10248

Diagram No. 8802-3

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey ... Hydrographic

Field No. ... RA-20-2-87

Registery No. ... H-10248

LOCALITY

State ... Alaska

General Locality ... Bristol Bay

Sublocality ... Eastern Togiak Bay to Ungalikthluk Bay

19 87

CHIEF OF PARTY
CAPT C.W. Fisher

LIBRARY & ARCHIVES

DATE ... February 2, 1989

☆U.S. GOV. PRINTING OFFICE: 1985—566-054

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"GP"

chts 16315, 16006, 16011 } CARTOG SIGN OFF ON FM IN BACK

NOAA FORM 77-28 (11-72)

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

HYDROGRAPHIC TITLE SHEET

REGISTER NO.

H-10248

INSTRUCTIONS - The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

FIELD NO.

RA 20-2-87

State Alaska

General locality Bristol Bay

Locality Eastern Togiak Bay to Unqalikthluk Bay

Scale 1:20,000 Date of survey June 22 - July 31, 1987

Instructions dated March 6, 1987 Project No. OPR-R184-RA

Vessel RAINIER S221 (2120); Launches: RA3 (2123), RA4 ((2124), RA5 (2125) RA6 (2126), RA8 (2128), RA9 (2129)

Chief of party Carl W. Fisher, CAPT, NOAA

Surveyed by LT White, LTJG Damm, ENS Poston, ENS O'Mara, ENS Hill, ENS Meis, ENS Larsen

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

Graphic record scaled by RAINIER Personnel

Graphic record checked by RAINIER Personnel

Evaluation by: ~~Protracted by~~ A. Luceno Automated plot by PMC Xynetics Plotter

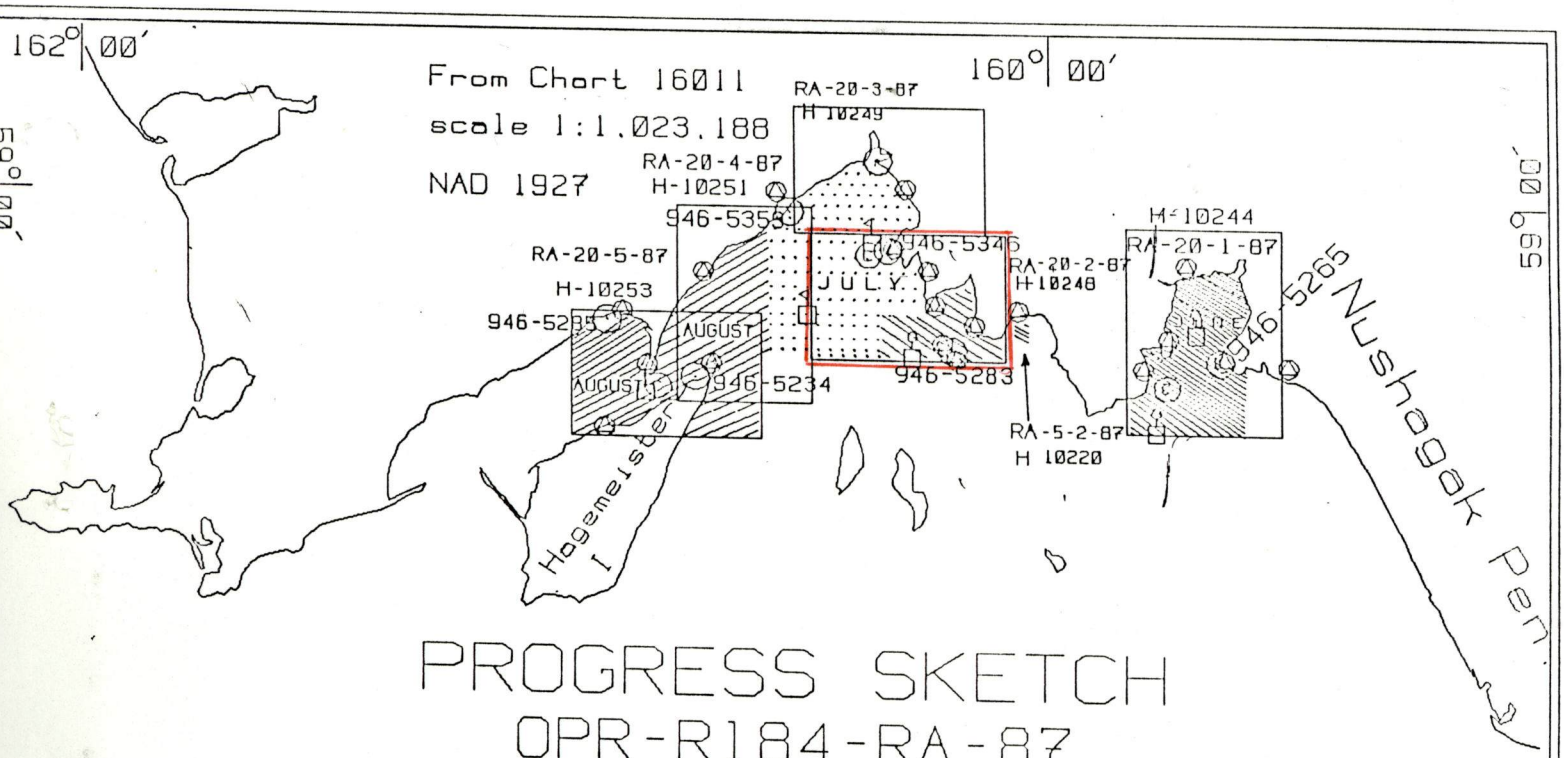
Verification by J. Shofner

Soundings in fathoms ~~feet~~ at ~~MLW~~ MLLW

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

L# 325-97 ✓ AWOIS + SURF 4/89 RWD

☆ U.S. GOVERNMENT PRINTING OFFICE: 1978-665-010-1174



PROGRESS SKETCH

OPR-R184-RA-87

HYDROGRAPHIC SURVEY

TOGIAK BAY, ALASKA

JUNE 7 - SEPT. 01

NOAA SHIP RAINIER

CARL W. FISHER, CAPT, NOAA

COMMANDING

JUN	JUL	AUG	SEP	
81.4	122.7	94.88	-	SQ.N.M. Sounding
1108	1565	1961	-	L.N.M. Sounding
460	988	1015	10	L.N.M. Misc. Distance
78	65	119	1	Bottom Samples (Grab)
10	8	5	-	Electronic Control Stations
4	--	-	-	Temp. Depth. Sound Velocity
—	3	2	-	Nansen Cast
4	2	1	-	Tide Gages
15	11	5	-	Geodetic Control Stations
3	18	17	-	Water Samples Analyzed
1.65	2.97	2.42	-	SQ. N.M. Side Scan Sonar
82	15.4	76.4	-	L.N.M. Side Scan Sonar
1	1	.2	-	Current Stations Occupied

Descriptive Report to Accompany Hydrographic Survey H-10248

Field Number RA-20-2-87
Scale 1:20,000
1987

NOAA Ship RAINIER
Chief of Party: Captain Carl W. Fisher

A. Project

A basic hydrographic survey of Ungalikthluk Bay and East Togiak Bay was completed as specified by Project Instructions OPR-R184-RA, dated March 6, 1987, Change Number 1, dated March 20, 1987, and Change Number 2, dated June 2, 1987. (See Eval. Report for other applicable changes to Proj. Instruction)

This was one of a series of surveys in a project to provide modern hydrographic survey coverage of Bristol Bay, Alaska, between Cape Newenham and Cape Constantine, for existing and new charts that are planned for the area. This project responds to requests from the Alaska congressional delegation, U.S. Coast Guard, State of Alaska, Bristol Bay Native Association, Togiak Fishing Fleet, and other commercial fishermen.

The survey was designated sheet K on the original sheet layout for the project dated January 25, 1985. The field number for the survey was RA-20-2-87 and the assigned registry number was H-10248.

B. Area Surveyed

The survey was located in north Bristol Bay, Alaska, between the Walrus Islands and the fishing village of Togiak. This area provides an eastern entrance to the rich fishing grounds of Togiak Bay. The survey extends from Ungalikthluk Bay on the east, to the approximate center of Togiak Bay on the west. The village of Togiak is approximately ten miles to the north northwest.

Several embayments exist in the survey area, the largest being Ungalikthluk Bay which is 2.2 by 2.5 miles. These bays were found to be shallow and muddy. Large concentrations of eel grass were observed within the tidal zone of the bays. The shoreline throughout the survey varies from foul rocky cliffs to sandy gravel beaches. A large portion of the shoreline was found to be foul with numerous boulders scattered offshore.

The shoreline of Summit Island, which lies in the southeast corner of the survey area, is steep and rugged. Numerous foul areas exist around the island. Yet, there are small, sheltered, sandy beaches on the northeast and southwest sides of the island. Several hazards were located in the channel between Summit Island and the mainland. The rocky points which deliniate Ungalikthluk Bay extend southward into this channel and are associated with the located hazards.

The offshore waters of Togiak Bay west of Summit Island are shallow and gently sloping with depths ranging from 5 to 17 fathoms. This area was found to be free of navigational hazards.

The survey area was bounded by the following geographic limits:

North	58° 58' 00" N
South	58° 50' 00" N
East	160° 05' ~~45~~ 32" W
West	~~159~~ 160° 30' 45" W

Data acquisition was conducted from June 22 through July 31, 1987 (day 173 - day 212).

C. Sounding Vessels

Data were acquired with the following vessels:

Vessel	EDP No.	Operation
RAINIER	2120	Bottom samples, Velocity cast
RA-3	2123	R/R, R/AZ, Side scan
RA-4	2124	R/R, R/AZ
RA-5	2125	Bot. samples,Shore. ver., R/R
RA-6	2126	R/R, R/AZ, Shor. ver.
RA-8 (B Whaler)	2128	Shoreline verification
RA-9 (MonArk)	2129	Shoreline verification

No changes to the standard sounding configuration of the automated survey launches were necessary.

A 19-foot, aluminum-hulled MonArk and a 16-foot, fiberglass Boston Whaler were used during shoreline verification. These vessels were not outfitted with automated sounding or positioning equipment.

Bottom samples were acquired with the RAINIER on day 178, when weather conditions prevented launch operations.

D. Sounding Equipment and Corrections to Echo Soundings

The automated survey launches used for this survey were equipped with Raytheon DSF-6000N echo sounders. 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 fathoms and tenths of fathoms. Two-fathom bar checks were conducted and recorded daily, using both the LOW and the HIGH + LOW (HIGH DIGITIZED) functions, in accordance with the Provisional Instructions "RAYTHEON DSF-6000N ECHO-SOUNDER OPERATING AND PROCESSING INSTRUCTIONS," dated July 5, 1983, and the N/CG2 memorandum "DSF-6000N Depth Errors as a Function of Receiver Gain," dated May 23, 1986.

