

10431

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-10-6-92
Registry No. H-10431

LOCALITY

State Alaska
General Locality Cook Inlet
Sublocality Knik Arm Shoal & Vicinity

19 92

CHIEF OF PARTY
CAPT T.W. Richards

LIBRARY & ARCHIVES

DATE October 21, 1993

10431

HL

1002

1003
1004
1005

HYDROGRAPHIC TITLE SHEET

H-10431

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-10-6-92

State Alaska

General locality Knik Arm Shoal and Vicinity

Locality Cook Inlet

Scale 1:10000 Date of survey June 16-August 2, 1992
April 14, 1992

Instructions dated May 8, 1992 - Change No. 1 Project No. OPR-P319-RA
May 27, 1992 - Change No. 2

Vessel RAINIER

Chief of party CAPT Thomas W. Richards, NOAA

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

Soundings taken by echo sounder, ~~hand lead, pole~~ Side Scan Sonar Raytheon DSF-6000N, EG&G Model 260

Graphic record scaled by RAINIER Personnel

Graphic record checked by RAINIER Personnel

Verification by: S. Otsubo, R. Shipley, E. Brown Automated plot by PHS Kynetics Plotter

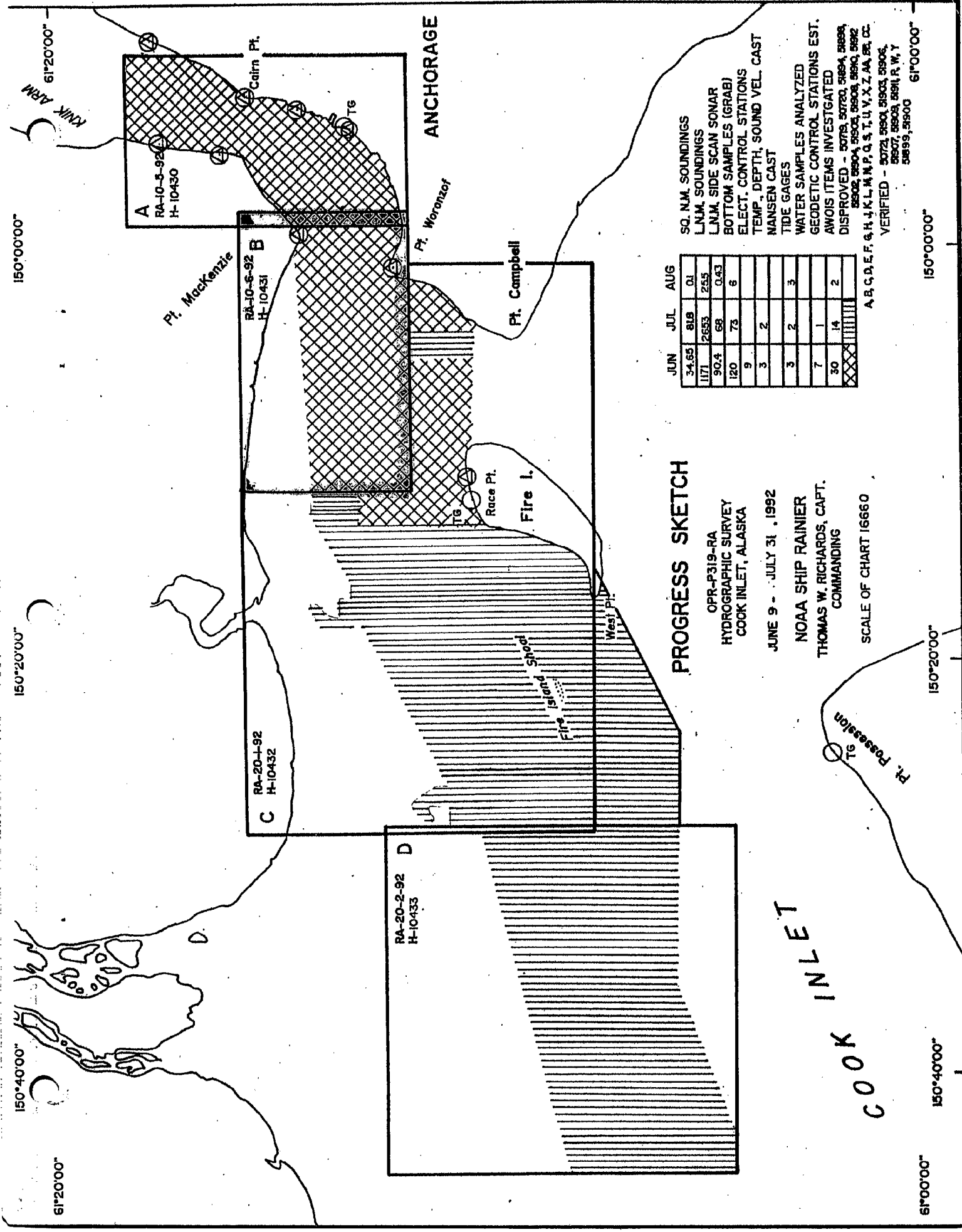
Evaluation by: I. Almacen

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

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

AWOIS + SURF
RWD ✓ 10/93

11-2-91
J.W.W.



ANCHORAGE

PROGRESS SKETCH

OPR-P319-RA
HYDROGRAPHIC SURVEY
COOK INLET, ALASKA

JUNE 9 - JULY 31, 1992
NOAA SHIP RAINIER
THOMAS W. RICHARDS, CAPT.
COMMANDING

SCALE OF CHART 16660

- SG. 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 INVESTGATED
- DISPROVED - 5078, 50720, 51894, 51899, 51902, 51904, 51905, 51908, 51910, 51912, 51915, 51916, 51917, 51918, 51919, 51920, 51921, 51922, 51923, 51924, 51925, 51926, 51927, 51928, 51929, 51930, 51931, 51932, 51933, 51934, 51935, 51936, 51937, 51938, 51939, 51940, 51941, 51942, 51943, 51944, 51945, 51946, 51947, 51948, 51949, 51950, 51951, 51952, 51953, 51954, 51955, 51956, 51957, 51958, 51959, 51960, 51961, 51962, 51963, 51964, 51965, 51966, 51967, 51968, 51969, 51970, 51971, 51972, 51973, 51974, 51975, 51976, 51977, 51978, 51979, 51980, 51981, 51982, 51983, 51984, 51985, 51986, 51987, 51988, 51989, 51990, 51991, 51992, 51993, 51994, 51995, 51996, 51997, 51998, 51999, 52000
- VERIFIED - 5072, 51901, 51903, 51904, 51907, 51908, 51911, 51912, 51919, 51920

	JUN	JUL	AUG
34.65	818	01	
1171	2653	255	
90.4	68	0.43	
120	73	6	
9			
3	2		
3	2	3	
7	1		
30	14	2	
XX	XX	XX	

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COOK INLET

150°00'00"

150°20'00"

150°40'00"

61°20'00"

61°20'00"

61°00'00"

150°40'00"

150°20'00"

150°00'00"

61°00'00"

Descriptive Report to Accompany Hydrographic Survey H-10431
Knik Arm Shoal

Field Number RA-10-6-92
Scale 1:10,000
1992

NOAA Ship Rainier
Captain Thomas W. Richards, Chief of Party

A. PROJECT

This survey was conducted in accordance with Hydrographic Project Instructions OPR-P319-RA, Cook Inlet, Alaska, dated April 14, 1992, Change Number One dated May 8, 1992, Change Number Two dated May 27, 1992, and Change Number Three dated August 18, 1992. ✓

Survey H-10431 corresponds to "Sheet B" as defined in the Project Instructions. ✓

This survey is part of a project designed to identify all dangers to navigation in the navigable approaches to the Port of Anchorage. Data will be used by the U.S. Coast Guard 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., Sec 1

The area surveyed includes Knik Arm Shoal and the approaches to the Port of Anchorage between Points MacKenzie and Woronzof. The northern sheet limit is the zero meter curve, and the southern limit is 61/11/36N. The western limit is 150/11/45W, and the eastern limit is 149/58/36W. ✓

Data were acquired from June 16, Day Number (DN) 168, through August 2, DN 215.

