H10802

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. A

Registry No. H-10802

LOCALITY

State Alaska

General Locality Cook Inlet

Sublocality West of Nikiski

1998

CHIEF OF PARTY
Robert Kohut

NOAA FORM 77-28
(11-72)

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

REGISTER NO.

HYDROGRAPHIC TITLE SHEET

H-10802

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.
A

State **Alaska**

General Locality **Cook Inlet**

Sublocality **West of Nikiski**

Scale **1:10,000** Date of Survey **June 6-September 1, 1998**

Instructions Date **11/28/97 *** Project No. **OPR-P367-KR**

Vessel **Sea Ducer**

Chief of Party **Robert Kohut**

Surveyed by **Terra Surveys, LLC**

Soundings taken by echo sounder,hand lead,pole **Reson 8101 Multibeam Echo Sounder**

Graphic record scaled by **N/A**

Graphic record checked by **N/A**

Evaluation by **C.J. Barry** Automated plot by **HP Design Jet 650C**

Verification by **C.J. Barry**

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

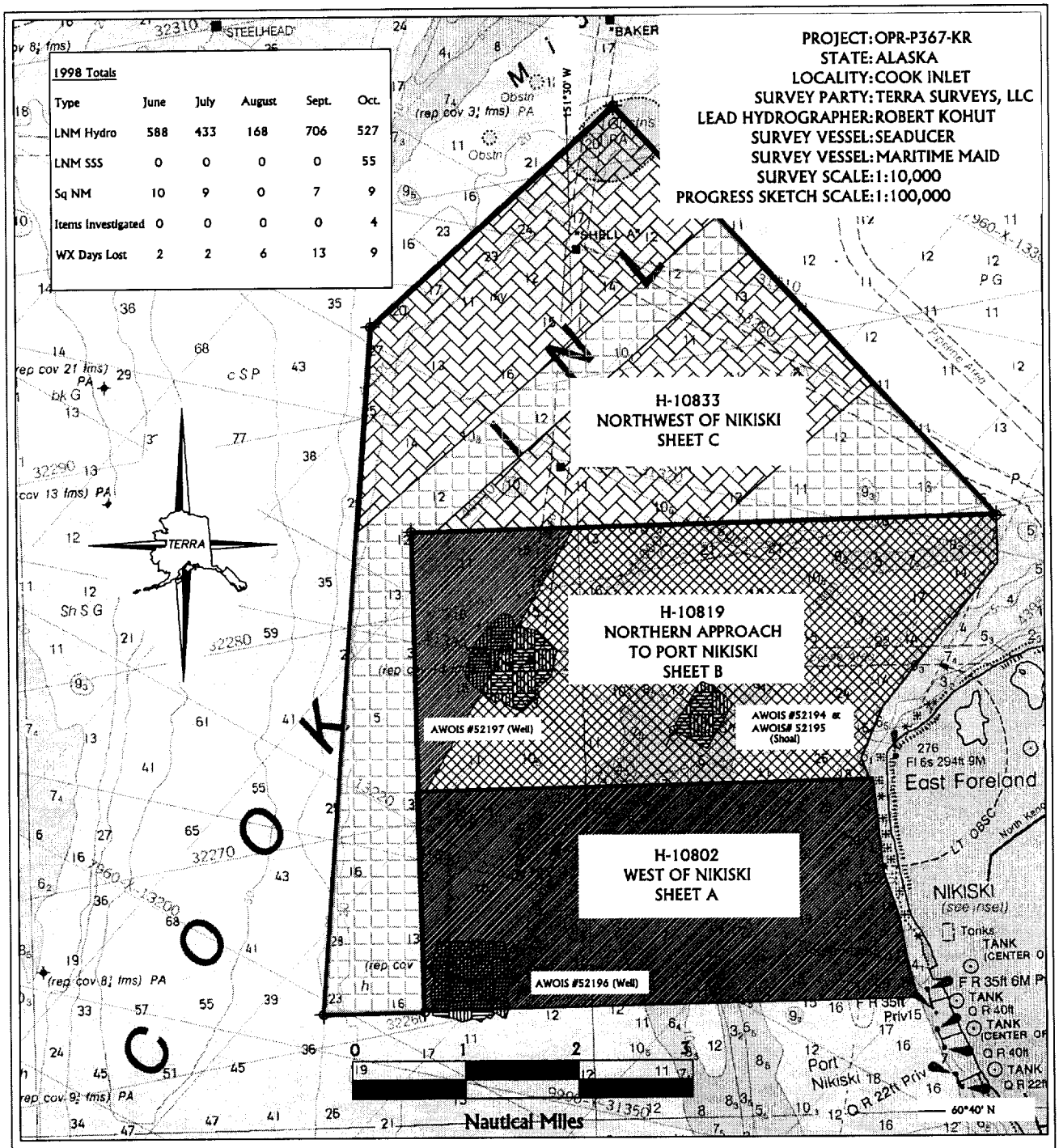
REMARKS: **Time in UTC. Revisions and marginal notes in black were generated during office processing. All separates are filed with the hydrographic data. As a result, page numbering may be interrupted or non-sequential.**

All depths listed in this report are referenced to mean lower low water unless otherwise noted.

*** Ammended 1/6/98 and 4/25/98**

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537 U.S. GOVERNMENT PRINTING OFFICE: 1986 - 652-007/41215

AW015 √ # SURF √ 3/14/01 BY MBH



Contract 50-DGNC-8-90021

	WORK ORDER 1				WORK ORDER 2					WORK ORDER 3				WORK ORDER 4
Registry #	H-10802				H-10819					H-10833				AWOIS
Started	06/06/1998				06/29/1998					07/11/1998				10/19/1998
Completed	09/01/1998				10/07/1998					10/11/1998				10/24/1998
Month	June	July	Aug	Sept	June	July	Aug	Sept	Oct	July	Aug	Sept	Oct	Oct
Area		Holidays						Holidays		Reference Surface				
LNM Hydro	491	52	157	8	97	364	0	270	7	17	11	428	520	
LNM SSS														55
Sq NM	8.1	0	0	0	1.7	8.7	0	0	0	0	0	6.7	8.5	0.3
Items Investigated														4
WX Days Lost	2	0	6	0	0	2	0	4	0	0	0	9	5	4

INDEX OF SHEETS

Descriptive Report to Accompany Hydrographic Survey H-10802

Scale 1:10,000

June-July 1998

Terra Surveys, LLC

Chief of Party: Robert Kohut, P.L.S., and Certified Hydrographer

A. PROJECT ✓

This navigable area survey was conducted in accordance with Hydrographic Project Instructions OPR-P367-KR, Northern approach to Port Nikiski, Cook Inlet, Alaska, dated November 28, 1997 and amended January 6, 1998.

The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of this area. Numerous obstructions and shoaling have been reported in this area. The area is adjacent to four docks including one commercial multipurpose dock used primarily in oilfield support, a petroleum dock, a liquid natural gas (LNG) dock and a loading dock for a fertilizer manufacturing plant. The area is transited by oil tankers, liquid natural gas tankers, oilfield support vessels, commercial fishing boats, commercial fishing tenders, tug and barge contractors and oil spill response vessels.

The project area is approximately 8.1 square nautical miles and extends two miles south and four miles west of the East Foreland on upper Cook Inlet. The survey extends from near shore across a deep area and over a shoal and into the deeps

A shallow water multibeam sonar system was used to locate and determine the least depth over the obstructions and shoals as well as determine the least depths over the entire project area. Every effort has been made to provide complete traceability of this survey product and is reconstructable from the raw data.

B. AREA SURVEYED ✓ SEE EVAL. REPORT, SECTION B

The area surveyed (Sheet A) for H-10802 covers approximately 8.1 square nautical miles west of Nikiski, Alaska. The following NAD 83 latitudes and longitudes are the hydrographic survey limits:

Degrees Latitude (N)		Degrees Longitude (W)	
✓ 60.683521	60° 41.01'	151.550511	151° 33.03'
✓ 60.715928	42.96'	151.550912	33.05'
✓ 60.716123	42.97'	151.414353	24.86'
✓ 60.702220	42.13'	151.411957	24.72'
✓ 60.695487	41.73'	151.407658	24.46'
✓ 60.689385	41.36'	151.405701	24.34'
✓ 60.683541	41.01'	151.402965	24.18'

The Index of Sheets shows the area surveyed for H-10802.

C. SURVEY VESSELS ✓

The ***Sea Ducer***, a 31-foot Uscola Offshore Pilot with aluminum hull, was used for all data acquisition.

The Sea Ducer 1997 Uscola Offshore Pilot	AK ID # 0691 Hull ID # UCN0317M997
Manufacturer	Uscola Boat Works Palmer , AK
L.O.A.	31 ft.
Beam	10 ft.
Draft	1.5-2.0 ft.
Power Plant	Twin 188hp AD41/DP Volvo-Penta turbo diesels with stern drives.
Data collection power source	24vdc, 12vdc from mains 110vac from 2.4 kW Trace Inverter 110vac from 5kw Northern Lights Genset
Cruise Speed	35 knots
Fuel Cap	204 gallons
Fuel consumption	13 gal/hr @ cruise
Gross tonnage	5 short tons displacement

ADDITIONAL VESSEL INFORMATION, DIAGRAMS AND PHOTOGRAPHS ARE FILED WITH THE HYDROGRAPHIC DATA.

D. Automated Data Acquisition and Processing ✓ SEE EVAL. REPORT, SEC. D

Data Collection ✓

Multibeam data collection was performed on a 333 MHz Pentium II PC running Reson's 6042 Multibeam Data Collection software under Windows 95. The data collection PC received Reson 8101 bathymetry via a serial interface and Reson 8101 sonar imagery via an Ethernet interface. It received motion and position information (heave, pitch, roll, heading, latitude and longitude) via serial interface from the Seatex Seapath 200 system. The Seapath 200 received differential correctors from an Ag120 GPS receiver tuned to the U.S. Coast Guard Beacon Kenai.

The Reson 8101 received motion information from the Seapath 200 to aid in filtering. The motion information allowed the Reson to apply filters based on minimum and maximum depths while the vessel was experiencing roll.

Coastal Oceanographics' Hypack software was utilized for navigation and line tracking as well as for the collection of quality control statistics. The Hypack software ran on a 200mhz Pentium computer. It received motion and position data (heave, pitch, roll, heading, latitude and longitude) from the Seapath 200. It also received a check position from a second Ag120 GPS receiver receiving differential correctors from the U.S. Coast Guard Beacons Kodiak or Cape Hinchinbrook.

Processing Overview ✓

The Reson 6042 software collects multibeam data in its native format, a binary file with a 'SVY' extension. The first step in processing the data was to convert the 'SVY' file to a 'XTF', **E**xtended **T**riton **F**ormat, for compatibility with CARIS HIPS. This was done using the Reson 6042 software while offline. The data was then transferred in Hypack raw navigation data files off the vessel via 2.6-gigabyte **M**agneto-**O**ptical (MO) disks.

The MOs were transferred daily from the vessel to the project office for processing. The data was copied to the server for storage and archived on 4mm DAT tapes. The XTF files were converted to HIPS files using HIPS' refoXTF program.

Once converted, the lines were reviewed in HIPS 'Line' mode for defects in positioning, motion sensor data or sounding data. The positioning data was examined for jumps in position and if necessary data was rejected without interpolation. The various sensors, including azimuth, heave, pitch, roll and tide, were also checked. If necessary data was rejected without interpolation or in the case of small isolated spikes, rejected with interpolation._ Typically no rejection was required for either the positioning or for the various sensors. The soundings were then reviewed in the Hydrographic Data Cleaning System (HDCS) editor where the user could filter or manually reject outliers. Filters used were beam quality, beam number and (when implemented by Universal) a roll value or angle from nadir filters. Beams of only the highest quality were accepted. If a question arose about a possible bottom feature then beams of lesser quality were reviewed. Initially, beam filters were overused resulting in some data after editing

yielding only 61 beams per profile. This practice was quickly discarded and only the beam filtering necessary to speed processing was performed, typically 5 to 15 outer beams on each side. The implementation of an angle filter by Universal was used when available and soundings outside a 100 degree sector about nadir were rejected by filter after that. Line spacing was adjusted with water depth in the field to ensure three-beam overlap on adjacent lines with a 90° swath. This underestimation of swath width ensured sufficient overlap. When reviewing the soundings, the sidescan imagery obtained from the Reson 8101 was viewed in a window on the edit screen. This allowed the hydrographer to make decisions about the veracity of questionable features with the sidescan imagery to aid them.

Following adjustment for the sound velocity profile measured in the field, the data was beam edited in **HIPS** 'Line' mode. Preliminary tides for the National Ocean Service (NOS) gage at Nikiski (945-5760) were applied without zoning. The next step in HIPS was to 'merge' the data. In the merge step the various sensors for motion and position of the vessel were used to compute the final position and depth of the sounding.

Following merging, the data was reviewed in the HIPS 'Subset' editor for outliers. Soundings for a geographic area from multiple lines can be viewed from several directions and flagged as 'Rejected' if deemed an outlier or as 'Outstanding' if it is a feature the user desires to track. The soundings 'Rejected' in subset mode were typically single outliers. Soundings marked as 'Outstanding' are features which rose ten percent of the water depth. In the absence of sidescan information or reports of obstructions, these features are assumed to be rocks. The status of the 'Outstanding' flag is accessible from this point to the final drawing.

Following the 'Subset' editor, the data was exported to the Caris Editor, a **G**eographic **I**nformation **S**ystem (GIS) and inspected for coverage. In the Caris Editor, the soundings were displayed and the operator zoomed and panned along each line to check for sufficient overlap between adjacent lines and gaps within the line. Areas requiring additional coverage were outlined and fill in lines were chosen, data collected and edited as described.

Once coverage was complete for the project, the data was exported from the Caris HIPS files to a database. During the export, the tide zone for each profile was determined, the angle from nadir that the sounding was taken at was determined and the athwartships footprint size was calculated. This information with all the flags from Caris HIPS are maintained in the database. After transfer to the database the soundings were tide adjusted using the zoning scheme provided and the Final Verified tides from the NOS gage at Nikiski (945-5760). These tides were down loaded from the NOS internet site. The tide was applied equally to all soundings within each profile. A new tidal datum was provided after final processing was complete and the data was reprocessed starting from the merge step. Ten percent of the subsets were reviewed as a check. This data was exported to a binary file format developed by Terra Surveys. The data was then sorted into one meter square cells. Each cell collected information on the number of soundings in that cell, the average depth for the cell and the shoalest sounding for each cell with it's corresponding sounding ID number for later retrieval. The average depth for each square

meter is exported to an ASCII file which can be read into the Caris Editor. A DTM was created and rechecked for coverage.

Following the tide adjustment, soundings were flagged as rejected if the footprint was deemed toolarge for the required shoal detection or the angle at which the sounding was taken was outside of the acceptable swath. The athwartships footprint was maintained at 2 meters or less down to 30 meters (MLLW) and at 10% of water depth or less (tide reduced) below 30 meters. The angle from nadir was maintained at less than 50° for most of this survey. Crossline statistics indicated that the allowable angle could be raised to 58° in water depths less than 30 meters (MLLW) and to 55° in water depths greater than 30 meters (MLLW). These wider nadir angles were used to reaccept a limited number of soundings in a small area devoid of soundings. The accepted soundings were within expected accuracy standards and footprint size.

An average of the acceptable soundings within each square meter was then exported to the Caris Editor as a tide adjusted final data set. The cleaned cross lines were exported to the Caris Editor in their entirety. The combined data was used for cross line analysis, tide zone analysis and coverage plots.

All accepted soundings were checked for overplot removal. Deeper soundings that would overplot the shoalest soundings were then suppressed. The unsuppressed soundings were then exported to AutoCAD. The unsuppressed soundings, which had been flagged by the operators as 'Outstanding', were placed on a separate layer in AutoCAD for identification on the drawing as rocks.* All of the plotted soundings in AutoCAD contain an identification number, which allows tracing the sounding back to the database and thus back through all steps to collection. A histogram of unsuppressed soundings was generated from the database. The data was also exported to AutoCAD for trackline plots which depict the track of the sonar head.

Quality Control ✓

The raw navigation files from Hypack were used for quality assurance. The files were processed using HPTools to summarize the start and end times of lines, distance traveled, average vessel speed, minimum number of satellites and maximum HDOP encountered. There were some incidences when the Hypack log was inadvertently turned off during the running of a line. In these instances, the lineal nautical mileage and speed were computed from the XTF files. The lines were then checked for the several conditions that could cause disqualification. Disqualification could be due to going to fast for the range scale used causing insufficient sounding density or inadequate GPS caused by less than 4 satellites or when the Horizontal Dilution of Precision (HDOP) was greater than 2.5.

