34/92 An obstruction originating from survey H-10012 in the vicinity of 61°14'36"N, 149°53'14"W, was not found. The obstruction was investigated using 200% side scan sonar coverage with a 150-meter search radius.

Recommendation: The obstruction no longer exists and should not be charted. **Concur**

AWOIS Item 51911: A charted, wreck on shore originating from survey H-9440 in the vicinity of 61°17'39"N, 149°55'00"W, was found (Position 4935), at latitude 61/17/38.84N, longitude 149/55/00.12W.

Recommendation: Retain the wreck on the chart. **Concur**

AWOIS Item 51912: (not presently charted) CL 433/92 The obstruction originating from survey H-10012, was reported in the vicinity of 61°14'47"N, 149°53'14"W, was found. The obstruction was investigated using 5-meter line spacing in a 150-meter search radius. In addition 200% side scan sonar coverage was used. The shoalest depth was 33 feet (10.20 meters). at lat 61/14/47.71N, long 149/53/15.03W

Recommendation: Chart as an obstruction with a shoalest depth of 33 feet (10.20 meters). **Concur**

AWOIS Item "D":

(presently not charted)
AWOIS Item "D" is a 19 foot depth from survey BP140130, 1989. It is located in the vicinity of 61°14'15"N, 149°57'07"W and was investigated using a 25-meter line spacing development. The shoalest depth found was 20 feet (7.6 meters). Also within area covered by 100% side scan sonar.

Recommendation: Replace the 19 foot depth with sounding data from the present survey. **Concur.**

While conducting hydrography a tug boat was observed with a fouled anchor. The captain notified the RAINIER that they were going to cut the chain. The anchor and chain were cut loose and then positioned. Position 2316 marks the anchor and chain. The average depth was 26.8 meters. at latitude 61/14/33.44N, longitude 149/54/05.94W

Recommendation: The hydrographer recommends that this anchor and chain not be charted due to its depth. **do NOT CONCUR.** Chart area according to this survey.

Dangers to Navigation

No dangers to navigation were reported for this survey. **Concur**

Since the survey area has undergone significant change over a large area, two chartscale, excessed plots of all survey data have been forwarded to the Nautical Charting Division, with the recommendation that they be used to produce a preliminary chart of the area. *The preliminary chart has been produced*

O. ADEQUACY OF SURVEY

This survey is complete and adequate to supersede all prior surveys covering this *Concur* area. Dredging occurs annually along the Port of Anchorage pier face from July to September and was ongoing during the time of this survey, for this reason, detailed hydrography was not conducted along the Port of Anchorage pier face. Depths along the Port of Anchorage pier face can be obtained from the Alaska District Army Corps of Engineers.

P. AIDS TO NAVIGATION *See Final Rpt, sect 7.d.*

Two landmarks are to be charted on NOS Charts 16660, 16665, and 16667. These landmarks are:

<u>LANDMARK</u>	<u>POSITION</u>	<u>HEIGHT</u>
Elmendorf Microwave Tower <i>(beyond limits of this survey)</i>	^{lat} 61°18'40.1"N, ^{long.} 149°48'46.6"W	80.6M
Elmendorf Radio Tower	61°17'20.0"N, 149°50'10.8"W	80.4M
Knik Arm Microwave Relay Tower <i>should be charted on NOS Chart 16660.</i>	^{lat} 61°25'19.9"N, ^{long.} 149°52'27.6"W	286.2 meters high,

The landmark's name at position 61°10'36.2"N, 149°58'58.6"W should be revised to PATCO INT'L CONTROL TOWER on NOS Chart 16665. *(Beyond limits of this survey)*

Q. STATISTICS ✓

<u>Vessel</u>	<u>2123</u>	<u>2124</u>	<u>2125</u>	<u>2126</u>	<u>Total</u>
Positions Used	643	2419	649	733	4444
NM of Hydro	100.31	327.03	55.66	75.95	559
NM ² of Hydro	11.0				
Detached Positions	8				
Reference Numbers	12				
Velocity Casts	4				
Tide Stations	2				
Bottom Samples	83				

R. MISCELLANEOUS ✓

Loran C comparisons were sent to DMAHTC and U.S. Coast Guard. ✓

In accordance with Project Instructions, bottom samples were not sent to the Smithsonian Institution. They were, however given to the U.S. Army Corps of Engineers for analysis and use in their ongoing Cook Inlet study. ✓