The echo sounders functioned properly throughout the project with two exceptions. On day 192, instrument A114N (vessel 2124) was replaced by B046N for the remainder of the day. On day 194, instrument A117N (vessel 2123) was replaced by B046N for the remainder of the day. In both cases, the trace acquired prior to the breakdown was adequate and was retained in the field records. The original echo sounders were repaired and returned to the respective survey launch by the following morning.

Raytheon DSF-6000N Echo Sounders

Vessel	Serial Number	Days
2123	A117N	173-212
	B046N	194
2124	A114N	173-212
	B046N	192
2125	A103N	173-212
2126	A119N	173-212

A Klein side scan unit was used to investigate AWOIS item #50932 on day 200. The unit was operated in accordance with the Provisional Side Scan Sonar Manual, dated April 25, 1986.

Klein Side Scan System

Equipment	Model	Serial No.
Recorder	521T	254
Transducer	422XS-101AF	410M

Least depths over a bottom feature were obtained by divers with a 3D Instruments pneumatic depth gage (S/N 8504192N) on day number 196. The gage was operated in accordance with Hydrographic Survey Guideline #55, and was last calibrated on December 19, 1986, by 3D Instruments, Inc. (Appendix IV). (filed with the hydrographic data.) The instrument calibration was checked the morning before the dive. Results agreed with the original calibration to ±0.5 foot.

Corrections to Echo Soundings

Corrections to all soundings were determined for sea conditions, draft, velocity of sound through water, settlement and squat, and tides. These correctors are eventually to be applied to all survey vessels and all areas of this survey. However, in plotting the final field sheet, the determined correctors were applied for sea conditions, draft, and velocity only. Settlement and squat correctors were not applied. Predicted tide correctors were used and the field tide records have been forwarded to N/OMA121, in accordance with Hydrographic Survey Guideline #50 and the PMC OPORDER. Variations in the instrument initial, stylus arm length, and belt tension are not present with the DSF-6000N.

Sea Conditions

Corrections for sea conditions were applied while scanning. The scanning technique used in comparing the analog trace with the digital record was chosen to eliminate fluctuations greater than 0.2 fathoms resulting from sea action, while at the same time preserving the trend of this gently sloping area.

Draft

Transducer depths of 0.3 fathom were measured for all four launches on March 26, 1987 by divers using a large wooden T-square. The draft measurements were made at PMC with the fuel tanks all between full and half full, and with zero, then four, people aboard. The average computed transducer depths of 0.3 fathom agree with RAINIER historical records. Transducers are mounted starboard, midships, in a location such that all sounding corrections apply to both the low and high frequency echo-sounder signals.

Velocity Correctors

Velocity of sound through water and the associated corrections to echo soundings were determined by two Nansen casts. Two attempts using the ship velocity probe,a Plessy/Grundy model 9040 CTD (S/N 5652) coupled to a Hewlett-Packard 5326B Universal Frequency Counter (S/N 1312A02159), and two attempts using a portable Plessy/Grundy Sound Velocity Sensor (S/N 3444) coupled to a Hewlett-Packard 5315A Frequency Counter (S/N 1946A03637) gave useless results.

A velocity cast (cast #3) was performed on day 175, using the ship's CTD system, in the deep water on the west side of Summit Island. Electronic problems between the probe and the frequency counter interfered with data collection. The results of cast #3 gave no correctors of less than 0.05 fm, however the values seemed a bit odd because they were slightly negative. Once analyzed, the surface water samples for cast #3 did not agree with the probe velocities. It was decided to conduct another cast using the portable sound velocity probe in order to check the results of the ship's system. Casts #4 and #5 were performed on days 179 and 189, respectively. The results of these two casts were similar, but the sound velocity values were outside normal limits, which implies that the probe was somehow knocked out of calibration. Therefore, the data from casts 3,4 and 5 were rejected.

On day 197 both a CTD cast and a Nansen cast were performed. The ship's CTD system once again experienced electrical difficulties and the CTD cast was terminated. The results of the Nansen cast(#6) drastically differed from the results of CTD cast #3. On day 212, another Nansen cast(#9) demonstrated very similar results to the earlier Nansen cast. An average of cast #6 and cast #9 was taken in order to determine the velocity correctors for this survey. Thus, velocity tape #2, as listed in Appendix IV, was used on the final smooth plot for this survey. →(filed with the hydrographic data.)

Velocity Cast Locations

Cast No.	Deepest Depth (m)	Day	Geographic Position
3(rejected)	25	175	58° 49.9'N, 160° 16.7'W
4(rejected)	25	179	58° 51.9'N, 160° 17.8'W
5(rejected)	25	189	58° 52.5'N, 160° 14.4'W
6	25	197	58° 50.0'N, 160° 16.7'W
9	20	212	58° 50.0'N, 160° 16.8'W

The Nansen cast provides data only at discreet, preselected depths, rather than continuously throughout the water column. Therefore, the method used to compute velocity correctors was similar to that outlined in the Hydrographic Manual, Fourth Edition as Example 2 on page 4-77. Velocity computations and plots may be found in Appendix IV. (filed with the hydrographic data)

Settlement and Squat

Settlement and squat correctors were determined for the automated survey launches in Seymour Canal on April 28 and May 5, 1987, over hard bottom in a depth well exceeding seven times the vessels' drafts. Both sea and wind were calm. Observations were made through a Zeiss Ni2 leveling instrument (S/N 87102) to a rod held vertically on the deck of each launch, almost directly over the transducer. Five level readings were made at each speed tested, and the average taken, to compute the correctors. Tide staff readings were taken concurrently with each set of level readings, and all tide height differences were normalized to the tide height of the dead-in-the-water level readings before the correctors were computed.

Soundings on the final field sheet are not corrected for settlement and squat, although corrections of 0.1 fathom must be made for certain vessels at some RPMs. TC/TI tapes for each automated sounding vessel have been prepared and submitted with this survey. Records of settlement and squat data are included in Appendix IV. (filed with the hydrographic data.)

Tide Correctors

The final field sheet is plotted using predicted tide correctors from the Project Instructions and given below. These correctors apply to predicted tides for Black Rock, Walrus Islands, Alaska (946-5182), provided by the Tides and Water Levels Branch and included in Appendix XIII. (filed with the hydrographic data)

Tide Correctors

Applicable Area	Time Correcton		Height Ratio
	High Water	Low Water	
East of longitude 160°20 ' W	+ 10 min	+ 10 min	x1.03
West of longitude 160°20 ' W	+ 20 min	+ 20 min	x1.06

During this survey, tide stations were in operation at NE Summit Island (946-5283); East Side, Togiak Bay (946-5346); and West Side, Togiak Bay (946-5359). Field tide records have been submitted (see Field Tide Note in Appendix II) and a request for approved tides made (Appendix XI). (filed with the hydrographic data)

E. Hydrographic Sheets

The field sheets were all prepared aboard RAINIER, on a Houston Instrument Complot DP-3 roll plotter, using the PDP8/e Hydroplot system and program RK201, "Grid, Signal, Lattice Plot". Program RK201 draws a modified transverse mercator projection. The final field sheet, a 1:20,000-scale projection, was plotted on two plotter sheets designated RA-20-2N-87 and RA-20-2S-87.

Five expansion sheets at 1:5,000 scale were used to plot special investigations and are also included with the survey data. A stable base, final position plot of the sidescan survey (Expansion #5) was also prepared.

Expansion Sheets

Sheet	Survey Area	Boundaries
Expansion #1	Shoal 25m splits development	North - 58° 51' 40" N South - 58° 50' 35" N East - 160° 08' 25" W West - 160° 09' 20" W
Expansion #2	Shoal 25m splits development	North - 58° 52' 00" N South - 58° 51' 20" N East - 160° 11' 50" W West - 160° 12' 55" W
Expansion #3	AWOIS #50929 25m splits development	North - 58° 52' 00" N South - 58° 45' 15" N East - 160° 13' 30" W West - 160° 16' 00" W
Expansion #4	Shoal 25m splits development	North - 58° 52' 45" N South - 58° 52' 00" N East - 160° 10' 30" W West - 160° 11' 35" W
Expansion #5	AWOIS # 50932 Side scan survey	North - 58° 57' 30" N South - 58° 56' 30" N East - 160° 19' 30" W West - 160° 21' 15" W

Least depths from these expansion sheets have been transferred to the final field sheet. The central meridian, false easting, and controlling latitude were held constant on all field sheets (Appendix I). (filed with the hydrographic data.)

Depth contours are drawn on the final field sheet in accordance with the Hydrographic Manual. A number of supplemental depth contours have been added to adequately describe the bottom in this area.

Depth Contour(fm)	Color
0	Orange
1	Green
2	Red
3	Blue
4	Orange
5	Red
6	Green
8	Brown
10	Orange
12	Brown
14	Brown

The final field sheet and accompanying field records, along with this Descriptive Report, ~~are being~~ have been forwarded to the Pacific Marine Center for verification.

F. Control Stations

Eight geodetic stations were used to control this survey. Positions for NEMESIS, OWENS, SUMMIT and SUMMIT AZ are from the NGS data base. BLAKE, DUCE, TOG, and UNGALI were positioned during this survey and their positions are unadjusted field positions.

Station	Order Class	Date Established	Signal #
BLAKE	31	1987	122
DUCE	31	1948	209
NEMESIS	11	1948	223
OWENS	11	1948	119
SUMMIT	11	1948	108
SUMMIT AZ	11	1948	201
TOG	31	1987	121
UNGALI	31	1987	120

NEMESIS, OWENS, SUMMIT, and SUMMIT AZ were verified with check angles during the horizontal control field work. DUCE and UNGALI were located by triangulation from SUMMIT and SUMMIT AZ. TOG was located by triangulation from OWENS and SUMMIT AZ. BLAKE was located by triangulation from TOG and NEMESIS.

All stations met third-order, class I standards for positioning and further information can be found in the Horizontal Control Report, OPR-0184-RA-87.

Geographic positions were based on the North American Datum of 1927 and Clark Ellipsoid of 1866.

G. Hydrographic Position Control

Soundings were located using range-range and range-azimuth geometry. Range data were acquired with Motorola's Mini-Ranger III electronic positioning system. Azimuths were measured using WILD T-2 theodolites. In addition, the "See Field Sheet" method of positioning was used on day 212 where electronic positioning was not available. Loran C positioning was used by RAINIER in acquiring bottom samples on day 178 and to position velocity casts on days 197 and 212.

Positioning Equipment

Four Mini-Ranger console/RT pairs were used during this survey. Each pair remained with an assigned vessel for the survey's duration. The following table lists the days of use and corresponding vessel for each console/RT pair.

