

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

DESCRIPTIVE REPORT

Type of Survey _____ Hydrographic Survey _____

Field No. H11840 _____

Registry No. _____ OPR-P385-TE-08 _____

LOCALITY

State _____ Alaska _____

General Locality _____ Northern Cook Inlet _____

2008

CHIEF OF PARTY

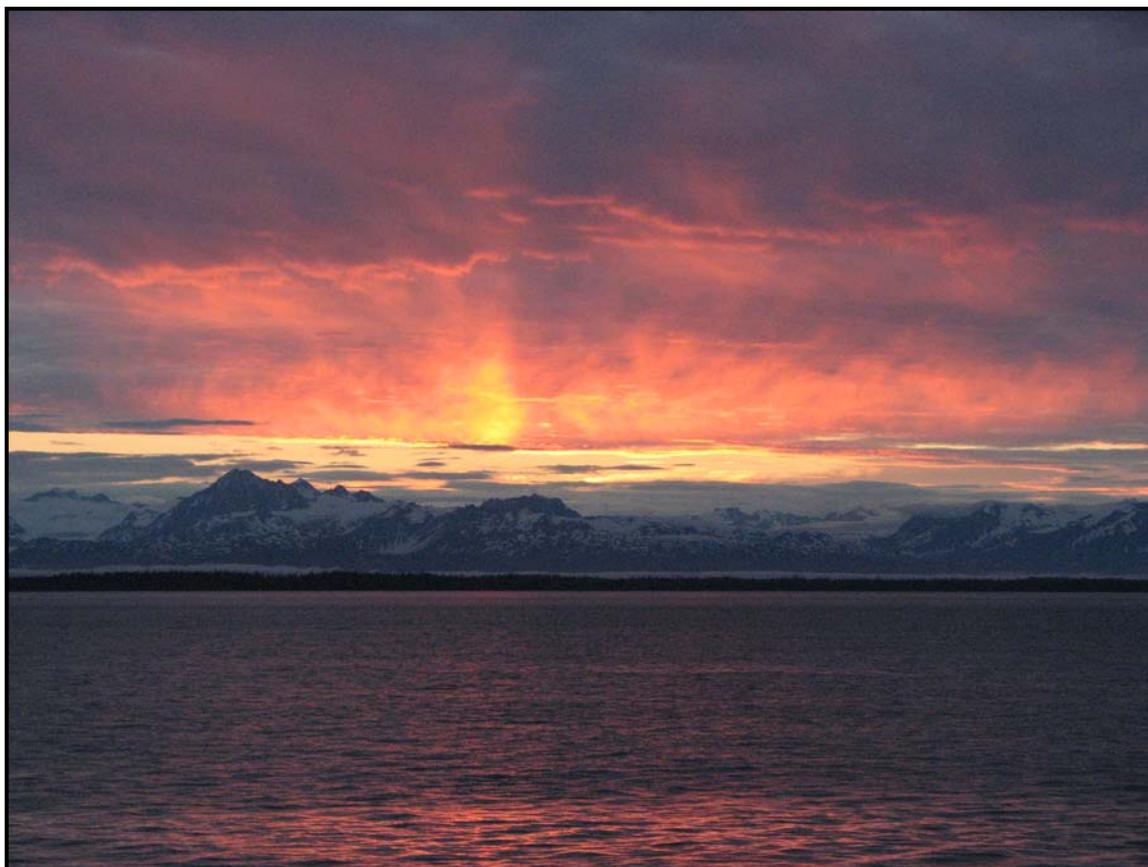
Kathleen Mildon

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DATE _____ November 2009 _____

NOAA FORM 77-28 (11-72) <p style="text-align: center;">U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION</p> <p style="text-align: center;">HYDROGRAPHIC TITLE SHEET</p>	REGISTRY No <p style="text-align: center;">OPR-P385-TE-08</p>
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. H11840
Alaska State _____	
General Locality <u>Northern Cook Inlet</u>	
Sub-Locality _____	
N/A Scale <u>1:20,000</u>	Date of Survey <u>July 21 – August 17, 2008</u>
Instructions dated <u>March 3, 2008</u>	Project No. <u>OPR-P385-TE-08</u>
Vessel <u>R/V Mt. Mitchell & R/V Mt. Augustine</u>	
Katie Chief of party <u>Mildon</u>	
TerraSond Supported by <u>_____ Ltd.</u>	
Soundings by echo sounder, lead line, pole <u>Multibeam Echosounder, Side Scan Sonar</u>	
N/A Graphic record scaled by _____	
N/A Graphic record checked by _____ Automated Plot <u>N/A</u>	
N/A Verification by <u>Atlantic Hydrographic Branch</u>	
Soundings in fathoms feet at MLW MLLW _____ Meters at MLLW	
<p style="color: red;">H-cell compilation units in: FEET at MLLW</p>	
REMARKS: <u>Contract No.: DG133C-05-CQ-1079</u>	
<u>Contractor: TerraSond Ltd.</u> <u>All times recorded in UTC</u>	
<u>1617 South Industrial Way, Suite 3</u>	
<u>Palmer, AK 99645</u>	

DESCRIPTIVE REPORT
OPR-P358-TE-08



Cook Inlet sunset

Registry Number: **H11840**

Vessels: ***R/V Mt. Mitchell and Mt. Augustine***

Survey: **D**

State: **Alaska**

General Locality: **Northern Cook Inlet**

Survey Dates: July 21 – August 17, 2008

Lead Hydrographer: **Kathleen Mildon**

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- II Sound Velocity Profile Data
- III Hydrographic Survey Letter Instructions/Statement of Work
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A. AREA SURVEYED

A navigable area survey was conducted in Northern Cook Inlet, Alaska in accordance with the NOAA, National Ocean Service, Statement of Work, Shallow Water Multibeam Sonar and Side Scan Sonar Services, OPR-P385-TE-08, dated March 3, 2008. **Concur**

The purpose of this project was to provide NOAA with modern, accurate hydrographic survey data with which to update the nautical charts of the assigned area. The project area was approximately 64 square nautical miles and was located in the northern-most half of the Cook Inlet estuary, approximately 15 nautical miles in length. **Concur**

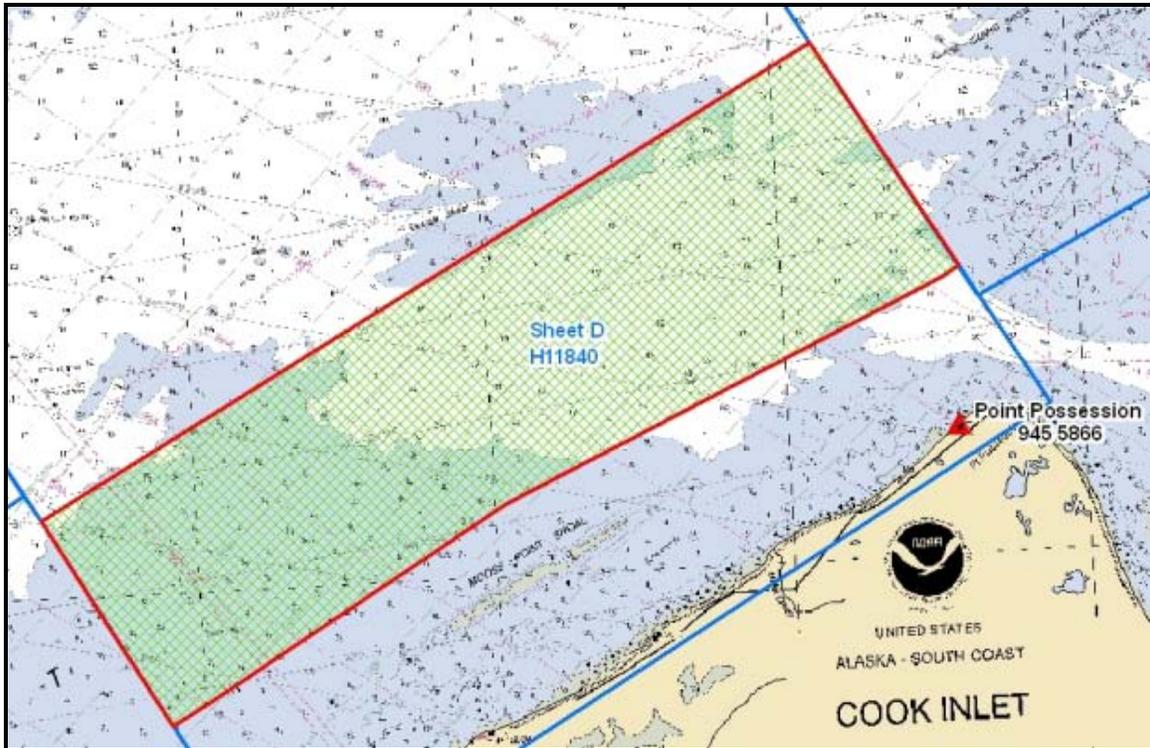


Figure 1 – Overview of H11840- with Chart 16663, 8th Edition, March 2006. Soundings in fathoms.