S. RECOMMENDATIONS ✓

Since the survey area has undergone significant change over an area too large to disseminate as chartlets in Notice to Mariners, the hydrographer recommends that the Nautical Charting Division immediately issue a preliminary chart using the field survey data. *The preliminary chart has been issued.* ✓

T. REFERRAL TO REPORTS ✓

The following supplemental reports contain additional information relevant to this survey:

<u>Title</u>	<u>Date Sent</u>	<u>Office</u>
Summer 1992 Horizontal Control Report for OPR-P319-RA	September 2, 1992	N/CG2333
Summer 1992 Electronic Control Data Package for OPR-P319-RA	September 1992 ¹	N/CG245
Summer 1992 Corrections to Echo Soundings Data Package for OPR-P319-RA	September 1992 ¹	N/CG245
Summer 1992 Coast Pilot Report for OPR-P319-RA	November 1992 ¹	N/CG245
Summer 1992 User Evaluation for OPR-P319-RA	October 1992 ¹	N/CG245
Corps of Engineers Trip Report Field Data Collected in Upper Cook Inlet, 15-24 July, 1992	July 1992	PMC

¹ Estimated date

Written and Submitted by,

Dede L. Pitts

Dede L. Pitts
Ensign, NOAA

Approved and Forwarded,

Thomas W. Richards

Thomas W. Richards
Captain, NOAA
Commanding Officer

CONTROL STATIONS as of 4 Sep 1992

No	Type	Latitude	Longitude	H	Cart	Freq	Vel	Code	MM/DD/YY	Station Name	Quad Nos.
100	F	061:10:33.311	150:10:04.002	2	250	0.0	0.0	0	06/09/92	POLE 1973	611503
101	F	061:09:52.095	150:04:06.610	2	250	0.0	0.0	2	06/09/92	BELL	611503
102	F	061:13:11.230	149:54:09.308	47	250	0.0	0.0	7	06/09/92	✓ANCHOR STEAM 1982	611492
103	F	061:14:17.461	149:59:13.836	29	250	0.0	0.0	8	06/09/92	✓MAC 1960 RM 3 RM 1 USE	611492
104	F	061:12:08.534	150:00:59.324	49	250	0.0	0.0	2	06/10/92	✓WOR 7 1992(GPS)	611503
105	F	061:10:20.814	150:12:19.345	2	250	0.0	0.0	0	06/12/92	✓RIFE 1960	611503
106	F	061:17:31.011	149:54:58.867	8	250	0.0	0.0	9	06/14/92	✓ANDY TP 1992	611492
107	F	061:17:43.996	149:49:56.407	21	250	0.0	0.0	0	06/14/92	✓DEDELK 1992	611492
108	F	061:15:30.097	149:52:42.807	7	250	0.0	0.0	C	07/21/92	✓LOW RHI 1992	611492
109	F	061:15:31.147	149:52:46.645	3	250	0.0	0.0	C	06/14/92	LDW	611492
110	F	061:16:07.258	149:55:18.204	6	250	0.0	0.0	5	07/21/92	✓SLAM 1992	611492
111	F	061:10:23.478	150:09:38.611	8	250	0.0	0.0	E	06/29/92	✓FIRE 1992	611503
112	F	061:09:16.928	150:03:27.311	72	250	0.0	0.0	1	07/01/92	KINCAID	611503
113	F	061:07:33.790	150:16:55.990	9	250	0.0	0.0	3	07/07/92	✓WEST POINT 1992(GPS)	611503



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEANIC SERVICE
Coast and Geodetic Survey
Seattle, Washington 98116-0070

October 19, 1992

MEMORANDUM FOR: Captain Thomas W. Richards, NOAA
Commanding Officer, NOAA Ship RAINIER

FROM:


J. Gary Fredrick
Chief, Pacific Photo Party

SUBJECT: Horizontal Control Data Submission
Northern Cook Inlet, Alaska
S-P319-RA-SUMMER-1992

Subject data has been reviewed by this office and most observations meet or exceed the accuracies sought. This project was observed following Third-Order Class I specifications.

All data was digitized into MTEN and DDPROC format by RAINIER. All data was placed into BBOOK format by this office. The BBOOK file was run through program GEOID90 before being adjusted by this office. All GP's were computed using NAD-83 positions on the GRS-80 ellipsoid with OSU geoidal heights.