C. SOUNDING VESSELS ✓

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

<u>Vessel</u>	<u>Identification Number</u>	<u>Operation</u>
RA-3	2123	Hydrography Side Scan Sonar Shoreline Verification ✓
RA-4	2124	Hydrography

RA-5 2125

Hydrography
Side Scan Sonar
Shoreline Verification
Velocity Casts
Bottom Samples

RA-6 2126

Hydrography

D. AUTOMATED DATA ACQUISITION AND PROCESSING

This survey was conducted using the following HDAPS programs:

<u>Program</u>	<u>Version</u>	<u>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	RA-3	
Fish 015598		168-214
Recorder 61475	RA-5	
Fish 0011904		164-169
Fish 015598		170
Fish 0011902		176-193

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 the bit using a stopper made of cotton line. ✓

Due to the high currents and nonexistent water visibility in the project 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. ✓

Problems

While surveying on sheet A, the initial towfish (SN 0011904) used on 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. No data for this survey were affected. ✓

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 the recorder (SN 61475) on RA-5 was operated on the 150 meter range scale, the sonargram 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 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 sonargrams with pertinent data:
 - Vessel speed
 - Cable length
 - Conditions affecting records; 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 sonargram 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 contacts 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." ✓

F. SOUNDING EQUIPMENT ✓

All survey launches were equipped with Raytheon DSF-6000N echo sounders as detailed below. The echo sounders were operated in the HIGH+LOW (HIGH DIGITIZED) setting. The echo sounders were operated in accordance with the provisional "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 No.</u>	<u>Days Used</u>
2123	B044N	169-215
2124	A103N	178-214
2125	B048N	168-189
2126	A117N	169-181

G. CORRECTIONS TO SOUNDINGS ✓

Corrections to echo soundings were determined for static draft, velocity of sound through water, and settlement and squat. Predicted tides were used for all plots. Sounding correctors apply to both 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 the water column were computed from data obtained with an SBE SEACAT Profiler, Serial Number 811. These data were then processed by the program VELOCITY in accordance with Hydrographic Survey Guideline (HSG) 69.

<u>Cast No.</u>	<u>HDAPS Table #</u>	<u>Deepest Depth</u>	<u>Applicable Days</u>	<u>Position of Cast</u>	<u>Day of Cast</u>
2	1	49.9 m	160-171	61/13/07N 149/59/10W	162
* 3	2	49.6 m	174-184	61/15/38N 149/54/01W	176
* 5	4	49.0 m	188-207	61/15/30N 149/54/00W	203
7	5	46.7 m	208-219	61/13/10N 149/59/29W	215

* Plot outside survey limits.

The SEACAT was calibrated by Northwest Regional Calibration Center on March 3, 1992.

Static Draft ✓

The static draft for all launches was determined by measuring the distance from the transducer face to the gunwale using a large metal square. Static draft measurements were then determined by measuring from the gunwale to the water and subtracting this distance from the previous. These measurements were conducted with the fuel tanks averaging 3/4 full and three people on board. A static draft of 0.6 meters for all four launches was measured on March 21-22, 1992.

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

Settlement and Squat ✓

Settlement and squat correctors were measured in Shilshole Bay, Washington on the following dates:

<u>Vessel</u>	<u>Date</u>	<u>HDAPS</u>	
		<u>Offset</u>	<u>Table #</u>
2123	3/11/92		3
2124	3/16/92		4
2125	3/16/92		5
2126	3/11/92		6

Correctors were measured and determined in accordance with Section 4.9.4.2 of the Hydrographic Manual, and using Figures 2.2 and 2.3 from the FPM. The computed settlement and squat values were entered into each launches Offset table. Observations were made using a Zeiss Ni2 level (S/N 103453).

Heave ✓

Data acquired during periods of significant sea action were checked 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 Pacific Marine Center (PMC).

Tide Correctors ✓

Tidal zoning and correctors applicable to predicted tides for the Anchorage, Alaska, reference station (945-5920) were provided in the Project Instructions. This survey was covered by the following tide zones as defined in the Project Instructions:

<u>Zone</u>	<u>Time Correction</u>	<u>Range Ratio</u>
VII	-20 minutes	0.92
VIII	-10 minutes	0.94
IX	-5 minutes	0.96
X	No correction	0.98

H. CONTROL STATIONS ✓ *See EVAL RPT., Section 2*

Geographic positions for all 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 included in ~~Appendix III~~ this report.

Positions for all existing stations are from the National Geodetic Survey (NGS) data base. All existing stations were recovered in accordance with methods outlined in Section 5.2.4 of the FPM. 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 ✓

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

Falcon 484 ✓

Accuracy requirements as stated in the Hydrographic Manual and the FPM were met. When maximum residuals exceeded the specified limits, the launch was held at a constant speed and course while

the stations causing the problem were 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 DR's 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 and System Check Methods ✓

Falcon 484 ✓

Baseline calibrations were conducted in accordance with the FPM. Calibrations were performed at the MATTHEWS PARK BEACH BASELINE on May 21-28, 1992 (DN 142-149). Calibration data are included in the "Summer 1992 Electronic Control Data Package."

Formal system checks were not documented for hydrography run with three or more LOP's in accordance with Section 3.1.3.3 of the FPM. Data acquired with two LOP's were always bracketed by data acquired with three or more LOP's.

Ashtech GPS ✓

VHF Differential shore stations were established at stations WOR 7 and WEST POINT. After each station was 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 at either station.

* Filed with the hydrographic data.

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 system 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.

Offsets ✓

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, Sec. 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 disproven by hydrographic developments and detached positions at a minus tide. ✓

** Filed with the hydrographic data.*

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.

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. The ten foreshore rocks on this survey were checked at a minus tide, and no significant rocks were seen. These rocks have been removed from the final field sheet. Sequential numbers and associated notes are recorded in sounding volumes included with the survey data.

Many of the rocks in the offshore area have either moved or, in some cases, the elevations of the rocks have changed. This can be attributed to several factors: high current conditions, 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~~ ^{smooth} field sheet. *Concur.*

Two significant changes to features seaward of the shoreline were identified during the course of this survey:

The two rocks, one awash and one exposed, and corresponding zero meter curve west of Point Woronzof (vicinity of 61/12/10N, 150/01/30W) were not found. A detached position (position number 3553) was taken at this location during a -0.3 meter tide, and no rocks or shoaling were evident. Twenty-five meter line spacing was run over the area, and no indications of the feature were found. Least depths in the area are in the two meter range. The hydrographer recommends removing the rock symbols from the chart and using the survey depths for the area. *Concur.*

The charted rocks south^{and} east of Point MacKenzie (vicinity of 61/14/00N, 149/59/00W) are part of a large area foul with small boulders. The offshore extent of this area is defined by a detached position (position number 6669). The hydrographer recommends replacing the charted rocks with a foul area. *Concur.*

The tank charted at Point Woronzof, is actually part of the shoreside installation of a sewer outfall. The feature is a large concrete cylinder with several valves and pipes extending from the top. The cylinder appears to be a small tank from seaward, therefore the hydrographer recommends retaining the feature as charted. *Concur.*

K. CROSSLINES ✓

Both crosslines and rangelines were used for comparisons. These totaled 39.4 NM, representing 7% of the total hydrography (including developments). ✓

Crossline soundings agree with mainscheme soundings to within 1.5 meters. 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. Sec. 5

This survey junctions with survey H-10430 (1:10,000, 1992) to the east and survey H-10432 (1:20,000, 1992) to the south and west. Soundings along the junctions with these surveys agree to within one meter. No major irregularities in the contours were found at the survey junctions. Minor variance in the contour junctions are attributable to inaccuracies in predicted tides. *Concur.*

M. COMPARISON WITH PRIOR SURVEYS - See EVAL RPT. Sec. 6

This survey was compared to four prior surveys. The entire upper Cook Inlet area is extremely changeable due to the presence of high current velocities and large amounts of sand and sediment. The results of the comparisons with the prior surveys reveals 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 this area has changed significantly since the last surveys were performed. ✓