The project area includes several offshore oil and gas production fields, as well as numerous oil and gas pipelines running throughout Cook Inlet. The inlet splits into two branches at Point Campbell, Knik Arm and Turnagain Arm, both well known for their abundance of silt and strong tides, making marine navigation difficult. Cook Inlet supports a strong commercial fishing infrastructure and an active annual tourist draw, as well as national and international shipping traffic. Shipping traffic can include crude oil, refined oil products, and liquefied natural gas. The frequency and density of high-risk marine traffic limited by winter ice conditions, shallow depth waterways, dynamic seafloor profiles, and powerful tides and currents demand the most accurate and up-to-date navigational charts to operate in a safe and efficient manner. **Concur**

The Port of Anchorage and the ships that use it rely heavily on the accuracy of the nautical charts for this area. **Concur**

Full bottom coverage, consisting of 100% side scan sonar supplemented with shallow-water multibeam echosounder coverage, was achieved within the limits of hydrography for this survey. The sidescan and multibeam imagery was used to locate and determine the least depth over obstructions and shoals as well as to determine the least depths over the entire project area. This survey has a maximum depth of 32.4 meters and a minimum depth of 2.7 meters below the Mean Lower Low Water (MLLW) tidal datum. There were a total of 55 bottom samples collected at 2,000 meter interval. **Concur with clarification. The field was unable to achieve 200% side scan sonar coverage due to environmental factors.**

For H11840 survey limits, refer to Figure 1 on the preceding page. **Concur**

B. DATA ACQUISITION AND PROCESSING

B.1. Equipment

Bathymetry for this survey was acquired using the hydrographic survey vessel *R/V Mt. Mitchell* and *R/V Mt. Augustine*. **Concur**

R/V Mt. Mitchell

The *R/V Mt. Mitchell* is a steel hull vessel, 70 meters length overall with a 12.7 meter beam and a 3.9 meter draft. Major systems used on the *R/V Mt. Mitchell* are listed in Table 1. **Concur**

VESSEL <i>R/V Mt. Mitchell</i> LOA: 70m, BEAM 12.7m, DRAFT: 3.9m	
Equipment	Manufacturer & Model
Multibeam sonar	Kongsberg EM 710
Side Scan Sonar	EdgeTech 4200FS
Positioning	Applanix POS M/V
Sound speed	Odim MVP 200 with AML SV plus probe
Vessel attitude	Applanix POS M/V

Table 1 - Major systems used aboard the R/V Mt. Mitchell.

R/V Mt. Augustine

The *R/V Mt. Augustine* is an aluminum hull vessel, 10.2 meters length overall with a 3.3 meter beam and a 0.9 meter draft. Major systems used on *R/V Mt. Augustine* are listed in Table 2. **Concur**

VESSEL <i>R/V Mt. Augustine</i> LOA: 10.2m, BEAM 3.3m, DRAFT: 0.9m

VESSEL <i>R/V Mt. Augustine</i> LOA: 10.2m, BEAM 3.3m, DRAFT: 0.9m	
Equipment	Manufacturer & Model
Multibeam sonar	Reson SeaBat 8101
Side Scan Sonar	EdgeTech 4200FS
Positioning	Applanix POS M/V
Sound speed	Applied Microsystems SV Plus & SV Plus (V2)
Vessel attitude	Applanix POS M/V

Table 2 - Major systems used aboard the R/V Mt. Augustine.

Equipment performance details are provided in the Data Acquisition and Processing Report (DAPR), Sections A. Equipment and B. Quality Control. **Concur**

B.2. Quality Control

B.2.1. Side Scan Sonar

Daily confidence checks of the side scan sonar operation were conducted by recording a screen shot of the side scan record which included the side scan image and all operational settings. The confidence checks were performed when distinctive bottom features (e.g. trawls cars, submerged vessels, etc.) were continuously visible in the record from the maximum range of one channel to the maximum range of the other channel. A rub test was performed on both channels of the side scan transducer prior to deployment to ensure adequate signal return. The network aboard the *R/V Mt. Mitchell* was found to create a latency issue with the sidescan please refer to the Data Acquisition and Processing Report (DAPR) section B office data processing for further details on this. **Concur**

B.2.2. Shallow Water Multibeam

No conditions with the potential for adversely affecting data integrity were encountered with the multibeam suite used during this survey. **Concur**

Multibeam confidence checks were conducted on the *R/V Mt. Mitchell* to verify proper operation of the multibeam suite on a weekly basis, weather permitting. The confidence checks were performed by comparing nadir beam depths with lead line depths. **Concur**

Uncertainty surfaces were built in CARIS Hips and Sips, the uncertainty child layer was analyzed to verify the quality of the data in the surface. Data was found to meet IHO Order 1 specifications. **Concur**

Sound speed profiles were taken as deep as possible and were geographically distributed within the survey area to meet the criteria specified in NOS Hydrographic Surveys Specifications and Deliverables. Sound speed profiles extended to 95% of the anticipated water depth and are representative of local and diurnal variability. In this survey, the mixing of Turnagain Arm into Cook Inlet made sound speed modeling difficult. Data

quality was closely monitored onboard the vessel and profiling frequency increased as necessary. No data quality issues related to speed of sound measurements were encountered during the survey. **Concur with clarification. Data quality issues related to sound speed were encountered. See section 6 of the SAR.**

A detailed discussion of multibeam system calibrations, patch tests, data acquisition, and processing is provided in the DAPR. **Concur**

B.2.3. Crosslines

232 mainscheme lines totaling 1546.5 linear nautical miles and 24 lines totaling 77.0 linear nautical miles of crosslines were run during the 2008 survey of H11840. The ratio of the linear nautical miles of crosslines to the linear nautical miles of mainscheme lines, at 5.0 %, meets the 5 % required by “NOAA, NOS Hydrographic Surveys Specifications and Deliverables”, April 2007, Section 5.1.4. **Concur**

The crossline analysis was conducted using CARIS HIPS’ QC Report routine. Each crossline was selected and ran through the process, which calculated the difference between each accepted crossline sounding and a BASE surface created from the mainscheme data. **Concur**

The differences in depth were grouped by beam number and statistics computed which included the percentage of soundings compared whose differences from the BASE surface fall within IHO survey Order 1. **Concur**

All beams meet IHO Order 1 at the 95 % confidence level or better. Refer to Separate IV for QC Reports. **Concur**

B.2.4. Contemporary Survey Junctions

This survey junctions with three other surveys. The easterly limits of this survey junctions with the ~~easterly~~ **westerly** limits of H11838 (OPR-P385-TE-08). The westerly limits of this survey junctions with **the easterly limits of** H11842 (OPR-P385-TE-08). The northerly limits of this survey junctions with the southerly limits of H11839 (OPR-P385-TE-08). In CARIS Hips and Sips the base surfaces for each survey sheet were opened. The tool tip feature was then incorporated to analyze the difference between sounding values for each sheet at multiple locations along the survey junction. The soundings are in good general agreement between the surveys. No adjustments or recommendations were made based on the junction analysis. **Concur**