A minimally constrained adjustment yielded a variance unit weight of 5.22 with mean abstract residuals of 2.561 seconds for Horizontal Directions, 12.353 seconds for Zenith Distances, and 0.011 meters for Measured Distances. A fully constrained adjustment yielded a variance unit weight of 12.61 with mean abstract residuals for Horizontal Directions of 3.119 seconds, for Zenith Distances of 12.435 seconds, and for Measured Distances of 0.046 meters. Observations with large residuals in the Zenith Distance observations were rejected. For the minimally constrained adjustment the following stations were held horizontally and vertically fixed: PATCO INTL CONTROL TOWER, MAC RM3 RM1, RACE POINT LIGHT, FIRE ISLAND RNG FRONT LT, PT MACKENZIE RNG FRONT LT, RAINIER, WEST POINT. The following stations were held fixed vertically only: ANCHOR STEAM, WOR 7, PT WORONZOF RNG REAR LT. The following stations were held fixed horizontally only: PT WORONZOF INTAKE TANK, PT WORONZOF RNG FRONT LT, ANCHORAGE ACS MICROWAVE TWR, ANCHORAGE MUNICIPAL TANK, ANCHORAGE RADIO STA KENI TOWER, RIFE. For the constrained adjustment the following additional stations were held horizontally and vertically fixed: PT WORONZOF RNG FRONT LT, LOW, WOR 7, PT WORONZOF RNG REAR LT. No vertical only constraints were entered. Station ANCHOR STEAM was the additional horizontal only fixed station.

The positions for ANCHOR STEAM, PATCO INTL CONTROL TOWER, RAINIER, AND WEST POINT were obtained from prior survey OPR-P358-RA-82/ GTZ-G-17511. The position for WOR 7 sourced from PACIFIC PHOTO PARTY survey CM-9201/PWS GPS-444 PROCESSING ID: AKPW072D.060.



Several problems existed with this survey. These problems are discussed in the paragraphs that follow.

GP's for FIRE ISLAND RNG REAR LT, RACE POINT RNG REAR LT, and PT MACKENZIE RNG REAR LT were obtained from the Coast Guard. The stations were then converted from NAD 27 to NAD 83 by ship's personnel, the GP's were then incorrectly assumed to meet 3rd order class I standards. Several problems exist with that assumption. First, unless the Coast Guard obtained the GP's from the NGS data base there is no guarantee as to the method or accuracy of the position. Secondly, datum shifts using NADCON or CORPSCON do not necessarily provide an accurate conversion. Two of the above stations were listed in the NGS NAD-83 data base FIRE ISLAND RNG REAR LT, and PT MACKENZIE RNG REAR LT but observations did not confirm their positions. The Hydrographic Manual requires these navigation aids to be positioned/recovered to 3rd order class I standards and this office is unable to process data that does not meet the minimal 3rd order class I standards. Observations involving the above stations did not meet minimum standards because only two plate settings were turned to the stations. Additionally the check angle turned to RACE POINT RNG REAR LT reflected a 418.39 second bust. therefore all the above stations were removed from the data.

Observations for PT MACKENZIE LT NO 11 did not contain enough plate settings to position it, so this station had to be removed from the data set. Observations to position KNIK ARM MICROWAVE RELAY TOWER were in error by 8.5 meters so this station was also removed from the data set. Check angle observations to PT WORONZOF RNG FRONT LT And FIRE ISLAND RNG FRONT LT were rejected because the wrong aiming points were sighted on causing a 41 second and a 50 second bust respectively. Additionally RACE POINT RNG FRONT LT was not in the data base.

It is impossible for this office to guess why the short sides of figures were not observed but if the intent of the observations listed above were to produce 3rd order positions the shorter sides should be observed. As example: the Pt Mackenzie Range Lights were observed from stations Rife and Fire at 14 and 12 kilometers distant when station Mac is only 200 and 350 meters distant. The Fire Island and Pt Woronzof Range Lights were observed in this manner also. Perhaps the lines are all blocked. NOT!

Five stations did not have enough redundancy to compute elevations with checks. They are being submitted as no check elevations.

The station description data set was incomplete and not checked. Several errors in the station description data set were found and corrected by this office. The errors ranged from stations sharing the same serial number to incorrectly entered geographic positions. If these records had been checked the errors would have most likely been spotted and corrected in the field. The station recovery notes were missing the PID entry. The PID is required on recovery notes when they go forward to NGS this is something that is best done in the field when the records are first created. Additionally, stations were not named as they appeared in the data base. Naming a station differently than it appears in the data base can cause a multiple entry into the data base for one station. All recovery notes had to be edited and reprinted by this office.

All related files, included with the Data Set and associated BBOOK, AFILE, DDPROC and Hard copy of the adjustment were submitted to NGS.