Console/RT pair	Day	EDP #	Vessel Name
720/B1405	190-212	2123	RA-3
30269/C1712	173-212	2124	RA-4
715/911615	179-180	2125	RA-5
715/H3705	190-212	2125	RA-5
711/B1388	179-212	2126	RA-6

The following eight shore transponders were used to locate the vessels:

Code	Serial Number
A	G3510
C	G3500
D	911634
E	F3256
F	G3501
0	C1789
2	B1106
3	911635

The following theodolites were used to acquire azimuth data during this survey:

Model	Serial Number
Wild T-2	75599E
Wild T-2	73226
Wild T-2	57259
Wild T-2	68648

Loran-C data was acquired by the RAINIER with a Raytheon receiver unit, model RAYNAV 7000. The 9990 chain(Y and Z time delay pair), was available in the area.

Calibrations and System Checks

Opening baseline calibrations for the console/RT pairs and transponders were conducted in accordance with PMC OPORDER 3.3 at the following locations on the corresponding dates:

Console/RT Pair	Location	Date	Codes
720/B1405	Sitka, AK	17 May 87	A-3
30269/C1712	Sitka, AK	19 May 87	A-3
711/~~B1388~~ 911102	Summit Is., Ak	20 Jun 87	A-3
715/911615	Sitka, AK	20 May 87	A-3
715/H3705	Dutch Harbor, AK	01 Jul 87	A,D-0,3
715/H3705	Summit Is., AK	18 Jul 87	2
715/H3705	Dutch Harbor, AK	14 Aug 87	C

The calibrations were conducted over open water with the following ranges:

Calibration Site	Baseline Distance
Sitka, AK	1910 meters
Summit Is., AK	810 meters
Dutch Harbor, AK	1215 meters

From these calibrations, signal strength cutoffs and baseline correctors were developed; see Appendix V for tables listing baseline correctors and signal strength cutoffs.

Critical system checks were conducted at least once per week using theodolite intersection and fixed point methods; station UNGALI(120) was used for fixed point critical checks on stations SUMMIT(108), SUMMIT AZ(201), and DUCE(209). System checks were performed in accordance with PMC OPORDER 3.3. Correctors computed during system checks showed agreement within 10 meters of baseline correctors, throughout the survey.

The final field sheet was plotted on board the RAINIER using the opening baseline correctors. A waiver of bi-monthly baseline calibrations was issued on March 23, 1987 (see Appendix V). Final baseline calibrations are to be conducted upon the RAINIER's return to Seattle. Because the system checks showed good agreement within opening baseline calibrations and because the baseline calibrations were close in time to the period of the survey, it is recommended that the opening baseline calibration correctors be used in plotting the smooth sheet.

A complete discussion of the electronic control for this project, including baseline calibrations and summaries of system checks may be found in Electronic Control Report OPR-R184-RA-87.

Problems and Unusual Position Configurations

No significant problems were encountered concerning the electronic or azimuth positioning control used for this survey.

A series of T-2 critical system checks on day 193 initially did not meet the allowable ± 10 meter tolerance. This was due to use of a preliminary position for station TOG(121). Once TOG was correctly positioned, the system checks were recomputed and all fell within the 10 meter limit. The values were corrected on the respective printouts and computation sheets.

Code 2 was used with console/RT pair 715/H3705 (vessel RA-5) for obtaining positions on bottom samples and detached positions 5166-5168 on days 194-196. Code 2 had not yet been calibrated with that console/RT pair. System checks were made on days 195-196 and they agreed within 10 meters of the results of the baseline calibration conducted on day 199. Care was taken not to alter the existing console adjustments for code 2 in any way during the calibration.

On day 212, vessel 2123(RA3) used the "see-field-sheet" method of positioning to run approximately 0.5 mile of shoreline on RA-20-2N-87. Range/azimuth hydrography was attempted from station TOG(121) but land obstructed the observer's view. No other positioning method was available. The launch steered magnetic courses and course changes were made when the vessel's position could be determined relative to verified shoreline features. Courses and course changes were recorded on the raw printout. The positions and corresponding position numbers were noted on the boat sheet. Geodetic positions were scaled from the boat sheet for these fixes. Range/azimuth data from TOG(121) were computed for each position to enable automated plotting of the data. Positions 3878-3896 were located in this manner. Hydrographic Guideline, which directs not scaling these positions in the field, was not received until after this field sheet was processed. HG #62 dated 8/27/87

Null zones and low signal strengths were observed throughout the survey. Null zones were covered with time and course interpolation if the zones were shorter than 6 centimeters along the sounding line. Ranges with signal strengths one unit less than the cut off were recorded and maintained in the records if they plotted in agreement with dead reckoning. These signals were generally long distances from the station(>20 km) or associated with null zones.

Andist

The transducer is located directly beneath the antenna on the four automated survey launches (2123,2124,2125, and 2126). The ANDIST is 0,0. No sounding data for survey purposes were acquired with the RAINIER (2120). The ANDIST for the RAINIER was not used in processing the bottom samples and velocity cast positioning data.

H. Shoreline

Shoreline features on the field sheet were transferred from NOS shoreline manuscript:

NATIONAL OCEAN SERVICE
SHORELINE MANUSCRIPT
TP-01186
ALASKA
TOGIAK BAY TO
CAPE CONSTANTINE
SCALE 1:20,000
TRANSVERSE MERCATOR PROJECTION
10,000 FOOT GRID BASED ON
ALASKA STATE PLANE COORDINATE SYSTEM
ZONE 6
1927 NORTH AMERICAN DATUM

Shoreline details were verified by visual inspection from a skiff (vessels 2129 and 2128) or launch (vessels 2125 and 2126) at or near low tide. Shoreline verification was accomplished in all areas except inshore of the mouth of the Ungalikthluk River. Shallow water prohibited safe entry. Features which appeared as depicted on the TP-sheet were assigned reference numbers and heights as directed in PMC OPORDER 3.6. The reference numbers were recorded with heights and descriptive information in a sounding volume and on a paper copy of the TP-sheet. To fascillitate transfer to the final field sheet, some reference numbers and features were also transferred to the stable base, transparent copy of the TP-sheet.

Descriptive annotations were recorded on the TP-sheet and occasionally supplied on the raw data printouts at the inshore terminations of sounding lines. The paper copy of the TP sheet contains notes about topography behind the high water line over the entire area. Significant descriptions have been transferred to the final field sheet.

The location of significant offshore features, and additional alongshore features not shown on the ~~TP-sheet~~ shoreline maps, were recorded as detached positions. Cartographic codes have been assigned in the field records.

Shoreline details and features have been transferred to the field sheet with additions shown in black and changes shown in red. Detached positions were plotted on the final field sheet with their four-digit position numbers. Reference positions were plotted with their three-digit numbers, preceded by an 'R'. Heights were given in feet and have been corrected for predicted tides. Heights given for ledges, reefs, rocks, and islets refer to the highest portion of each feature.

It was clearly evident during the field work that the photography for shoreline map TP-01186 was flown during a stage of tide higher than MLLW, probably as high as mid-tide. The majority of shoreline features depicted on TP-01186 were isolated rocks and groups of rocks. Field work performed at periods of low water proved many of the rocks to be within the limits of a foul area. On the final field sheet, foul area delimitations (a dashed line) have been shown in black as additions to the shoreline. In some cases, depicted groups of rocks were found to be the higher points of a ledge or group of interconnected ledges and reefs. These ledges have been shown in black as additions and the TP-sheet rock symbols have not been transferred to the final field sheet unless they represent a point or points to which a height or average height was assigned.

see sections 2 & 6 of Eval. Report

In many locations, for clarity on the final field sheet, heights obtained on numerous rocks within foul areas have been grouped under one reference number for the entire foul area and cross-indexed in the reference sounding volume. The original, paper, field copy of the TP-sheet must be consulted as an index to heights referenced to individual rocks within these foul areas.

Additions

Three specific additions to the manuscript should be mentioned. These features are not depicted on historical TP-sheets.

1. Foul Area	Area foul with numerous boulders Carto Code 894 R160, Day 200 58° 56.9' N 160° 15.9' W
2. Foul Area	Area foul with numerous boulders Carto Code 894 R170, Day 210 58° 56.6' N 160° 17.5' W
3. Ledge	Ledge extending off Rocky Point Carto Code 009 R174, Day 200 Fix 8363+3+insert, Day 195 58° 53.2' N 160° 14.7' W

Prior Photogrammetric Survey

TP-01186 included 5 shoreline features that were labelled "5 Rocks (T-9242 or 9237)." These features were not shown by positions, but were presented as circled areas outlining rocks from prior maps. These items originated from U.S. Coast and Geodetic Survey Topographic Maps (1:20,000 scale polyconic projection, 1927 NAD) compiled in 1950 from aerial photographs taken in October, 1948:

Map Number	Number of Features Transferred to TP-01186
T-9237	2
T-9242	3

T-9237 was made available for this project in 1986.
T-9242 was not supplied for comparison during this survey.

These features were investigated during shoreline verification and their status determined as follows:

Feature Location	Verification Position Number	Status
58° 51.53'N 160° 06.04'W	R-101	The rock indicated from T-9242 was not observed. However, this area is rocky and foul with offshore reefs. Since this location was not examined at a sufficiently low tide to disprove the existence of the rock, it is recommended that it be retained at the position shown on T-9242. concur Rock in violet on smooth sheet.
58° 50.49'N 160° 13.92'W	R-136	The rock indicated from T-9242 was not observed. The hydrography in this area, as well as the shoreline verification, gives evidence to the foul nature of this area. Since this location was not examined at a sufficiently low tide to disprove the existence of the rock, it is recommended that it be retained at the position shown on T-9242. concur Rock in violet on smooth sheet.
58° 51.3' N 160° 13.0" W	D.P.5169 D.P.5181	This area is foul with boulders and foul area limits have been determined which encompass the rocks from T-9242. Rock in violet from T-9242
58° 53.24'N 160° 09.11'W	R-162	A negative sounding (Fix 8375) was obtained at this location during shoreline hydrography. This area is flat and shoal and could not be approached at a suffiently low tide for further visual examination. The position of the rock should be obtained from T-9237. concur Rock in red on smooth sheet.
58° 57.72'N 160° 18.8' W	R-168	The rock shown on T-9237 was observed and referenced together with other rocks alongshore. This area is foul with scattered boulders. Rock in red on smooth sheet

The above referenced features have been transferred to the ~~final field~~ smooth sheet at their ~~estimated~~ positions shown on the shoreline maps

It was noted that the T-9237 map presented a more accurate depiction of the shoreline features, such as ledges, than did the contemporary manuscript TP-01186.

see sect. 2 of Eval. Report

Control Stations Seaward of the Shoreline

There were no control stations located seaward of the shoreline during this survey.