Lines were also disqualified by the Caris HIPS operators if they were excessively noisy or had missing data due to improper filtering in the collection process.

* BASED ON PHB CRITERIA THAT IN ORDER TO BE DISTINGUISHED AS A SUBMERGED ROCK A SOUNDING MUST BE AT LEAST TWO FATHOMS SHOALER THAN SURROUNDING DEPTHS, MOST SOUNDINGS IDENTIFIED BY THE CONTRACTOR AS ROCKS WERE RE-CLASSIFIED AS SOUNDINGS. ON THE SMOOTH SHEET, THE CONTRACTOR'S "Rk" DESIGNATIONS WERE EXCESSED TO LEVEL 63 IN MICROSTATION.

Software Summary ✓

SeaBat 6042 Software produced by Reson was used for all multibeam data acquisition. Caris Hips, a processing program developed by Universal System Ltd., was used for all multibeam post processing and quality assurance.

The following table lists software used for data supporting this survey:

Program Name	Version	Date	Usage and Dates Used
Reson/SeaBat 6042	5.01.6	6/10/98	6/6/98 through completion. Multibeam data collection software
Coastal Oceanographics, Inc/Hypack	7.1 8.1a	4/16/96 5/19/98	Navigation and collection of quality control and statistical data.
Tides and Currents	2.2	11/26/96	Predicted Tides
Caris Hips	4.32b	4/16/99	Multibeam Data Processing.
Caris Editor	4.31	9/3/98	Data Visualization, manipulation
Caris Tools	4.31	9/3/98	Data Manipulation, Contouring
Geocalc	2.06	1993	Coordinate Conversion
Trimble/DSMCHAT	3.2	94-96	Configure AgGPS120 GPS receiver
Seapath 200 Control Center	1.01.01	Nov. 13,1997	Configure Seapath 200
Procomm	2.4.2	1985,1986	Collect SVP data through serial interface
Winzip	6.0	91-95	Compressing and transferring large data files
Trimble/Probeacon		9/12/94	PC interface for AgGPS 120
Power Desk Utilities 98	3.032	6/26/98	File management
ACAD MAP 3	3	7/14/98	Drafting
Quicksurf	5.1	6/26/97	Surface modeling, contouring
Corpscon	5.11	6/10/98	Coordinate Conversion
Reson 6042	5.01G	6/10/98	Data collection.
Wizard	5.05-5.06	1997	Tide data down load, programming and calibration for the MicroTide tide gage
Endeco 1150OPS Endeco 1150RPT		5/23/90 2/28/91	Tide data download, programming and calibration for the Endeco tide gage
Terra Surveys HPTools		5/98 – 10/99	Inhouse program for generation of line and gps quality statistics
Microsoft SQL Server	6.5	8/19/97	Database server for storage and manipulation of sounding data.
Terra Surveys Multibeam Suite		6/98 – 11/99	Suite of programs for transfer of data from Caris HIPS to SQL Server and tide adjustment, determination of acceptable data, sounding suppression, trackline generation and export to Caris Editor.
Seatex MRC	2.50a 2.51	1/31/98 4/27/98	PC Interface to Seatex MRU-5
Seapath Control Center	1.00		PC Interface to Seatex Seapath 200

Microsoft Access	97		Database Management
Microsoft Excel	97		Spreadsheet Program
Microsoft Word	97		Word Processing Software
Microsoft Visual Basic	6.0		Programming Language & Tools
Windows NT Server	Server 4.0		Operating System
Service Pack	4		Operating System
MS-DOS	6.22		Operating System
TEXTPAD32	V3.2.2		Text Viewing & Editing
RCMCONF	V1.33	1997	Radio Modem Config Program
Windows NT Workstation	4.0		Operating System

E. SONAR EQUIPMENT (Towed sidescan)

The Specifications of the Side scan sonar used during the AWOIS item investigation survey, (refer to Item Investigation Report in section N: COMPARISON WITH THE CHART), are as follows:

S.E.A. Transceiver, Model ST350, S/N 9701 100/500 kHz System

The Primary Fish used was a Klein 100 kHz, the Secondary fish was a Klein 500 kHz. Both were operated with a 1.5 degree beam width and 20 degree depression angle.

The sonar system was interfaced with Terra Surveys Triton Elics "ISIS" Processing system, for data storage, enhancement, and display. An EPC 1086 graphic recorder was used to display sonar images real time during the survey. The sonar images were displayed real time on the EPC using uncorrected for slant range and speed. The data displayed on the Triton "ISIS" system was viewed with corrections for slant range and speed, to provide a more realistic view of the collected data.

The sonar fish was towed from the stern of the vessel using approximately 600 feet of Klein 8 conductor tow cable interfaced with a slip ring and deck cable.

F. SOUNDING EQUIPMENT ✓

The survey vessel, *Sea Ducer* was equipped with a Reson SeaBat 8101 multibeam echo sounder system (serial # 85100120). The system's two main components consist of a surface processor (serial # 13983) and transducer head (serial # 049710).

Soundings were recorded in meters and corrected for the speed of sound through water from multiple daily measurements of the water column profile (see Section G)*[Depths encountered in the survey range from 5.1 meters/2.8 fathoms (Latitude 60.686085° N, Longitude 151.461881° W,) to 49.6 meters/27.1 fathoms (Latitude 60.712648° N, Longitude 151.429937° W,) at MLLW] based on verified tide data from the Nikiski Gage (945-5760).* DO NOT CONCUR, SEE EVAL REPORT SEC. B.

Metric leadlines were used for depth comparison with the depth sounder. Leadlines were constructed from metric fiberglass survey tapes with 24 or 36 ounce lead balls attached such that the bottom of the ball was at the zero mark. Leadline comparisons were conducted a minimum of once weekly by simultaneously reading the draft marks on the sonar head pole, the leadline depth (typically 3-6 meters) and the depth from the 8101. The comparison was made with the formula:

Error = Leadline Depth – Draft – 8101 Depth ✓

The multibeam did experience a fault during the survey. While checking raw data from the unit ("snapshots"), Reson Engineers discovered a bad former on the starboard side. The unit was shipped to Reson in California on August 19, 1998 and was back in service on August 25, 1998. Reson's engineers found a broken trace on a circuit board controlling the beam forming for the four outermost beams on the starboard side. Those beams were not included in the smooth sheet.

Data analysis has revealed a slight frown shaped swath in the 8101. This feature first became apparent in reference surface analysis and sub-set editing in CARIS HDCS. The general trend is a raised surface in the middle of the swath. Part of this feature is a nipple effect (raised ridge) generated around nadir by several beams. The nipple effect was minimized in the field by lowering the sounder gain to its lowest level without losing data, but could not be eliminated. Terra Surveys LLC and Reson have explored possible causes for these effects throughout the project by analyzing raw data directly from the 8101 sonar head ("snapshots"). The cause of the problem was not resolved at the time of this report, but Reson does not feel the sounder is out of specifications and the problem will not cause the accuracy of the data to be out of specifications. CONCUR

G. Corrections to Soundings ✓

The following methods were used to determine, evaluate and apply corrections to soundings.

Speed of sound through water ✓

The velocity of sound through water was determined by a minimum of two casts per day with the following two instruments.

Velocimeter (sound velocity, temperature and depth profiler)	*SVPlus* (standard instrument with 50 dBar pressure sensor and 350 ms temperature sensor)
Manufacturer	Applied Microsystems Ltd. Sydney, British Columbia, Canada
Serial number	**3201**
Pressure Calibration	4/30/98 by Applied Microsystems Ltd.
Temperature Calibration	4/29/98 by Applied Microsystems Ltd.
Distilled Water Sound Calibration	4/20/98 by Applied Microsystems Ltd.
Voltage Calibration	5/27/98 by Applied Microsystems Ltd.

Velocimeter (sound velocity, temperature and depth profiler)	*SVPlus* (standard instrument with 50 dBar pressure sensor and 350 ms temperature sensor)
Manufacturer	Applied Microsystems Ltd. Sydney, British Columbia, Canada
Serial number	**3259**
Pressure Calibration	4/30/98 by Applied Microsystems Ltd.
Temperature Calibration	4/29/98 by Applied Microsystems Ltd.
Distilled Water Sound Calibration	4/21/98 by Applied Microsystems Ltd.
Battery Calibration	4/30/98 by Applied Microsystems Ltd.

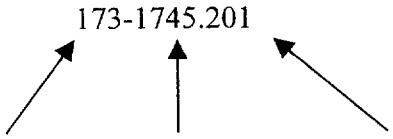
The following instrument was operated at the surface.

Velocimeter (sound velocity, temperature and depth profiler)	*Smart SV&P* (standard instrument with 50 dBar pressure sensor)
Manufacturer	Applied Microsystems Ltd. Sydney, British Columbia, Canada
Serial number	**4177**
Pressure Calibration Distilled Water Sound Calibration	6/10/98 by Applied Microsystems Ltd. 4/20/98 by Applied Microsystems Ltd.

Copies of the manufacturer's calibration reports are included in Appendix G.*

The velocimeters were set at a sample rate of 15 samples per second during casts, and 1 sample per minute for the continuous monitoring of the work area. A daily log was kept to note any variance between the two velocimeters. Dual casts were done a minimum of once a day for comparison between velocimeters. During survey operations, either one of the *SVPlus* velocimeters or the *Smart SV&P* logged the sound velocity once per minute. The casts were taken as deep as possible and geographically distributed to satisfy the 95% anticipated water depth and represent local and diurnal variability. The velocimeters were manually initialized and downloaded using PROCOMM terminal software.

The sound velocity data file name convention follows:



Julian Day Time of deployment Velocimeter serial number

The naming convention incorporated the Julian day and time as well as the serial number of the sensor. On days 157 and 158 the field crew used Julian day and Universal Coordinated Time (UTC). On days 159 through 179 the field crew used Alaska Daylight Savings Time. The office reductions then verified and reflected the true Julian day and UTC derived directly from the raw data header. From day 179 to the end of the project the field crew reverted back to using true Julian day and UTC.

*FILED WITH THE HYDROGRAPHIC DATA

Example Raw Data header:

du 173-1745.201
SVPlus S/N 3201
New cast started on **06-23-98 at 01:50:52**
Sample rate is 1 second
Depth increment 0.50
Sound velocity increment 0.00

Julian Date and Time

Julian Day and UTC file names will reflect an 8-hour difference or be the same depending on which naming convention was used. Regardless of the naming convention used, the correct Julian day was derived directly from the raw data, and applied to the soundings in CARIS from a continuous SVP file of all the casts.

Sound Velocity Data after conversion:

File Name: C201__173-1745

Section 1998-**174**	**1:50:52**
26.7	1477.21
26.1	1477.22
25.5	1477.2
24.6	1477.18
24.0	1477.17
23.2	1477.16
22.6	1477.16

The converted file names start with C (converted) and the serial number:

C201__173-1745.

Processing Procedures ✓

The velocimeter raw pressure data was converted to depths in meters in a spreadsheet using Foronoff and Saunders formula as provided by Applied Microsytems Ltd. The formula is as follows.

P=pressure in decibars

x=sin(latitude/57.29578)

X=x^2

Gr=9.780318*(1+(0.0052788+0.0000236*X)*X+0.000001029*X

D=(((-0.00000000000000182*P+0.0000000002279)*P+9.72659)*P

Depth=D/Gr

The formula was checked with latitudes for the north and south extent of the survey and the resulting depths varied by millimeters so an average was used. This method was also tested against the results of Applied Microsystems Ltd. *Total System Software* and found to be identical.

The data was then converted to a CARIS format where the profile corrections were applied to the soundings. CARIS applies the most recent velocity cast in the file so the newest correctors were always being used. The following Sound Velocity Profile Summary shows the casts, their positions and the maximum depths of each cast. See Appendix J for listings of each cast. *

* FILED WITH THE HYDROGRAPHIC DATA

Instrument Corrections ✓

No special instrument corrections were made.

Corrections determined from bar checks and vertical casts. ✓

Metric lead lines were used for depth comparison with the depth sounder. Lead lines were constructed from metric fiberglass survey tapes with 24 or 36-ounce lead balls attached such that the bottom of the ball was at the zero mark. Lead line comparisons were conducted a minimum of once weekly by simultaneously reading the draft marks on the sonar head pole, the lead line depth (typically 3-6 meters) and the depth from the 8101. The comparison was made with the formula:

Error = Lead line Depth – Draft – 8101 Depth

The lead lines are summarized below:

Date	Draft (m)	8101 Depth (m)	Lead Line (m)	Error (m)
9 June 1998 JD 160	1.07	4.83	5.90	0.00
25 June 1998 JD 176	1.04 1.05	2.83 2.86	3.88 3.90	+0.01 -0.01
2 July 1998 JD 183	1.06 1.06	3.11 2.91	4.20 3.95	+0.03 -0.01
15 August 1998 JD 227	1.09 1.09	3.56 3.52	4.63 4.65	-0.02 -0.04

An alternate method of checking was used on the 29th of August. The reduced nadir beam depth was compared to a reduced single beam echosounder. The data was corrected for offsets in both the horizontal and vertical planes. Sound velocity, heave, pitch, and roll corrections were also applied.

Date	8101 Depth in meters	ODOM Depth in meters	Vertical Offset (m)	Error (m)
29 August 1998 JD 241	27.89	28.45	.53	.03

Static Draft ✓

A metric adhesive rod face was adhered to the sides of the hull and the multibeam pole for daily readings of the vessel draft. The tapes were calibrated to read the depth of the sonar head. The draft was recorded a minimum of once daily and usually twice. The draft readings were incorporated in a spreadsheet, which included the date and time, line name, engine rpm and draft. From the spreadsheet data and the measured offsets for the boat, the distance from the boat's reference point to the water line was computed for every line and utilized in the HIPS Vessel Configuration File (see following discussion of settlement for more detail).

Settlement ✓

Measurements for the Squat and Settlement were conducted near East Forelands in the work area, using **O**n **T**he **F**ly **R**eal **T**ime **K**inematic (OTF-RTK) GPS survey procedures. The measurements were conducted with two Trimble 7400MSi's on the *Sea Ducer* and a Trimble 4000SSi as a base station. Pacific Crest Radio modems were used to transmit the correctors to the vessel.

Two Trimble 7400MSi antennas were installed on the Sea Ducer. One antenna was installed near the bow and one on the aft swim deck, both on the centerline of the vessel. The relationship of these antennas to the vessel baseline was surveyed and recorded.

Three files were collected during each test; one ASCII file was recorded for each of the two Kinematic GPS Receivers. These files contained the National Marine Electronics Association (NMEA) "GGA" string, a GPS output string which contains the time, position, ellipsoid height, HDOP and mode. The third file was collected using Triton ISIS which logged the attitude information from the Seapath 200. The *Sea Ducer's* attitude and elevations were recorded at rest and at various RPM settings to determine vessel dynamics. The static data for the vessel at rest was observed as a baseline and used to correct for tide changes with a starting and ending tide. The results of the measurements were compiled in a spreadsheet. A graph depicting vessel settlement and speed at various RPM settings is shown on the following page. The vessel dynamics appear to react, as any small launch would be expected. At low RPMs (speed), the aft lowers, the bow rises, and the vessel settles into the water. As the RPM is increased the settlement increases to a point where the hull begins to plane. At the upper end of the useable survey speeds (RPM 2800 – 3000) the vessels reference point is actually 3-9 cm above its elevation at rest.

The daily draft readings, RPM values, and the reference point to water line distance for each line were recorded on the written line notes. A macro converted this information to a text file for insertion into the HIPS Vessel Configuration file.

Vessel Configuration File (VCF).✓

An example of the Reference Point to Water Line entry in the VCF is as follows:

```
# +-----------------------------------------+
#|                                         |
# | RP Definition                          |
#|                                         |
# +-----------------------------------------+
RPDfn
        {
        1998-157-17:10
                {
                Waterline       0.41                    # in meters
                Apply           "YES"                   # in merge
                Comment         "File=157-0000/RPM=1200/Settlement=-0.026/8101 Draft=1.040"
                Authorization " "
                }
```

The entry above is for a day when the draft (of the sonar head) was 1.04 meters and the settlement is –0.026 for an engine RPM of 1200. The resulting waterline measurement is 0.41 meters. The equation used for computation of RP definition is:

RP Definition (Waterline) = SeaBat Elevation Offset - Draft + Settlement*

*SETTLEMENT GRAPH FILED WITH THE HYDROGRAPHIC DATA

Heave, roll and pitch ✓

The Seatex Seapath 200 sensor system was used to determine heave, roll and pitch as well as azimuth and position.