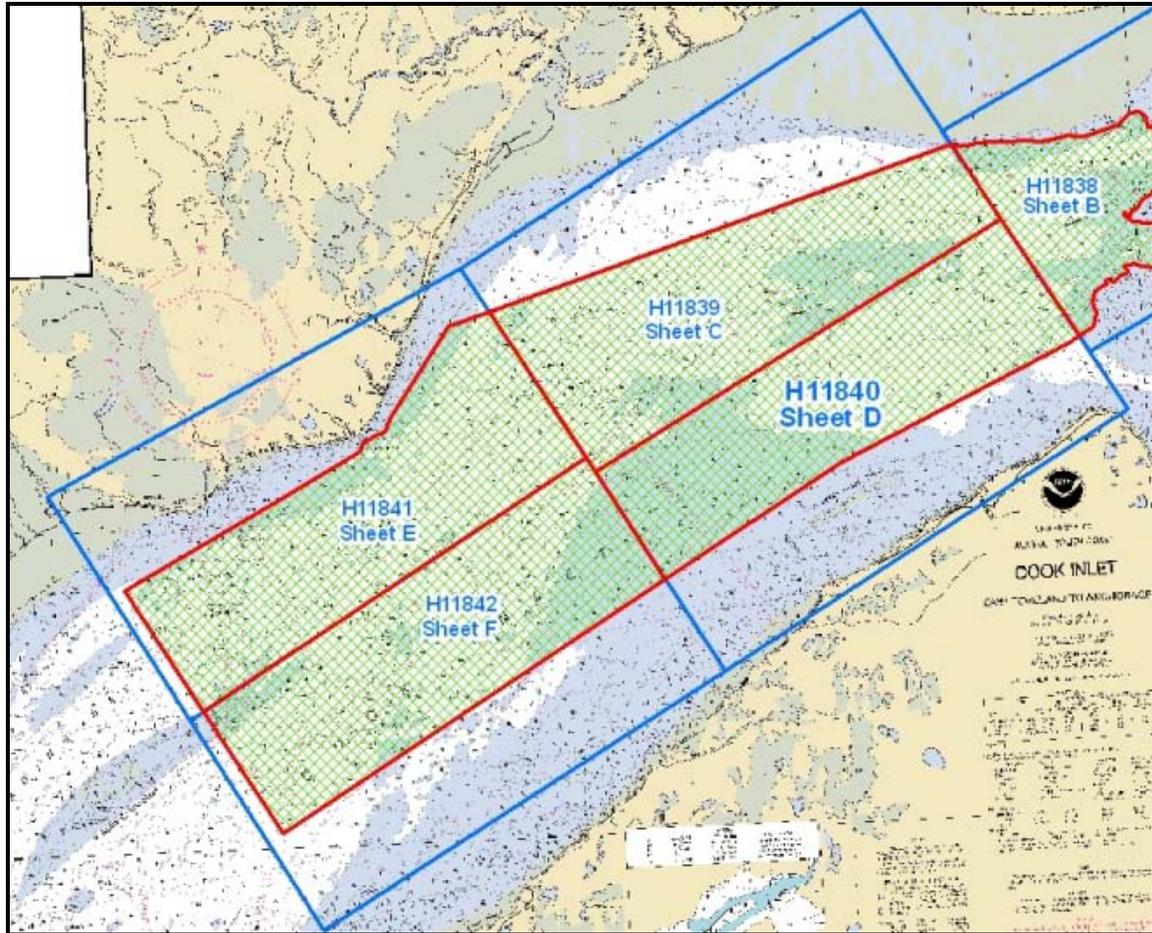


Figure 2 – Overview of survey area showing the junction locations of H11840 with H11838, H11839, and H11842 (OPR-P385-TE-08).

B.3. Corrections to Echo Soundings

Survey H11840 was performed in conjunction with five other surveys in Project OPR-P385-TE-08. Any change to the corrections to echo soundings affects all surveys in the area and is described in detail in the DAPR. *Concur*

Sounding data were reduced preliminarily using zoning provided by NOAA/CO-OPS under the project instructions and final tides from the historic USC&GS tide stations at Point Possession, AK (945-5866) and North Foreland, AK (945-5869). Refer to the Horizontal and Vertical Control Report (HVCR) Appendix for tidal zoning methods and operations. *Concur*

Final sounding data were reduced using Post Processed Kinematic Smoothed Best Estimate Trajectory (PPK SBET). SBET's were applied to the sounding data through CARIS. The navigation and elevation were applied to the sounding data. An offset model between Mean Lower Low Water and the Ellipsoid was used and GPStide was applied. Refer to the Horizontal and Vertical Control Report (HVCR) for PPK methods and operations. Refer to the Data Acquisition and Processing Report (DAPR) for data collection and processing methods. *Concur*

B.4. Data Processing

The final depth information for this survey was submitted as a collection of CARIS BASE surfaces which best represented the seafloor at the time of the 2008 survey. All possible measures were taken to ensure the data was correctly processed and the appropriate designated soundings, representing the least depth of significant contacts, were selected and retained in the finalized surfaces. *Concur*

In accordance with the statement of work, shallow water multibeam (SWMB) line spacing was set to achieve the desired side scan sonar coverage. This was not optional for SWMB coverage and resulted in SWMB coverage gaps as the outer beams of adjacent lines did not meet. *Concur*

Several grids of varying resolution were created for H11840 due to the wide depth range and varying bathymetry found in the survey area. Grid spacing of 1 and 2 meters were used for the BASE surfaces and Digital Terrain Models (DTM). *Concur*

Depth Range	BASE Surface Resolution
0-23m	1m
20-52m	2m

Table 3 - BASE surface resolution vs. survey depth.

4 digital products (1 for each variable BASE surface and 2 images of the entire area at a 2m resolution) were submitted for the 2008 survey. 2008 survey depths were submitted as a CARIS BASE Uncertainty surface which was weighted by the greater of either the standard deviation of sounding values, or a priori uncertainty values derived from HIPS TPE calculation. Additionally, two sun-illuminated, geographically referenced Digital Terrain Model images depicting the coverage of the survey area was submitted; one representing the depth child layer and one representing the uncertainty child layer. All grids are projected to UTM Zone 5 North, NAD 1983. Naming conventions for each grid are as follows:

CARIS BASE Uncertainty Surface: H11xxx_1m_0to23m_Final

- H11xxx represents the sheet (H11837-H11842)
- 1m represents the resolution
- 0to23m represents the depth range

Sun-Illuminated Elevation DTM: H11840_Coverage.tif

Uncertainty DTM: H11840_Uncertainty.tif

Concur

Additional containing a single S -57 (.000) base cell file and supporting files was submitted in conjunction with the other 2008 survey deliverables. The base cell contains information on objects not represented in the depth grid, including, but not limited to, shoreline and the nature of the seabed (bottom samples). Each feature object includes the mandatory S -57 attributes, contract specific attributes, and any additional attributes assigned. *Concur*

The DAPR Sections A: Equipment – Data Collection; and B: Quality Control contain a detailed discussion of the steps followed when acquiring and processing the 2008 survey data. **Concur**

C. VERTICAL AND HORIZONTAL CONTROL

Final sounding data were reduced using Post Processed Kinematic Smoothed Best Estimate trajectory (PPK SBET). SBET's were applied to the sounding data through CARIS. The navigation and elevation were applied to the sounding data. An offset model between Mean Lower Low Water and the Ellipsoid was used and GPSTide was applied. Refer to the Horizontal and Vertical Control Report (HVCR) for PPK methods and operations. **Concur**

The horizontal control datum used for this survey is the North American Datum of 1983 (NAD 83). The projection used was UTM, Zone 5 North. **Concur**

D. RESULTS AND RECOMMENDATIONS

D.1. Chart Comparison

The chart comparison for H11840 was performed by comparing all RNC and ENC charts that intercept the project area to the surveyed data. **Concur**

Discrepancies are discussed in context of the largest scale chart available and assumed to apply to the smaller scale charts unless specifically mentioned. **Concur**

Chart	Type	Scale	Edition	Issue Date	NM / LNM Corrected Through
16665	RNC	1:50,000	9 th	2006-03-01	2006-03-04 2006-02-21
16663	RNC	1:100,000	8 th	2006-03-01	2006-03-18 2006-03-07
16662	RNC	1: 100,000	8 th	2007-09-01	2007-09-15 2007-09-04
16660	RNC	1:194,154	30 th	2006-06-01	2006-06-17 2006-06-06
16013	RNC	1: 969, 761	30 th	2006-07-01	2006-07-15 2006-07-04
531	RNC	1:2,100,000	24 th	2007-07-01	2007-07-21 2007-07-03
500	RNC	1:3,500,000	8 th	2003-06-01	2003-05-31 2003-05-13

50	RNC	1:10,000,000	6 th	2003-06-01	2003-05-31 2003-05-13
US3AK1DM (16660)	ENC	N / A	8 th	2009-06-04	2009-05-26
US4AK15M (16663)	ENC	N / A	10 th	2009-06-05	2009-06-05

Table 4 – Charts used during chart comparisons

Notices to Mariners (NM) and Local Notice to Mariners (LNM) issued from March 2008 through September 2008 (from issuance of SOW to completion of survey) that affected the survey were examined as well, ending with NM 36/ 08 and LNM 37/ 08. One discrepancy was found. It is described below. **Concur**

1. Add Depth 6 fathoms 2 feet at 60-59-09.43N 150-52-34.87W (NM 15/08 [NOS]). Sounding does not appear on chart 16660. The charted sounding does appear on charts 16663, 16662 and a s 11.5 meters in charted units on US4AK15M. Recommend addition of sounding to chart 16660. **Concur with clarification. See Appendix 1- DtoN Report.**

1.