H-9441 (1:10,000, 1974)

Overall, the soundings from this survey match the soundings from the present survey. The area between Point MacKenzie and Point Woronzof is relatively stable. The only major change is the disappearance of a shallow channel located west of Point MacKenzie in the mud flats. The area has filled in and the channel no longer exists. ✓

AWOIS Item 51901: A wrecked barge originating from survey H-9441 just west of Point MacKenzie was verified as charted (Position Number 2133). *Lat 61° 14' 26.72" N, Long 150° 00' 09.11" W.* ✓

Recommendation: The hydrographer recommends that the sounding data from the present survey supersede that of H-9441 within their common area. The charted wreck, AWOIS Item 51901, should be retained as charted. *Concur.*

H-9442 (1:10,000, 1974)

Significant change has occurred in the common area. North Point Shoal has moved southwest and grown shoaler, from depths of 16 feet, to a current shoalest depth of 0^{1.3} feet (0.2⁴ meter) in the vicinity of 61/12/36N, 150/09/30W. The zero curve has moved north up to 1.5 nautical miles. This is manifested as a retreating of the Susitna mud flat, and the elimination of the shallow channel mentioned in the comparison with H-9441. *Concur.*

Recommendation: The hydrographer recommends that the sounding data from the present survey supersede that of H-9442 within their common area. *Concur.*

H-10000 (1:20,000, 1982)

Significant change is evident in the common area with this survey. As with H-9442, North Point Shoal has moved southwest and grown shoaler. Knik Arm Shoal was developed with 10-meter line spacing, and while remaining relatively stable in shape, has grown slightly deeper and slightly ^{wider} smaller, with a least depth of 18 feet (5.6 meters). The present survey shows a 2^{7.8} foot (8.2⁴ meter) depth at the charted 27 foot sounding on the Point Woronzof range, just to the south of Knik Arm Shoal. As this is the controlling sounding for traffic entering the Port of Anchorage, it was developed with five-meter line spacing to ensure that the least depth on this critical feature was located. Of further significance, depths along the Point MacKenzie range have shoaled from the charted depths on the order of 32 to 52 feet, to as shoal as 25⁴ feet (7.7⁵ meters). Soundings in the area south of North Point Shoal and west of Knik arm shoal are also generally shallower, with some areas as much as 20 feet shoaler.

Recommendation: The hydrographer recommends that the sounding data from the present survey supersede that of H-10000 within their common area. *Concur.*

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

As with survey H-9441, the soundings from this survey correspond well with the soundings from the present survey. The common area between these two surveys represent a relatively stable bottom area located between Point MacKenzie and Point Woronzof.

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

N. COMPARISON WITH THE CHART - See EVAL RPT. Sec. 7

This survey was compared to NOS chart 16665 (1:50,000, 2nd edition, May 19, 1990, NAD83). Most charted soundings are from the prior surveys discussed in Section M and are not discussed further here.

Two numbered AWOIS Items in addition to the one already addressed in the previous section were investigated during the course of this survey.

AWOIS Item 51898: A sounding of 12 feet reported in the vicinity of 61/14/00N, 150/04/18W. This item was investigated by a 25-meter line spacing development in a 500-meter radius around the charted location. No evidence of shoaling was found, and the survey depths in the vicinity were approximately 25 feet (7.5 meters).

Recommendation: Delete the charted 12 foot sounding from the chart. *Concur. Chart the area with soundings from the present survey.*

AWOIS Item 51899: Sewer outfall pipe. Side scan sonar was used to cover the area around the charted location after hydrography in the area showed no indications of the outfall pipe. No indications of the outfall were seen after surveying the area with 100% coverage at the 100 meter range scale. The area was further examined at a minus tide, and the outfall was not seen. The item shown on the chart as a "tank" in the immediate vicinity, is actually part of the shoreside end of the outfall system. This would indicate that the outfall was constructed, and that it was buried in the bottom as the Corps of Engineers permit indicated it would be. The burial was apparently sufficient to completely obscure all surface indications of the outfall, making it impossible to locate using available hydrographic means. *The charted "tank" is a "chlorination tower" as shown on the Corps of Engineers blueprint.*

Recommendation: Retain the outfall as charted. *CONCUR. See EVAL RPT Sec. 7a*

Lettered AWOIS Items

Four charted soundings which fall within the limits of the present survey originated from surveys conducted by private contractors. These soundings were assigned as lettered AWOIS items and were investigated with the following results:

<u>Letter</u>	<u>Source</u>	<u>Reported Depth</u>	<u>Survey Depth</u>	<u>Recommendation</u>
A	BP140130	56 feet	15 ⁴ ft (4 ⁷ / ₆ m)	Remove from chart <i>Use present survey</i>
G	BP142290	9 feet	10 ft (3.1 m)	Use present survey
H	BP142290	25 feet	20 ft (6.1 ² m)	Use present survey
J	BP142290	24 feet	27 ⁴ ft (8.3 m) 7.4	* Use present survey <i>The present survey confirms the reported depth of 24 ft. in the area.</i>

BP140130 is a survey conducted in 1989 by Besse, EPPS & Potts.
BP142290 is a survey conducted in 1990 by Lounsbury and Associates, Inc. Items not verified by the present survey were

<u>ITEM</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>
(A)	61° 13' 25.0" N	149° 59' 28.0" W
(G)	61° 12' 37.0" N	150° 08' 06.0" W
(H)	61° 12' 39.0" N	150° 06' 57.0" W
(J)	61° 12' 36.0" N	150° 05' 48.0" W

investigated by 25-meter line spacing developments in a 100-meter radius around the charted location.

All shoreline features shown on the chart are addressed in Section J. ✓

Six Dangers to Navigation located within the limits of this survey were reported to the Seventeenth Coast Guard District and DMAHTC. Copies of the radio messages and correspondence are included in ~~Appendix I~~ of this report. Position numbers associated with the items are noted on the radio message. In addition, as the survey area has undergone significant change over a large area, two chart-scale, excessed plots of all survey data have been forwarded to the Nautical Chart Division, with the recommendation that they be used to produce a preliminary chart of the area. ✓

O. ADEQUACY OF SURVEY ✓

This survey is complete and adequate to supersede all prior surveys covering this area. *Concur.*

P. AIDS TO NAVIGATION ✓

Five non-floating aids to navigation are located within the limits of this survey.

<u>Name</u>	<u>Light List Number</u>	<u>Light List Position</u>	<u>Charted Position</u>
Point Woronzof Range Front Light	26435	61/12.1N 150/01.3W	61/12.12N 150/01.34W
Point Woronzof Range Rear Light	26440	None	61/12.14N 150/01.02W
Point MacKenzie Light 11	26445	61/14.3N 149/59.2W	61/14.30N 149/59.24W
Point MacKenzie Range Front Light	26450	61/14.3N 149/59.4	61/14.25N 149/59.41W
Point MacKenzie Range Rear Light	26455	None	61/14.45N 149/59.00W

Light list positions are from the Light List, Volume IV, 1992. The charted positions are scaled from NOS chart 16665, Second Edition. All non-floating aids have characteristics which match those in the light list and on the chart. All non-floating aids have published Third Order positions. These positions were verified by observing azimuths from control stations, and comparing the observed value to the value computed using the published positions. All published positions were verified. ✓

These computations are contained in the "Spring 1992 Horizontal Control Report for OPR-P319-RA." ✓

Two floating aids to navigation are located within the limits of this survey: Knik Arm Shoal Lighted Buoy 7, and Knik Arm Shoal North Side Buoy 2KA. Both aids are seasonal and are repositioned by the Coast Guard in the spring. Both were positioned using hydrographic means, and the survey position agrees with the charted position. The characteristics of both aids match those on the chart. *Concur.* ✓