Manufacturer :	Seatex
Model :	Seapath 200 m320-00
Seapath Serial number:	0361
Motion Reference Unit:	MRU-5
MRU Serial number:	299cus
Manufacturers stated accuracy:	
Heading:	0.05° 1σ (4 meter baseline)
Roll and Pitch:	0.05° 1σ
Heave:	0.05 meters 1σ
Position Accuracy:	2 meters 2σ

Tide correctors ✓

In accordance with section 6.1 of the statement of work, the NOS tide station at Nikiski, Alaska (945-5760) was used as the source for the MLLW datum for this project. No supplemental gauges were installed. The unverified (preliminary) 6-minute data was downloaded from NOS database via the Internet and applied during the CARIS post processing routine. A height corrector of -6.067 meters was applied to the preliminary data to reference tides to MLLW (per contractor's note at web site http://www.opsd.nos.noaa.gov/aknote.html). No zoning was applied to the preliminary data.

Verified 6-minute tides acquired from NOS after the survey was completed. The verified tide data was downloaded from the Ocean Products and Services Division (OPSD) World Wide Web site (http://www.opsd.nos.noaa.gov). The time and height tidal zoning correctors listed in Appendix E* were applied during transfer of the soundings from CARIS to the SQL Server Database. After determining the tidal zone for each profile, the associated soundings were adjusted for the final tide.

*FILED WITH THE HYDROGRAPHIC DATA

H. Control Stations ✓

The horizontal control datum for this project is North American Datum of 1983 (NAD 83). All software, comparisons of junctions and prior surveys referenced NAD 83.

All data provided in NAD 27 was translated to NAD 83. The National Ocean Service Automated Wreck and Obstruction Information System (AWOIS) data was converted from NAD 27 to NAD 83 with Blue Marble's Geographic Calculator.

The U.S. Coast Guard Differential Navigation Beacons at Kenai, Kodiak and Cape Hinchinbrook were used during hydrographic survey operations for horizontal positions and confidence checks. The NGS second order control station, NIK, was used as a DGPS performance check site. NAD 83 Geographic Coordinates for these horizontal control stations are found in Appendix C. *

No control was set during this survey. Concur ✓

* FILED WITH THE HYDROGRAPHIC DATA

I. Hydrographic Position Control ✓ SEE EVAL. REPORT, SECTION I

Position Accuracy ✓

Differential Global Positioning System (DGPS) provided the basis of hydrographic positions throughout the survey. The total horizontal positional error falls within 10 meters at the 95% confidence level for all features in this project. A fixed-point DGPS Performance Check was performed to confirm this accuracy standard and a graphical analysis of the check is included in Appendix H.*

In addition to the accuracy of the DGPS system, the accuracy of the sounding position depends on the following:

Characteristics of the multibeam system
Depth of water
Accuracy of heave, pitch, roll, and heading measurements
Accuracy that latencies are accounted for and applied
Accuracy and reliability of the of Sound Velocity Profile (SVP)

Position Control ✓

Differential GPS (DGPS) provided hydrographic position control throughout this survey. The following stations were used for project control:

U.S. Coast Guard DGPS Broadcast Site	USCG DGPS Broadcast Frequency
Kenai, Alaska ✓	310 kHz
Kodiak, Alaska ✓	313 kHz
Cape Hinchinbrook, Alaska ✓	292 kHz

Control Station	NGS PID	Horizontal Order
NIK	TT0543	SECOND

The United States Coast Guard (USCG) Differential Global Positioning System (DGPS) Beacons at Kenai, Kodiak and Cape Hinchinbrook were used during hydrographic operations for horizontal positions and confidence checks. Control station "NIK" was used as a DGPS performance check site.

* FILED WITH THE HYDROGRAPHIC DATA

DGPS Performance Check ✓

The National Geodetic Service (NGS) station "NIK" was used as a fixed-point DGPS performance check site during a 24 hour observation period. The USCG Kenai DGPS beacon was checked against the fixed position of "NIK". A Trimble Ag120 DGPS receiver, capable of receiving beacon correctors in the **R**adio **T**echnical **C**ommission **M**arine (RTCM) format was placed on control station "NIK". It computed a differentially corrected position at a rate of one per second and output a **N**ational **M**arine **E**lectronics **A**ssociation (NMEA 0183) "GGA" message once per second to a logging computer. The computed position was compared to the control point's published position. A graphical analysis of this data is found in Appendix H.*

The Kenai, Kodiak and Cape Hinchinbrook USCG differential navigation beacons were used for horizontal survey positions and confidence checks during hydrographic operations. A confidence check was performed by simultaneously receiving positions on the vessel from two different beacons. When Kenai correctors were used for primary positioning, Kodiak was used as a confidence check. When Kenai was down for maintenance, Kodiak correctors were used for primary positioning and Cape Hinchinbrook was used as a confidence check. The Kenai CORS site had a scheduled outage on Julian days 159 through 165. There were 7 days throughout the survey when a confidence check was not possible due to lack of available correctors from a secondary beacon. The data from these days was accepted based on the fact that the primary beacons had proven reliable and exhibited no questionable behavior on the days without independent verification. The high bulkhead walls at *Sea Ducer's* Arness Dock berth precluded setting a fixed point for confidence checks because the satellites were blocked. A fixed confidence checkpoint was established at the Kenai River launch ramp for later work orders. Data supporting the confidence checks and the positioning criteria can be found in Appendix H.*

Positioning Equipment ✓

The following GPS equipment was used:

Equipment Location	Type of Receiver/Antenna	Receiver serial No.	Compact Dome Antenna serial No.
Primary	Ag120/Trimble	0220061863	0220661841
Aft	SEATEX/Trimble	Seapath-2497011	0220110175
Backup	Ag120/Trimble	0220061678	0220061769
Forward	SEATEX/Trimble	Seapath-2497011	0220109126

*Refer to diagrams included in Section C (Vessels) for the instrument locations on the *Sea Ducer*.

* FILED WITH THE HYDROGRAPHIC DATA

Difficulties that degraded the expected position accuracy included insufficient satellite coverage near oilrigs and multipath on very calm waters. Tracklines around oilrigs were run at an angle to the main scheme tracklines in order to insure sufficient satellite visibility and good geometry. A choke ring collar was mounted on the receiver's antenna to reduce multipath from flat, calm water. HDOP spikes due to atmospheric conditions or satellite constellation configurations were rare. Spikes that did occur were caught either in the field and no further data was collected or by the quality control procedures in the office using the recorded data. There were no unusual atmospheric conditions that affected data quality. The only malfunctions involving positioning equipment were the result of power outages. Surveying would continue when power was restored. Concur

Systematic errors were resolved during pre-survey testing with configuration modifications to the AgGPS120, Reson, and Seatex Seapath 200 systems until results proved reasonable. Detailed configuration settings are listed in Appendix G.*

Prior to field season, all sensor locations were established and a precise conventional survey of the vessel was performed utilizing a Theodolite / EDM and steel chain. From this, sensor offsets, stationing and elevations were determined and applied to the appropriate sensor or processing stage. The origin point (RP) of the vessel was called CL3 and the position of the multibeam sonar transducer was called Seabat 8101.

* FILED WITH THE HYDROGRAPHIC DATA

J. SHORELINE ✓ SEE EVAL. REPORT, SECTION J

Not applicable

K. Crosslines ✓

Following reduction of the sounding data a DTM was created in the Caris Editor. First the soundings within the database that had not been rejected either in editing or in the database due to footprint size, angle or beam number were gridded on a 2 meter interval. Gridding involved extracting and averaging soundings within each 2 meter by 2 meter area and averaging the depths. A record was then output with the average depth and the coordinates for the center of the cell. This set of records comprised 8.3 million points and was imported to the Caris Editor. A Regular DTM was created using a 5 meter cell size and a radius of 5 meters. Each cell within the regular DTM was an weighted average of the soundings within a 5 meter radius of the cell center. Weighting within the radius was based on the distance from the center of the cell with closer soundings given higher weights. After a DTM was made each crossline was compared to the DTM four ways. The acceptable soundings (not rejected) were compared by beam number and by angle. Then the soundings not rejected in HDCS but unusable due to having a footprint too large or an excessive launch angle were compared to the DTM using both launch angle and beam number.

An artifact in the swath was found in parts of the data where the swath appeared to be "cupped". When this appeared the outer beams of the swath were lower than the center. The source of the "cupping" was not determined although it could be related to either bottom material type or power and gain settings of the Reson 8101 sounder. The "cupping" did not degrade the data used for coverage and the smooth sheet to the degree that the data became unacceptable. CONCUR

The accuracy required for this survey was that 90% of the soundings used have an error of 0.3 meters or 1% of water depth whichever is greater. An equivalent error budget is allowed for water level corrections for a total error budget of 0.6 meters or 2%, whichever is greater. The table below summarizes the crossline statistics. The columns labeled 90% are either the largest angle or outboard beam numbers which had 90% or greater compliance with the required accuracy.

Refer to the report "Crosslines"* for the statistics found in this process. The file naming indicates the line name, whether the data was accepted or rejected and whether organized by angle or beam number. An example is:

1580002_a_b

1580002 would be the line name.
The first character indicates whether the soundings are **A**ccepted or **R**ejected.
The second character indicates whether the data is grouped by **B**eam number or **A**ngle.

For data organized by angle user number 1 contains soundings with an angle between 0° and 1°, user number 2 has soundings with an angle between 1° and 2° and so on.

For data organized by beam the user number equals the Reson 8101 beam number.

*CROSSLINE TABLES ARE FILED WITH THE HYDROGRAPHIC DATA

L. Junctions ✓ SEE EVAL. REPORT, SECTION L.

Not applicable.

M. Comparison with Prior Surveys ✓ SEE EVAL. REPORT, SECTION M

Not applicable.

N. Comparison with the Chart ✓ SEE EVAL. REPORT, SECTION O

This survey was compared in Autocad Map to the following charts:

Chart	Scale	Edition	Date
16662	1:100,000	4th	August 31, 1996
16662 Inset	1:50,000	4th	August 31, 1996

General agreement between the chart and inset on the chart and this survey was good although changes in the edges of the shoal were detected. This survey also found a number of rocks not noted on the chart. This is probably the result of the high sounding density of this survey. CONCUR ✓ As a result the soundings tended to both match the chart and contain higher and lower values within the same area of the chart. CONCUR

The shape of the shoal has changed slightly with signs of accretion and erosion occurring in different areas. The following page shows some examples of common chart differences. CONCUR

H-10802 Fathoms	Latitude				Longitude				Comment On Agreement With Chart
✓ 9.4	60°	42'	06.198"	N	151°	31'	47.108"	W	9.4 rock near 10.3 charted sounding
✓ 9.4	60°	42'	07.952"	N	151°	30'	16.321"	W	Well into shallow side of 5 fathom contour
✓ 11.2	60°	41'	13.180"	N	151°	31'	08.001"	W	Well into shallow side of 10 fathom contour
✓ 11.8	60°	41'	20.695"	N	151°	31'	28.899"	W	Well into shallow side of 10 fathom contour
✓ 14.8	60°	41'	48.506"	N	151°	31'	01.877"	W	Well into shallow side of 10 fathom contour
✓ 18.0	60°	41'	24.731"	N	151°	24'	59.910"	W	Well into deep side of 20 fathom contour
✓ 20.2	60°	41'	33.315"	N	151°	26'	02.993"	W	Well into shallow side of 20 fathom contour
✓ 20.3	60°	42'	09.302"	N	151°	26'	24.053"	W	Well into deep side of 20 fathom contour

SEE EVAL. REPORT, SECTION N

Attachment #12

Item Investigation Report ✓

Item Description (as charted): AWOIS #52196

Well named Pan American Forelands State Unit No. 1

Source: Unknown, Approx. 1987

Charted Position: Latitude 60°41'15.96" N Longitude 151°32'10.07" W NAD 83

Charts Affected: 16660
16662 w/ Inset
16663

Investigation

Dates(s)/Day Number(s):	Survey Vessel Name: M/V Maritime Maid October 19, 20, 21, 1998
Position Numbers/Time:	Item Not Found
Investigation Method:	Sidescan Sonar (400%)
Surveyed Position (NAD83):	
Position Determined By:	DGPS/USCG Beacon at Kenai (310Khz)

Investigation Summary:

A side scan sonar survey was performed on this reported well location encompassing a 500-meter search radius. Vessel track lines were spaced 80 meters apart in two orthogonal directions to achieve 400% coverage. The tow point was located at the vessel

stern on centerline. The system was operated at a 100-meter range scale with tow fish altitudes adjusted to 8-20% of the range scale. Average depths in survey area are 12 fathoms. Confidence checks were performed daily using features found in the course of the survey including sand waves, rocks, oil platforms and pipelines.

The data quality was reasonable considering the marginal weather and high currents in the work area, but some problems were encountered with very high stress on the tow cable and sonar fish. A failure occurred in the tow cable at the fish end, due to a open conductor in the starboard channel. This intermittent open conductor caused the data quality to suffer at times until the problem was identified and fixed. In addition, an intermittent problem was encountered due to the bulkhead connector on the 100 kHz sonar fish as a carbon trace between the 750-volt trigger line and seawater. This problem was very intermittent and was made worse by the high towing speeds encountered during the survey at the survey site. The strumming of the tow cable would effect the mechanical connection of the tow cable and the sonar fish causing a slight electrical path for a high voltage leak. Thus not allowing the transmit capacitor in the towed fish to fully charge for consistent ping rates. Lines with marginal data quality were re-surveyed while in the field to ensure sufficient coverage with useable data. ✓ Concur

---

Charting Recommendation

Recommended Least Depth: The item was not found. The item is of unknown diameter and may be too small to be detected. It is recommended that the item be left on the chart. CONCUR

==========

Office Use:

O. Not Used by Contractor ✓

P. Aids to Navigation ✓ SEE EVAL. REPORT, SECTION Q

A red NUN "2" buoy was located in the survey area. Its position and description is in agreement with East Forelands Buoy 2 listed in Light List Volume VI and its charted position on Chart 16662. Buoy shown on smooth sheet as found during survey.

East Forelands Buoy 2	Latitude	Longitude
Light List Position	60°42.4' N ✓	151°30.6'W ✓
Scaled Position Chart 16662 5th Ed. July 5, 1997	60°42.36'N	151°30.63'W
Found positions this survey		
Flood	60° 42.374'N	151° 30.679'W
Ebb	60° 42.366'N	151° 30.649'W
Mean:	60° 42.370'N	151° 30.664'W

Q. Statistics ✓

The following list of statistics applies to surveying performed from the *Sea Ducer*, the only vessel used on this survey.

Lineal Nautical Miles of Sounding Lines (Shallow Water Multibeam)	708
Lineal Nautical Miles of Side Scan Sonar	0
Square Nautical Miles (100% Shallow Water Multibeam Coverage)	8.1
Days of data acquisition	30
Total number of soundings	236,742,990
Number of selected soundings on preliminary smooth sheet	12,466
Number of detached positions	0
Number of bottom samples	29
Number of velocity casts	124
Number of Horizontal Control Stations Occupied / Established	0
Number of tide stations installed	0

R. Miscellaneous ✓

This survey found the general location and depths over the shoal to be very similar to the chart. Sand waves were found in several areas and when lines were run at later dates to cover holidays the locations of the wave crests had changed indicating movement. This movement was not unexpected in an area with peak currents in excess of 6 knots.

The smooth sheet soundings were analyzed for the number of soundings representing each beam on the Reson 8101 and are included below.