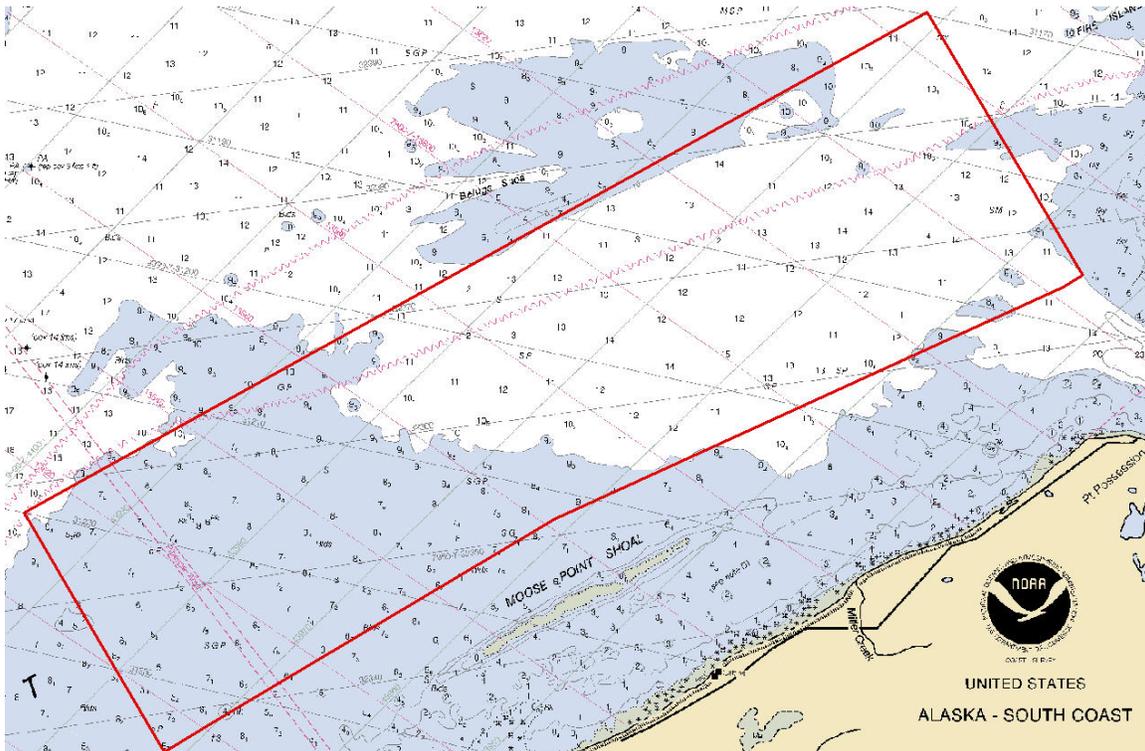


Figure 3 – Survey limits of H11840 shown on chart 16663

The chart comparison was accomplished by generating shoal-biased soundings and contours and overlaying them along with the finalized BASE surfaces on the latest edition NOAA charts. The general agreement between charted soundings and H11840

soundings was then examined and a more detailed comparison was undertaken for any shoals or other dangerous features. **Concur**

General agreement between this survey and the charts is fair. Significant differences are itemized in the sections below. **Concur**

D.1.1. New Features

Four new DTON features were identified during H11840. *

2. A rock at 61-00-54.875N, 150-53-57.106W, with a depth of 10.016 meters (5 fathoms 3 feet in chart units of chart 16663). This was reported as a DTON (DTON report OPR_P385_TE_08_H11840_DtonReport_6) and included in LNM 33/08 (17th District) with a preliminary depth of 10.263 meters (5 fathoms 3 feet) and preliminary position at 61-00-54.87N, 150-53-57.10W. Recommend retaining charted location and depth of 5 fathoms 3 feet. **Concur with clarification. See Appendix 1- Dton Report.**
3. A rock at 61-01-10.175N, 150-50-21.822W, with a depth of 12.800 meters (7 fathoms 0 feet in chart units of chart 16663). This was reported as a DTON (DTON report OPR_P385_TE_08_H11840_DtonReport_7) and included in LNM 08/09 (17th District) with a preliminary depth of 12.514 meters (6 fathoms 5 feet) and preliminary position of 61-01-10.17N, 150-50-21.82W. Recommend updating chart to final depth of 12.800 meters (7 fathoms 0 feet). **Concur with clarification. See Appendix 1- Dton Report.**
4. A rock at 61-01-05.614N, 150-49-48.594W, with a depth of 11.016 meters (6 fathoms 0 feet in chart units of chart 16663). This was reported as a DTON (DTON report OPR_P385_TE_08_H11840_DtonReport_8) and included in LNM 08/09 (17th District) with a preliminary depth of 11.001 meters (6 fathoms 0 feet) and preliminary position at 61-01-05.61N, 150-49-48.59W. Recommend retaining chart location and depth of 6 fathoms 0 feet. **Concur with clarification. See Appendix 1- Dton Report.**
5. A rock at 60-57-53.363N, 150-51-06.451W with a depth of 7.680 meters (4 fathoms 1 foot in chart units of chart 16663). This was reported as a DTON (DTON report OPR_P385_TE_08_H11840_DtonReport_15) during chart comparisons. Preliminary reported position at 60-57-53.4N, 150-51-06.4W. Recommend updating chart to survey location and depth. **Concur with clarification. See Appendix 1- Dton Report.**

D.1.2. Charted Features

Survey results regarding potentially hazardous features within the survey extents are itemized below. Features labeled PA, ED, PD, or Rep. are itemized in section D.1.6.

1. Charted Rk (chart 16665), depth 66 feet, was confirmed by this survey with a depth of 20.206 meters (66 feet) at 61-07-21.02N, 150-30-31.67W. Feature received complete multibeam coverage. Recommend update charted rock to survey position. **Concur with clarification. See Appendix 1- Dton Report.**

2. Charted Rk (chart 16665), depth 68 feet, was confirmed by this survey with a depth of 20.698 meters (68 feet) at 61-07-24.44N, 150-29-14.32W. Feature received complete multibeam coverage. Recommend update charted rock to survey position. **Concur with clarification. See Appendix 1- Dton Report.**
3. Charted Rk (chart 16663), depth 4 fathoms 4 feet, was confirmed by this survey with a depth of 8.469 meters (4 fathoms 4 feet) at 60-58-22.74N, 150-49-17.39W (AWOIS record ID 50174). Feature received complete multibeam coverage. Recommend retain charted rock position and depth and update to the AWOIS database. **Concur with clarification. See Appendix 1- Dton Report.**

D.1.3. Soundings

Survey depth agreement with the charts varies across the project area. **Concur**

There were two areas of possible trends in the shoaling or deepening areas. The center of the northern side of the survey showed a general shoaling on the order of 10-20 feet south of the 60-foot contour versus charted data (in the units of chart 16665). The southwestern section of the survey area showed a general deepening in areas on the order of 10 feet (chart units of 16665) and a deepening of 1-2 fathoms (in the chart units of 16663).