The positions for ANCHOR STEAM, PATCO INTL CONTROL TOWER, RAINIER, AND WEST POINT were obtained from prior survey OPR-P358-RA-82/ GTZ-G-17511. The position for WOR 7 sourced from PACIFIC PHOTO PARTY survey CM-9201/PWS GPS-444 PROCESSING ID:AKPW07ZD.060.

Observations to support FIRE ISLAND RNG REAR LT, RACE POINT RNG REAR LT, PT MACKENZIE RNG REAR LT, PT MACKENZIE LT NO 11, and KNIK ARM MICROWAVE RELAY TOWER did not meet survey standards so these stations were removed from the data set. Observations to PT WORONZOF RNG FRONT LT And FIRE ISLAND RNG FRONT LT were rejected because the wrong aiming points were used to sight on.

Stations FIRE, FIRE ECCENTRIC, and ANDY TP were temporary points, they were included because they strengthened the adjustment. These stations are not submitted for entry into the NGRS.

Several elevations of aids to navigation and landmarks were set to 0 and held fixed in the adjustments because no Zenith Distances were observed and no elevations were available.

All related files, included with the Data Set and associated BBOOK, AFILE, and DDPROC are included on floppy disk. Hard copy of the adjustments are also included.

cc: RAINIER
N/CG233

APPROVAL SHEET

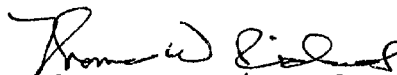
for

H-10430

RA-10-5-92

Standard procedures were followed in accordance with the Hydrographic Manual, Fourth Edition; the Hydrographic Survey Guidelines; and the Field Procedures Manual in producing this survey. The data were examined daily during data acquisition and processing.

The field sheet and accompanying records have been examined by me, are considered complete and adequate for charting purposes, and are approved.


Thomas W. Richards
Captain, NOAA
Commanding Officer



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

COPY

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: January 27, 1993

MARINE CENTER: Pacific

OPR: P319-RA

HYDROGRAPHIC SHEET: H-10430 (amended)

LOCALITY: Southern Approach To Knik Arm, Cook Inlet, Alaska

TIME PERIOD: June 10 - August 5, 1992

TIDE STATIONS USED: 945-5920 Anchorage, Alaska
Lat. $61^{\circ} 14.3'N$ Lon. $149^{\circ} 53.3'W$

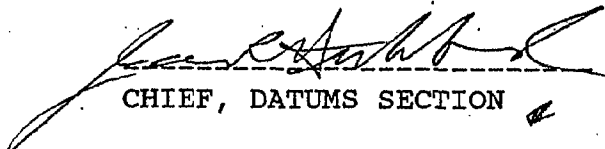
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 6.41 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 28.3 ft.

REMARKS: RECOMMENDED ZONING

1. In Cook Inlet, north of $61^{\circ} 10.0'N$, south of $61^{\circ} 15.6'N$, east of $149^{\circ} 59.0'W$ and west of $149^{\circ} 55.8'W$, times are direct and apply a x0.98 range ratio.
2. In Cook Inlet, north of $61^{\circ} 12.0'N$, south of $61^{\circ} 18.4'N$, east of $149^{\circ} 55.8'W$ and west of $149^{\circ} 50.0'W$, times and heights are direct.

Notes: Hourly heights are tabulated in Alaskan Standard Time.


CHIEF, DATUMS SECTION



GEOGRAPHIC NAMES

Name on Survey	ON CHART NO. 16665 ON PREVIOUS SURVEY CON U.S. QUADRANGLE MAPS FROM LOCAL INFORMATION ON LOCAL MAPS P.O. GUIDE OR MAP RAND McNALLY ATLAS U.S. LIGHT LIST											
	A	B	C	D	E	F	G	H	I	J	K	
ALASKA (title)	X											1
ANCHORAGE	X											2
CAIRN POINT	X											3
COOK INLET	X											4
FISH CREEK	X											5
KNIK ARM	X											6
MACKENZIE, POINT	X											7
SHIP CREEK	X											8
												9
												10
												11
												12
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												24
												25

Approved:

Charles E. Huntington

Chief Geographer - N/CG 2x5

MAR 24 1993

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

RECORD DESCRIPTION		AMOUNT	RECORD DESCRIPTION		AMOUNT
SMOOTH SHEET		1	SMOOTH OVERLAYS: POS., ARC, EXCESS		3
DESCRIPTIVE REPORT		1	FIELD SHEETS AND OTHER OVERLAYS		5
DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDION FILES	3		w/ depth records	w/ depth records	
ENVELOPES					
VOLUMES	4				
CAHIERS					
Bindings				2	