S. Recommendations ✓

We are unaware of any planned activities involving construction or dredging within or adjacent to this area.

```
1        National Geodetic Survey,   Retrieval Date = JULY 15, 1997
 AB6390 ***********************************************************************
 AB6390  CORS          -  This is a GPS Continuously Operating Reference Station.
 AB6390  DESIGNATION   -  KENAI 1 CORS L1 PHASE CENTER
 AB6390  CORS_ID       -  KEN1_19960131
 AB6390  PID           -  AB6390
 AB6390  STATE/COUNTY- AK/KETCHIKAN GATEWAY BOROUGH
 AB6390  USGS QUAD     -
 AB6390
 AB6390                          *CURRENT SURVEY CONTROL
 AB6390
 AB6390* NAD 83(CORS)-  60 40 30.28642(N)     151 21 00.57281(W)      ADJUSTED
 AB6390* NAVD 88      -
 AB6390
 AB6390  EPOCH DATE   -         1996.00
 AB6390  X            -  -2,748,338.082 (meters)                      COMP
 AB6390  Y            -  -1,501,545.462 (meters)                      COMP
 AB6390  Z            -   5,537,749.048 (meters)                      COMP
 AB6390  ELLIP HEIGHT-            55.66  (meters)                      GPS OBS
 AB6390  GEOID HEIGHT-             7.76  (meters)                      GEOID96
 AB6390
 AB6390  HORZ ORDER   -  SPECIAL (CORS)
 AB6390  ELLP ORDER   -  SPECIAL (CORS)
 AB6390
 AB6390
 AB6390
 AB6390.ITRF positions are available for this station.
 AB6390.The coordinates were established by GPS observations
 AB6390.and adjusted by the National Geodetic Survey in April 1996.
 AB6390.The coordinates are valid at the epoch date displayed above.
 AB6390.The epoch date for horizontal control is a decimal equivalence
 AB6390.of Year/Month/Day.
 AB6390
 AB6390
 AB6390.The XYZ, and position/ellipsoidal ht. are equivalent.
 AB6390
 AB6390.The ellipsoidal height was determined by GPS observations
 AB6390.and is referenced to NAD 83.
 AB6390
 AB6390.The geoid height was determined by GEOID96.
 AB6390
 AB6390                          SUPERSEDED SURVEY CONTROL
 AB6390
 AB6390.No superseded survey control is available for this station.
 AB6390
 AB6390_STATION IS THE L1 PHASE CENTER OF THE GPS ANTENNA
 AB6390
 AB6390                          STATION DESCRIPTION
 AB6390
 AB6390'DESCRIBED BY NATIONAL GEODETIC SURVEY 1996
 AB6390'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
 AB6390'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
 AB6390'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
 AB6390'    FTP CORS.NGS.NOAA.GOV: CORS/COORD  AND  CORS/STATION_LOG
 AB6390'    HTTP://WWW.NGS.NOAA.GOV  UNDER PRODUCTS AND SERVICES.
```

```
1        National Geodetic Survey,   Retrieval Date = JULY 15, 1997
 AB6391
 ***********************************************************************
 AB6391  CORS         -  This is a GPS Continuously Operating Reference
 Station.
 AB6391  DESIGNATION -  KODIAK 1 CORS L1 PHASE CENTER
 AB6391  CORS_ID      -  KOD1_19960201
 AB6391  PID          -  AB6391
 AB6391  STATE/COUNTY-  AK/ANCHORAGE BOROUGH
 AB6391  USGS QUAD    -  KODIAK C-1
 AB6391
 AB6391                          *CURRENT SURVEY CONTROL
 AB6391
 ______________________________________________________________________
 AB6391* NAD 83(CORS)-  57 37 03.68582(N)     152 11 36.26128(W)      ADJUSTED
 AB6391* NAVD 88      -
 AB6391
 ______________________________________________________________________
 AB6391  EPOCH DATE   -        1996.00
 AB6391  X            -  -3,028,720.128  (meters)                    COMP
 AB6391  Y            -  -1,597,308.467  (meters)                    COMP
 AB6391  Z            -   5,363,076.245  (meters)                    COMP
 AB6391  ELLIP HEIGHT-          26.63    (meters)                    GPS OBS
 AB6391  GEOID HEIGHT-          13.70    (meters)                    GEOID96
 AB6391
 AB6391  HORZ ORDER   -  SPECIAL (CORS)
 AB6391  ELLP ORDER   -  SPECIAL (CORS)
 AB6391
 AB6391
 AB6391
 AB6391.ITRF positions are available for this station.
 AB6391.The coordinates were established by GPS observations
 AB6391.and adjusted by the National Geodetic Survey in April 1996.
 AB6391.The coordinates are valid at the epoch date displayed above.
 AB6391.The epoch date for horizontal control is a decimal equivalence
 AB6391.of Year/Month/Day.
 AB6391
 AB6391
 AB6391.The XYZ, and position/ellipsoidal ht. are equivalent.
 AB6391
 AB6391.The ellipsoidal height was determined by GPS observations
 AB6391.and is referenced to NAD 83.
 AB6391
 AB6391.The geoid height was determined by GEOID96.
 AB6391
 AB6391                            SUPERSEDED SURVEY CONTROL
 AB6391
 AB6391.No superseded survey control is available for this station.
 AB6391
 AB6391_STATION IS THE L1 PHASE CENTER OF THE GPS ANTENNA
 AB6391
 AB6391                            STATION DESCRIPTION
 AB6391
 AB6391'DESCRIBED BY NATIONAL GEODETIC SURVEY 1996
 AB6391'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
 AB6391'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
 AB6391'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
 AB6391'    FTP CORS.NGS.NOAA.GOV: CORS/COORD  AND  CORS/STATION_LOG
 AB6391'    HTTP://WWW.NGS.NOAA.GOV  UNDER PRODUCTS AND SERVICES.
```

```
1        National Geodetic Survey,   Retrieval Date = JULY 15, 1997
 AB8268
 ***********************************************************************
 AB8268  CORS         -  This is a GPS Continuously Operating Reference
 Station.
 AB8268  DESIGNATION -  CAPE HINCHINBROOK 1 CORS L1 PHASE CENTER
 AB8268  CORS_ID      -  CHI1_19960913
 AB8268  PID          -  AB8268
 AB8268  STATE/COUNTY-  AK/VALDEZ-CORDOVA CENSUS
 AB8268  USGS QUAD    -
 AB8268
 AB8268                          *CURRENT SURVEY CONTROL
 AB8268
 AB8268* NAD 83(CORS)-  60 14 14.88761(N)     146 38 49.06012(W)      ADJUSTED
 AB8268* NAVD 88      -
 AB8268
 AB8268  EPOCH DATE   -        1996.00
 AB8268  X            -  -2,651,410.756 (meters)                      COMP
 AB8268  Y            -  -1,745,166.941 (meters)                      COMP
 AB8268  Z            -   5,513,731.800 (meters)                      COMP
 AB8268  ELLIP HEIGHT-          84.64   (meters)                      GPS OBS
 AB8268  GEOID HEIGHT-          13.25   (meters)                      GEOID96
 AB8268
 AB8268  HORZ ORDER   -  SPECIAL (CORS)
 AB8268  ELLP ORDER   -  SPECIAL (CORS)
 AB8268
 AB8268
 AB8268
 AB8268.ITRF positions are available for this station.
 AB8268.The coordinates were established by GPS observations
 AB8268.and adjusted by the National Geodetic Survey in October 1996.
 AB8268.The coordinates are valid at the epoch date displayed above.
 AB8268.The epoch date for horizontal control is a decimal equivalence
 AB8268.of Year/Month/Day.
 AB8268
 AB8268
 AB8268.The XYZ, and position/ellipsoidal ht. are equivalent.
 AB8268
 AB8268.The ellipsoidal height was determined by GPS observations
 AB8268.and is referenced to NAD 83.
 AB8268
 AB8268.The geoid height was determined by GEOID96.
 AB8268
 AB8268                            SUPERSEDED SURVEY CONTROL
 AB8268
 AB8268.No superseded survey control is available for this station.
 AB8268
 AB8268_STATION IS THE L1 PHASE CENTER OF THE GPS ANTENNA
 AB8268
 AB8268                            STATION DESCRIPTION
 AB8268
 AB8268'DESCRIBED BY NATIONAL GEODETIC SURVEY 1996
 AB8268'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
 AB8268'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
 AB8268'BY ANONYMOUS FTP OR THE WORLDWIDE WEB.
 AB8268'    FTP CORS.NGS.NOAA.GOV: CORS/COORD  AND  CORS/STATION_LOG
 AB8268'    HTTP://WWW.NGS.NOAA.GOV  UNDER PRODUCTS AND SERVICES.
```

1 National Geodetic Survey, Retrieval Date = JULY 15, 1997

TT0543 **********

TT0543 DESIGNATION - NIK
TT0543 PID - TT0543
TT0543 STATE/COUNTY- AK/ANCHORAGE BOROUGH
TT0543 USGS QUAD -
TT0543
TT0543 *CURRENT SURVEY CONTROL
TT0543
TT0543* NAD 83(1986)- 60 40 58.70650(N) 151 23 57.33065(W) ADJUSTED
TT0543* NAVD 88 - 9.000 (meters) 29.53 (feet) ADJUSTED
TT0543
TT0543 LAPLACE CORR- -20.51 (seconds) DEFLEC96
TT0543 GEOID HEIGHT- 7.88 (meters) GEOID96
TT0543 DYNAMIC HT - 9.011 (meters) 29.56 (feet) COMP
TT0543 MODELED GRAV- 981,818.5 (mgal) NAVD 88
TT0543
TT0543 HORZ ORDER - SECOND
TT0543 VERT ORDER - FIRST CLASS II
TT0543
TT0543
TT0543
TT0543.The horizontal coordinates were established by classical geodetic methods
TT0543.and adjusted by the National Geodetic Survey in July 1986.
TT0543
TT0543.The orthometric height was determined by differential leveling
TT0543.and adjusted by the National Geodetic Survey in June 1991.
TT0543
TT0543.The Laplace correction was computed from DEFLEC96 derived deflections.
TT0543
TT0543.The geoid height was determined by GEOID96.
TT0543
TT0543.The dynamic height is computed by dividing the NAVD 88
TT0543.geopotential number by the normal gravity value computed on the
TT0543.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
TT0543.degrees latitude (G = 980.6199 gals.).
TT0543
TT0543.The modeled gravity was interpolated from observed gravity values.
TT0543

TT0543;	North	East	Units	Scale	Converg.
TT0543;SPC AK 4 -	744,992.050	423,547.879	MT	0.99997160	-1 13 12.4
TT0543;UTM 05 -	6,728,541.433	587,433.029	MT	0.99969367	+1 23 44.9

TT0543

TT0543:	Primary Azimuth Mark	Grid Az
TT0543:SPC AK 4 -	SALAM 1964	162 49 41.9
TT0543:UTM 05 -	SALAM 1964	160 12 44.6

TT0543

TT0543 PID	Reference Object	Distance	Geod. Az dddmmss.s
TT0543	NIK RM 1	11.430 METERS	05302
TT0543 TT0542	945 5760 TIDAL 1	307.388 METERS	07204
TT0543	NIK RM 2	18.581 METERS	13041
TT0543 UW5922	SALAM 1964	APPROX.11.6 KM	1613629.5
TT0543 UW5933	BOO 1961	23.387 METERS	34521

TT0543

TT0543 SUPERSEDED SURVEY CONTROL

TT0543
TT0543 NAD 27 - 60 41 00.75931(N) 151 23 49.25239(W) ADJUSTED
TT0543 NGVD 29 - 7.193 (meters) 23.60 (feet) ADJ UNCH
TT0543
TT0543.Superseded values are not recommended for survey control.
TT0543.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.

TT0543.See file format.dat to determine how the superseded data were derived.
TT0543
TT0543_MARKER: DS = TRIANGULATION STATION DISK
TT0543_SETTING: 38 = SET IN THE ABUTMENT OR PIER OF A LARGE BRIDGE
TT0543_STAMPING: NIK 1964
TT0543_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
TT0543_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
TT0543+SATELLITE: SATELLITE OBSERVATIONS - May 06, 1996
TT0543

TT0543 HISTORY	- Date	Condition	Recov. By
TT0543 HISTORY	- 1964	MONUMENTED	CGS
TT0543 HISTORY	- 1966	GOOD	CGS
TT0543 HISTORY	- 1969	GOOD	CGS
TT0543 HISTORY	- 1971	GOOD	NGS
TT0543 HISTORY	- 1973	GOOD	NGS
TT0543 HISTORY	- 1974	GOOD	NGS
TT0543 HISTORY	- 1976	GOOD	NGS
TT0543 HISTORY	- 19960506	GOOD	NGS

TT0543
TT0543 STATION DESCRIPTION
TT0543
TT0543'DESCRIBED BY COAST AND GEODETIC SURVEY 1964 (VBM)
TT0543'STATION IS LOCATED ABOUT 9 MILES NORTH OF KENAI ON THE EAST SIDE
TT0543'OF COOK INLET, AND ON THE WEST SIDE OF THE KENAI PIPE LINE PIER
TT0543'THAT PROJECTS ABOUT 1000 FEET OUT INTO THE INLET.
TT0543'
TT0543'TO REACH FROM THE POST OFFICE IN KENAI, GO EAST 0.05 MILE TO
TT0543'CROSSROADS, TURN LEFT AND GO NORTH ON THE MAIN ROAD FOR 2.7
TT0543'MILES AT THE WILDWOOD ARMY STATION ON THE RIGHT, CONTINUE NORTH
TT0543'ON THE MAIN GRAVEL ROAD FOR 8.0 MILES TO A SIDE ROAD LEFT,
TT0543'CONTINUE NORTH FOR 0.25 MILE, AT THE OFFICE OF THE KENAI PIPE
TT0543'LINE COMPANY, TURN LEFT, WEST, AND PASS THROUGH GATE ON NORTH
TT0543'SIDE OF OFFICE FOLLOWING MAIN TRAVELED ROAD FOR 0.4 MILE TO
TT0543'LARGE PIER. STATION IS AT EXTREME WEST END OF THE PIER.
TT0543'
TT0543'STATION MARK IS A STANDARD TRIANGULATION STATION MARK DISK,
TT0543'CEMENTED IN A DRILL HOLE IN THE CONCRETE PIER. IT IS STAMPED
TT0543'NIK 1964. MARK IS 76 FEET SOUTH OF A BOOM WITH TWO ARMS AND
TT0543'4.6 FEET EAST OF WEST EDGE OF PIER.
TT0543'
TT0543'REFERENCE MARK NUMBER 1 IS A PUNCH MARK IN THE SOUTHWEST BOLT
TT0543'HOLDING A METAL LIGHT POLE TO THE CEMENT PIER. IT IS THE
TT0543'FIRST LIGHT POLE ON THE RIGHT AS YOU ENTER THE MAIN PART OF
TT0543'THE PIER.
TT0543'
TT0543'REFERENCE MARK NUMBER 2 IS A PUNCH MARK IN A BOLT HOLDING A
TT0543'LARGE CAT-HEAD TO THE CEMENT PIER. THE CAT-HEAD IS ON THE
TT0543'SOUTHEAST END OF THE MAIN PART OF THE PIER.
TT0543
TT0543 STATION RECOVERY (1966)
TT0543
TT0543'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1966 (GLS)
TT0543'STATION RECOVERED IN GOOD CONDITION AS DESCRIBED IN 1964.
TT0543'ADDITION SHOULD BE MADE TO DESCRIPTION THAT PERMISSION MUST
TT0543'BE OBTAINED AT KENAI PIPELINE COMPANY OFFICE FOR ACCESS TO PIER.
TT0543
TT0543 STATION RECOVERY (1969)
TT0543
TT0543'RECOVERY NOTE BY COAST AND GEODETIC SURVEY 1969 (EAT)
TT0543'STATION RECOVERED IN GOOD CONDITION. DESCRIPTION ADEQUATE.
TT0543
TT0543 STATION RECOVERY (1971)
TT0543
TT0543'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1971