Concur

Significant differences (generally those greater than +/- 10% of charted depth) are itemized in the table below. It is recommended that soundings from H11840 supersede previously charted soundings. **Concur with clarification. It is recommended to chart shoalest sounding.**

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
16663	5 fathoms 2 feet	4 fathoms 5 feet	60-57-53.36N, 150-51-06.45W	DTON reported to AHB 11/17/09 (OPR_P385_TE_08_H11840_Dton Report_15) Concur. Chart shoal sounding
16665	77 feet	54 feet	61-05-36.11N, 150-37-56.67W	DTONs reported to AHB 11/17/09 (OPR_P385_TE_08_H11840_Dton Report_16) Concur with clarification. Shoaler sounding in close proximity.
16665	73 feet	58 feet	61-05-52.01N, 150-36-47.73W	
16665	72 feet	46 feet	61-05-23.86N, 150-38-54.93W	
16665	68 feet	47 feet	61-05-13.94N, 150-39-52.99W	
16665	65 feet	49 feet	61-04-56.83N, 150-40-47.40W	
16665	68 feet	51 feet	61-04-45.99N, 150-41-40.34W	

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
16665	61 feet	69 feet	61-06-57.02N, 150-28-55.55W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	60 feet	68 feet	61-06-46.87N, 150-30-04.81W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	59 feet	74 feet	61-06-10.76N, 150-30-27.88W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	51 feet	64 feet	61-06-07.95N, 150-36-43.05W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	36 feet	65 feet	61-06-02.93N, 150-37-27.08W	On survey edge <i>Concur</i>
16665	79 feet	88 feet	61-03-47.74N, 150-38-32.13W	<i>Concur</i>
16665	42 feet	57 feet	61-05-30.97N, 150-39-27.39W	On survey edge <i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	42 feet	57 feet	61-05-30.93N, 150-39-27.29W	On survey edge <i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	46 feet	52 feet	61-00-55.91N, 150-40-43.71W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	45 feet	52 feet	61-00-47.00N, 150-41-20.83W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
16665	47 feet	53 feet	61-00-28.96N, 150-41-53.06W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	46 feet	54 feet	61-01-10.96N, 150-42-29.92W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	43 feet	51 feet	61-00-24.93N, 150-42-26.28W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	42 feet	54 feet	61-00-11.48N, 150-42-45.11W	On survey edge <i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	38 feet	57 feet	61-00-17.45N, 150-43-01.56W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	42 feet	58 feet	61-00-50.67N, 150-43-16.53W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	47 feet	54 feet	61-01-26.16N, 150-44-44.14W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	47 feet	56 feet	61-00-50.12N, 150-44-13.35W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	46 feet	55 feet	61-00-20.69N, 150-43-42.84W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
16665	48 feet	52 feet	61-00-22.32N, 150-44-29.11W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	45 feet	53 feet	61-00-12.41N, 150-44-06.06W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	44 feet	51 feet	61-00-09.93N, 150-43-34.03W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	46 feet	55 feet	61-00-03.56N, 150-43-06.73W	On survey edge <i>Concur with clarification. Shoaler sounding in close proximity.</i>
16665	40 feet	55 feet	61-05-40.94N, 150-38-41.67W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	7 fathoms 3 feet	8 fathoms 3 feet	61-00-05.46N, 150-44-06.77W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	6 fathoms 2 feet	7 fathoms 2 feet	60-59-51.15N, 150-44-32.85W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	7 fathoms 2 feet	8 fathoms 2 feet	60-59-54.61N, 150-46-06.50W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	6 fathoms 5 feet	7 fathoms 5 feet	60-59-26.07N, 150-45-37.79W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
16663	7 fathoms 2 feet	8 fathoms 1 foot	61-00-10.70N, 150-47-43.69W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	7 fathoms 3 feet	8 fathoms 2 feet	61-00-35.00N, 150-47-38.74W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	7 fathoms 1 foot	8 fathoms 4 feet	61-01-24.15N, 150-49-00.85W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	6 fathoms 5 foot	7 fathoms 4 feet	61-00-09.53N, 150-48-59.46W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	6 fathoms 3 feet	7 fathoms 2 feet	60-59-20.36N, 150-48-52.59W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	6 fathoms 3 feet	7 fathoms 2 feet	60-59-50.68N, 150-50-18.81W	<i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	5 fathoms 3 feet	7 fathoms 5 feet	60-58-50.81N, 150-52-32.93W	On survey edge <i>Concur with clarification. Shoaler sounding in close proximity.</i>
16663	2 fathoms 1 foot	7 fathoms 3 feet	60-59-42.69N, 150-53-23.73W	On survey edge <i>Concur with clarification. Shoaler sounding in close proximity.</i>

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
US3AK 1DM	10.6 meters	19.2 meters	61-05-53.17N, 150-38-02.15W	On survey edge <i>Concur with clarification. Shoaler sounding in close proximity.</i>

Table 5 – Sounding discrepancies

D.1.4. Trends and Changeable Areas

Contours were created in IVS Fledermaus and examined concurrently with the charted contours from chart 16665 (largest scale chart) in CARIS HIPS. *Concur*

Agreement is variable across the survey area, with most areas comparing well. Exceptions include sections of the 60-foot contours in portions of the survey area have been displaced, but with no obvious trend. *Concur*

Several seaward and westward shifts of the 60-foot contour in the eastern portion of the survey area are illustrated below. *Concur*

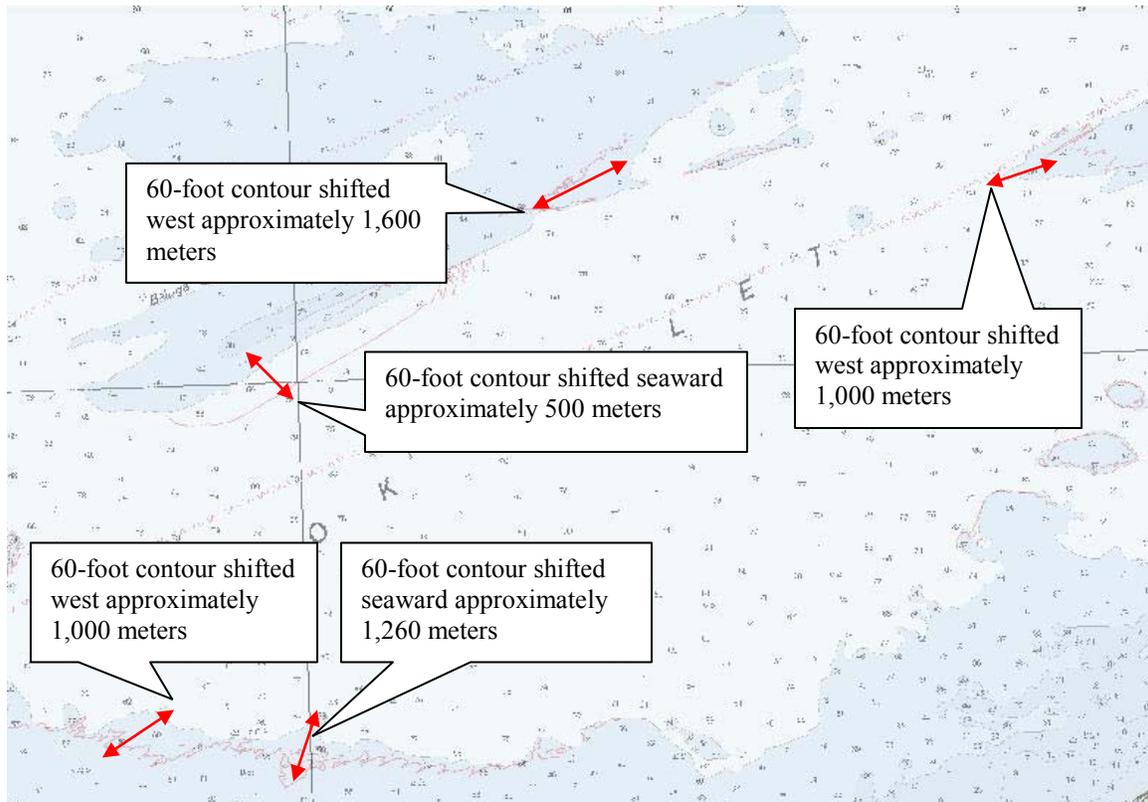


Figure 4 – Contours from H11840 (colored) overlaid on chart 16665

An example of 60-foot contour shift westward in the central portion, along the northern margin of the survey area, is illustrated below. *Concur*