I. Crosslines

A total of 74.2 nautical miles of crosslines were run, representing 8.2% of the mainscheme hydrography. In all cases, crossline soundings agreed with mainscheme soundings within three tenths of a fathom. A sample of 50 comparisons was made across the sheet.

Crossline/Mainscheme Agreement

Within 0.1 fathom	78%
Within 0.2 fathom	94%
Within 0.3 fathom	100%

With no major discrepancies noted, agreement between mainscheme and crossline soundings was evaluated to be very good.

J. Junctions

This survey junctions with two contemporary surveys: H-10220, along the eastern edge of the sheet, and H-10222, along the southern edge of the sheet. Both are 1:20,000 scale surveys completed by the RAINIER in 1986 as part of this project. A sample of thirty-five sounding comparisons were made at all locations where soundings directly overlapped. In all areas but one, junction agreement was within 0.3 fathom.

Junction Sounding Agreement

Within 0.1 fathom	65%
Within 0.2 fathom	94%
Within 0.3 fathom	100%

see sect. 5 of Eval. Report

One discrepancy was noted with the junction to H-10220. At the northeastern edge of the junction, soundings differed by as much as .9 fathoms. This junction occurs at a rocky point. The area was noted to be foul with rocks and it is believed the disagreement in soundings is due to the irregular and rocky bottom. Compared soundings did not precisely overlap.

Junction agreement between the sheets was considered very good, there being no discontinuities of depth curves between surveys except for that mentioned above.

K. Comparison With Prior Surveys

One prior survey exists in the area of this sheet. The survey H-7718(scale 1:100,000) was a reconnaissance survey conducted in 1948. ~~Three~~ *Thirteen* soundings fall within the limits of this survey. *see Sect. 6 of Eval. Report*

Prior Survey Sounding Agreement

H-7718	H-10248
6.9 fm	7.9 fm
8.3 fm	8.3 fm
6.7 fm	7.7 fm

Three ~~Two~~ soundings differ by 1.0 fathom. The discrepancies could be due to the small scale of the prior survey. It is recommended that the prior soundings be superseded by this survey.

L. Comparison With the Chart

This survey was compared to the following charts:

Chart Number	Scale	Edition	Date
16006	1:1,534,076	29th	8/23/86
16011	1:1,023,000	31st	6/29/85
16315	1:100,000	3rd	2/28/87

see Sect. 7 of Eval. Report.

Dangers to Navigation

One report of dangers to navigation was filed containing 3 items that pertained to this survey area. A radio message was transmitted on July 22, 1987, and a letter with chartlet was mailed on July 24, 1987. This correspondence went to both the U.S.C.G. Seventeenth District (Juneau, AK) and DMAHTC (Washington, DC). Copies of the correspondence are attached in ~~Appendix XII.~~ the Eval. Report

The following items were determined to be dangers to navigation. The positions shown here are final field positions and depths for the survey, and are slightly different from the preliminary positions included in the correspondence. Corrected correspondence was not considered necessary because corrections were very small.

Item 1: Shoal
Position Number: 7581+2
Survey Depth: 3.3 fm
Surrounding Charted Depth: 5 fm 73
Position: 58° 50' 55.4" N/160° 08' 53.6" W
Method of Investigation: The least depth was obtained by echo sounder.

Item 2: Shoal
Position Number: 7623 705
Survey Height: 2.5 fm
Surrounding Charted Depth: 4 fm 3.97
Position: 58° 51' 22.0" N/160° 08' 45.0" W
Method of Investigation: The least depth was obtained by echo sounder

Item 3: Rock
Position Number: 8363+3+insert
Survey Depth: 1 foot above MLLW
Surrounding Charted Depth: none nearby
Position: 58° 53' 11.4" N/160° 14' 45.6" W
Method of Investigation: The least depth was obtained by echo-sounder.

Comparison of Sounding Features

Chart 16315 was used to make comparisons with this survey, being the largest scale chart of the survey area.

Six charted soundings exist within the limits of the survey. A comparison of the six soundings was made as follows:

Charted Sounding	Geographic Position	H-10248 Sounding
6 fm, 4 ft	58° 50.5' N 160° 10.7' W	7.8 fm
6 fm	58° 52.3' N 160° 13.8' W	7.6 fm
6 fm	58° 53.5' N 160° 17.8' W	9.2 fm
4 fm, 3 ft	58° 52.9' N 160° 26.9' W	4.4 fm
3 fm	58° 55.0' N 160° 28.6' W	6.4 fm
5 fm	58° 56.8' N 160° 25.2' W	3.1 fm

The discrepancies noted between the charted and surveyed soundings are believed to be due to poor position control for the charted data and to the small scale of the chart relative to the survey. It is recommended that the charted depths be superseded by the current survey depths. concur

Shoal Developments

Ungalithluk Bay - Three areas in the vicinity of Ungalithluk Bay were developed to more precisely define shoals.

East point of Ungalithluk Bay

A shoal was located south of this point. The feature appeared as a ridge extending 0.8 nm south southeast of the point. The ridge rises as much as 2 fathoms from surrounding depths. This feature was developed with 25m splits and plotted on Expansion Sheet #1. A dive investigation was made. However, efforts were restricted by poor visibility and a strong current. The divers noted the feature to be a rocky ridge, but the depth determined by the divers was greater than those obtained by echo sounder. Least depth = 3.3 ft.

pos. 758/702 58/50/55.03 160/08/53.73

Three least depths were acquired during the echo sounder development. The depths are corrected for predicted tides.

Depth	Geographic Position	Fix	Day	Vessel
2.5fm	58° 51' 21.5" N 160° 08' 44.8" W	7623+02	195	2126
3.3fm	58° 50' 55.0" N 160° 08' 53.7" W	7581+2	195	2126
3.3fm	58° 51' 18.3" N 160° 09' 00.2" W	7576+insert	195	2126

This feature was submitted as a danger to navigation (Appendix XII). copy attached to Eval. Report)

Northwest of east point of Ungalithluk Bay

A shoal was located 0.75 nm northwest of the east point at the entrance to the bay. This feature appeared as a ridge with a NW/SE axis, rising 1-2 fathoms from surrounding depths. An echo sounder investigation with 25m splits was made. A plot of this development was made on Expansion Sheet #4. Four least depths were located and were corrected for predicted tides:

Depth	Geographic Position	Fix	Day	Vessel	
2.4fm	58° 52' 16.3" N 160° 10' 58.9" W	8578+insert	198	2124	
2.5fm	58° 52' 22.2" N 160° 11' 07.8" W	8578+insert	198	2124	excess 3
2.4fm	58° 52' 28.0" N 160° 11' 30.0" W	8625+insert	198	2124	
2.2fm	58° 52' 32.5" N 160° 11' 27.4" W	8585+insert	198	2124	

Rocky Point

A shoal area was found to be associated with Rocky Point, in the vicinity of AWOIS 50929. An echo sounder investigation with 25m splits was made in this area. One least depth reduced to 0.1fm above MLLW. Six additional least depths were recorded. These features were plotted on Expansion Sheet #3. The soundings were corrected for predicted tides.

Depth	Geographic Position	Fix	Day	Vessel	
5.4fm	58° 52' 38.4" N 160° 14' 50.0" W	8341+insert	195	2124	
3.5fm	58° 52' 59.4" N 160° 14' 52.1" W	3777+insert	211	2123	
4.8fm	58° 52' 37.0" N 160° 14' 27.7" W	3807+5 NSP	211	2123	see smooth sheet for selected & plotted soundings.
4.4fm	58° 52' 43.7" N 160° 14' 27.6" W	3800+5 NSP	211	2123	

4.2fm	58° 58' 53.2" N 160° 14' 20.2" W	3789+5+insert NSP	211	2123	
1.8fm	58° 53' 14.1 N 160° 14' 09.8 W	4169+insert	176	2124	✓
uncov. 1ft ~~-0.1fm~~	58° 53' 11.6 N 160° 14' 45.5 W	8363+insert	195	2124	

The -0.1fm sounding appears to be an extension of the ledge discussed in the investigation of AWOIS 50929, in the section "Comparison of Non-Sounding Features". The rock was submitted as a danger to navigation(Appendix XII). (attached to the Eval. Report)

Summit Island

A shoal area was located 0.55 nm northeast of Summit Island. An echo sounder investigation with 25m splits was made of this feature. The shoal appeared as a small ridge rising 1-2 fathoms from surrounding depths. The least depth was corrected for predicted tides.

Depth	Geographic Position	Fix	Day	Vessel	
5.6fm	58° 51' 46.7" N 160° 12' 29.1" W	7845+1+insert(NSP)	197-	2126	see smooth sheet for selected & plotted sounding.

Southeast Shore, Togiak Bay

A shoal feature was located 0.9 nm northwest of Rocky point. An echo sounder investigation with 25m splits was made. The feature extended 0.25 nm offshore and appeared to be an underwater extension of an associated point on the mainland. The shoal rises 1 fathom from surrounding depths. This development was plotted on Expansion Sheet #3. The least depth was corrected for predicted tides.

Depth	Geographic Position	Fix	Day	Vessel
2.3fm	58° 54' 05.4 N 160° 15' 33.8 W	8077+4	192	2124

Offshore Waters of Togiak Bay

Four areas in the southwest portion of the survey were developed with 100m line spacing(the 3.5fm shoal was developed to 50m spacing). In all cases the least depth rises approximately 1 fathom from surrounding depths. The least depths were corrected for predicted tides.

Depth	Geographic Position	Fix	Day	Vessel
3.3fm	58° 52' 32.8" N 160° 30' 16.1" W	7168+3	193	2126
3.5fm	58° 51" 41.1 N 160° 30' 12.8 W	7211+2 insert	193	2126
4.4fm	58° 51' 45.0 N 160° 27' 47.1 W	8526	196	2124
7.1fm	58° 50' 41.0 N 160° 23' 15.4 W	8665+5	196	2124

Comparison of Non-Sounding Features

Most non-sounding features are charted along the shoreline. A complete shoreline verification was performed during this survey and discussed in Section H of this report. It is recommended that all charted shoreline features be revised to reflect this survey.