TT0543'1 MI W FROM NORTH KENAI.
TT0543'THE STATION IS LOCATED ABOUT 1 MILE WEST OF THE NORTH KENAI POST
TT0543'OFFICE ON THE EAST SIDE OF COOK INLET AND ON THE WEST SIDE OF THE
TT0543'KENAI PIPELINE PIER WHICH IS THE NORTHERN ONE OF 3 PIERS THAT PROJECT
TT0543'ABOUT 1,000 FEET OUT INTO THE INLET. TO REACH FROM THE POST OFFICE IN
TT0543'NORTH KENAI, DRIVE NORTH ON THE PAVED HIGHWAY 0.7 MILES, AT THE OFFICE
TT0543'OF THE KENAI PIPELINE COMPANY TURN LEFT WEST AND PASS THROUGH GATE ON
TT0543'NORTH SIDE OF OFFICE FOLLOWING MAIN TRAVELED ROAD FOR 0.4 MILES TO
TT0543'LARGE PIER. ACCESS TO GATE AND PIER MUST BE OBTAINED FROM KENAI
TT0543'PIPELINE COMPANY OFFICE. STATION IS AT EXTREME WEST END OF THE PIER.
TT0543'STATION MARK IS A STANDARD TRIANGULATION STATION MARK DISK, CEMENTED
TT0543'IN A DRILL HOLE IN THE CONCRETE PIER. IT IS STAMPED NIK 1964. MARK IS
TT0543'76 FEET SOUTH OF BOOM WITH 2 ARMS 4.7 FEET EAST OF WEST EDGE OF PIER,
TT0543'13 FEET FROM CENTER OF THE APPROACH PIER, 46 FEET WEST FROM NORTHWEST
TT0543'CORNER OF HOUSE AND 11 FEET SOUTH OF 3RD BIT FROM SOUTH END OF DOCK.
TT0543'SEC 21, T 6N, R 12W.
TT0543
TT0543 STATION RECOVERY (1973)
TT0543
TT0543'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1973 (RBM)
TT0543'THE STATION AND REFERENCE MARKS WERE RECOVERED IN GOOD CONDITION
TT0543'EXCEPT REFERENCE MARK 2 IS A PUNCH MARK ON A LARGE BOLT THAT
TT0543'SECURES A CAPSTAN TO THE DECK OF THE PIER.
TT0543'
TT0543'AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN--9 MILES
TT0543'NORTH OF KENAI
TT0543
TT0543 STATION RECOVERY (1974)
TT0543
TT0543'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1974 (CAB)
TT0543'THE STATION MARK WAS RECOVERED IN GOOD CONDITION APPROXIMATELY 23
TT0543'METERS FROM TRIANGULATION STATION BOO 1961. THE ORIGINAL
TT0543'DESCRIPTION WAS NOT AVAILABLE.
TT0543'
TT0543'AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN--9 MILES N OF
TT0543'KENAI.
TT0543
TT0543 STATION RECOVERY (1976)
TT0543
TT0543'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1976 (REA)
TT0543'THE STATION WAS RECOVERED IN GOOD CONDITION BY THE NOAA SHIP
TT0543'FAIRWEATHER AS DESCRIBED BY V.B.M. IN 1964 EXCEPT THE PIER IS
TT0543'NOW OPERATED BY THE STANDARD OIL COMPANY. PERMISSION TO OCCUPY
TT0543'THE STATION MAY BE OBTAINED BY VISITING THEIR OFFICE APPROXIMATELY
TT0543'1/2 MILE NORTH OF THE PIER.
TT0543'
TT0543'AIRLINE DISTANCE AND DIRECTION FROM NEAREST TOWN--9 MILES NORTH
TT0543'OF KENAI
TT0543
TT0543 STATION RECOVERY (1996)
TT0543
TT0543'RECOVERY NOTE BY NATIONAL GEODETIC SURVEY 1996 (JGF)
TT0543'RECOVERED AS DESCRIBED. THE PROPERTY IS NOW OWNED BY THE TESORO OIL
TT0543'COMPANY. PERMISSION TO ACCESS THE PROPERTY MUST BE OBTAINED FROM THE
TT0543'TESORO PEOPLE ACROSS THE STREET AT THE REFINERY. A TELEPHONE NUMBER
TT0543'TO START WITH IS 907-776-3560 OR 8191.

TERRA SURVEYS LLC

ADVANCE INFORMATION

September 5, 1998

Commander (OAN)
Seventeenth Coast Guard District
P.O. Box 25517
Juneau, Alaska 99802-5517

Reference: NOAA Survey Number H-10802
Contract Number OPR-P367-KR

Dear Sir:

While conducting hydrographic survey operations for the approaches to Nikiski, Alaska (NOAA survey H-10802), Terra Surveys, LLC found numerous rocks either uncharted or shown deeper than this survey indicates. Attached is the Danger to Navigation Report and a section of chart 16662 indicating the position of these dangers.

Differential GPS and multibeam sonar were used to determine the position and depth. These data are preliminary and subject to office review.

Sincerely,
Terra Surveys, LLC

Robert Kohut, PLS
Partner

Enclosures

Cc: Gary Nelson
NOAA (COTR)

1930 South Whiting Circle – P.O. Box 1549 – Palmer, Alaska 99645 – Phone: (907) 745-7215 – Fax: (907) 746-5197 – Email: terra@alaska.net

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry: H-10802
State: Alaska
General Locality: Cook Inlet
Sublocality: West of Nikiski
Project Number: OPR-P367-KR

ADVANCE INFORMATION

The following items were found during hydrographic survey operations:

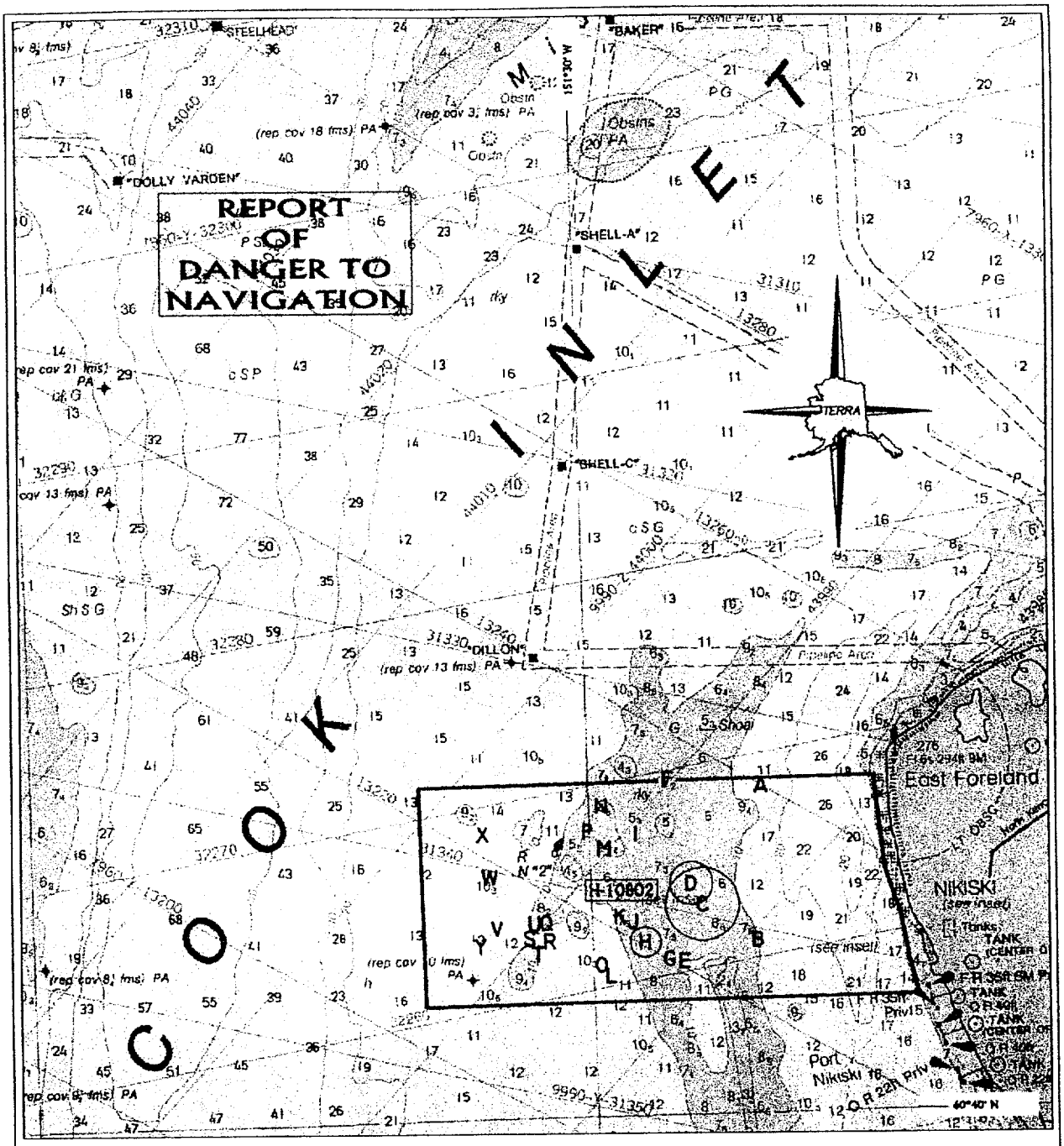
Objects Discovered: Rocks

Within the survey area bounded by Latitude 60°41'00.6"N and 60°42'58.0"N and Longitudes 151°24'10.6"W and 151°33'03.3"W numerous rocks were found. Within the 10 fathom curve rocks as shallow as 4 fathoms 1 foot were found. Numerous rocks were found to the east and west of the 10 fathom curve the most significant of which are listed below.

Items listed with a radius are the most significant of a cluster of rocks. All items listed were corrected to Mean Lower Low Water using observed tide correctors and affect charts:

Chart Number	Edition (Number / Date)
16662	5 / July 05, 1997
16663	5 / July 12, 1996
16660	27 / April 19, 1997

ITEM	RADIUS	REPORTED DEPTH	CHARTED HORIZ. DATUM	GEOGRAPHIC POSITION	
				LATITUDE	LONGITUDE
A	N/A	10 Fathoms 2 feet	NAD83	60° 42' 54.2 " N	151° 26' 53.9 " W
B	N/A	9 Fathoms 1 feet	NAD83	60° 41' 32.1 " N	151° 27' 2.8 " W
C	600 meter	7 Fathoms 4 feet	NAD83	60° 41' 51.5 " N	151° 28' 1.1 " W
D	350 meter	6 Fathoms 3 feet	NAD83	60° 42' 2.9 " N	151° 28' 12.5 " W
E	N/A	8 Fathoms 0 feet	NAD83	60° 41' 15.5 " N	151° 28' 29.3 " W
F	N/A	6 Fathoms 5 feet	NAD83	60° 42' 58.7 " N	151° 28' 33.6 " W
G	N/A	7 Fathoms 5 feet	NAD83	60° 41' 16.9 " N	151° 28' 38.6 " W
H	250 meter	7 Fathoms 0 feet	NAD83	60° 41' 32.3 " N	151° 29' 3.7 " W
I	N/A	4 Fathoms 3 feet	NAD83	60° 42' 30.0 " N	151° 29' 9.9 " W
J	N/A	6 Fathoms 4 feet	NAD83	60° 41' 43.4 " N	151° 29' 16.6 " W
K	N/A	6 Fathoms 4 feet	NAD83	60° 41' 46.2 " N	151° 29' 30.0 " W
L	N/A	9 Fathoms 3 feet	NAD83	60° 41' 14.9 " N	151° 29' 41.2 " W
M	N/A	4 fathoms 1 feet	NAD83	60° 42' 22.8 " N	151° 29' 44.8 " W
N	N/A	4 fathoms 1 feet	NAD83	60° 42' 45.3 " N	151° 29' 46.5 " W
O	N/A	9 fathoms 2 feet	NAD83	60° 41' 20.8 " N	151° 29' 51.6 " W
P	N/A	4 fathoms 1 feet	NAD83	60° 42' 31.7 " N	151° 30' 2.4 " W
Q	N/A	8 fathoms 2 feet	NAD83	60° 41' 42.3 " N	151° 30' 52.3 " W
R	N/A	8 fathoms 0 feet	NAD83	60° 41' 32.0 " N	151° 30' 58.8 " W
S	N/A	8 fathoms 0 feet	NAD83	60° 41' 30.3 " N	151° 30' 59.1 " W
T	N/A	8 fathoms 5 feet	NAD83	60° 41' 26.8 " N	151° 31' 0.6 " W
U	N/A	9 fathoms 0 feet	NAD83	60° 41' 38.2 " N	151° 31' 5.2 " W
V	N/A	10 fathoms 0 feet	NAD83	60° 41' 41.5 " N	151° 31' 43.2 " W
W	N/A	8 fathoms 4 feet	NAD83	60° 42' 8.9 " N	151° 31' 49.0 " W
X	N/A	8 fathoms 5 feet	NAD83	60° 42' 31.6 " N	151° 31' 55.3 " W
Y	N/A	10 fathoms 0 feet	NAD83	60° 41' 32.2 " N	151° 32' 1.1 " W



ADVANCE INFORMATION

REFER TO ACCOMPANYING TEXT FOR ITEM DETAILS

OPR-P367-KR
H-10802
Northern Approach to Port of Nikiski
Surveyed By Terra Surveys, LLC
Lead Hydrographer: Robert Kohut
Survey Vessel: Sea Ducer
Chart 16662 5th Ed., July 5, 1997
Scale of Sketch: 1:100,000
Scale of Survey 1:10,000

0 1 2 3

Nautical Miles

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-0070

July 31, 2000

Commander (OAN)
Seventeenth Coast Guard District
Post Office Box 25517
Juneau, Alaska 99802

During office review of hydrographic survey H-10802 West of Nikiski, Cook Inlet, Alaska, ten (10) potential dangers to navigation have been identified that affect the following charts:

Chart	Edition	Date	Datum
16660	27th Edition	April 19, 1997	NAD83
16662	5th Edition	July 5, 1997	NAD83
16662, Nikiski Inset	5th Edition	July 5, 1997	NAD83
16663	5th Edition	July 12, 1997	NAD83

It is recommended that the enclosed Report of Dangers to Navigation be included in the Local Notice To Mariners.

In addition, it should be noted that, due to numerous boulders, migrating shoals and generally shoaling depths since the area was originally charted, mariners should proceed with extreme caution in the vicinity of north latitudes 60°39.5' to 60°44.0', west longitudes 151°23.5' to 151°33.5'.

Questions concerning this report should be directed to the Pacific Hydrographic Branch at (206) 526-6836.

Sincerely

James C. Gardner
Commander, NOAA
Chief, Pacific Hydrographic Branch

Enclosure

cc: NIMA
N/CS261

REPORT OF DANGERS TO NAVIGATION

Hydrographic Survey Registry Number: H-10802

Survey Title: State: Alaska
Locality: Cook Inlet
Sublocality: West of Nikiski

Project Number: OPR-P367-KR

Survey Date: June - August 1998

Features are reduced to Mean Lower Low Water and are positioned on NAD 83.

Affected Nautical Charts:

Chart	Edition	Date	Datum
16660	27th Edition	April 19, 1997	NAD83
16662	5th Edition	July 5, 1997	NAD83
16662, Nikiski Inset	5th Edition	July 5, 1997	NAD83
16663	5th Edition	July 12, 1997	NAD83

ITEM	DANGER TO NAVIGATION	DECIMAL FMS / FMS & FEET	LATITUDE (N)	LONGITUDE (W)
1	Rock	8fm	60°42'32.0"	151°30'51.2"
2	Shoal	4.6fm / 4fm 3ft	60°42'38.9"	151°29'11.9"
3	Shoal	4.2fm / 4fm 1ft	60°42'34.9"	151°28'34.5"
4	Shoal	5fm	60°42'41.9"	151°27'54.9"
5	Shoal	6.6fm / 6fm 3ft	60°42'39.5"	151°27'27.8"
6	Rock	3.4fm / 3fm 2ft	60°42'17.6"	151°30'09.6"
7	Rock	4.8fm / 4fm 5ft	60°42'15.9"	151°29'21.7"
8	Shoal	6.2fm / 6fm 1ft	60°42'21.5"	151°28'23.3"
9	Shoal	3.7fm / 3fm 4ft	60°41'39.2"	151°27'48.5"
10	Shoal	3.1fm / 3fm	60°41'01.6"	151°27'34.1"

Questions concerning this report should be directed to the Pacific Hydrographic Branch at (206) 526-6836.