The charted cable area between Point Woronzof and Point MacKenzie was verified by a visit to Chugach Electric. The utility provided copies of the engineering blueprints and surveys of the cable runs. These are included with the survey records. A small excursion in the charted cable area (in the vicinity of 61/13/00N, 150/01/30W), however, is not verified by the blueprints or the present survey. The hydrographer recommends removing the excursion, and retaining the remaining area as charted. *Do not concur. See EVAL RPT, Sec. 7(f)* ✓

There are no bridges, overhead cables, or ferry routes through the survey area. *Concur.*

Q. STATISTICS ✓

<u>Vessel</u>	<u>2123</u>	<u>2124</u>	<u>2125</u>	<u>2126</u>
Positions Used	2920	639	925	914
NM of Hydro	252.51	154.69	39.64	169.51
NM ² of Hydro	16.47		Velocity Casts 4	
Detached Positions	7		Tide Stations 2	
Reference Numbers	7		Bottom Samples 43	

R. MISCELLANEOUS ✓

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

In accordance with the 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 Notices to Mariners, the hydrographer recommends that the Nautical Charting Division immediately issue a preliminary chart using the field survey data. *Concur.*
(Field data has been applied to the preliminary chart 16665 (3rd Edition) dated May 15, 1993)

The Point MacKenzie range should not be used by deep-draft vessels. *Concur.*


A "Changeable Area" note, as found near Woronzof Shoal, should be added to the chart near North Point Shoal. *Concur.*

T. REFERRAL TO REPORTS


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

<u>Title</u>	<u>Date Sent</u>	<u>to 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 Sounding 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 Report 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

Written and Submitted by,


Michael B. Brown
Lieutenant, NOAA

Approved and Forwarded,


Thomas W. Richards
Captain, NOAA
Commanding Officer

¹ Estimated Date

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	06/07/92	POLE 1973	611503
101	F	061:09:52.095	150:04:06.618	2	250	0.0	0.0	2	06/07/92	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	D	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 RMI 1992	611492
109	F	061:15:31.147	149:52:46.645	3	250	0.0	0.0	C	06/14/92	LOW	611492
110	F	061:16:07.258	149:55:10.204	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



DR
UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of NOAA Corps Operations
Pacific Marine Center
1801 Fairview Avenue East
Seattle, Washington 98102-3767

NOAA Ship RAINIER

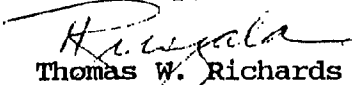
July 17, 1992

Director
DMAHTC
Attn: MCNM
6500 Brookes Lane
Washington, DC 20315-0030

Dear Sir:

While conducting hydrographic survey operations in Cook Inlet, Alaska, NOAA Ship RAINIER discovered six dangers to navigation. They have been reported to DMAHTCNAVWARN and the Seventeenth Coast Guard District. A copy of the correspondence describing the dangers is enclosed.

Sincerely,

for 
Thomas W. Richards,
Captain, NOAA
Commanding Officer

Enclosures





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of NOAA Corps Operations
Pacific Marine Center
1801 Fairview Avenue East
Seattle, Washington 98102-3767

NOAA Ship RAINIER

July 17, 1992

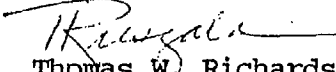
**ADVANCE
INFORMATION**

Commander
Seventeenth Coast Guard District
Post Office Box 25517
Juneau, AK 99802-5517

Dear Sir:

Attached is a confirmation copy of the radio message sent to your office regarding the dangers to navigation which I recommend for inclusion in the Local Notice to Mariners for the Seventeenth Coast Guard District. A copy of the chart showing the areas in which the dangers exist is also attached.

Sincerely,

for  *CAPT/NOAA*
Thomas W. Richards
Captain, NOAA
Commanding Officer

Enclosures

cc: DMAHTC
N/CG221
PMC



**ADVANCE
INFORMATION**

17:05, Wednesday, 8 July 1992
tPostOUT : Hellickson

:
:
P 081704Z JUL 92
FM NOAA S RAINIER
TO CCGDSEVENTEEN JUNEAU AK
DMAHTCNAVWARN WASHINGTON DC//MCNM//
INFO NOAA MOP SEATTLE WA
ACCT CM-VCAA
BT

UNCLAS

NOAA SHIP RAINIER FOUND THE FOLLOWING DANGERS TO NAVIGATION WHILE
CONDUCTING HYDROGRAPHIC SURVEY OPERATIONS IN COOK INLET, ALASKA.

THIS INFORMATION IS PROVIDED FOR PUBLICATION IN LOCAL NOTICE TO
MARINERS:

CHARTS AFFECTED: 16663 2ND ED MAY 19/90 1:100,000 NAD83
16665 2ND ED MAY 19/90 1:50,000 NAD83

DEPTHS ARE REDUCED TO MLLW BASED ON PREDICTED TIDES.

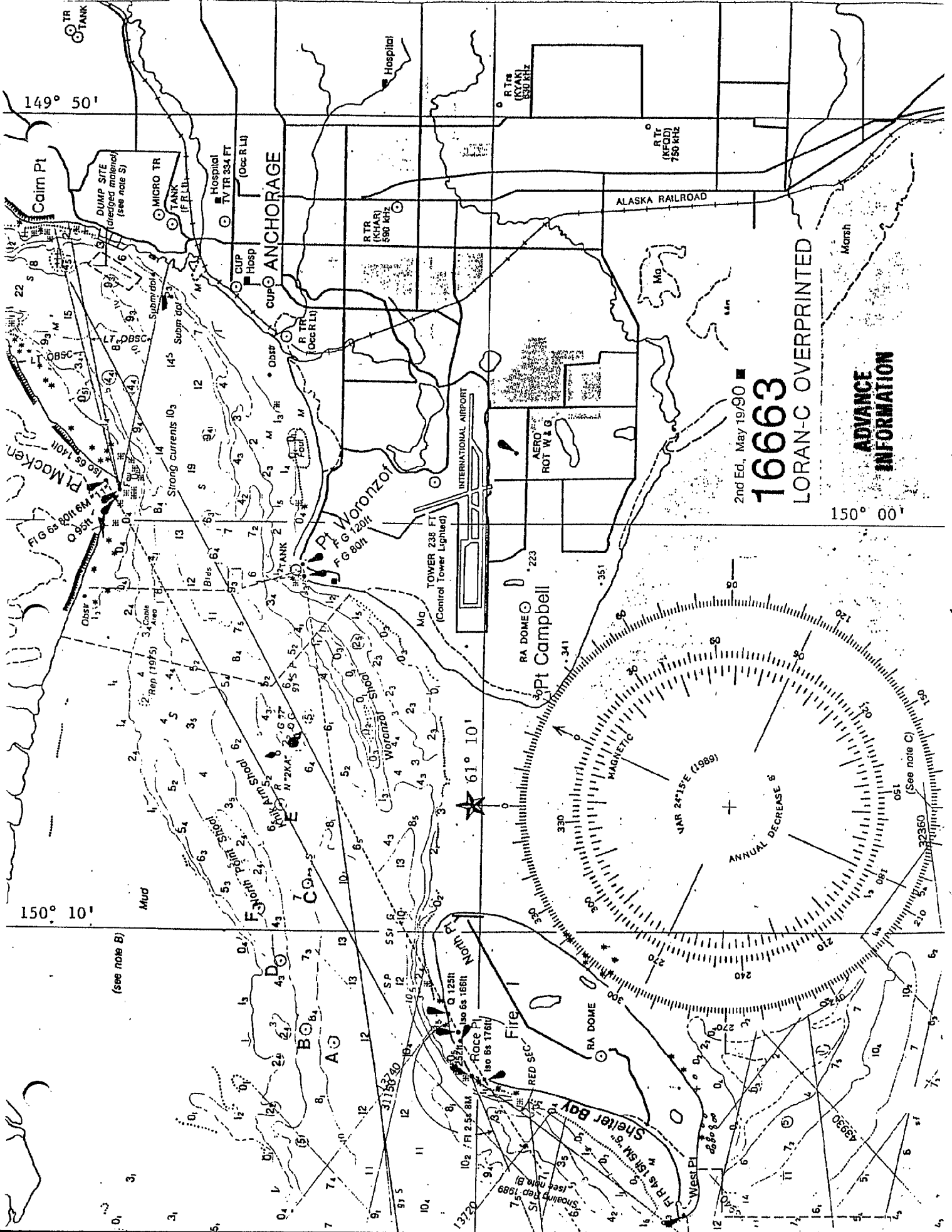
SIGNIFICANT SHOALING HAS OCCURRED NORTH OF THE POINT WORONZOF AND
POINT MACKENZIE RANGES ADJACENT TO NORTH POINT SHOAL. SOME
SOUNDINGS REPRESENTATIVE OF THIS SHOALING ARE:

ITEM	DANGER	DEPTH	LATITUDE	LONGITUDE	Pos. #
A.	SOUNDING	47 FT	61/11/42.57N	150/12/46.14W	
B.	SOUNDING	3 FT	61/12/02.16N	150/12/26.08W	
C.	SOUNDING	25 FT	61/12/02.24N	150/08/51.12W	4573
D.	SOUNDING	6 FT	61/12/20.82N	150/10/45.24W	8719
E.	SOUNDING	25 FT	61/12/22.42N	150/06/54.71W	4395
F.	SOUNDING	0 FT	61/12/36.68N	150/09/28.65W	4915

ADDITIONAL SHOALING MAY BECOME EVIDENT AS SURVEY WORK PROGRESSES.

QUESTIONS CONCERNING THIS MESSAGE SHOULD BE DIRECTED TO:
COMMANDING OFFICER, NOAA SHIP RAINIER, 1801 FAIRVIEW AVENUE EAST,
SEATTLE, WA 98102-3767 OR VIA RADIO CONTACT ON 2182 MHZ OR VHF
CHANNELS 13 AND 16, CALL LETTERS WTEF. RAINIER'S CELLULAR PHONE
NUMBER WHILE IN THE VICINITY OF ANCHORAGE IS (206) 799-0498. A
LETTER WITH ATTACHED CHARTLET IS BEING MAILED TO CONFIRM THIS
MESSAGE.

BT



149° 50'

150° 00'

150° 10'

61° 10'

2nd Ed., May 19/90

16663

LORAN-C OVERPRINTED

ADVANCE INFORMATION

(see note B)

(see note C)

32360

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DR

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of NOAA Corps Operations
Pacific Marine Center
1801 Fairview Avenue East
Seattle, Washington 98102-3767

NOAA Ship RAINIER

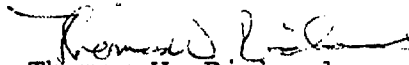
August 27, 1992

Director
DMAHTC
Attn: MCNM
6500 Brookes Lane
Washington, DC 20315-0030

Dear Sir:

While conducting hydrographic survey operations in Cook Inlet, Alaska, NOAA Ship RAINIER discovered four dangers to navigation. They have been reported to DMAHTCNAVWARN and the Seventeenth Coast Guard District. A copy of the correspondence describing the dangers is enclosed.

Sincerely,


Thomas W. Richards
Captain, NOAA
Commanding Officer

Enclosures





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of NOAA Corps Operations
Pacific Marine Center
1801 Fairview Avenue East
Seattle, Washington 98102-3767

NOAA Ship RAINIER

August 27, 1992

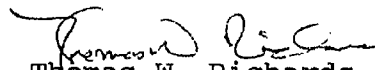
Commander
Seventeenth Coast Guard District
Post Office Box 25517
Juneau, AK 99802-5517

**ADVANCE
INFORMATION**

Dear Sir:

Attached is a confirmation copy of the radio message sent to your office regarding the dangers to navigation which I recommend for inclusion in the Local Notice to Mariners for the Seventeenth Coast Guard District. A copy of the chart showing the areas in which the dangers exist is also attached.

Sincerely,


Thomas W. Richards
Captain, NOAA
Commanding Officer

Enclosures

cc: DMAHTC
N/CG221
PMC



**ADVANCE
INFORMATION**

17:31, Friday, 21 August 1992
tPostOUT : McDaniel

P 211430Z AUG 92
FM NOAA S RAINIER
TO CCGDSEVENTEEN JUNEAU AK
DMAHTCNAYWARN WASHINGTON DC//MCNM//
INFO NOAA MOP SEATTLE WA
ACCT CM-VCAA
BT

UNCLAS
NOAA SHIP RAINIER LOCATED THE FOLLOWING DANGERS TO NAVIGATION
WHILE CONDUCTING HYDROGRAPHIC SURVEY OPERATIONS IN COOK INLET,
ALASKA.

THIS INFORMATION IS PROVIDED FOR PUBLICATION IN LOCAL NOTICE TO
MARINERS:

CHARTS AFFECTED: 16665 2ND ED MAY 1970 1:50,000 NAD83
16663 2ND ED MAY 1970 1:100,000 NAD83

DEPTHS ARE REDUCED TO MLLW BASED ON PREDICTED TIDES.

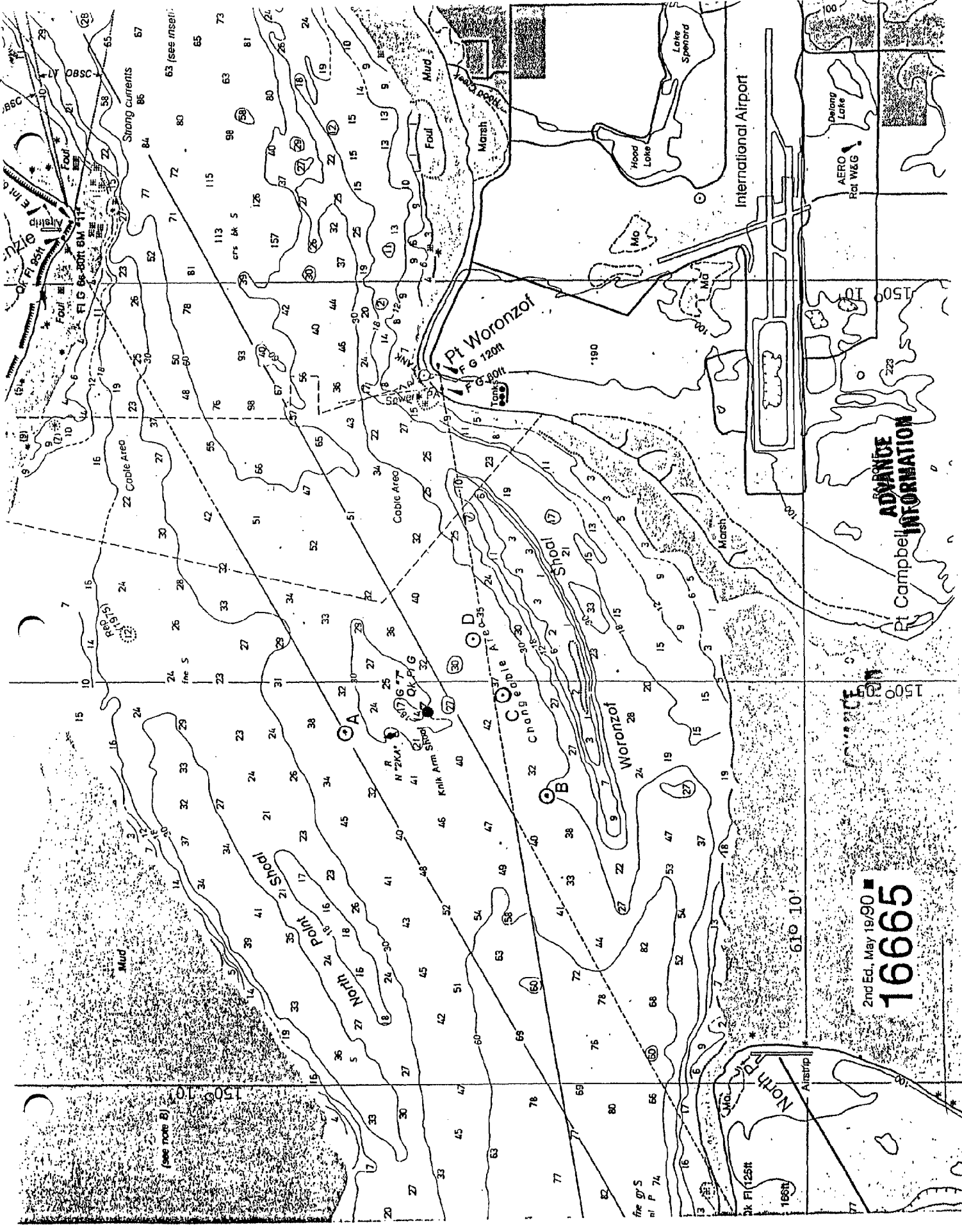
SIGNIFICANT SHOALING HAS OCCURRED NORTH OF WORONZOF SHOAL, AND ON
POINT MACKENZIE RANGE. SOME SOUNDINGS REPRESENTATIVE OF THIS
SHOALING ARE:

ITEM	CHART	DANGER	DEPTH	LATITUDE	LONGITUDE
A.	16665	SOUNDING			
	25 FT	61/12/42.74N	150/05/37.11W	Pos # 8263	
	16663		4 FM AND 1 FT		
B.	16665	SOUNDING			
	29 FT	61/11/31.92N	150/06/24.25W		
	16663		4 FM AND 5 FT		
C.	16665	SOUNDING			
	27 FT	61/11/47.55N	150/05/10.48W	Pos # 4371	
	16663		4 FM AND 3 FT		
D.	16665	SOUNDING			
	25 FT	61/11/57.67N	150/04/27.48W		
	16663		4 FM AND 1 FT		

SURVEY DATA ARE STILL BEING PROCESSED AND IT IS LIKELY THAT
ADDITIONAL DANGERS TO NAVIGATION EXIST IN THIS VICINITY.

QUESTIONS CONCERNING THIS MESSAGE SHOULD BE DIRECTED TO:
COMMANDING OFFICER, NOAA SHIP RAINIER, 1801 FAIRVIEW AVENUE EAST,
SEATTLE, WA 98102-3767 OR VIA RADIO CONTACT ON 2182 MHZ OR VHF
CHANNELS 13 AND 16. CALL LETTERS WTEF. A LETTER WITH ATTACHED
CHARTLET IS BEING MAILED TO CONFIRM THIS MESSAGE.

BT

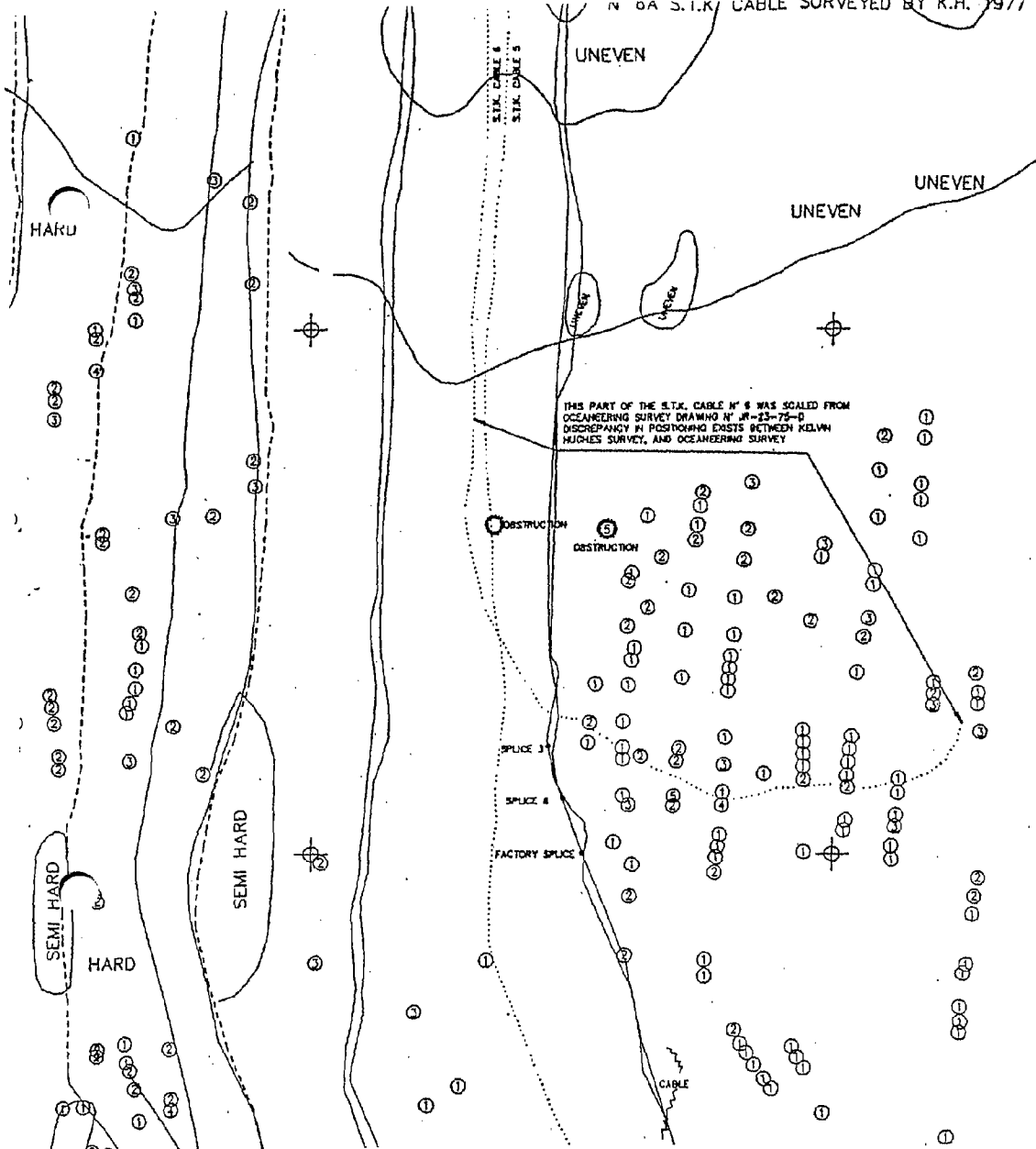


2nd Ed., May 19/90
16665

ADVANCE INFORMATION

610 10'

N 0A S.T.K. CABLE SURVEYED BY K.H. 1977



ALASKA
ANCHORAGE
 BELUGA PROJECT

CHART SHOWING INTERPRETATION OF SEABED, ROCKS,
 EMBEDDED CABLES AND EXPOSED CABLES

SURVEYED JULY 1977

NOTES

1. THE MAIN SURVEY WAS CARRIED OUT JUNE - OCTOBER 1967. THE AREA WAS RE-SURVEYED JUNE - AUGUST 1970 THE WEST SIDE FROM SIMPLEX CABLE N° 4 WAS RESURVEYED JULY 1976 BEFORE THE LAYING OF FOUR PIRELLI CABLES. ALL SEA BED INFORMATION, ROCKS AND CABLES ARE COMPILED FROM THE THREE SURVEYS.
2. THE CHART IS GRADUATED IN FEET ON THE ALASKAN CO-ORDINATE ZONE 4, AND A TRIANGULATION WAS CARRIED OUT BASED ON TWO COAST AND GEODETIC STATIONS.
3. POSITION OF SEWAGE OUTFALL OFF POINT WORONZOF WAS SUPPLIED BY THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA.
4. 1976 S.T.K. 5A WAS SURVEYED WITH CABLE DETECTOR, AND POSITION DIFFERED FROM LOCATION GIVEN BY OCEANEERING. 4 SPLICES WERE MADE TO THE SOUTHERN END OF THE CABLE.
5. 1977 POSITION OF S.T.K. 6A CABLE WAS ESTABLISHED BY CABLE DETECTOR AND AGAIN DIFFERED FROM POSITION GIVEN BY OCEANEERING. SOUTHERN PART OF THE CABLE, FROM SPLICE 3, WAS RESPLICED AND RELAYED.