SHORELINE DATA

SHORELINE MAPS (List):

PHOTOBATHYMETRIC MAPS (List):

NOTES TO THE HYDROGRAPHER (List):

SPECIAL REPORTS (List):

NAUTICAL CHARTS (List):

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			4040
POSITIONS REVISED	2	1	3
SOUNDINGS REVISED	18	10	28
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	EVALUATION	TOTALS
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS	46		46
VERIFICATION OF SOUNDINGS	145		145
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET	64		64
COMPARISON WITH PRIOR SURVEYS AND CHARTS		38	38
EVALUATION OF SIDE SCAN SONAR RECORDS		25	25
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		53	53
GEOGRAPHIC NAMES			
OTHER*			
*USE OTHER SIDE OF FORM FOR REMARKS	TOTALS	255	116
			371

Pre-processing Examination by Lt. J. Griffin	Beginning Date 10/5/92	Ending Date 11/4/92
Verification of Field Data by E. Brown	Time (Hours) 255	Ending Date 7/15/93
Verification Check by S. Otsubo	Time (Hours) 47	Ending Date 7/28/93
Evaluation and Analysis by G. Kay and J. Green	Time (Hours) 116	Ending Date 10/19/93
Inspection by B. Olmstead	Time (Hours) 55	Ending Date 11/30/93

EVALUATION REPORT H-10430

1. INTRODUCTION

Survey H-10430 is a basic hydrographic survey, under the navigable area concept, accomplished by the NOAA Ship *Rainier* according to the following Project Instructions.

OPR-P319-RA, dated April 14, 1992
CHANGE NO. 1, dated May 8, 1992
CHANGE NO. 2, dated May 27, 1992
CHANGE NO. 3, dated August 18, 1992

The inshore limit for soundings for this survey is the 0-meter curve, except for those features between MLLW and MHW which were to be addressed only if they were AWOIS items or significant changes or additions to the chart.

This survey was conducted in Alaska and covers an area in Cook Inlet in the vicinity of Anchorage. The surveyed area extends from latitude 61/12/07N to latitude 61/18/15N and longitude 149/50/21W to longitude 149/58/55. The sea floor consists of black or gray sand. Depths range from zero along the shore to 56 meters approximately one mile west of Cairn Point.

Side scan sonar was utilized during this survey along two tracks identified on the presurvey review chart, for 100% coverage of an area centered at latitude 61/14/15N, longitude 149/56/30W (shown on the presurvey review chart), and for AWOIS and other investigations as required. The side scan data was processed in accordance with the procedures contained in Hydrographic Surveys Branch memorandum, *Side Scan Sonar Processing Procedures*, dated June 28, 1993. The recommended disposition of the side scan investigations may be found in Section 3 of this report.

Predicted tides for Anchorage, Alaska, were used for the reduction of soundings during field processing. Approved hourly heights zoned from Anchorage, Alaska, gage 945-5920, were used during office processing.

The field sheet parameters have been revised to center the hydrography on the smooth sheet and to change the projection to polyconic. Daily system checks by comparison with Miniranger positions confirmed that the DGPS was operating properly. The dynamic draft, sound velocity and electronic control correctors are adequate. An accompanying computer printout contains the parameters and the correctors.

A digital file has been generated for this survey that includes categories of information required to comply with Hydrographic Survey Guideline No. 52, Standard Digital Data Exchange Format, April 15, 1986. Certain feature descriptive information, however, may not be in the digital record due to the restrictions of the presently available cartographic codes. The user should refer to the smooth sheet for complete information.

2. CONTROL AND SHORELINE

Sections H and I of the hydrographer's report and the Summer 1992 Horizontal and Electronic Control Reports for OPR-P319-RA contain adequate discussions of horizontal control and hydrographic positioning. In addition, see the Pacific Photo Party memorandum, dated October 19, 1993, in which several deficiencies in data quality are discussed.

Positions of horizontal control stations used during hydrography are 1992 field and published values based on NAD 83. These values were used during office processing for the computation of positions. The smooth sheet and accompanying overlays are annotated with NAD 27 adjustment ticks based on values determined with the NGS program NADCON. Geographic positions based on NAD 27 may be plotted on the smooth sheet using the NAD 83 projection by applying the following correction.

Latitude: -1.981 seconds (-61.333 meters)
Longitude: 7.968 seconds (118.787 meters)

The year of establishment of control stations shown on the smooth sheet originates with the previously listed horizontal control report and the published data.