Two offshore features were assigned as AWOIS items:

AWOIS 50929

History:BP18063(1916) - Pacific AM. Fish; subm rock, four in row due south from point of land. Position not scaled hor and vert control dubious, however it is in fair agreement with the charted rock 16011.
BP23186(1930) - AK Packers assn. chart (1924 ed); ledge, extends south from HWL approx. 1.5 miles. Hor. and vert. control dubious.
T9237/47/48 - "not visible on photographs" (compilation scale 1:20,000)
BP125151 - AK. Dept Pub Safety: Subm rock scaled (approx 1:125,000) in lat 58-53-40N long 160-15-40W. Charted as PA (rep 1985). Hor. and vert. contrl dubious.
CL381/85 - rock awash; letter redescribes rock as awash.
NM23/85 - rock awash; published from letter above. Notice provides position as lat 58-53-06N, long 160-15-35W, however chart 16315 shows the rock in lat 58-53-08N, long 160-15-35W, (1:100,000). (entered 6/85 RWD)
TP01186/83 - reviewed, class III, NTH: not visible on photographs, (updated 7/86 RWD)

Survey Requirements:Full - verify or disprove. Disprove by visual search at chart datum. If not visible a bottom drag/diver investigation with a minimum radius of .5nm is assigned: OPR-R184-RA-87

The following data set describes the investigation made of this area.

Day Number	Vesno	Fix Numbers	Type
179	2124	4280-4294	mainscheme
		4296-4301	
		4305-4309	
		4314-4318	
		4321-4325	
		4331-4335	
		4340-4344	
189	2124	4605-4607	mainscheme
		4167-4170	
		4615-4619	
192	2124	8014-8019	mainscheme
		8033-8039	
		8052-8055	
194	2124	8256-8279	splits(100m)
195	2124	8334-8374	splits (50m &25m)
197	2125	5233-5244	splits (100m)
211	2123	3754-3820	splits (50m)

Mainscheme hydrography over the charted position gave no evidence of a rock. The charted position of the AWOIS rock was visited during a minus tide on day 200 (D.P. 3505 and 3506, Vesno 2123) and no evidence of a rock was observed.

A rocky and irregular bottom was developed with sounding lines 0.46nm east northeast of the charted rock, and a ~~least depth~~ rock uncov. ~~of -0.1fm~~ 1 ft at MLLW was obtained at the following position:

58° 53' 11.6" N
160° 14' 45.5" W
Vesno: 2124, Day 195, Fix 8363+~~3~~ 04 ~~insert~~

On day 200 (vesno: 2123, R-174), a ledge exposed 2 feet at MLLW was observed extending out to the position of this sounding. The sounding represents the outermost extent of the ledge.

~~The -0.1fm sounding~~ This rock was reported as a danger to navigation (~~Appendix XII~~). (attached to the Eval. Report)

It is recommended that the charted rock awash be deleted and that the ledge found during this survey be charted. concur and rock

AWOIS 50932

History: T9236/48 - "not visible on photographs" (compilation scale 1:20,000).
BP125151(1985) - AK Dept Public Safety; subm rock, PA (1985), scaled from provisional chart 16315 in lat 58-57.0N, long 160-20.1W. Hor. and vert. control dubious. (entered (6/85 RWD)
TP01186/83 - Reviewed, class III, NTH; not visible on photographs, (updated 7/86 RWD)

Survey Requirements: Full - verify or disprove. Disprove by a bottom drag or diver investigation for a .5nm minimum radius. If found LD and GP required.

Mainscheme hydrography gave no evidence of an obstruction in the area of the charted submerged rock. This area has a gentle slope up to within 500 yards of the shore, where the slope becomes steep. The shore is foul with boulders. A 0.5 nm radius sidescan investigation was made in this area (see Expansion Sheet #5 and corresponding final position plot). Sidescan coverage was 200%. No obstructions were observed. Therefore, a bottom drag or diver investigation was not considered necessary. The reported rock was investigated with the following data set:

Day Number	Yesno	Fix Numbers	Type
194	2126	7265-7267 7308-7312 7439-7445 7470-7473 7499-7480	mainscheme
195	2123	3673-3678	mainscheme
198	2126	2046-2069	splits (100m)
200	2123	3368-3506	sidescan

It is recommended that the charted submerged rock be deleted concur

It has been noted that there are two points labeled "Rocky Point" on chart 16315 that are only 14.5 nautical miles apart. One point is located on the mainland north of Summit Island and the other is located on the northeast end of Hagemeister Island. It was not determined whether the duplicate geographic names caused confusion among local mariners, but both are within the same range of VHF radio communications. The hydrographer recommends that only one feature be labeled "Rocky Point" to avoid possible confusion. The local government should be consulted regarding which point is more appropriate. Attention chief Geographer

M. Adequacy of Survey

This survey is the first basic survey to be conducted over this area. The data is complete and adequate to be used for charting purposes and to supersede any historical data.

N. Aids to Navigation

There are no fixed or floating aids to navigation within the survey area.

O. Statistics

EDP No.	Number of Positions	Reference Numbers	Nautical Miles of Sounding Lines
2120	24	---	---
2123	~~897~~ 909	1	220.5
2124	~~1663~~ 1549	--	330.3
2125	~~245~~ 231	57	31.8
2126	~~2305~~ 1930	4	445.6
2128	---	4	---
2129	---	9	---
TOTAL	~~5134~~ 5094	75	1028.2

SQUARE MILES OF HYDROGRAPHY	:	78.4
MILES OF SIDE SCAN	:	12.3
BOTTOM SAMPLES	:	79
TIDE STATIONS	:	3
VELOCITY CASTS	:	5
DAYS OF PRODUCTION	:	34
MAGNETIC STATIONS	:	0
CURRENT STATIONS	:	1

P. Miscellaneous

Bottom Samples

All bottom samples have been submitted to the Smithsonian Institution (Appendix IX).

Current Stations

A twenty-five hour series of current observations was made on day 219 in the north portion of the survey area, in east Togiak Bay, at a location used often by the RAINIER to anchor.

58° 57.3' N
160° 21.1' W

The current was observed to be nearly reversing, conforming to the orientation of the shoreline. The flood direction was NNW at 2.4 knots. The ebb direction was SSW at 1.1 knots. Further information on currents in the area can be found in the Current Report OPR-R184-RA-87 and Current Report
OPR-R184-RA-86.

Siltation

During periods of ebb current a large turbidity plume was observed moving southeasterly out of Togiak Bay. K-Meter measurements, made near this survey area during the 1986 field season, confirmed a high level of suspended load in the waters. It is probable that the high rate of siltation is an important process occuring in the survey area.

Low visibility water made diver investigations difficult and unsuitable as a means of obtaining least depths.

Loran-C

Fixes were simultaneously acquired with Loran-C and Mini-Ranger control across the survey area. Vessels 2123 and 2126 were designated to gather the comparison data in order to present a sample of Loran-C performance in the area (in accordance with the Project Instructions and Hydrographic Survey Guideline No. 41). The launch Loran system used was an Internav LC204.

Loran-C available in the area is the 9990 chain, using the Y and Z lines of position. Loran-C control was compared to Mini-Ranger control by converting Mini-Ranger rates to a geographic position, then plotting the geographic position along with the associated Loran rates on chart 16315 (1987 edition). A sample of twenty comparisons was made. A small difference was observed in 14 of the samples. In 10 cases, the Loran-C position was offset 40 yards, bearing 180° true from the Mini-Ranger position. In 4 cases, samples differed by 40 yards, bearing 000° true from the Mini-Ranger position. No difference in positions was observed in 6 cases.

Loran-C positioning generally agrees very well with positions calculated by the Mini-Ranger positioning system.

Q. Recommendations

The hydrographer considers field work on this survey to be complete. Charting recommendations have been made in Section L of this report.

R. Automated Data Processing

Data acquisition and processing were accomplished with a PDP 8/e Hydroplot computer system, using the standard programs.

Computer Programs Used For Data Processing

NUMBER	DESCRIPTION	VERSION
RK 112	HYPERBOLIC,R/R HYDROPLOT	3/01/86
RK 116	RANGE-AZIMUTH RTS	3/01/86
RK 201	GRID, SIGNAL, AND LATTICE PLOT	4/18/75
RK 221	COMB R/R & HYPER PLOT NON-RT	7/25/86
RK 226	RANGE-AZ POSN & SND PLOT NON-RT	7/25/86
RK 300	UTILITY COMPUTATIONS	10/21/80
RA 362	RK 330 AND AM 602 COMBINED	8/20/84
RK 407	GEODETIC INVERSE/DIRECT COMP	9/25/78
RK 409	GEODETIC UTILITY PACKAGE	9/20/78
AM 500	PREDICTED TIDE GENERATOR	11/10/72
RK 530	LAYER CORRECTIONS FOR VELOCITY	5/10/76
RK 561	H/R GEODETIC CALIBRATION	12/01/82
RK 562	THEODOLITE CALIBRATION	9/05/84
AM 602	ELINORE - LINE ORIENTED EDITOR	12/08/82
RK 606	TAPE DUPLICATOR	8/22/74
AM 607	SELF-STARTING BINARY LOADER	8/10/80
RK 610	BINARY TAPE DUPLICATOR	1/31/85
RK 900	PLOT TEST TAPE GENERATOR FOR AM902	5/07/76
PM 901	CORE CHECK	3/01/72

AM 902	REAL TIME CHECKOUT	11/10/72
DA 903	DIAGNOSTIC-INSTRUCTION TIMER	2/27/76
RK 905	HYDROPLOT CONTROLLER CHECKOUT	3/18/81
RK 935	HYDROPLOT HARDWARE TESTS	3/15/82
RK 950	HARDWARE TESTS (DOCUMENTATION ONLY)	6/02/75

In plotting the final field sheet, overprints were removed by various techniques. The pen was manually lifted and special corrector tapes were made to edit out individual soundings. These tapes have not been submitted. Some soundings from NSP data, especially least depths, have been transferred by hand to the final field sheet.

Fix Numbers

A standard series of fix numbers was assigned to each survey vessel.

Vessel Number	Survey Fixes	
2120	1000-1023	
2123	3000-3896	R174
2124	4000-1991	
	8000-8670	
2125	5000-5244	R100-155,R173
2126	6000-6999	R156-159
	7000-7974	
	2000-2329	
2128		R160,168-170
2129		R161-167,171,172

A series of fixes was duplicated on one occasion. On day 200 with vessel 2123 the series 3368-3506 was duplicated while acquiring sidescan data. The data was labeled "NSP data" and was used in disproving a submerged rock from AWOIS 50932. Single duplicated fix numbers are noted in the Abstract of Positions (~~Appendix VII~~). (filed with the hydrographic data.)

S. Referral to Reports

Several supplementary reports contain additional information relevant to this survey.