SEMI
 ○ HARD

APPROVAL SHEET

for

H-10431

RA-10-6-92

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

ORIGINAL



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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: January 27, 1993

MARINE CENTER: Pacific

OPR: P319-RA

HYDROGRAPHIC SHEET: H-10431 (amended)

LOCALITY: Knik Arm Shoal, Cook Inlet, Alaska

TIME PERIOD: June 16 - August 2, 1992

TIDE STATION 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 $61^{\circ} 8.6'N$, south of $61^{\circ} 15.6'N$, east of $150^{\circ} 15.0'W$ and west of $150^{\circ} 5.0'W$, apply a -20 minute time correction and a x0.92 range ratio.
2. In Cook Inlet, north of $61^{\circ} 10.0'N$, south of $61^{\circ} 15.6'N$, east of $150^{\circ} 5.0'W$ and west of $150^{\circ} 1.4'W$, apply a -10 minute time correction and a x0.94 range ratio.
3. In Cook Inlet, north of $61^{\circ} 10.0'N$, south of $61^{\circ} 15.6'N$, east of $150^{\circ} 1.4'W$ and west of $149^{\circ} 59.0'W$, apply a -5 minute time correction and a x0.96 range ratio.

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4. 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.

Notes: Hourly heights are tabulated in Alaskan Standard Time.


CHIEF, DATUMS SECTION

GEOGRAPHIC NAMES

H-10431

Name on Survey	A ON CHART NO. 16665 B ON PREVIOUS SURVEY NO. C ON U.S. QUADRANGLE MAPS D FROM LOCAL INFORMATION E ON LOCAL MAPS F P.O. GUIDE OR MAP G RAND McNALLY ATLAS H U.S. LIGHT LIST K										
	ALASKA (title)	X									
COOK INLET (title)	X										2
KNIK ARM	X										3
KNIK ARM SHOAL	X										4
MACKENZIE, POINT	X										5
NORTH POINT SHOAL	X										6
WORONZOF, POINT	X										7
WORONZOF SHOAL	X										8
											9
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Approved:

Charles E. Harrington
Chief Geographer - N/CG 245

MAR 22 1993

NOAA FORM 77-27(H) (9-83)		U.S. DEPARTMENT OF COMMERCE		REGISTRY NUMBER	
HYDROGRAPHIC SURVEY STATISTICS				H-10431	
RECORDS ACCOMPANYING SURVEY: To be completed when survey is processed.					
RECORD DESCRIPTION		AMOUNT		RECORD DESCRIPTION	
SMOOTH SHEET		1		SMOOTH OVERLAYS: POS., ARC, EXCESS	
DESCRIPTIVE REPORT		1		FIELD SHEETS AND OTHER OVERLAYS	
DESCRIP-TION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/SOURCE DOCUMENTS
ACCORDION FILES	1		2		
ENVELOPES					
VOLUMES	2				
CAHIERS					
BOXES					
SHORELINE DATA					
SHORELINE MAPS (List):					
PHOTOBATHYMETRIC MAPS (List):					
NOTES TO THE HYDROGRAPHER (List):					
SPECIAL REPORTS (List):					
NAUTICAL CHARTS (List):					
OFFICE PROCESSING ACTIVITIES					
<i>The following statistics will be submitted with the cartographer's report on the survey</i>					
PROCESSING ACTIVITY			AMOUNTS		
			VERIFICATION	EVALUATION	TOTALS
POSITIONS ON SHEET					4863
POSITIONS REVISED					
SOUNDINGS REVISED					
CONTROL STATIONS REVISED					
			TIME-HOURS		
			VERIFICATION	EVALUATION	TOTALS
PRE-PROCESSING EXAMINATION					
VERIFICATION OF CONTROL					
VERIFICATION OF POSITIONS			53.5		53.5
VERIFICATION OF SOUNDINGS			72.0		72.0
VERIFICATION OF JUNCTIONS					
APPLICATION OF PHOTOBATHYMETRY					
SHORELINE APPLICATION/VERIFICATION					
COMPILATION OF SMOOTH SHEET			72.5		72.5
COMPARISON WITH PRIOR SURVEYS AND CHARTS				35.0	35.0
EVALUATION OF SIDE SCAN SONAR RECORDS				25.0	25.0
EVALUATION OF WIRE DRAGS AND SWEEPS					
EVALUATION REPORT				58.5	58.5
GEOGRAPHIC NAMES					
OTHER*					
*USE OTHER SIDE OF FORM FOR REMARKS			TOTALS	198.0	118.5
					316.5
Pre-processing Examination by J. Griffin			Beginning Date 9/23/92	Ending Date 10/22/92	
Verification of Field Data by S. Otsubo, R. Shipley, E. Brown			Time (Hours) 198.0	Ending Date 7/19/93	
Verification Check by S. Otsubo, I. Almacen			Time (Hours) 8.0	Ending Date 7/22/93	
Evaluation and Analysis by I. Almacen			Time (Hours) 118.5	Ending Date 9/9/93	
Inspection by B. Olmstead			Time (Hours) 29	Ending Date 9/28/93	

EVALUATION REPORT

H-10431

1. INTRODUCTION

Survey H-10431 is a basic hydrographic survey under the navigable area concept accomplished by the NOAA Ship RAINIER, under 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

This survey was conducted in Cook Inlet, Alaska, along the navigable approaches to the port of Anchorage between the area of Point MacKenzie and Point Woronzof. It stretches across from longitude 149/58/36N to longitude 150/11/45W, covering the areas of North Point Shoal and Knik Arm Shoal. The inshore area is made up of mud with rocks scattered along the coast particularly in the vicinity of Point MacKenzie and Point Woronzof. The bottom generally consists of silt, mud and sand mixed with gravel and pebbles. Depths range from zero along the shore to 51.0 meters.

On this survey, automated HDAPS was used for data acquisition and field processing. Miniranger was utilized as the primary positioning system with GPS (Global Positioning System) being operated simultaneously as a back-up system for this survey.

Side scan sonar was used on this survey to search the area between regular sounding lines for indications of possible dangers and bottom irregularities. The sonar search was conducted along the deep draft shipping route approaching the port of Anchorage with a 100% swath coverage of the bottom within the area specified in the project instructions and as indicated on the presurvey review chart. Significant side scan sonar contacts identified in the field were adequately investigated by echo sounder developments. The side scan data was processed at PHS in accordance with the procedures specified in Hydrographic Survey Branch memorandum, Side Scan Sonar Processing Procedures, dated June 28, 1993.

Predicted tides for Anchorage, Alaska, gage 945-5920, were used for the reduction of soundings during field processing. Approved hourly heights zoned from the same gage 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. NAD 83 is used as the horizontal datum for plotting and position computation. The TRA, sound velocity and electronic control correctors are adequate. An accompanying computer printout contains the parameters and the correctors used for this survey.

A digital file has been generated for this survey as required by the specifications contained in Hydrographic Survey Guideline No.52, Standard Digital Data Exchange Format, April 15, 1986. Certain 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 depiction of survey data.

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.

Additional information concerning the result of the review of the 1992 horizontal control observations by the Pacific Photogrammetry Party(N/CG233) is contained in the memoranda (copies included in the survey records) to the Commanding Officer, NOAA Ship RAINIER and the Chief, NOS Geodetic Reference Sources Group, dated October 19, 1992.

The positions of horizontal control stations used during hydrography are 1934 published and 1992 field values based on NAD 83. These values were used during office processing for the computation of positions. The NGS adjusted positions for the 1992 stations were compared with the field values used during this survey and no significant differences were found. 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 utilizing the NAD 83 projection by applying the following corrections.

Latitude: -1.985 seconds (-61.451 meters)
Longitude: 7.993 seconds (119.312 meters)

The year of establishment of control stations shown on the smooth sheet originates with NGS listing and the previously referenced horizontal control report.