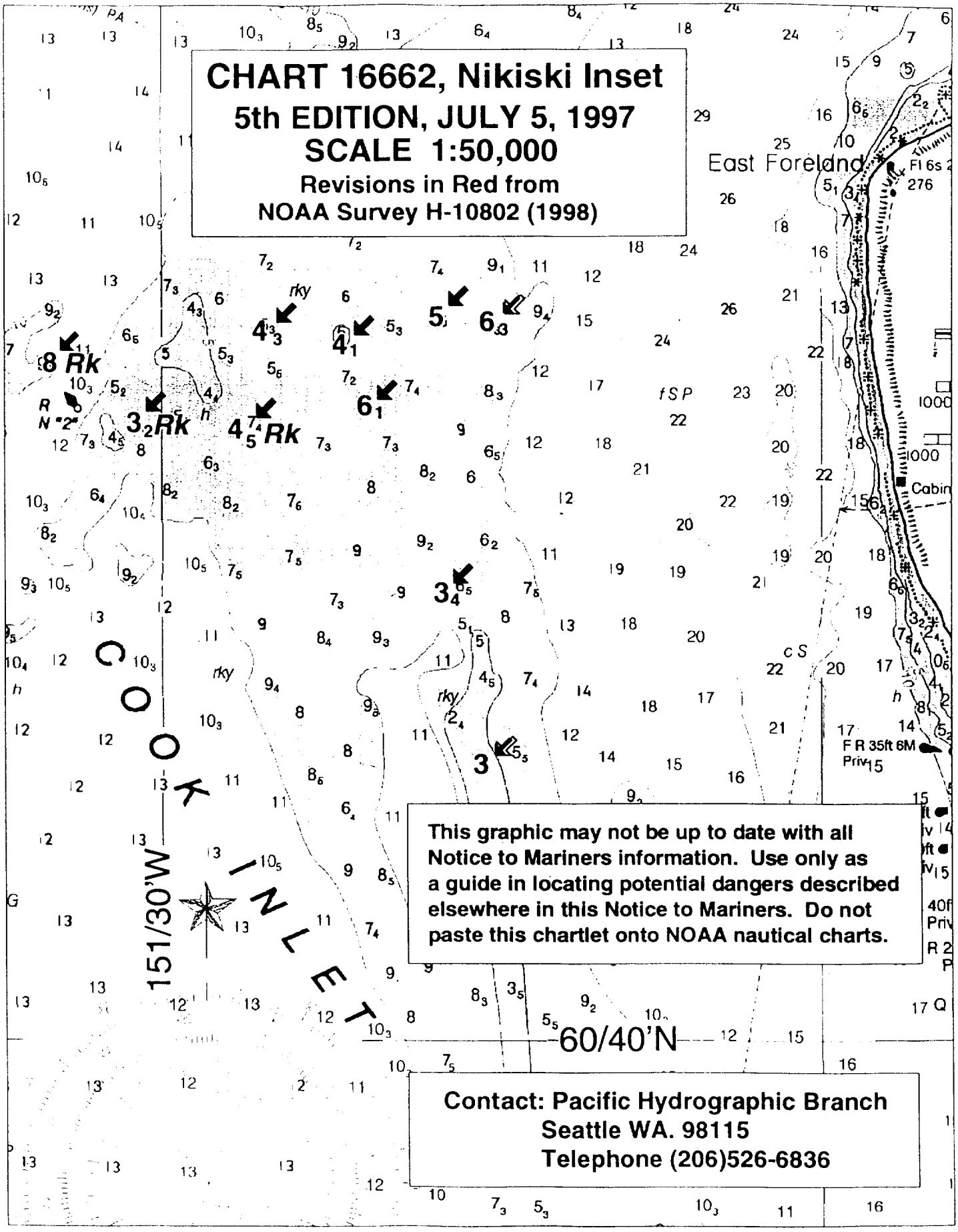


CHART 16662, Nikiski Inset
5th EDITION, JULY 5, 1997
SCALE 1:50,000
Revisions in Red from
NOAA Survey H-10802 (1998)
East Foreland
Fl 6s 2
276
Cabin
1000
1000
F R 35ft 6M
Priv
COOK INLET
151/30'W
60/40'N
This graphic may not be up to date with all Notice to Mariners information. Use only as a guide in locating potential dangers described elsewhere in this Notice to Mariners. Do not paste this chartlet onto NOAA nautical charts.
Contact: Pacific Hydrographic Branch
Seattle WA. 98115
Telephone (206)526-6836

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-0070

August 8, 2000

TO: Lynn Preston
Chief, Nautical Data Branch

FROM: Cdr. James C. Gardner, NOAA
Chief, Pacific Hydrographic Branch

SUBJECT: Report of Danger to Navigation

During office review of hydrographic survey H-10802 West of Nikiski, Cook Inlet, Alaska, it was discovered that recently applied adjustments for the new vertical tidal datum in Cook Inlet affected some of the dangers that were originally submitted. The corrections to two previously submitted dangers to navigation are considered significant and affect the following charts:

Chart	Edition	Date	Datum
16660	27th Edition	April 19, 1997	NAD83
16662	5th Edition	July 5, 1997	NAD83
16662, Nikiski Inset	5th Edition	July 5, 1997	NAD83
16663	5th Edition	July 12, 1997	NAD83

It is recommended that the enclosed Report of Dangers to Navigation be included in the Local Notice To Mariners.

Questions concerning this report should be directed to the Pacific Hydrographic Branch at (206) 526-6836.

Enclosure

cc: NIMA
N/CS261

REPORT OF DANGERS TO NAVIGATION

Hydrographic Survey Registry Number: H-10802

Survey Title: State: Alaska
Locality: Cook Inlet
Sublocality: West of Nikiski

Project Number: OPR-P367-KR

Survey Date: June - August 1998

Features are reduced to Mean Lower Low Water and are positioned on NAD 83.

Affected Nautical Charts:

Chart	Edition	Date	Datum
16660	27th Edition	April 19, 1997	NAD83
16662	5th Edition	July 5, 1997	NAD83
16662, Nikiski Inset	5th Edition	July 5, 1997	NAD83
16663	5th Edition	July 12, 1997	NAD83

ORIGINAL ITEM	DANGER TO NAVIGATION	DEPTH: ORIGINAL/ CORRECTED	NORTH LATITUDE	WEST LONGITUDE
Q	Rock	8fm2ft / 7fm5ft	60°41'42.3"	151°30'52.3"
U	Shoal	9fm / 8fm3ft	60°41'38.2"	151°31'05.2"

Questions concerning this report should be directed to the Pacific Hydrographic Branch at (206) 526-6836.

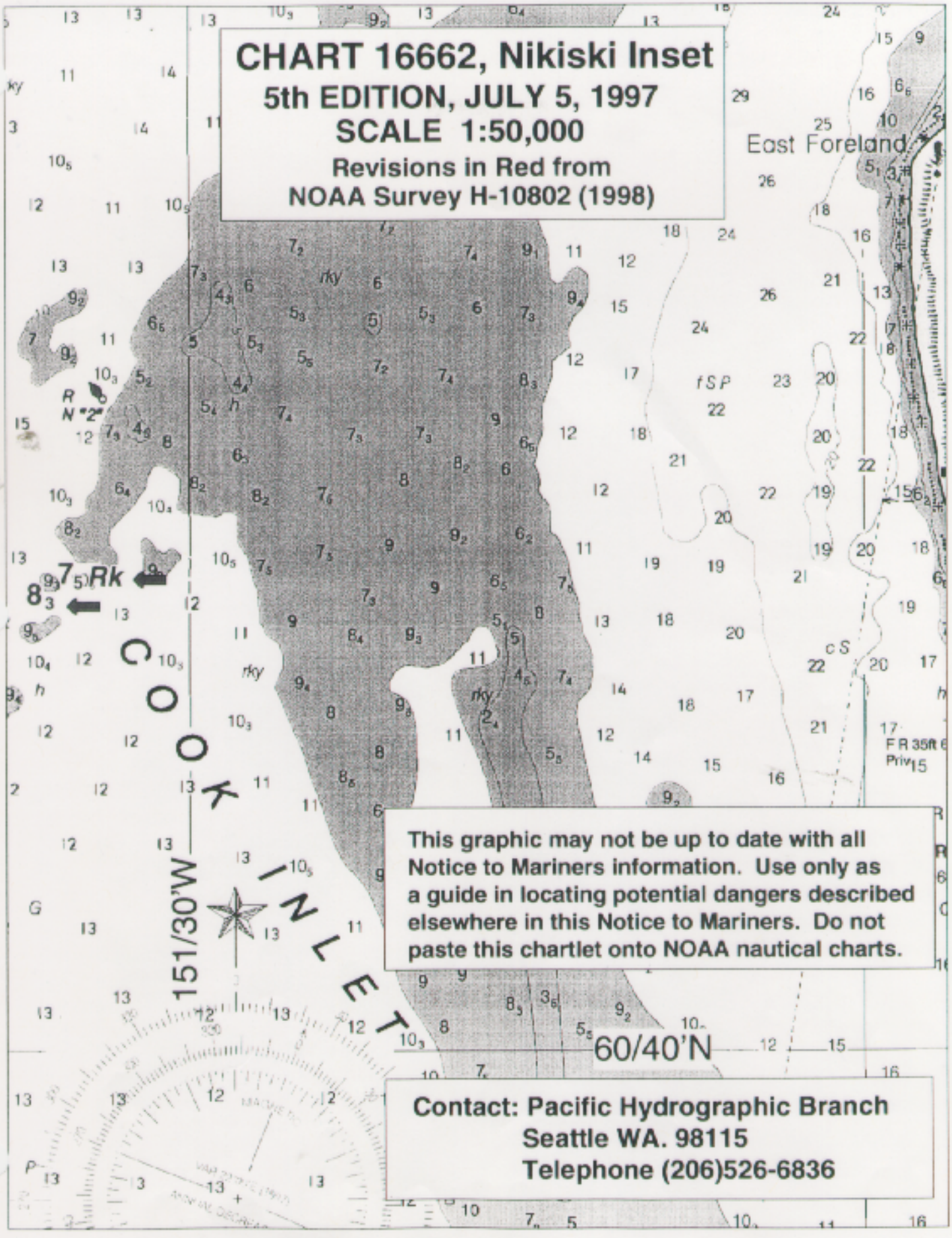


CHART 16662, Nikiski Inset
5th EDITION, JULY 5, 1997
SCALE 1:50,000
Revisions in Red from
NOAA Survey H-10802 (1998)
East Foreland
COOK INLET
151/30'W
60/40'N
This graphic may not be up to date with all Notice to Mariners information. Use only as a guide in locating potential dangers described elsewhere in this Notice to Mariners. Do not paste this chartlet onto NOAA nautical charts.
Contact: Pacific Hydrographic Branch
Seattle WA. 98115
Telephone (206)526-6836

TERRA SURVEYS LLC
Terrestrial and Sea Floor Mapping

LETTER OF APPROVAL

REGISTRY NO. H-10802

This report and the accompanying smooth sheet are respectfully submitted.

Field operations contributing to the accomplishment of survey H-10802 were conducted under my direct supervision with frequent checks of progress and adequacy. This report and smooth sheets have been closely reviewed and are considered complete and adequate as per the Statement of Work.

Thomas S. Newman
Hydrographer
Terra Surveys, LLC
July 17th, 2000

1930 South Whiting Circle - P.O. Box 1549 - Palmer, Alaska 99645-1549 - Phone: (907) 745-7215 - Fax: (907) 745-7273 - Email: terra@terra-surveys.com - Web Site: www.terra-surveys.com

Tide Notes

The field data was corrected with the preliminary tide data from the NOS Nikiski gage (945-5760) obtained from the NOS Internet site. The preliminary data was adjusted using an offset of –6.067 meters. The offset was obtained from a note left on the Internet site for users of the Nikiski gage. During the initial editing soundings were adjusted for tide in Caris with unzoned tide data.

The final tide data was obtained from the NOS internet site with the updated datum created by NOS' NWLON to be applied to all surveys performed after January 1, 1998. During the extraction of the soundings from Caris, the tidal zone for each profile was determined and the verified tidal data from the NOS Nikiski gage (945-5760) was used in conjunction with zoning parameters provided by NOS as seen below.

Tidal Zoning

The following tidal zoning was provided by NOS. This tidal zoning was used with the Nikiski gage to correct the soundings for this project.

Note: For time corrections, a negative (-) time correction indicates that the time of tide in that zone is earlier than (before) the predicted tides at the reference station, whereas, a positive (+) time correction indicates that the time of tide in that zone is later than (after) the predicted tides at the reference station. For height corrections, the water level heights **relative to MLLW** at the reference station are multiplied by the range ratio to estimate the water level heights relative to MLLW in the applicable zone.

		Time Corrector (Minutes)	**Range Ratio**
ZONE C200		-12	1.00
60 ° 40.91' N	151 ° 23.88' W		
60 ° 41.07' N	151 ° 25.99' W		
60 ° 37.64' N	151 ° 25.40' W		
60 ° 34.99' N	151 ° 25.20' W		
60 ° 34.56' N	151 ° 19.33' W		
60 ° 39.16' N	151 ° 21.25' W		
60 ° 40.91' N	151 ° 23.88' W		
ZONE C201		-12	0.99
60 ° 41.07' N	151 ° 25.99' W		
60 ° 41.28' N	151 ° 28.83' W		
60 ° 37.74' N	151 ° 27.99' W		
60 ° 35.16' N	151 ° 27.45' W		
60 ° 34.99' N	151 ° 25.20' W		
60 ° 37.64' N	151 ° 25.40' W		
60 ° 41.07' N	151 ° 25.99' W		

ZONE C202			-12	0.98
	60 ° 41.45' N	151 ° 31.06' W		
	60 ° 37.19' N	151 ° 29.84' W		
	60 ° 35.31' N	151 ° 29.47' W		
	60 ° 35.16' N	151 ° 27.45' W		
	60 ° 37.74' N	151 ° 27.99' W		
	60 ° 41.28' N	151 ° 28.83' W		
	60 ° 41.45' N	151 ° 31.06' W		
ZONE C203			-12	0.97
	60 ° 41.45' N	151 ° 31.06' W		
	60 ° 41.63' N	151 ° 33.48' W		
	60 ° 35.48' N	151 ° 31.87' W		
	60 ° 35.31' N	151 ° 29.47' W		
	60 ° 37.19' N	151 ° 29.84' W		
	60 ° 41.45' N	151 ° 31.06' W		
ZONE C212			+6	1.00
	60 ° 43.27' N	151 ° 24.54' W		
	60 ° 41.50' N	151 ° 26.04' W		
	60 ° 41.07' N	151 ° 25.99' W		
	60 ° 40.91' N	151 ° 23.88' W		
	60 ° 43.27' N	151 ° 24.54' W		
ZONE C213			+6	0.99
	60 ° 43.27' N	151 ° 24.54' W		
	60 ° 43.65' N	151 ° 27.08' W		
	60 ° 43.05' N	151 ° 28.49' W		
	60 ° 42.42' N	151 ° 28.83' W		
	60 ° 41.28' N	151 ° 28.83' W		
	60 ° 41.07' N	151 ° 25.99' W		
	60 ° 41.50' N	151 ° 26.04' W		
	60 ° 43.27' N	151 ° 24.54' W		
ZONE C214			+6	0.98
	60 ° 43.98' N	151 ° 29.35' W		
	60 ° 43.29' N	151 ° 31.01' W		
	60 ° 42.98' N	151 ° 31.46' W		
	60 ° 42.66' N	151 ° 31.52' W		
	60 ° 41.45' N	151 ° 31.06' W		
	60 ° 41.28' N	151 ° 28.83' W		
	60 ° 42.42' N	151 ° 28.83' W		
	60 ° 43.05' N	151 ° 28.49' W		
	60 ° 43.65' N	151 ° 27.08' W		
	60 ° 43.98' N	151 ° 29.35' W		

ZONE C215		+6	0.97
60 ° 43.98' N	151 ° 29.35' W		
60 ° 44.33' N	151 ° 31.56' W		
60 ° 43.28' N	151 ° 33.54' W		
60 ° 42.98' N	151 ° 33.85' W		
60 ° 42.73' N	151 ° 33.90' W		
60 ° 41.63' N	151 ° 33.48' W		
60 ° 41.45' N	151 ° 31.06' W		
60 ° 42.66' N	151 ° 31.52' W		
60 ° 42.98' N	151 ° 31.46' W		
60 ° 43.29' N	151 ° 31.01' W		
60 ° 43.98' N	151 ° 29.35' W		
ZONE C216		+6	0.96
60 ° 44.55' N	151 ° 33.11' W		
60 ° 43.34' N	151 ° 35.39' W		
60 ° 43.02' N	151 ° 35.76' W		
60 ° 41.79' N	151 ° 35.73' W		
60 ° 41.63' N	151 ° 33.48' W		
60 ° 42.73' N	151 ° 33.90' W		
60 ° 42.98' N	151 ° 33.85' W		
60 ° 43.28' N	151 ° 33.54' W		
60 ° 44.33' N	151 ° 31.56' W		
60 ° 44.55' N	151 ° 33.11' W		
ZONE C221		+24	0.99
60 ° 45.87' N	151 ° 20.76' W		
60 ° 45.45' N	151 ° 21.58' W		
60 ° 44.38' N	151 ° 25.41' W		
60 ° 43.65' N	151 ° 27.08' W		
60 ° 43.27' N	151 ° 24.54' W		
60 ° 44.51' N	151 ° 15.41' W		
60 ° 45.87' N	151 ° 20.76' W		
ZONE C222		+24	0.98
60 ° 44.64' N	151 ° 28.02' W		
60 ° 43.98' N	151 ° 29.35' W		
60 ° 43.65' N	151 ° 27.08' W		
60 ° 44.38' N	151 ° 25.41' W		
60 ° 45.45' N	151 ° 21.58' W		
60 ° 45.87' N	151 ° 20.76' W		
60 ° 46.55' N	151 ° 23.31' W		
60 ° 44.64' N	151 ° 28.02' W		

ZONE C223		+24	0.97
60 ° 46.55' N	151 ° 23.31' W		
60 ° 47.21' N	151 ° 25.87' W		
60 ° 44.33' N	151 ° 31.56' W		
60 ° 43.98' N	151 ° 29.35' W		
60 ° 44.64' N	151 ° 28.02' W		
60 ° 46.55' N	151 ° 23.31' W		
ZONE C224		+24	0.96
60 ° 47.72' N	151 ° 27.93' W		
60 ° 45.80' N	151 ° 30.72' W		
60 ° 44.55' N	151 ° 33.11' W		
60 ° 44.33' N	151 ° 31.56' W		
60 ° 47.21' N	151 ° 25.87' W		
60 ° 47.72' N	151 ° 27.93' W		
ZONE C225		+24	0.94
60 ° 48.19' N	151 ° 29.73' W		
60 ° 46.49' N	151 ° 31.86' W		
60 ° 44.79' N	151 ° 34.68' W		
60 ° 44.55' N	151 ° 33.11' W		
60 ° 45.80' N	151 ° 30.72' W		
60 ° 47.72' N	151 ° 27.93' W		
60 ° 48.19' N	151 ° 29.73' W		

Adequacy of Zoning

Analysis of the tidal zoning provided shows that the maximum error is along the phase lines or where adjacent zones have 18-minute differences in the adjustment off of the Nikiski gage. The absolute difference reaches a maximum difference of 0.72 meters and an average (absolute) difference of 0.27 meters. Added to the allowable accuracy of 0.3 meters for the soundings (exclusive of tide) the expected error along the edges of zones due to zoning will be at least 0.7 meters. A table on the following page lists the differences found between adjacent tide zones.