Supplemental Reports

TITLE	DATE TO BE SENT TO MARINE CENTER
Horizontal Control Report, OPR-R184-RA-87	October, 1987
Electronic Control Report, OPR-R184-RA-87	October, 1987
Marine Mammal Report, RP-12-87	October, 1987
Coast Pilot Report, OPR-R184-RA-87	October, 1987
Current Report, OPR-R184-RA-87	October, 1987
Current Report, OPR-R184-RA-86	October, 1986
User Evaluation Report OPR-R184-RA-87	October, 1987

Respectfully Submitted;

John C Damm

John C. Damm
LTJG, NOAA

001 MASTER STATION LIST
002 OPR-R184-RA-87, TOGIAK BAY, ALASKA
003 RA-20-2-87 (H-10248)
004
005 FINAL VERSION
006
007
008 108 3 58 49 45084 160 11 15727 250 0240 000000
009 /SUMMIT 1948, G-15848, QUAD 581601, STA. 1010
010
011 119 3 58 55 55384 160 14 24307 250 0028 000000
012 /OWENS 1948, G-15848, QUAD 581601, STA. 1008
013
014 120 3 58 52 07284 160 09 46643 250 0004 000000
015 /UNGALI 1987 RAINIER G.P.
016
017 121 3 58 56 46472 160 18 58407 250 0030 000000
018 /TOG 1987 RAINIER G.P.
019
020 122 3 59 00 46511 160 15 55039 250 0025 000000
021 /BLAKE 1987 RAINIER G.P.
022
023 201 3 58 50 49897 160 13 15720 250 0151 000000
024 /SUMMIT 1948 AZ MK, G-15848, QUAD 581601, STA. 1011
025
026 209 3 58 53 19527 160 14 32985 250 0009 000000
027 /DUCE 1987 RAINIER G.P.
028
029 223 3 59 01 57366 160 28 15468 139 0058 000000
030 /NEMISIS 1948, G-15848, QUAD 591607, STA. 1007

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

NOAA Ship RAINIER S-221
1801 Fairview Ave. East
Seattle, WA 98102

July 22, 1987

Commanding Officer
Seventeenth Coast Guard District
P.O. Box 3-5000
Juneau, AK 99802

RE: Notice to Mariners

REF: My Radio Message P220050Z JUL 87

Dear Sir:

We request the following be published in the Local Notice to Mariners for the Seventeenth District:

The NOAA ship RAINIER of the National Ocean Service is conducting charting operations in Togiak Bay and has completed charting operations in Kulukak Bay. The following dangers to navigation have been discovered (all depths and heights reduced to MLLW using predicted tides):

A. 3.3 FATHOM SHOAL AT 58/50/55.4N 160/08/53.6W ABOUT 0.8 NAUTICAL MILE SOUTH OF THE HEADLAND BETWEEN NUNAVACHAK AND UNGALIKTHLUK BAYS.

B. 2.5 FATHOM SHOAL AT 58/51/22.0N 160/08/45.0W ABOUT 0.4 NAUTICAL MILE SOUTH OF THE HEADLAND BETWEEN NUNAVACHAK AND UNGALIKTHLUK BAYS.

C. ROCK BARING 1 FOOT AT MLLW AT 58/53/11.4N 160/14/45.6W ABOUT 0.2 NAUTICAL MILE SOUTH-SOUTHWEST OF ROCKY POINT.

D. 1.4 FATHOM SHOAL AT 58/49/41.5N 159/36/37.1W ABOUT 1.4 NAUTICAL MILES EAST-SOUTHEAST OF KULUKAK POINT AND ABOUT 0.4 NAUTICAL MILE FROM CLOSEST POINT OF LAND TO NORTHEAST.

E. ROCK BARING 2 FEET AT MLLW AT 58/49/45.28N 159/45/17.24W LORAN C RATES CHAIN 9990 Y32599.99 Z45972.70 ABOUT 0.3 NAUTICAL MILE SOUTHEAST OF EASTERN POINT OF METERVIK BAY ENTRANCE.

1.9 FATHOM SHOAL AT 58/49/40.1N 159/45/37.0W ABOUT 0.3 NAUTICAL MILE SOUTH-SOUTHEAST OF EASTERN POINT OF METERVIK BAY ENTRANCE.

0.6 FATHOM SHOAL AT 58/49/43.8N 159/46/08.3W ABOUT 0.3 NAUTICAL MILE SOUTHWEST OF EASTERN POINT OF METERVIK BAY ENTRANCE.

F. 2.8 FATHOM SHOAL AT 58/47/00.5N 159/49/39.4W ABOUT 2.7 NAUTICAL MILES EAST-NORTHEAST OF RIGHT HAND POINT AND ABOUT 0.5 NAUTICAL MILE FROM CLOSEST POINT OF LAND TO NORTH.

G. 3.6 FATHOM SHOAL AT 58/46/38.2N 159/50/15.0W ABOUT 2.3 NAUTICAL MILES EAST-NORTHEAST OF RIGHT HAND POINT AND ABOUT 0.6 NAUTICAL MILE FROM CLOSEST POINT OF LAND TO WEST-NORTHWEST.

The following NOS charts are affected:

16315	3RD ED FEB28/87	1:100000	NAD27 DATUM
16011	31ST ED JUN29/86	1:1023188	NAD27 DATUM
16006	29TH ED AUG23/86	1:1534076	NAD27 DATUM.

These are preliminary depths, heights, and positions subject to office review.