The features shown on this survey were positioned by either DGPS or Miniranger. Several DGPS positions exceeded the geometrical accuracy specification limit in terms of HDOP values. A review of the data indicates that none of these positions are used to locate dangers to navigation. Several additional positions acquired by Miniranger control also exceed the accuracy specification limit in terms of ECR and residual. The review of this data also indicates that none of these are used to locate dangers to navigation. The features located by these positions from both methods of control are consistent with the adjoining data. They have been accepted.

The islet bearing 9.3 meters at MHW shown on the smooth sheet at latitude 61/14/43.5N, longitude 149/57/33W, is plotted from the final field sheet without adequate supporting positional information.

There are no shoreline maps applicable to this survey. The shoreline shown on the smooth sheet was compiled from an enlarged copy of chart 16665, 2nd Edition, May 1990, and from prior survey H-9440. It is shown for orientation purposes only.

The charted shoreline was changed by hydrographic information at the following locations.

<u>Feature</u>	<u>Latitude (N)</u>	<u>Longitude(W)</u>
Pier	61/13/30	149/54/18
MHWL	61/13/42	149/54/03

These features are shown on the smooth sheet as dashed red lines. These changes are supported with positional information and are adequate to supersede the charted shoreline.

3. HYDROGRAPHY

Except as noted below, hydrography is adequate to:

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

There were no significant side scan sonar contacts in the two tracks approaching the Port of Anchorage shown on this survey. Side scan sonar coverage of the center track of the route approaching the Port of Anchorage was terminated at latitude 61/13/43.5N, longitude 149/57/05W, 1350 meters short of the end of the line as shown on the presurvey review chart.

Two contacts were found in the area requiring 100% coverage (centered at latitude 61/14/15N, longitude 149/56/30W). These contacts were adequately developed by echo sounder and the results of the hydrographic development depicted on the smooth sheet.

The side scan sonar was also used for disprovals on several AWOIS item investigations and for other investigations. Except for the side scan investigation centered at latitude 61/16/10N, longitude 149/54/40W, significant side scan sonar contacts identified in the field were adequately investigated by echo sounder developments and the results of these hydrographic investigations depicted on the smooth sheet. There is no evidence that the contacts found within the area of side scan sonar coverage centered at latitude 61/16/10N, longitude 149/54/40N, were investigated by echo sounder development beyond the 50-meter splits. Since the area where these contacts are found is rough and often steeply sloping, the area encompassing these contacts is depicted as foul on the smooth sheet.

Because dive operations to visually identify the contact were not possible the more significant findings resulting from the hydrographic investigations of the side scan sonar contacts are annotated as rocks, based on historical information.

4. CONDITION OF SURVEY

The hydrographic records and reports received for processing are adequate and conform to the requirements of the Hydrographic Manual, 4th Edition, revised through Change No. 3, the Hydrographic Survey Guidelines, and the Field Procedures Manual, March 1992 Edition, except for the following.

Complete reports for each of the investigations of significant side scan contacts were not included in the hydrographic records as required by section 7.1 of the project instructions.

Several side scan sonar contacts indicated by the hydrographer as significant were not developed adequately by echo sounder or other acceptable methods of investigation. See section 3 of this report.

Several rocks verified by reference numbers and shown on the chart, plotting within the limits of the survey, were not positioned. These features originate from prior surveys H-9440 add H-9441.

Horizontal control work contained several deficiencies relative to the positioning of aids to navigation. See section 7.d for information on the affected aids common to this survey. See the attached Pacific Photo Party memorandum, dated October 19, 1993 for specific information on the types of deficiencies.

5. JUNCTIONS

Survey H-10430 junctions with the following survey.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H-10431	1992	1:10,000	Southwest

The junction with survey H-10431 is complete.

There is no junction survey to the north. A comparison with chart 16665, 2nd Edition, May 1990, scale 1:50,000, shows adequate agreement.

6. COMPARISON WITH PRIOR SURVEYS

Survey H-10430 was compared to the following prior surveys.

H-10012(1982) 1:10,000

Survey H-10012 covers the area of this survey south of latitude 61/16/07N, offshore of approximately the 12-foot depth curves. The general area east of longitude 149/56/00W has experienced significant change. Although a comparison of standard depth curves seems to indicate a relatively stable bottom with some lateral shifting parallel to the channel axis, a closer comparison of soundings indicate that in general the center and deeper portion of Knik Arm is becoming more shallow by as much as 30 feet (9.1 meters), while the areas near each shoreline are becoming deeper by up to 20 feet (6.1 meters). It should also be noted that there are areas throughout the present survey that reveal very little change compared to soundings gathered in 1982. Survey H-10430 is adequate to supersede survey H-10012 for the area of common coverage.