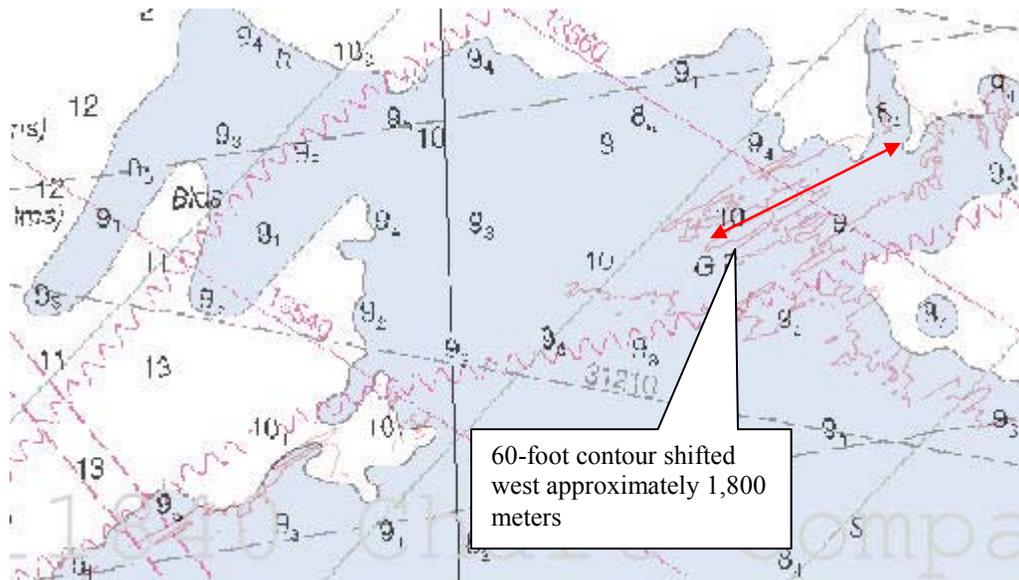


Figure 5– Contours from H11840 (colored) overlaid on chart 16663

The widely variable changes from the charts found by this survey confirm that chart NOTE B (chart 16665), that the “Area is subject [to] Drastic and continuing change...” is entirely appropriate. The note should be retained. **Concur**

The hydrographer recommends that the charted contours be updated to reflect the 2008 survey data. **Concur**

D.1.5. AWOIS Items Summary

Investigation of Automated Wreck and Obstruction Information System (AWOIS) items was not required under this task order. **Do not Concur. See Appendix II- Survey Feature Report**

D.1.6. Features Labeled PA, ED, PD, or Rep.

There were no charted features labeled “PA, ED, PD, or Rep.” within the survey extents. **Concur**

D.2. Additional Results

D.2.1. Aids to Navigation

There are no charted Aids to Navigation within the survey extents. **Concur**

D.2.2. Drilling Structures

An investigation of drilling structures is not required under this task order. **Concur**

No charted drilling structures exist within the extent of the survey extents of H11840. **Concur**

D.2.3. Comparison with Prior Surveys

A comparison with prior surveys was not required under this task order. See Section D1 for a comparison to the nautical charts. *Concur*

D.2.4. Bottom Samples

55 bottom samples were collected in support of the 2008 survey within the survey extents of H11840 (Appendix V). The samples were distributed geographically to obtain a full representation of the bottom characteristics as specified in “NOAA Hydrographic Surveys Specifications and Deliverables”, Section 7.1. *Concur with clarification. 29 out of the 55 collected bottom samples were included in H-cell for full representation of bottom characteristics of survey area.*

D.2.5. Bridges and Overhead Cables

There are no bridges or overhead cables in the survey area. *Concur*

D.2.6. Submarine Cables and Pipelines

One charted submarine cable intersects the survey area. The 2008 survey data does not support nor disprove the existence or location of this cable. Recommend retain as charted. *Concur*

One charted pipeline area exists in the survey area, leading from the “PHILLIPS-A” platform to shore. The 2008 survey data supports the existence and location of this pipeline. Recommend retain as charted.

Concur

LETTER OF APPROVAL

REGISTRY NO. H11840

This report and the accompanying digital data are respectfully submitted.

Field operations contributing to the accomplishment of survey H11840 were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report, digital data, and accompanying records have been closely reviewed and are considered complete and adequate as per the Statement of Work. Other reports submitted with this survey include the Data Acquisition and Processing Report and the Horizontal and Vertical Control Report.

I believe this survey is complete and adequate for its intended purpose.

__This document is digitally signed in the .pdf____

Kathleen Mildon, Hydrographer

TerraSond Ltd.

Date__11/23/2009_____



APPENDIX I

Danger To Navigation Reports

Danger to Navigation Report

Registry No.: H11840
State: Alaska
General Locality: Northern Cook Inlet
Sub Locality: Moose Point Shoal
Project Number: OPR-P385-TE-08
Survey Dates: 07/21/2008 – 08/17/2008

Depths are reduced to Mean Lower Low Water (MLLW) using verified tides. Positions are based on the NAD83 horizontal datum.

The DTONs in this report result from comparison of 2008 survey data to the largest scale Electronic Navigational Chart(s) (ENC's) covering the survey area (Table 1). During office review of H11840, 10 features were identified by the 2008 survey and are recommended for addition (Table 2).

ENC	Edition Number	Issue Date	Chart	Scale
US4AK15M 5		1/16/08	16663	1:100,000
US5AK16M 7		2/21/08	16665	1:50,000

Table 1 – The largest scale Electronic Navigation Charts that cover the extents of survey area H11840.

Feature Number	Feature Name	Feature Type	Latitude	Longitude	Sounding Value (m)	LNTM
TSL#6	5_3 Rk	Rock	61° 00' 54.9"N	150° 53' 57.1"W	10.263 m	33/08
TSL#7	6_5 Rk	Rock	61° 01' 10.18" N	150° 50' 21.8" W	12.514 m	08/09
TSL#8	6 Rk	Rock	61° 01' 05.62" N	150° 49' 48.6" W	11.001 m	08/09
1.1	Rock	Rock	60° 57' 53.4" N	150° 51' 06.5" W	7.68 m	
1.2	52ft Shoal	Shoal	61° 04' 47.3" N	150° 41' 40.6" W	15.92 m	
1.3	49ft Shoal	Shoal	61° 04' 57.5" N	150° 40' 48.7" W	15.02 m	
1.4	48ft Shoal	Shoal	61° 05' 15.2" N	150° 39' 53.6" E	14.84 m	
1.5	46ft Shoal	Shoal	61° 05' 25.4" N	150° 38' 52.1" W	13.95 m	
1.6	54ft Shoal	Shoal	61° 05' 35.8" N	150° 37' 59.1" W	16.57 m	

1.7	58ft Shoal	Shoal	61° 05' 52.2" N	150° 36' 48.6" W	17.86 m	
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Table 2 – Uncharted features in H11840 identified by the 2008 survey.

DTONs TSL#6 – 8 were submitted to NOAA previously, but no responses were received. They have been added to the charts, and the relevant Local Notices To Mariners are referenced in Table 2.

Attachments:

Terrasond Reports for TSL#6-8:

2008-008_NOAA_CookInlet_DtonReport_6.pdf

2008-008_NOAA_CookInlet_DtonReport_7.pdf

2008-008_NOAA_CookInlet_DtonReport_8.pdf

Local Notices to Mariners for TSL#6-8

lnm17332008.pdf

lnm17082009.pdf

NOAA Response for DTONs 1.1 – 1.6

H11840_DtoN#1.pdf

Digital Data:

NOAA Response for DTONs 1.1 – 1.6

H11840_DtoN#1.xml

Danger to Navigation Report

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H11840

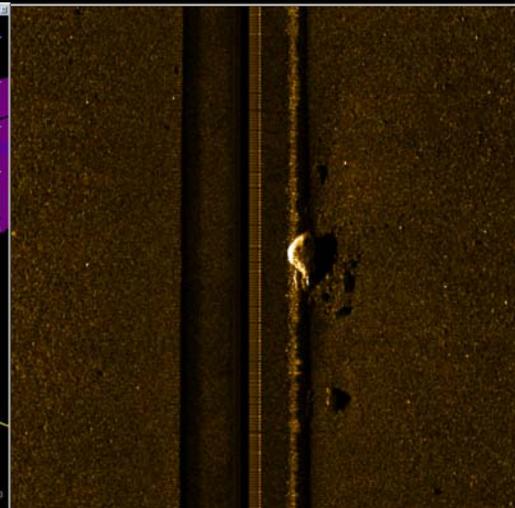
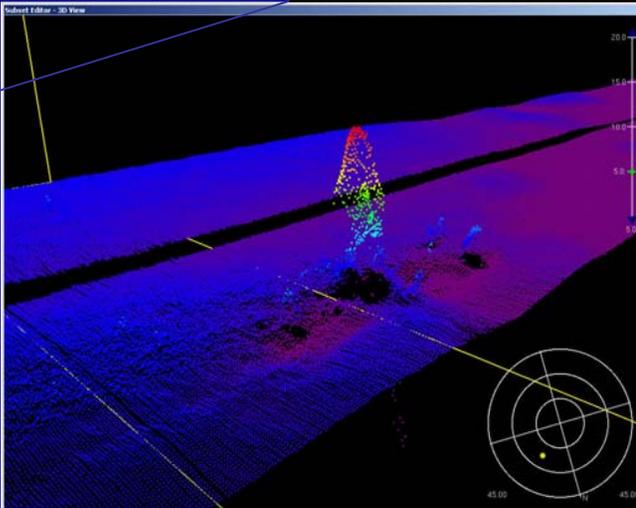
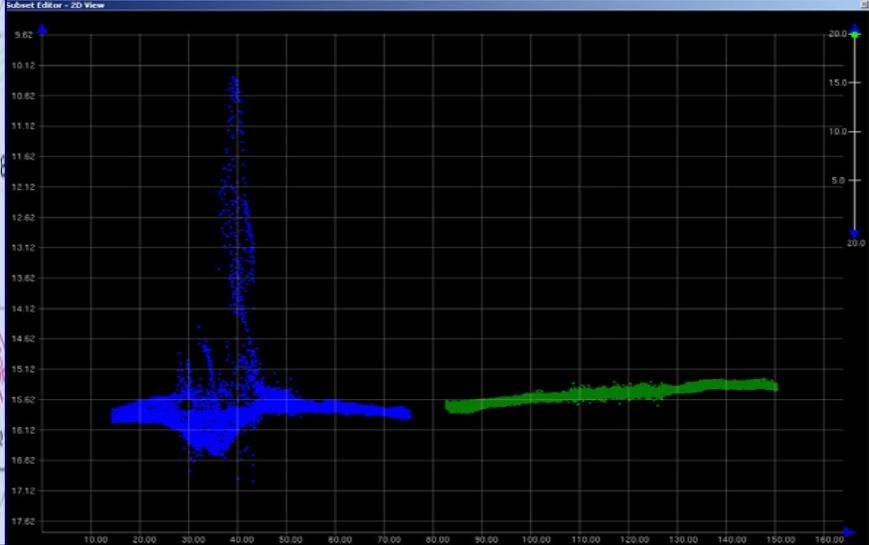
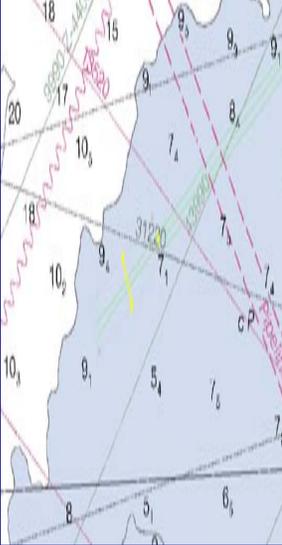
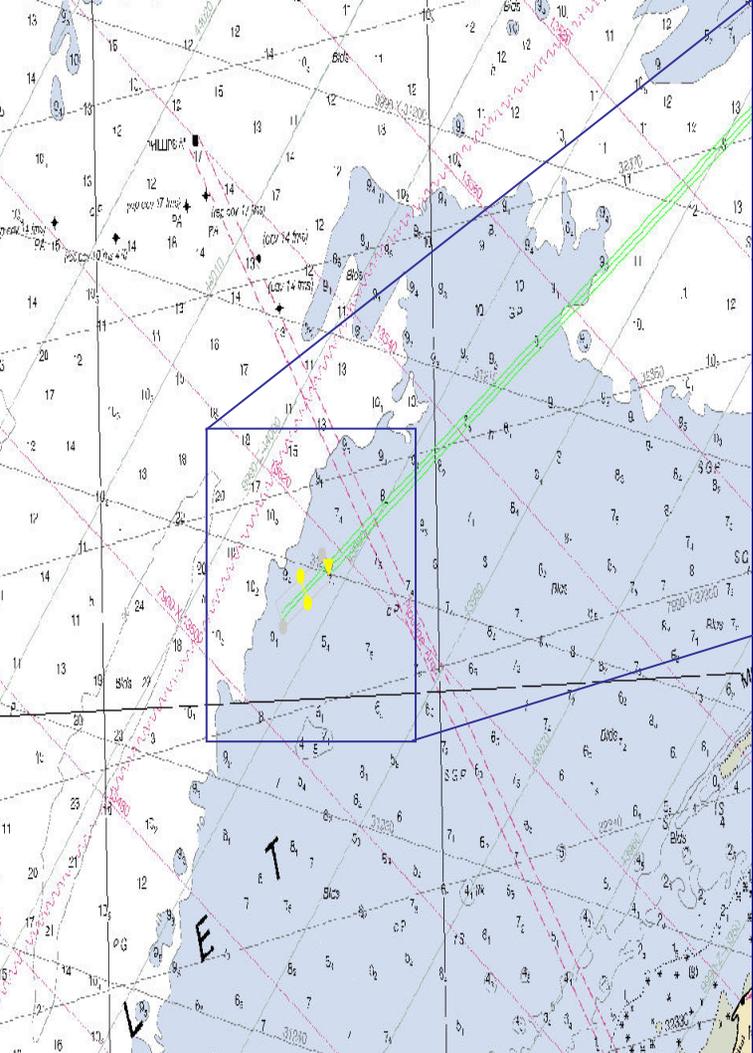
State: Alaska
General Locality: Northern Cook Inlet
Sublocality: No Name
Project Number: OPR-P385-TE-08

The following item was found during hydrographic survey operations:

Object Discovered: Rock
Contact observed 5 meters off floor corrected to Mean Lower Low Water using predicted tide correctors.

Affected nautical charts:

Chart Number	Edition		Reported Depth	Charted Horiz. Datum	Geographic Position	
	No.	Date			Latitude	Longitude
16660	30	6/1/2006	10.263 m	NAD 83	61°00'54.90"N	150°53'57.08"W
16662	8	9/1/2007				
16663	8	3/1/2006				



Rock with 33ft least depth in charted 58ft

NOT FOR NAVIGATION

Sheet D



Project: OPR-P385-TE-08
 Survey: H11840
 State: Alaska
 Locality: Northern Cook Inlet
 Sub-locality: No Name
 Survey Scale: 1:20,000

Sounding Units: Meters
 Sounding Datum: MLLW
 Horizontal Datum: NAD 83
 Projection: UTM 5N
 Central Meridian: 093° 00 00
 Scale Factor: 0.9996