Sincerely,

Carl W. Fisher

Carl W. Fisher
Captain, NOAA
Commanding Officer

Enclosure
cc:DMAHTC
N/CG222
N/MOP

3rd Ed., Feb. 28/87

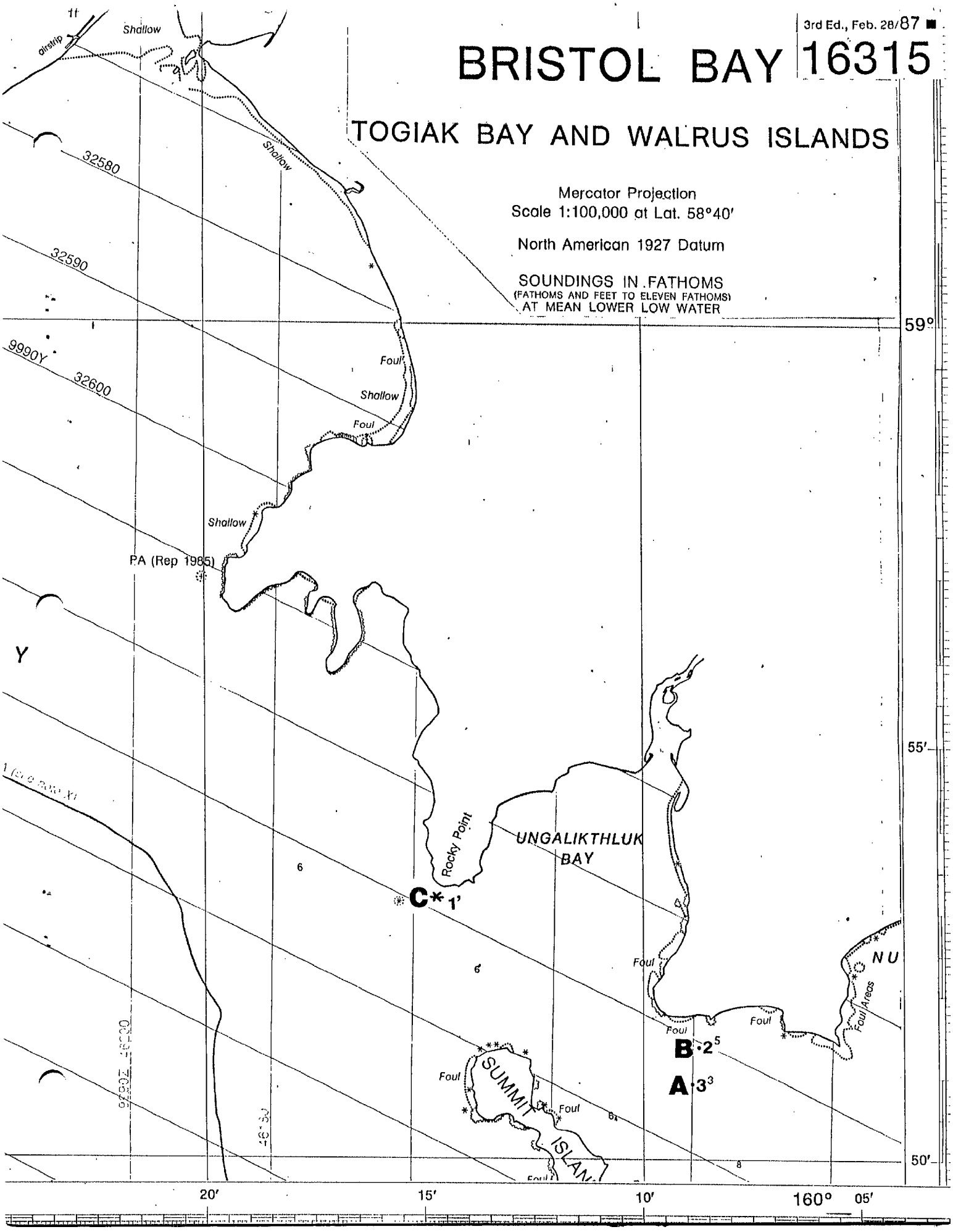
BRISTOL BAY 16315

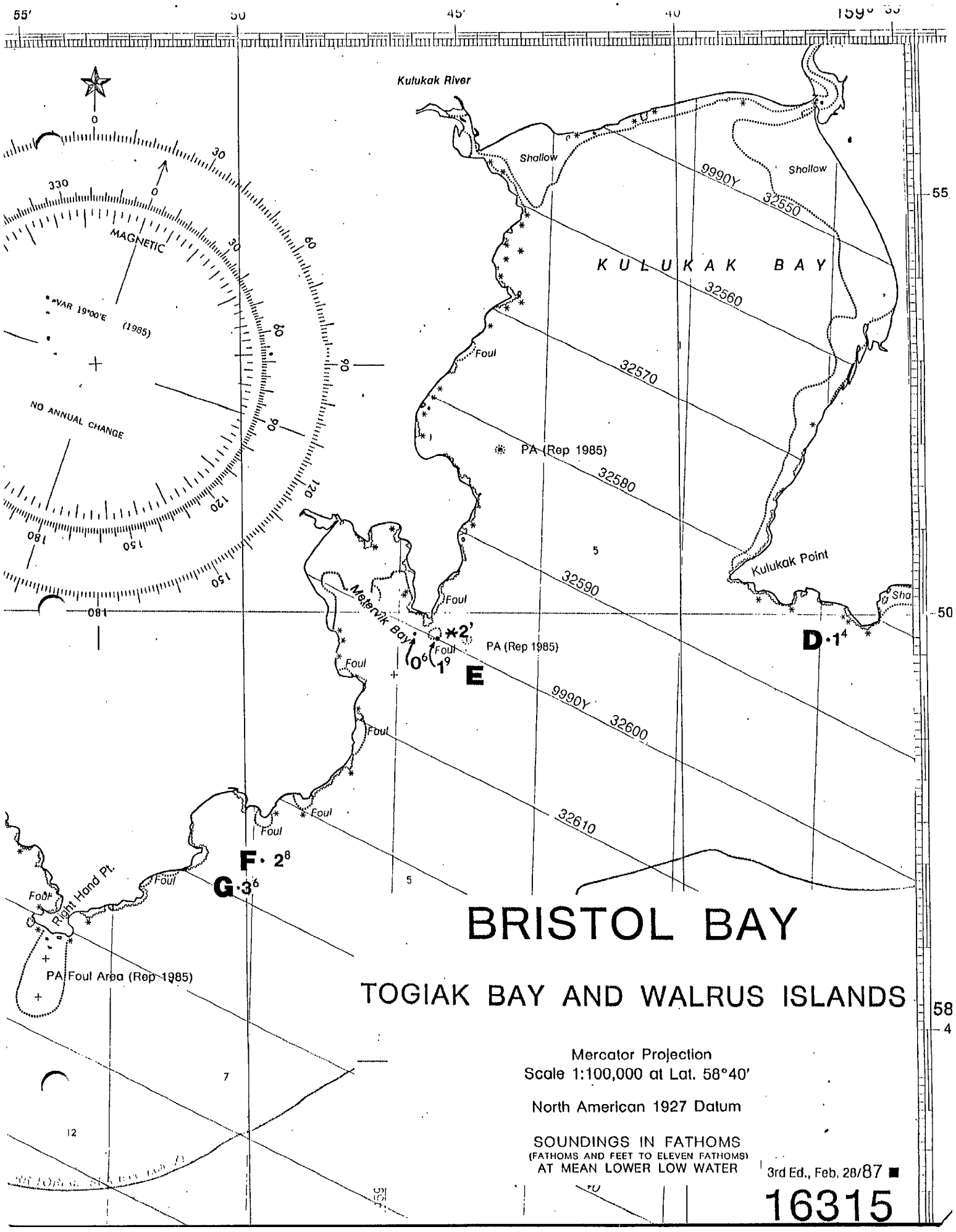
TOGIAK BAY AND WALRUS ISLANDS

Mercator Projection
Scale 1:100,000 at Lat. 58°40'

North American 1927 Datum

SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO ELEVEN FATHOMS)
AT MEAN LOWER LOW WATER





BRISTOL BAY

TOGIAK BAY AND WALRUS ISLANDS

Mercator Projection
Scale 1:100,000 at Lat. 58°40'

North American 1927 Datum

SOUNDINGS IN FATHOMS
(FATHOMS AND FEET TO ELEVEN FATHOMS)
AT MEAN LOWER LOW WATER

3rd Ed., Feb. 28/87 ■

16315

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE

NOAA Ship RAINIER S-221
1801 Fairview Ave. East
Seattle, WA 98102-3767

July 22, 1987

Director
DMAHTC
6500 Brooks Lane
Washington, DC 20315-0030

RE: Notice to Mariners

REF: Radio Messages P220050Z JUL 87

Dear Sir:

In the last month, during surveys in northern Bristol Bay, Alaska, the NOAA ship RAINIER has discovered nine dangers to navigation. These have been reported to the Seventeenth Coast Guard District for publication in the Local Notice to Mariners. A copy of the report describing these dangers is attached.

Sincerely,

Carl W. Fisher

Carl W. Fisher
Captain, NOAA
Commanding Officer

Enclosure

APPROVAL SHEET

Descriptive Report to Accompany

Hydrographic Survey

RA-20-2-87

H-10248

Standard procedures were followed in accordance with the Hydrographic Manual, Third Edition; Hydrographic Survey Guidelines; and PMC OPORDER in producing this survey. The data were examined daily during acquisition and processing phases of the survey.

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

Carl W. Fisher

Carl W. Fisher
Captain, NOAA
Commanding Officer

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

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE: December 29, 1987

MARINE CENTER: Pacific

OPR: R184

HYDROGRAPHIC SHEET: H-10248

LOCALITY: East Togiak Bay to Ungalikthluk Bay, Bristol Bay, Alaska

TIME PERIOD: June 22 - August 2, 1987

TIDE STATION(S) USED: 946-5283 N.E.Side Summit Island, AK
946-5346 East Side, Togiak Bay, AK
946-5358 West Side, Togiak Bay, AK

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 946-5283 = 10.34 ft.
946-5346 = 9.80 ft.
946-5358 = 9.08 ft.

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 946-5283 = 10.0 ft.
946-5346 = 9.5 ft.
946-5358 = 9.4 ft.

REMARKS: RECOMMENDED ZONING:

1. See Page 2.

James T. Hubbard

CHIEF, TIDAL DATUM QUALITY
ASSURANCE SECTION

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

TIDE NOTE FOR HYDROGRAPHIC SHEET (PAGE 2)

DATE: December 29, 1987

MARINE CENTER: Pacific

OPR: R184

HYDROGRAPHIC SHEET: H-10248

REMARKS: RECOMMENDED ZONING:

1. East of longitude 160 25.0'

a. [SE of a line formed by 2 points located at 58 57.0' 58 53.0'
160 ~~19.5'~~ 19.0' 160 25.0'
zone direct on 946-5283. EAST OF 160° 19']

* b. WEST OF 160° 19' ZONE ON 946-5283 AND APPLY 0.95 RANGE RATIO.

c. b. Northwest of the previous line, zone direct on 946-5346.

2. West of longitude 160 25.0'

a. North of a line formed by 2 points located at 58 53.0' 58 55.0'
160 25.0' 160 31.0'
zone direct on 946-5358.

b. South of the previous line, zone on 946-5358 and apply a - 10 minute time correction and a X0.96 range ratio to all heights.

* FROM PHONE CONV. W/ JOE M. ON 1-14-88.

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

H-10248

Name on Survey	A ON CHART NO. 16315	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)										1
ANCHOR POINT										2
BRISTOL BAY										3
ROCKY POINT										4
SUMMIT ISLAND										5
TOGIAK BAY										6
UNGALIKTHLUK BAY										7
UNGALIKTHLUK RIVER										8
										9
										10
										11
										12
										13
										14
										15
										16
				Approved:						17
										18
				Charles M. Harrington						19
				Chief Geographer - N/CG2x5						20
				MAR 21 1988						21
										22
										23
										24
										25

NOAA FORM 76-155 SUPERSEDES C&GS 197

NOAA FORM 77-27(H) (9-83)

U.S. DEPARTMENT OF COMMERCE

HYDROGRAPHIC SURVEY STATISTICS

REGISTRY NUMBER: H-10248

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

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	SMOOTH OVERLAYS: POS., ARC, EXCESS	7 (4 Mylar, 3 Paper)
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	3

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES	2					
ENVELOPES						
VOLUMES	2					
CAHIERS						
BOXES						

SHORELINE DATA

SHORELINE MAPS (List): TP-01186 (1983)

PHOTOBATHYMETRIC MAPS (List):

NOTES TO THE HYDROGRAPHER (List):

SPECIAL REPORTS (List):

NAUTICAL CHARTS (List): Charts 16315 (4th Ed.) 16011 (31st Ed.) & 16006 (29th Ed.)

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			5094
POSITIONS REVISED			
SOUNDINGS REVISED			551
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION			
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS	114.0		114.0
VERIFICATION OF SOUNDINGS	213.0		213.0
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET	160.5		160.5
COMPARISON WITH PRIOR SURVEYS AND CHARTS		45.0	45.0
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		78.0	78.0
GEOGRAPHIC NAMES			
OTHER*			
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS	487.5	123.0	610.5

Pre-processing Examination by LT M. Mozgala	*Beginning Date*	*Ending Date* 11/13/87
Verification of Field Data by R. Mihailov, J. Shofner, J. Stringham	*Time (Hours)* 10/08/87	*Ending Date* 7/18/88
Verification Check by S. Otsubo, B. Olmstead	*Time (Hours)* 5/31/88	*Ending Date* 7/22/88
Evaluation and Analysis by A. Luceno	*Time (Hours)* 7/25/88	*Ending Date* 10/14/88
Inspection by D. Hill	*Time (Hours)* 4	*Ending Date* 12-14-88

☆ U.S. GOVT. PRINTING OFFICE 1983: 764-006/8061

PACIFIC MARINE CENTER
Evaluation Report
H-10248

1. INTRODUCTION

Survey H-10248 is a basic hydrographic survey accomplished by the NOAA Ship RAINIER under the following Project Instructions.

OPR-R184-RA, dated March 6, 1987
CHANGE NO. 1, dated March 20, 1987
CHANGE NO. 2, dated June 2, 1987
CHANGE NO. 3, dated August 10, 1987
CHANGE NO. 4, dated May 2, 1988
CHANGE NO. 5, dated July 19, 1988

This survey occurred in Alaska and covers the southeastern portion of Togiak Bay including Ungalikthluk Bay. The surveyed area extends from latitude 58°50'00"N to latitude 58°58'00"N and from longitude 160°05'32:W to longitude 160°30'45"W. The northern portion of Summit Island is within the surveyed area. The bottom is fairly regular and consists of silt and sand in the western portion of the surveyed area and scattered patches of broken shell, pebbles, mud and gravel in the rest of the area. Depths range from 0 to 17 fathoms, with the deepest depth located about 1.2 nautical miles southwest from the northern tip of Summit Island.

Predicted tides for Black Rock, Walrus Island, Alaska were used for the reduction of soundings during field processing. Approved hourly heights zoned from Summit Island, gage 946-5283, and Togiak Bay, gages 946-5346 and 946-5358, 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. TRA, sound velocity and electronic control correctors are adequate and required no revision. An accompanying computer printout contains the parameters and the correctors.

A digital file, generated for this survey, includes categories of information required to comply with N/CG2 Hydrographic Survey Guideline No. 23, Completion of Digital Hydrographic Surveys, September 7, 1983. 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 information.

2. CONTROL AND SHORELINE

Sections F and G of the hydrographer's report and the Horizontal and Electronic Control Reports for OPR-R184-RA contain adequate discussions of horizontal control and hydrographic positioning.

Positions of horizontal control stations used during hydrography are 1948 published values and 1987 field values based on NAD 27. These values were used during office processing for the computation of positions. The smooth sheet and accompanying overlays are annotated with NAD 83 adjustment ticks based on values determined by N/CG121.

Geographic positions based on NAD 83 may be plotted on the smooth sheet utilizing the NAD 27 projection by applying the following corrections:

latitude: 2.778 seconds (86.0 meters)
longitude: -7.947 seconds (-127.1 meters)

The year of establishment of control stations shown on the smooth sheet originates with published and field data. The 1987 field positions are subject to change pending certification of the data by NGS.

There are 402 weak fixes (angles of intersection less than 30 degrees or more than 150 degrees) noted in this survey. However, there are no significant plotting differences between the soundings located by these fixes and those in adjacent areas. Also, none of these fixes are used to position dangers to navigation. These fixes are considered acceptable.