H-9438(1974) 1:5,000
H-9440(1974) 1:10,000
H-9441(1974) 1:10,000

Survey H-9440 covers the present survey area north of latitude 61/16/07N and the areas south of latitude 61/16/07N to the junctions with surveys H-9438 and H-9441 between the 12-foot curves and MHW. Depths on this survey are generally less deep, up to 20 feet in areas, than those on survey H-9440. Several rocks from survey H-9440 falling within the area of hydrography on this survey were not specifically investigated. These rocks have been brought forward to this smooth sheet in red ink.

The charted rocks just off Cairn Point in the vicinity of latitude 61/15/09N, longitude 149/53/02W, were verified as charted. The foul area referred to by the hydrographer is depicted on this survey. Most of the rocks in this area have been located on this survey, the four charted rocks that were not located have been carried forward to this smooth sheet from survey H-9440. Chart the foul area found on this survey and retain the presently charted rocks as charted.

The charted rocks west of Cairn Point in the vicinity of latitude 61/15/45N, longitude 149/55/15W, were verified as charted. The foul area referred to by the hydrographer is depicted on this survey. These rocks were located during this survey, except for one, which has been brought forward to this survey from survey H-9440. Chart the foul area found on this survey and retain the presently charted rocks as charted.

With the transfer of these rocks, survey H-10430 is adequate to supersede survey H-9440 for the area of common coverage, offshore of MLLW. The area between MLLW and MHW should continue to be charted from survey H-9440 and the current shoreline maps.

Survey H-9438, except for a few soundings along the Anchorage Wharf and some rocks inshore of MLLW, has been superseded by survey H-10012. These inshore soundings are up to 27 feet shoaler than those found on the present survey. There has been major work accomplished on the Anchorage Wharf since the prior and all the depths in the vicinity are significantly deeper. Survey H-10430 is adequate to supersede survey H-9438 for the area of common coverage. The area between MLLW and MHW should continue to be charted from survey H-9438 and the current shoreline maps.

Survey H-9441 covers the inshore areas on both sides of Cook Inlet west of longitude 149/55/00W. The offshore areas, generally from the 18-foot depth curve, have been superseded by survey H-10012. The inshore soundings generally agree or are slightly shoaler on the present survey.

The rocks east of Point MacKenzie in the vicinity of latitude 61/14/15N, longitude 149/58/30W, were verified as charted. Although falling within a foul area depicted on this survey, they have been brought forward from survey H-9441.

An additional rock at latitude 61/12/28N, longitude 149/57/10W, and a 12-foot (3.6 meter) sounding at latitude 61/12/49N, longitude 149/57/45W, have also been carried forward.

With the transfer of the above rocks and sounding, survey H-10430 is adequate to supersede survey H-9441 for the area of common coverage. Rocks and features between MLLW and MHW should continue to be charted from H-9441 and the most current shoreline maps.

AWOIS items originating from prior surveys are discussed in sections M and N of the hydrographer's report, supplemented as follows.

AWOIS Item 50721 is charted as a wreck covered 29 feet originating from survey H-10012 at latitude 61/15/04N, longitude 149/53/39W. According to the AWOIS write-up, this wreck originated from an hydrographer's comment on the echogram. This feature

was investigated by side scan sonar and echo sounder developments of significant contacts. A minimum depth of 8.9 meters (29 feet) was found by the echo sounder development at latitude 61/15/04.25N, longitude 149/53/38.8W. Although the AWOIS write-up stated that a lead line depth was required, the side scan sonar and echo sounder developments are considered adequate under the circumstances. The side scan sonar records show several contacts indicating a significant feature, however, there is not sufficient evidence to say conclusively that the feature is a wreck. As it is presently charted as a wreck, this feature should continue to be charted as a wreck covered 29 feet at the position found on this survey.

7. COMPARISON WITH CHART

Survey H-10430 was compared to the following charts.

<u>Chart</u>	<u>Edition</u>	<u>Date</u>	<u>Scale</u>	<u>Datum</u>
16665	2nd	May 19, 1990	1:50,000/1:20,000	NAD 83
16665	3rd	May 15, 1993	1:50,000/1:20,000	NAD 83

a. Hydrography

The 3rd edition of this chart is noted as preliminary and has been updated by the chartlet submitted by the field party as a danger to navigation for this survey. Charted hydrography on the 2nd edition originates with the prior surveys discussed in section 6 of this report and miscellaneous sources.