Some of the fixes in this survey exceeded the specification in terms of the maximum allowable limits of ECR (error circle radius) and residual values or have angles of intersection less than 30 degrees or more than 150 degrees. A review of the data, however, indicates that the positioning of soundings based on these fixes was consistent with the surrounding areas and the data are considered acceptable. With the exception of a fix taken to verify the position of a presently charted rock at latitude 61/14/22.27N, longitude 150/00/51.10W, none of these other fixes were used to locate dangers to navigation. GPS performance checks were conducted in the field and found adequate.

There are no shoreline maps applicable to this survey. The shoreline depicted on the smooth sheet was compiled from an enlarged copy of Chart 16665, 2nd edition, dated May 1990, and is shown in brown for orientation purposes only.

3. HYDROGRAPHY

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.

Apparent tide errors of up to 0.5 meters exist in this data, no doubt caused by the extremely rapid changes in tidal heights characteristic of Cook Inlet. However, these errors do not require a specific warning to mariners because the hazards created by the rapidly changing depths as a result of natural causes are more significant dangers than these tide errors. The charted note B,

which warns mariners of drastic and continuing changes in this region, is considered to be an adequate response to this problem. However, it is recommended that the location of the charted notes be revised to center them within the actual navigable areas of Cook Inlet.

Side scan sonar was used as a search tool in detecting any indications of possible dangers to navigation within the navigable area of the survey. The significant contacts identified during the sonar search were developed by echo sounder. Detached positions and least depths of significant findings are adequately determined and are depicted on the smooth sheet as rocks, based on historical information for this area.

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, the Field Procedures Manual, January 1990 Edition, and the Side Scan Sonar Manual (September 1988).

5. JUNCTIONS

Survey H-10431 junctions with the following survey.

<u>Survey</u>	<u>Year</u>	<u>Scale</u>	<u>Area</u>
H-10430	1992	1:10,000	East
H-10432	1992	1:10,000	South/West

The junction with survey H-10430 is complete. Comparison reveals good agreement with the present survey.

Survey H-10432 is still in processing and junction comparisons were made using a preliminary sounding plot. The junction appears to be adequate, however, the junction will be addressed in the Evaluation Report for survey H-10432.

6. COMPARISON WITH PRIOR SURVEYS

H-9441(1974) 1:10,000
H-9442(1974) 1:10,000
H-10000(1982) 1:10,000
H-10012(1982) 1:10,000

Comparisons with these prior surveys shows the area has experienced significant change that could be attributed to the prevailing strong current within the channel and the effect of considerable movement of ice throughout the winter period. Bottom sediments have shifted considerably particularly along the northern coast, North Point Shoal and Knik Arm Shoal.

Surveys H-9441 and H-9442 of 1974 provide the basic coverage of the area. The mud flat in the vicinity of latitude 61/13/30N, longitude 150/09/30W, uncovering from -1.0 foot to -11.0 feet (-0.3 m. to -3.4 m.) at MLLW, was not found during this survey. This area is presently covered by about 5 to 9 meters of water. The middle of the channel was found to be generally shoaler by about 6 meters (19 ft.), while the inshore areas off Point MacKenzie and Point Woronzof remained relatively stable.

A portion of the area covered by the above 1974 surveys was superseded by a 1978 special survey H-9760. Survey H-9760 covers the approach channel to the Port of Anchorage between Fire Island and Point MacKenzie. The significant differences in depths between the 1974 and 1978 surveys confirms that continuous bottom changes are still occurring in this area of Cook Inlet.

Surveys H-10000 and H-10012 were accomplished in 1982 at the scale of 1:20,000 and 1:10,000 respectively, covering the area from Fire Island Shoal to Knik Arm. As with the 1974 and 1978 surveys, some significant changes were noted between the priors and the present survey. North Point Shoal has shifted laterally southwest from its previous location and with shallower depths ranging from 1.3 feet to 17.0 feet (0.4 m. to 5.0 m.). Knik Arm Shoal has grown slightly deeper and expanded in area compared to the prior survey. The present soundings along the middle of the channel, particularly between the shoals are generally shallower than the earlier surveys.

Significant changes were noted in some areas along the Point MacKenzie range. The 30-foot curve delineating Knik Arm Shoal has now expanded along the area in the vicinity of latitude 61/12/45N, longitude 150/05/30W, with shoal depths of up to 24 feet (7.5 m.). Also, in the vicinity of latitude 61/12/25N, longitude 150/06/40W, shoaling of up to 24 feet (7.5 m.) was found during this survey.

Additional detailed comparisons with these prior surveys can be found in section M of the hydrographer's report.

Survey H-10431 is adequate to supersede the prior surveys within the common area.

7. COMPARISON WITH CHART

Chart 16665, 2nd edition, dated May, 19, 1990; scale 1:50,000

Chart 16665, 3rd edition, dated May 15, 1993, scale 1:50,000

a. Hydrography

The charted hydrography on chart 16665 (2nd edition) originates from prior surveys mentioned in section 6 of this report and from miscellaneous sources which requires no further discussions. The 3rd edition of chart 16665 (preliminary chart) has been updated from the final field sheet of the present survey. This preliminary chart is being distributed as an interim product while the 1992 survey is being processed and compiled to a final chart of the area.

The two (2) charted rocks along the low water line at latitude 61/14/21N, longitude 150/00/50W and latitude 61/14/25N, longitude 150/01/45W, were located during this survey. It is recommended that these rocks be charted as shown on the smooth sheet.

The two (2) charted rocks located east of Point Woronzof at latitude 61/12/10N, longitude 149/59/37W, were not found during this survey. However, a rock was located within the area at latitude 61/12/09.9N, longitude 149/59/36.4W. It is recommended that the charted rocks be deleted and the newly located rock be charted as shown on the smooth sheet.

The presently charted limits of the cable area between Point MacKenzie and Point Woronzof were based on the results of the Beluga Project (Port of Anchorage) accomplished by Kelvin Huges surveying company in 1977. The excursion was drawn to include the remaining portion of the "disused cable" shown on the project plan. It is recommended that the charted cable area be retained as charted.

With the exception of the charted cable area and the sewer outfall (AWOIS Item 51899) in the vicinity of latitude 61/12/15N, longitude 150/01/18W, survey H-10431 is adequate to supersede the charted hydrography within the common area.

b. AWOIS

AWOIS item 51901 originates with prior survey H-9441 and is adequately discussed in section M of the hydrographer report.

There are two (2) AWOIS items (51898 & 51899) on this survey originating with miscellaneous sources. Discussion and disposition of each of these items are included in section N of the hydrographer's report.

An additional four (4) lettered AWOIS items (A,G,H & J) originating from prior surveys conducted by private contractors were investigated during this survey. The results of these investigations are adequately discussed in section N of the hydrographer's report.

c. Controlling Depths

There are no charted channels with controlling depths within the area of this survey.

d. Aids to Navigation

There are five (5) fixed and two (2) floating aids to navigation located within the limits of this survey. These aids were found to be in good condition and adequately serve their intended purpose. Additional information concerning these aids can be found in section P of the hydrographer's report.

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

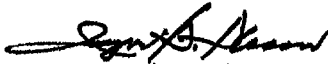
Six (6) dangers to navigation found on this survey were reported to the USCG and DMAHTC on July 8 and August 21, 1992. Copies of the reports are attached. No additional dangers were discovered during office processing.

8. COMPLIANCE WITH INSTRUCTIONS

Survey H-10431 adequately complies with the Project Instructions.

9. ADDITIONAL FIELD WORK

This is a good hydrographic survey and no additional field work is required. However, due to the continuous shifting of bottom sediments noted along the navigable approaches to the port of Anchorage, periodic field investigation is recommended for purposes of updating the chart.


Isagani A. Almacén
Cartographer

APPROVAL SHEET
H-10431

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.

Bruce A. Olmstead Date: 9/28/93
for 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: 10/8/93
Commander Douglas G. Hennick, NOAA
Chief, Pacific Hydrographic Section

Final Approval

Approved:

J. Austin Yeager Date: 10/27/94
J. Austin Yeager
Rear Admiral, NOAA
Director, Coast and Geodetic Survey