Abstract of Hydrography

Julian Day	Calendar Date	Start Time	End Time
157	6/06/98	17:00:34	23:59:02
158	6/07/98	00:53:22	23:44:57
159	6/08/98	01:30:10	23:39:44
160	6/09/98	00:42:00	23:45:20
161	6/10/98	00:00:00	22:44:24
162	6/11/98	18:52:22	23:59:59
163	6/12/98	00:13:08	23:55:33
164	6/13/98	00:03:31	01:48:53
171	6/20/98	21:06:00	23:53:26
172	6/21/98	00:04:49	20:23:15
173	6/22/98	17:19:53	23:14:45
174	6/23/98	00:02:23	22:40:05
175	6/24/98	18:37:47	19:30:18
176	6/25/98	00:42:40	23:55:53
177	6/26/98	00:02:21	23:55:16
178	6/27/98	00:01:52	11:38:04
179	6/28/98	06:18:51	13:15:37
180	6/29/98	00:52:48	18:32:30
189	7/08/98	18:47:34	23:32:23
190	7/09/98	00:35:53	17:58:08
225	8/13/98	20:18:48	23:46:38
226	8/14/98	00:03:35	22:37:14
227	8/15/98	01:45:51	02:27:23
238	8/26/98	17:45:11	23:59:59
239	8/27/98	00:04:10	23:50:10
240	8/28/98	00:02:10	23:53:43
241	8/29/98	00:02:48	23:57:23
242	8/30/98	00:02:00	23:59:12
243	8/31/98	00:01:05	02:46:06
244	9/01/98	21:13:32	23:37:38

Tide Zone Differences in height for Northern Approach to Nikiski, AK.

June 6, 1998 through October 11, 1998

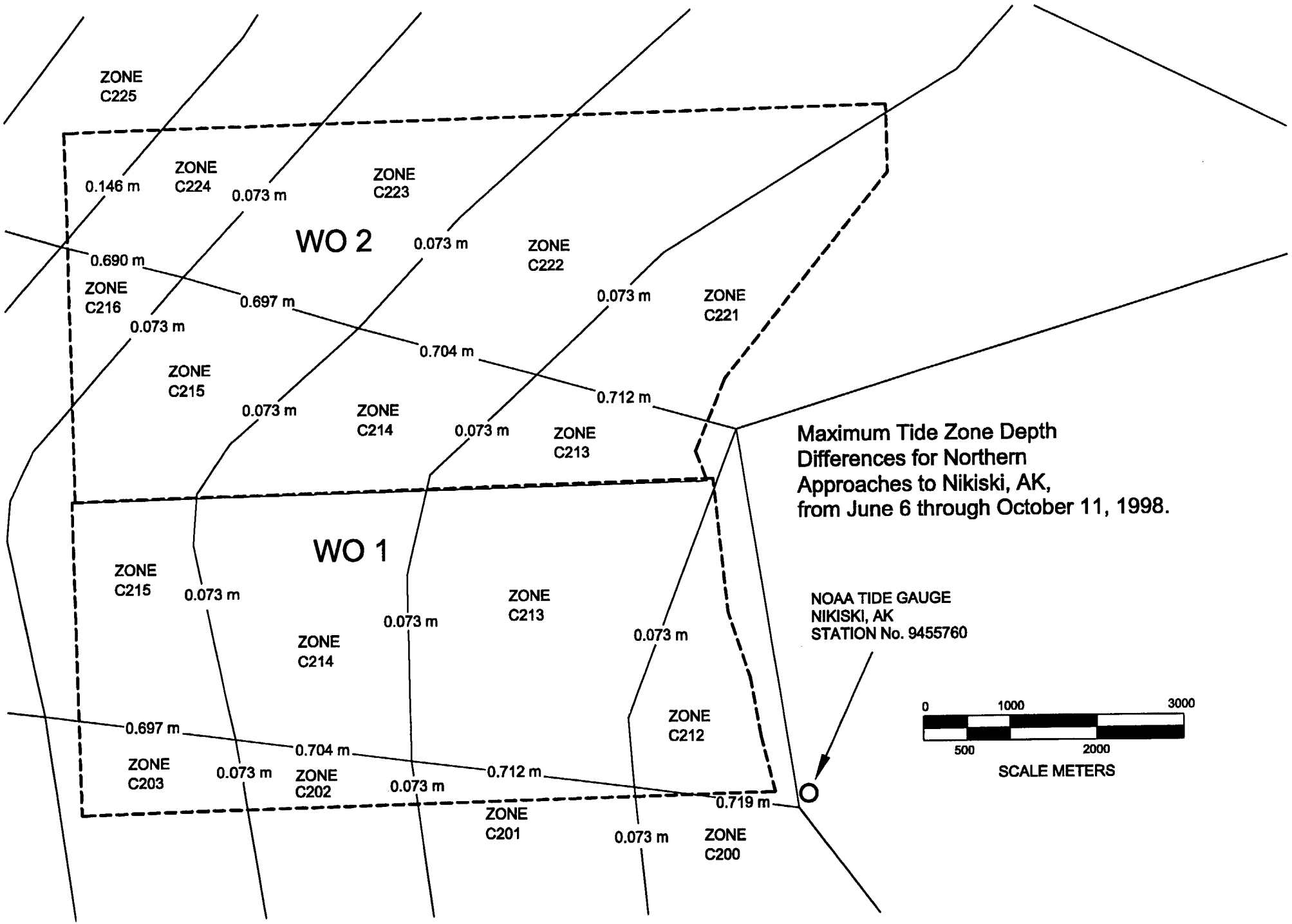
Based on NOAA Tide Gauge Station No. 9455760
Nikiski, AK

Note: Tidal Differences in Meters

	Zone C200 - C212	Zone C200 - C201	Zone C201 - C213	Zone C201 - C202	Zone C202 - C214	Zone C202 - C203	Zone C203 - C215
Max. =	0.719	0.073	0.712	0.073	0.704	0.073	0.697
Min. =	-0.586	-0.016	-0.580	-0.017	-0.574	-0.017	-0.569
Average (abs. value) =	0.269	0.031	0.266	0.031	0.263	0.031	0.260
Standard Deviation =	0.304	0.020	0.301	0.020	0.297	0.020	0.294

	Zone C212 - C213	Zone C213 - C221	Zone C213 - C214	Zone C214 - C222	Zone C214 - C215	Zone C215 - C223	Zone C215 - C216
Max. =	0.073	0.712	0.073	0.704	0.073	0.697	0.073
Min. =	-0.016	-0.580	-0.017	-0.574	-0.017	-0.569	-0.016
Average (abs. value) =	0.031	0.266	0.031	0.263	0.031	0.260	0.031
Standard Deviation =	0.020	0.301	0.020	0.297	0.020	0.294	0.020

	Zone C216 - C224	Zone C221 - C222	Zone C222 - C223	Zone C223 - C224	Zone C224 - C225	Zone C225 - C200
Max. =	0.690	0.073	0.073	0.073	0.146	0.877
Min. =	-0.563	-0.017	-0.017	-0.016	-0.033	-1.434
Average (abs. value) =	0.258	0.031	0.031	0.031	0.063	0.545
Standard Deviation =	0.291	0.020	0.020	0.020	0.040	0.598


ZONE C225
ZONE C224
ZONE C223
ZONE C222
ZONE C221
ZONE C216
ZONE C215
ZONE C214
ZONE C213
ZONE C212
ZONE C203
ZONE C202
ZONE C201
ZONE C200
WO 2
WO 1
0.146 m
0.073 m
0.690 m
0.697 m
0.704 m
0.712 m
0.719 m
Maximum Tide Zone Depth Differences for Northern Approaches to Nikiski, AK, from June 6 through October 11, 1998.
NOAA TIDE GAUGE
NIKISKI, AK
STATION No. 9455760
0
1000
3000
500
2000
SCALE METERS

NOAA FORM 76-155
(11-72)

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

GEOGRAPHIC NAMES

SURVEY NUMBER

H-10802

Name on Survey	A ON CHART NO. 16662	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		X							1
COOK INLET	X		X							2
EAST FORELAND	X		X							3
NIKISKI	X									4
										5
										6
										7
										8
										9
										10
										11
										12
										13
										14
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										22
										23
										24
										25

Approved

Dennis J. Romberg

NOV 14 2000

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-10802

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

RECORD DESCRIPTION	AMOUNT	RECORD DESCRIPTION	AMOUNT
SMOOTH SHEET	1	SMOOTH OVERLAYS: POS., ARC, EXCESS	N/A
DESCRIPTIVE REPORT	1	FIELD SHEETS AND OTHER OVERLAYS	N/A

DESCRIPTION	DEPTH/POS RECORDS	HORIZ. CONT. RECORDS	SONAR-GRAMS	PRINTOUTS	ABSTRACTS/ SOURCE DOCUMENTS	
ACCORDION FILES	0					
ENVELOPES						
VOLUMES						
CAHIERS						
BOXES				1		

SHORELINE DATA

SHORELINE MAPS (List):	N/A
PHOTOBATHYMETRIC MAPS (List):	N/A
NOTES TO THE HYDROGRAPHER (List):	N/A
SPECIAL REPORTS (List):	N/A
NAUTICAL CHARTS (List):	Chart 16662, 5th Ed., July 5, 1997

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			
POSITIONS REVISED			
SOUNDINGS REVISED			
CONTROL STATIONS REVISED			
	TIME-HOURS		
	VERIFICATION	*EVALUATION*	*TOTALS*
PRE-PROCESSING EXAMINATION	201		201
VERIFICATION OF CONTROL			
VERIFICATION OF POSITIONS			
VERIFICATION OF SOUNDINGS			
VERIFICATION OF JUNCTIONS			
APPLICATION OF PHOTOBATHYMETRY			
SHORELINE APPLICATION/VERIFICATION			
COMPILATION OF SMOOTH SHEET	154		154
COMPARISON WITH PRIOR SURVEYS AND CHARTS			
EVALUATION OF SIDE SCAN SONAR RECORDS			
EVALUATION OF WIRE DRAGS AND SWEEPS			
EVALUATION REPORT		174	174
GEOGRAPHIC NAMES			
OTHER* (Chart Compilation)		135	135
*USE OTHER SIDE OF FORM FOR REMARKS — TOTALS	355	309	664

Pre-processing Examination by: G. Nelson, R. Davies, D. Hill	*Beginning Date*: 1/4/99	*Ending Date*: 5/25/00
Verification of Field Data by: G. Nelson, C. Barry	*Time (Hours)*: 355	*Ending Date*: 7/26/99
Verification Check by: B. Olmstead	*Time (Hours)*: 26	*Ending Date*: 1/31/2001
Evaluation and Analysis by: C. Barry	*Time (Hours)*: 174	*Ending Date*: 8/15/00
Inspection by: B. Olmstead	*Time (Hours)*: 4	*Ending Date*: 2/6/2001

☆ U.S. GOVT. PRINTING OFFICE 1983: 764-006/6061

EVALUATION REPORT

H-10802

A. PROJECT

Survey H10819 was conducted under contract 50-DGCN-8-90021 awarded on April 10, 1998. A Statement of Work (SOW), dated November 28, 1997 contains specific requirements. The purpose of this contract is to provide NOAA with modern, accurate hydrographic survey data with which to update the existing nautical charts of the area.

This survey was conducted by Terra Surveys, LLC of Palmer, Alaska, which is hereafter referred to as the hydrographer. Specific information pertaining to this contractor may be obtained from NOS Hydrographic Survey Division (N/CS35).

The hydrographer's report contains a complete discussion of the project information.

B. AREA SURVEYED

The survey area is adequately described in the hydrographer's report. Page-size plots of the charted area depicting the limits of supersession accompany this report as Attachments 1 and 2.

The bottom consists mainly of medium stones, fine pebbles, coarse gravel and medium sand. Depths range from 2.6 fathoms to 26 fathoms.

C. SURVEY VESSELS

The hydrographer's report contains information relating to survey vessels.

D. AUTOMATED DATA ACQUISITION AND PROCESSING

Survey data was processed using USL CARIS /HIPS, the same software used by the hydrographer, and AutoCAD.

Digital data for this survey exists in CARIS/HIPS format, a database format using the .xtf extension. In addition, the smooth sheet drawing is filed in the MicroStation format, i.e., .dgn (extension). Copies of these files will be forwarded to the Hydrographic Surveys Division and a backup copy will be retained at PHB. Database records forwarded are in the Internal Data Format (IDF) and are in compliance with specifications in existence at the time of survey processing.

The drawing files necessarily contain information that is not part of the CARIS/HIPS data set such as geographic names text, line-type data, and minor symbolization. In addition, those soundings deleted from the drawing for clarity purposes remain unrevised in the CARIS/HIPS digital files to preserve the integrity of the original hydrographic data set. Cartographic codes used to describe the digital data are those authorized by the NOS Hydrographic Surveys Specifications and Deliverables.

The data are plotted using a Universal Transverse Mercator projection and are depicted on a single sheet.

E. SONAR EQUIPMENT

Sonar equipment has been adequately addressed in the hydrographer's report

F. SOUNDING EQUIPMENT

Sounding equipment has been adequately addressed in the hydrographer's report.

G. CORRECTIONS TO SOUNDINGS

The sounding data have been reduced to Mean Lower Low Water (MLLW). The reducers include corrections for an actual tide, static draft, dynamic draft (settlement and squat), sound velocity, and heave, pitch and roll. These reducers have been reviewed and are consistent with NOS specifications.

Unverified (preliminary) tides were used for reduction of soundings during field processing. After the survey was completed, the contractor used verified 6-minute heights direct from the Nikiski tide gage, gage number 945-5760, downloaded from the Internet, to reduce these soundings. These verified tides were adjusted to the new vertical datum in Cook Inlet, dated, January 1, 1998. This correction of the datum is intended to rectify a situation in which the seafloor is 0.3' – 1.3' higher than it was during the last tidal datum epoch, 1960-1978. This change is caused by isostatic rebound. See section H of the Hydrographer's report for additional information.

H. CONTROL STATIONS

Sections H and I of the Hydrographer's report contain adequate discussions of horizontal control and hydrographic positioning.

The positions of horizontal control stations used during hydrographic operations are published values based on NAD 83. The geographic positions of all survey data are based on NAD 83. The smooth sheet is annotated with an NAD 27 adjustment tick 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:	-2.031 seconds	(-62.851 meters)
Longitude:	8.070 seconds	(122.484 meters)

I. HYDROGRAPHIC POSITION CONTROL

Differential GPS (DGPS) was used to control this survey. A horizontal dilution of precision (HDOP) not to exceed 10.0 meters at the 95% confidence level was computed for survey operations. The quality of some positions exceeds limits in terms of HDOP. These positions are isolated and occur randomly throughout the survey area. A review of the data, however, suggests that none of these fixes are used to position dangers to navigation. The features or soundings located by these fixes are consistent with the surrounding information. These fixes are considered acceptable. DGPS performance checks were conducted in the field and found adequate.