Except as noted below, survey H-10430 is adequate to supersede charted hydrography within the common area.

The position approximate sewer terminus (AWOIS Item 51900) charted at latitude 61/12/42N, longitude 149/55/49W, was not found. A review of the blueprints submitted with this project did not result in data sufficient to remove the position approximate. This feature should remain as charted.

An obstruction, charted at latitude 61/12/33N, longitude 149/56/24W, and originating from a miscellaneous source, was not investigated during this survey. Although it falls inshore of the MLLW line and therefore beyond the limits this survey, it is mentioned as it is the only non-rock feature in the foreshore area not specifically listed as an AWOIS item. This feature should remain as charted.

The mooring buoy charted at latitude 61/13/47N, longitude 149/54/41W, was not in place at the time of this survey. As the buoy is likely seasonal, it should be retained as charted.

b. AWOIS

AWOIS items within the limits of this survey are discussed by the hydrographer in sections M and N of the descriptive report and supplemented as follows.

AWOIS Item 51902 is a 28-foot (8.5 meters) shoal sounding originating from LNM 26/85 and charted at latitude 61/14/13N, longitude 149/56/43W. The 1993 edition of the chart shows a note "rep (1985)" added to the 28-foot sounding. In addition to the echo sounder development mentioned by the hydrographer, this item falls within the 100% side scan sonar investigation area. No significant contacts were noted in the area of this sounding. The minimum depth found is a 10.8-meter (35 feet) sounding 150 meters to the southwest. The 28-foot sounding is considered disproved and should be removed from the chart. Chart soundings as found on this survey.

AWOIS Item 51903 is a 28-foot (8.5 meters) sounding originating from LNM 26/85 and charted at latitude 61/14/28N, longitude 149/56/32W. The 1993 edition of the chart shows a note "rep (1985)" added to the 28-foot sounding. In addition to the echo sounder development mentioned by the hydrographer, this item falls within the 100% side scan sonar investigation area. No significant contacts were noted in the area of this sounding. However, 8.5 to 9.3 meter soundings exist 100 meters west of the charted 28 foot sounding. The 28-foot sounding is considered disproved and should be removed from the chart. Chart soundings as found on this survey.

c. Controlling Depths

There are no channels with controlling depths on survey H-10430.

d. Aids to Navigation

Point MacKenzie Light 11 and Point MacKenzie Range Rear Light are symbolized on the smooth sheet as being less than 3rd order position accuracy(cartocode 200). These features were not adequately surveyed to 3rd order accuracy. See the attached Pacific Photo Party memorandum, dated October 19, 1992, for further information. These aids serve their intended purpose and should be retained as charted.

One landmark, Elmendorf Radio Tower, is shown on this survey. The NOAA Form 76-40 is attached. The other charted landmarks, not addressed in the hydrographer's report, should be retained as charted.

e. Geographic Names

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

f. Dangers to Navigation

As the survey area has changed significantly, a chartlet was submitted by the field party with the recommendation that a preliminary chart of the area be produced. The 3rd edition of chart 16665 (preliminary) is a result of this recommendation.

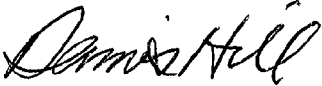
No additional dangers were found during the office processing of this survey.

8. COMPLIANCE WITH INSTRUCTIONS

Survey H-10430 adequately complies with the Project Instructions except where noted in this report.

9. ADDITIONAL FIELD WORK

This is an adequate hydrographic survey. Contemporary MLLW photography should be acquired to update the foreshore and near shore rocks in this area. Also, contemporary photography should be used to update the shoreline in the vicinity of Ship Creek, where many shoreline changes have occurred.


for James S. Green
Supervisory Cartographer

APPROVAL SHEET
H-10430

Initial Approvals:

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

for Bruce A. Olmstead Date: 11/30/93
Dennis J. Hill
Chief, Hydrographic Processing Unit
Pacific Hydrographic Section

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.

Douglas G. Hennick Date: 12/23/93
Commander Douglas G. Hennick, NOAA
Chief, Pacific Hydrographic Section

Final Approval

Approved:

J. Austin Yeager Date: 1/14/93
J. Austin Yeager
Rear Admiral, NOAA
Director, Coast and Geodetic Survey

MARINE CHART BRANCH
RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10430

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
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
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