The following shoreline map applies to this survey.

	Photo Date	Class
TP-01186	July, August 1983	III

The above contemporary map originates with photography taken at mid-tide and fails to accurately define nearshore features such as rocks, ledges and reefs. The hydrographer, aware of this significant deficiency, attempted to define the features but was unable to complete the task due to time and weather restrictions. The nearshore area as depicted on the smooth sheet has been supplemented with information from prior shoreline maps. See section 6 for additional details.

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.

4. CONDITION OF SURVEY

The hydrographic records and reports received for processing are adequate and conform to the requirements of the Hydrographic Manual, Fourth Edition, revised through CHANGE No. 3; the Hydrographic Survey Guidelines; and the PMC OPORDER.

5. JUNCTIONS

Survey H-10248 junctions with the following surveys.

Survey	Year	Scale	Area
H-10220	1986	1:20,000	East
H-10222	1986	1:20,000	Southeast
H-10249	1987	1:20,000	North
H-10251	1987	1:20,000	West
H-10276	1988	1:20,000	South

The junctions with surveys H-10249 and H-10251 are complete.

The junctions with surveys H-10220 and H-10222 have not been formally completed since these surveys were previously processed and forwarded for charting. The junction comparisons were made using copies. Three soundings and a rock (in orange) from survey H-10222 have been transferred on survey sheet H-10248 to better portray the bottom. Soundings are in good agreement. Portions of the depth curves on surveys H-10220 and H-10222 should be adjusted to conform with those on survey H-10248.

The present survey will junction with survey H-10276 (1988) to the southwest. Survey H-10276 is in a preliminary stage of processing. This junction will be addressed in the report for that survey.

6. COMPARISON WITH PRIOR SURVEYS

H-7718 (1948) 1:100,000

Thirteen soundings on survey H-7718, located east of Summit Island, are within the area covered by the present survey. Three soundings from survey H-7718 are shallower by one fathom. Taking into consideration the differences in the scales of the surveys and the methods of surveying, comparison with this prior survey is satisfactory.

The following prior shoreline maps were compared to as required by CHANGE NO. 5 of the Project Instructions.

Survey	Photo Date	Scale
T-9237	1948	1:20,000
T-9242	1948	1:20,000

The prior shoreline maps depict foreshore rocks and ledges in greater detail than does the present survey or contemporary shoreline maps. These features have been carried forward to supplement the present survey in areas where nearshore development is deficient.

There are no AWOIS items originating from the prior surveys applicable to the present survey.

With the transfer of features noted above, survey H-10248 is adequate to supersede prior survey H-7718 and prior shoreline maps T-9237 and T-9242 within their common areas.

7. COMPARISON WITH CHART

Preliminary Chart 16315, 4th Edition, dated January 2, 1988; scale 1:100,000
Chart 16011, 31st Edition, dated June 29, 1985; scale 1:1,023,188
Chart 16006, 29th Edition, dated August 23, 1986; scale 1:1,534,076

a. Hydrography

Charted information on charts 16006 and 16011 originate from unknown sources and does not compare well with the charted data. Charted data on the fourth edition of preliminary chart 16315 originate with advance information from this survey and compare well to the processed data of the present survey. Survey H-10248 is adequate to supersede charted hydrography within the common area.

b. AWOIS

AWOIS item 50929, a rock awash, PA, at latitude 58°53'08"N, longitude 160°15'35"W originates from miscellaneous sources and its disposition is adequately discussed in section L. of the hydrographer's report.

AWOIS item 50932, a submerged rock, PA, reported in 1985, at latitude 58°57'00"N, longitude 160°20'06"W originates also from miscellaneous sources and its disposition is adequately discussed in section L. 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 no fixed or floating aids located within the area of this survey.

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

The hydrographer reported to the Seventeenth Coast Guard District (Juneau, Alaska) and to DMAHTC (Washington, D.C.) nine items considered to be dangers to navigation. Three of the nine items fall within the limits of this survey. A copy of the report is attached.

No additional dangers were reported during office processing.

8. COMPLIANCE WITH INSTRUCTIONS

Survey H-10248 adequately complies with the Project Instructions.

9. ADDITIONAL FIELD WORK

This is a good hydrographic survey. No additional field work is recommended.

Arsenio A. Luceno
Cartographer

This survey has been examined and it meets Charting and Geodetic Services' standards and requirements for use in nautical charting. Approval is recommended.

Dennis Hill
Chief, Hydrographic Section

APPROVALS

I have reviewed the smooth sheet, accompanying data, and reports associated with hydrographic survey H-10248. This survey meets or exceeds Charting and Geodetic Services' standards for products in support of nautical charting.

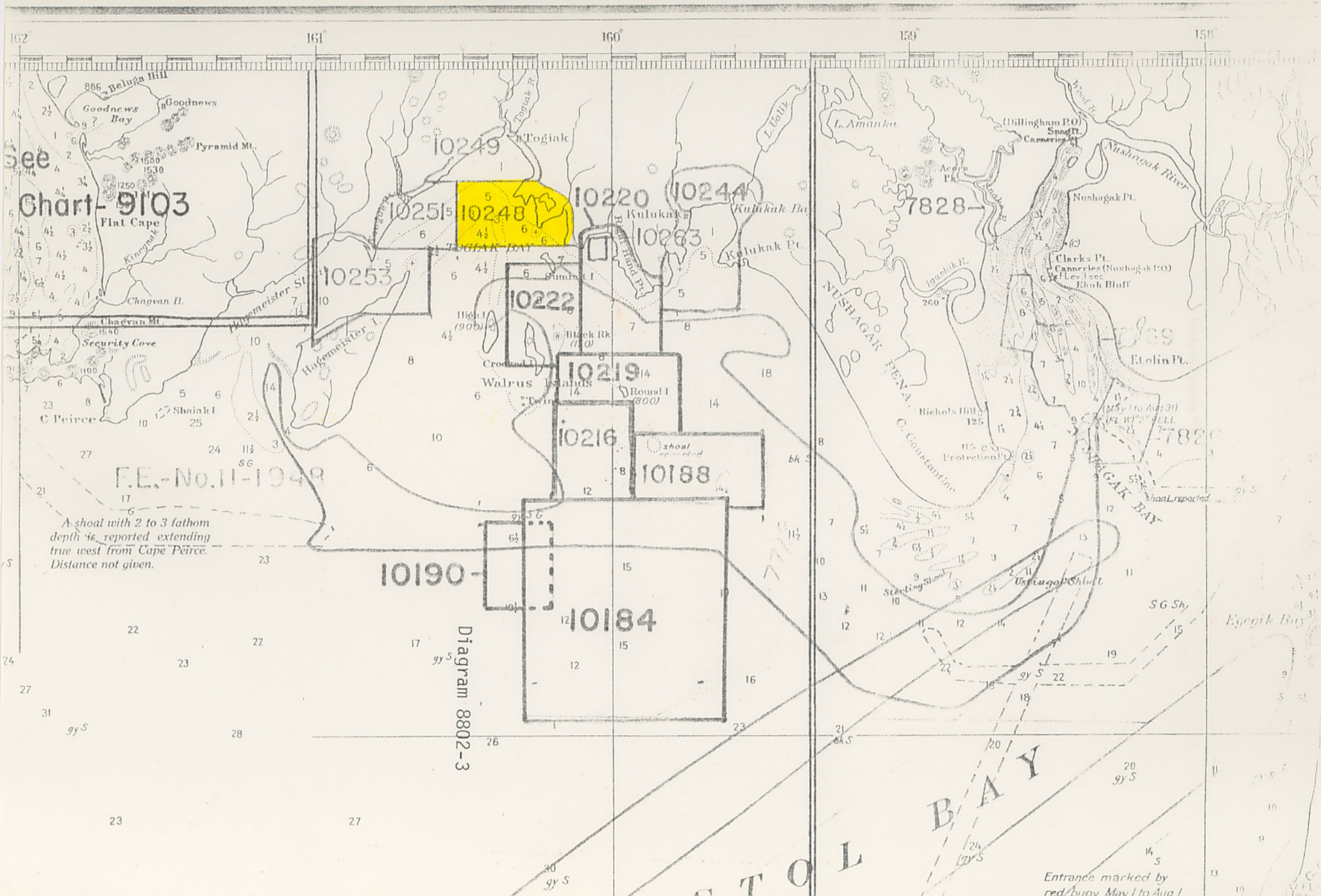
Chief, Nautical Chart Branch (Date)

CLEARANCE: SIGNATURE AND DATE:

N/MOP2:LWMordock

After review of the smooth sheet and accompanying reports, I hereby certify this survey is accurate, complete, and meets appropriate standards.

Director, Pacific Marine Center (Date)


See Chart- 9103
Flat Cape
Goodnews Bay
Goodnews
Beluga Hill
886
Pyramid Mt.
Kingegnak
Chagvan B.
Chagvan Mt.
Security Cove
C Peirce
Shaiak I
Hagemeister St
Hagemeister I
10249
Togiak
Togiak R.
10251
10248
10220
10244
Kulukak
Kulukak Ba
Kulukak Pt.
10263
10253
TOGIAK BAY
Sumrall I
10222
High I (90b)
Black Rk (1)
Crooked I
Walrus Islands
Twins
10219
Round I (80b)
10216
shoal reported
10188
F.E.-No.11-1048
A shoal with 2 to 3 fathom depth is reported extending true west from Cape Peirce. Distance not given.
10190
10184
Diagram 8802-3
L. Amanka
(Dillingham P.O)
Spaght
Canneries
Acorn Pt.
Nushagak River
Nushagak Pt.
7828
Clarks Pt.
Canneries (Nushagak P.O.)
Elephant Lev 3 sec
Elephant Bluff
Igushik R.
NUSHAGAK PEN.
C. Constantine
Nichols Hill
125
Protection Pt.
Etolin Pt.
GAK BAY
shoal reported
Sterling Shoal
Nushagak Shoal
Egegik Bay
BRISTOL BAY
Entrance marked by red buoy May 1 to Aug 1

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

EXAMINED FOR NM
GDBU PC
fjmo 9-26-89

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10248

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
16011	3-15-89	Russell P Kennedy	Full ~~Part~~ Before After Marine Center Approval Signed Via Forward
			Drawing No. 30 until applied to 16315
16315	10/13/89	Ed Martin	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. 5
16006	3-21-90	John Pierce	Full ~~Part Before~~ After Marine Center Approval Signed Via
			Drawing No. 26 Applied through chart 16011
16011	7/12/93	Kenny O'Neil	Full ~~Part Before~~ After Marine Center Approval Signed Via
	8-10-93	Douglas Harper	Drawing No. 31. Applied THRU C-16315 #8.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.

Appd To Stds 2-3-89 PCR