NAD 83 is used as the horizontal datum for plotting and position computations.

Additional information concerning specific control system type, calibrations and system checks can be found in the hydrographer's report and in the separates related to horizontal position control and corrections to position data.

J. SHORELINE

Shoreline shown on the smooth sheet is for orientation only, and originates with the Nikiski inset of Chart 16662, 5th Edition, July 5, 1997.

K. CROSSLINES

Crosslines are discussed in the hydrographer's report.

L. JUNCTIONS

Survey H-10802 junctions with the following surveys:

Survey	Year	Scale	Area
H-10819	1998	1:10,000	North
H-10884	1999	1:10,000	Southeast

The junctions with survey H-10819 and H-10884 are complete. "Joins" notes have been added to the smooth sheet where applicable. A few soundings from the junctional surveys have been transferred within the common areas of H-10802 to better delineate the bottom configuration.

M. COMPARISON WITH PRIOR SURVEYS

Survey	Year	Scale	Datum
H-9619	(1976)	1:20,000	NAD27
H-9621	(1976)	1:20,000	NAD27
H-10610	(1995)	1:10,000	NAD83

The present survey was compared to digital copies of H-9619, H-9621 and H-10610. The registration and legibility of these prior surveys to the present survey was good. Prior surveys H-9619 and H-9621 cover the entire area of the present survey. Prior survey H-10610 provides more recent coverage of the southeast portion of the survey area.

Nikiski and East Foreland areas are characterized by a tide range of 14 to nearly 30 feet and experience prevailing fall, winter and spring winds from the north and northeast. Tidal currents reaching up to nine knots contribute to the dynamic nature of the seafloor morphology. Shoals appear to be especially vulnerable to these influences, as evidenced by the evolution of their shape since the time of earlier surveys. Sand waves appear to form and disperse seasonally. There is also evidence of migration of some shoal features. This is typified by pronounced differences in the locations of shoal areas of similar size and shape on prior and current surveys.

While sounding agreement is generally good between the prior and the current surveys, comparisons reveal a general shoaling trend, especially evident in water depths less than ten fathoms. Examinations made during previous surveys indicated an overall pattern of slight shoaling in the region, and comparison with the present survey supports this premise. In comparison with H-10610 shoaling is characterized by consistent differences of 0.5 to 1 fathom. In comparison with the older priors, H-9619 and H-9621, shoaling is evidenced by 0.5 to two fathom differences. Numerous previously undetected shoals and rocks were discovered during the present survey using shallow water multibeam technology.

Differences in depths between prior and current surveys may be attributed to three factors: (1) Adjustment to the vertical datum in Cook Inlet (see section G for further information of the datum adjustment); (2) Natural geomorphic trends in the area, such as erosion and deposition, and migration of shoals under the influence of strong ocean currents; and (3) Improved hydrographic and positioning systems resulting in superior sounding coverage, positioning and sounding methods, and relative accuracy of the data acquisition techniques.

With the transfer of near shore features from prior surveys H-10610 and H-9621 survey H-10802 is adequate to supersede the prior surveys within the common area.

N. ITEM INVESTIGATIONS

52196

There was one AWOIS item assigned to this survey, ~~#52916~~, a charted wellhead, *rep cov 10 fms PA*. This item was investigated by side scan sonar and not located. Because of the wellhead may have failed detection due to it's small diameter and the approximate nature of the geographic position, the item should be retained as charted.

O. COMPARISON WITH CHART

Survey H-10802 was compared with the following chart.

Chart	Edition	Date	Scale
16662	5th	July 5, 1997	1:100,000 and 1:50,000

a. Hydrography

Charted hydrography originates with the previously discussed prior surveys. The prior surveys have been adequately addressed in section M and require no further discussion.

Survey H-10802 is adequate to supersede charted hydrography within the charted area.

b. Dangers To Navigation

Twenty-five dangers to navigation were discovered during survey operations and reported to the USCG on September 5, 1998. Sounding values for these dangers subsequently changed with the application of the new vertical tidal datum in Cook Inlet. The depth values for two of these dangers were considered significant and reported to N/CS26 on August 8, 2000. Ten additional dangers to navigation were found during office processing. These were reported to the USCG, NIMA and N/CS1 on July 31, 2000. Copies of these reports are attached.

P. ADEQUACY OF SURVEY

Hydrography contained on survey H-10802 is adequate to:

a. Delineate the bottom configuration, determine least depths, and draw the required 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.

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, NOS Hydrographic Surveys Specifications and Deliverables dated November 29, 1997, appended on May 17, 1999 and on September 30, 1999 and the Field Procedures Manual, April 1994 Edition.

Q. AIDS TO NAVIGATION

One floating aid to navigation, East Foreland Buoy 2, was located and adequately marks the feature intended. See the Descriptive Report section P for complete details.

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

There were no features of landmark value located within the area of this survey. The hydrographer made no charting recommendations for new landmarks.

R. STATISTICS

Statistics are itemized in the hydrographer's report.

S. MISCELLANEOUS

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

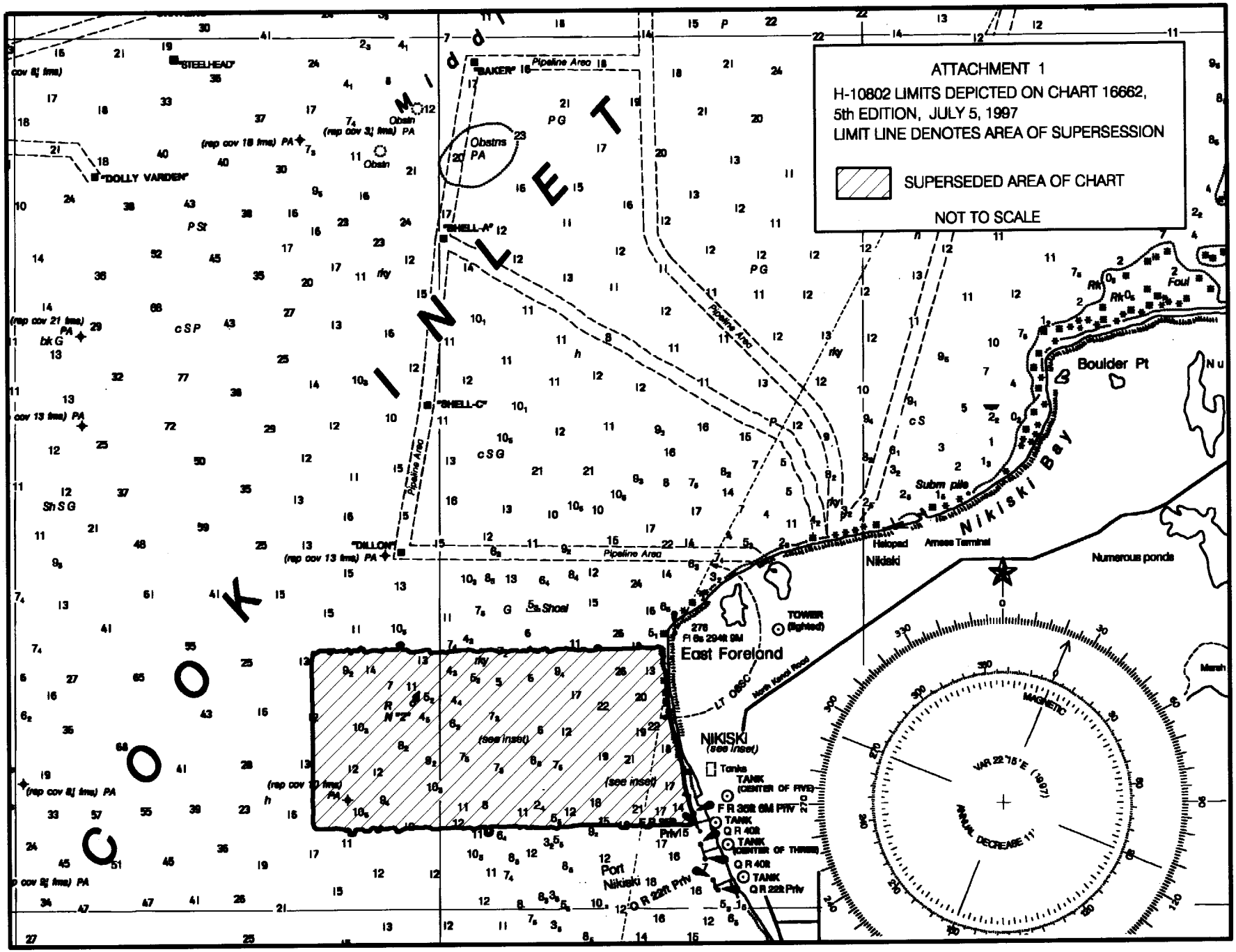
T. RECOMMENDATIONS

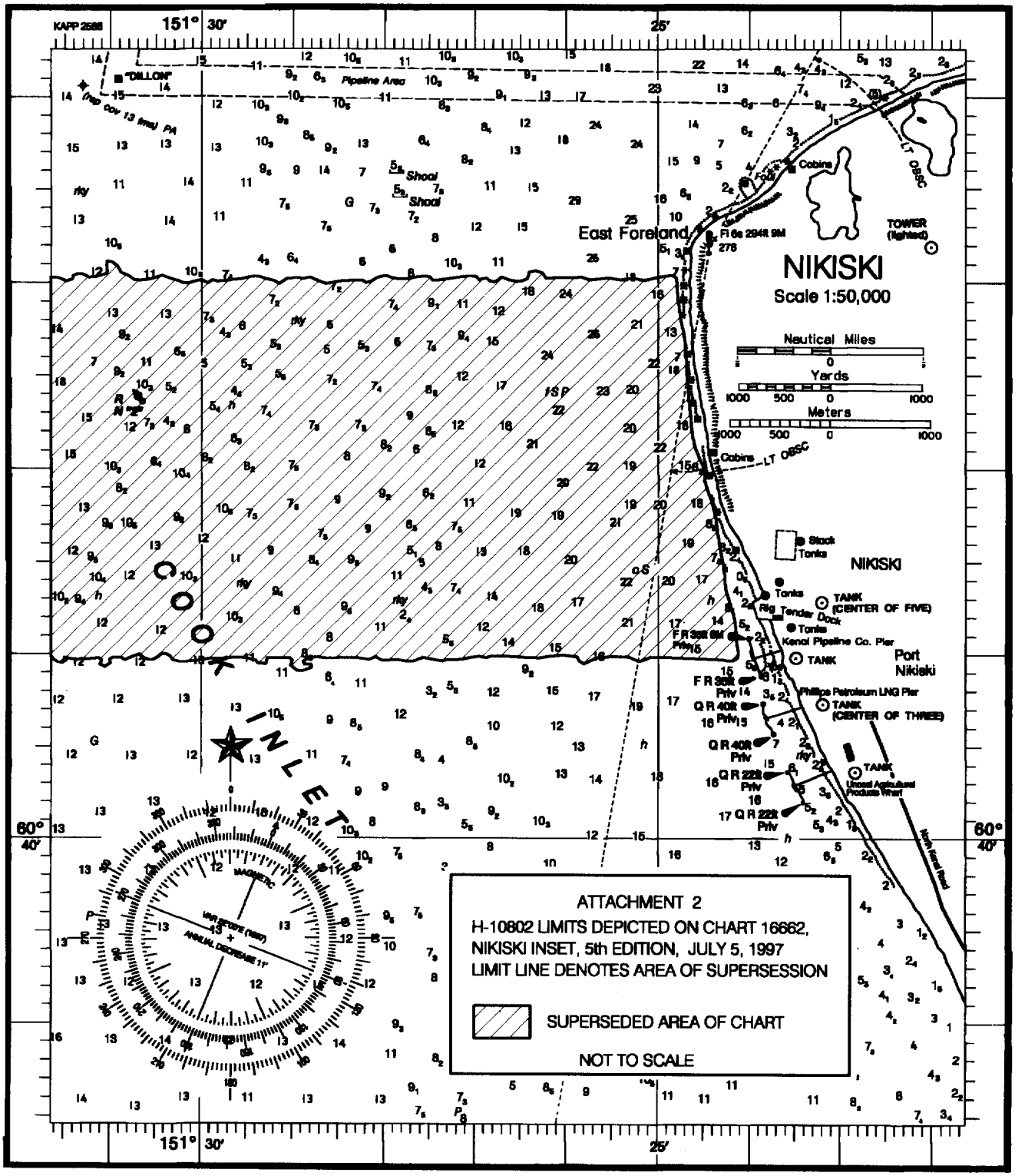
This is a good hydrographic survey. No additional work is recommended.

U. REFERRAL TO REPORTS

Referral to reports is discussed in the hydrographer's report.

CJ Barry
Cartographer


ATTACHMENT 1
H-10802 LIMITS DEPICTED ON CHART 16662,
5th EDITION, JULY 5, 1997
LIMIT LINE DENOTES AREA OF SUPERSESSION
SUPERSEDED AREA OF CHART
NOT TO SCALE
COOK INLET
Middle
"STEELHEAD"
"DOLLY VARDEN"
"BAKER"
"SHELL-A"
"SHELL-C"
"DILLON"
Pipeline Area
Obstns
PA
Boulder Pt
Nikiski Bay
Subm pile
Heloped
Amoco Terminal
Nikiski
Numerous ponds
East Foreland
TOWER
(lighted)
North Kenai Road
NIKISKI
(see inset)
Tanks
TANK
(CENTER OF FIVE)
TANK
TANK
(CENTER OF THREE)
TANK
Port
Nikiski
MAGNETIC
VAR 22°15' E (1997)
ANNUAL DECREASE 11'


KAPP 2588
151° 30'
25'
"DILLON"
Pipeline Area
Shoal
Shoal
East Foreland
Fl 6s 294ft 9M
276
TOWER
(lighted)
Cabins
LT OBSC
NIKISKI
Scale 1:50,000
Nautical Miles
0
Yards
1000 500 0 1000
Meters
1000 500 0 1000
Cabins
LT OBSC
Stock
Tanks
NIKISKI
Tanks
TANK
(CENTER OF FIVE)
Rig Tender Dock
Tanks
Kenai Pipeline Co. Pier
TANK
Port
Nikiski
Phillips Petroleum LNG Pier
TANK
(CENTER OF THREE)
TANK
Unocal Agricultural
Produce Wharf
North Kenai Road
COOK INLET
60° 40'
MAGNETIC
ANNUAL DECREASE 1°
ATTACHMENT 2
H-10802 LIMITS DEPICTED ON CHART 16662,
NIKISKI INSET, 5th EDITION, JULY 5, 1997
LIMIT LINE DENOTES AREA OF SUPERSESSION
SUPERSEDED AREA OF CHART
NOT TO SCALE

APPROVAL SHEET
H-10802

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, cartographic symbolization, comparison with prior surveys and verification or disproval of charted data. The survey records and digital data comply with NOS requirements except where noted in the Evaluation Report.

Bruce A. Olmstead Date: 2/2/2001
for Dennis Hill
Chief, Cartographic Team
Pacific Hydrographic Branch

I have reviewed the smooth sheet, accompanying data, and reports. This survey and accompanying digital data meet or exceed NOS requirements and standards for products in support of nautical charting except where noted in the Evaluation Report.

James C. Gardner Date: 2-22-01
James C. Gardner
Capt., NOAA
Chief, Pacific Hydrographic Branch

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Final Approval

Approved:

Samuel P. DeBow Date: April 13, 2001
Samuel De Bow
Capt., NOAA
Chief, Hydrographic Surveys Division

NOAA FORM 75-96
(10-83)

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

MARINE CHART BRANCH

RECORD OF APPLICATION TO CHARTS

FILE WITH DESCRIPTIVE REPORT OF SURVEY NO. H-10802

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
16662	8-3-00	CJ BARRY	Full ~~Part Before After~~ Marine Center Approval Signed Via FULL APPLICATION OF
			~~Drawing No.~~ SOUNDINGS, CURVES AND FEATURES FROM SMOOTH SHEET
			AND THRU INSET
16662	8-3-00	CJ BARRY	Full ~~Part Before After~~ Marine Center Approval Signed Via FULL APPLICATION OF
[INSET]			~~Drawing No.~~ SOUNDINGS, CURVES AND FEATURES FROM SMOOTH SHEET
			Full Part Before After Marine Center Approval Signed Via
			Drawing No.
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			Drawing No.

SUPERSEDES C&GS FORM 8352 WHICH MAY BE USED.