R/V Mt. Mitchell

July 22, 2008

Danger to Navigation Report

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H11840

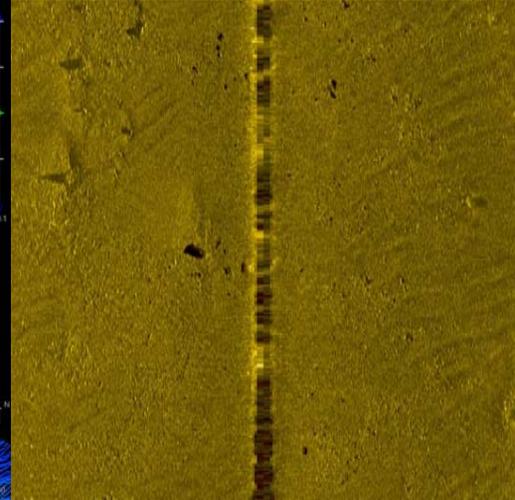
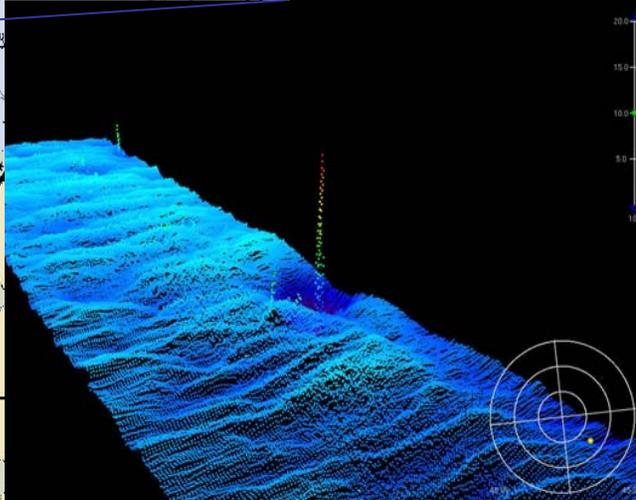
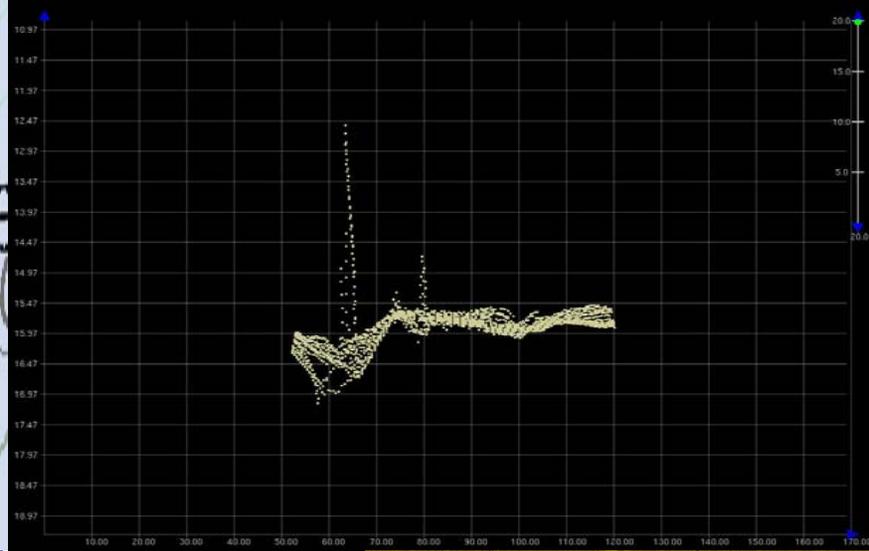
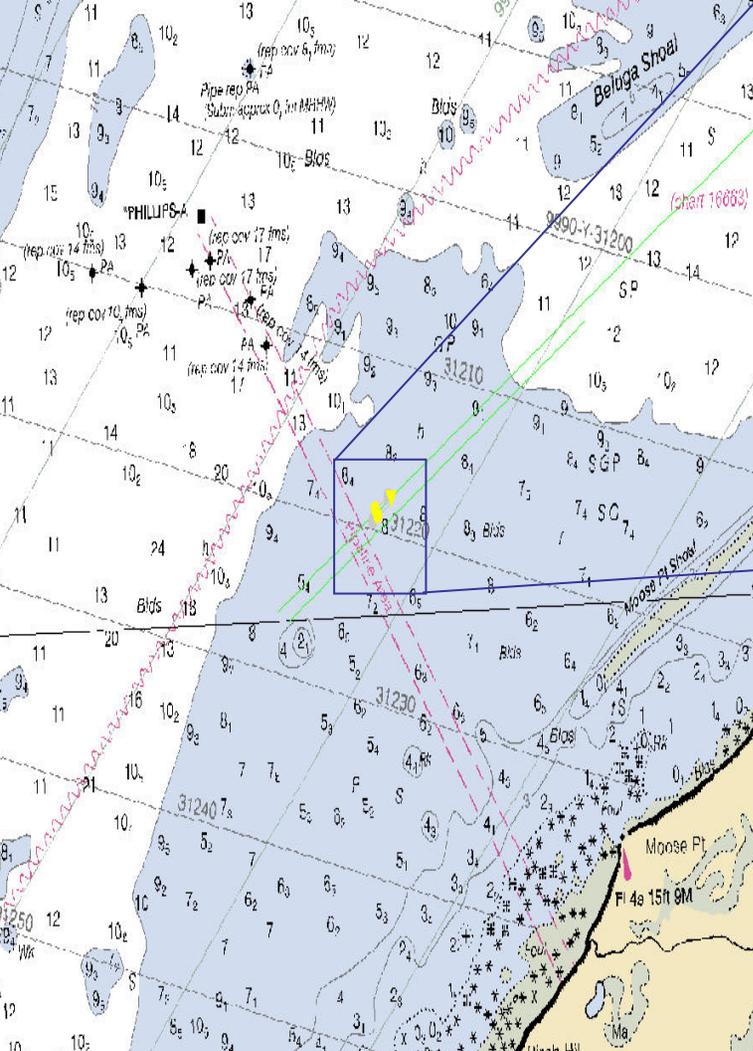
State: Alaska
General Locality: Northern Cook Inlet
Sublocality: n/a
Project Number: OPR-P385-TE-08

The following item was found during hydrographic survey operations:

Object Discovered: Rock
Contact observed 4 meters off floor corrected to Mean Lower Low Water using predicted tide correctors.

Affected nautical charts:

Chart Number	Edition		Reported Depth	Charted Horiz. Datum	Geographic Position	
	No.	Date			Latitude	Longitude
16660	30	6/1/2006	12.514 m	NAD 83	61° 01' 10.18" N	150° 50' 21.79" W
16662	8	9/1/2007				
16663	8	3/1/2006				



Rock with 41ft least depth in charted 48ft

NOT FOR NAVIGATION

Sheet D

TERRASOUND
 TERRESTRIAL AND SEA FLOOR MAPPING

Project: OPR-P385-TE-08
 Survey: H11840
 State: Alaska
 Locality: Northern Cook Inlet
 Sub-locality: n/a
 Survey Scale: 1:20,000

Sounding Units: Meters
 Sounding Datum: MLLW
 Horizontal Datum: NAD 83
 Projection: UTM 5N
 Central Meridian: 093° 00 00
 Scale Factor: 0.9996

R/V Mt. Mitchell

July 29, 2008

Danger to Navigation Report

REPORT OF DANGER TO NAVIGATION

Hydrographic Survey Registry Number: H11840

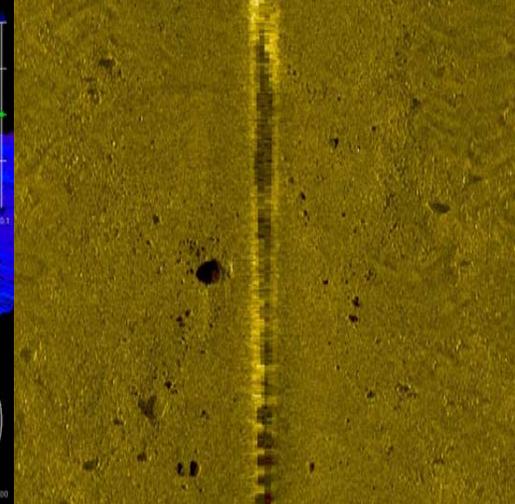
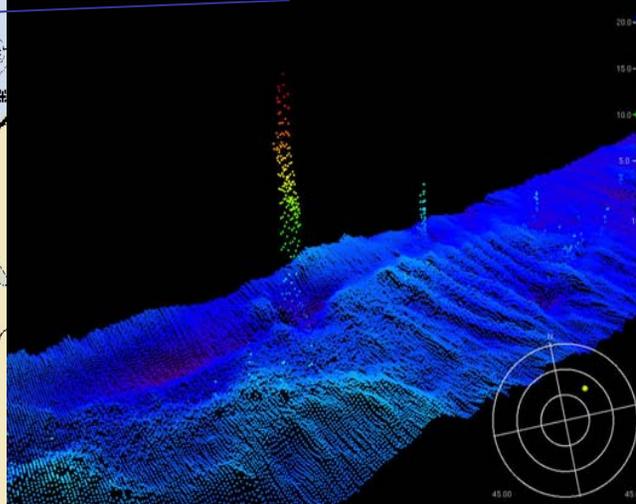
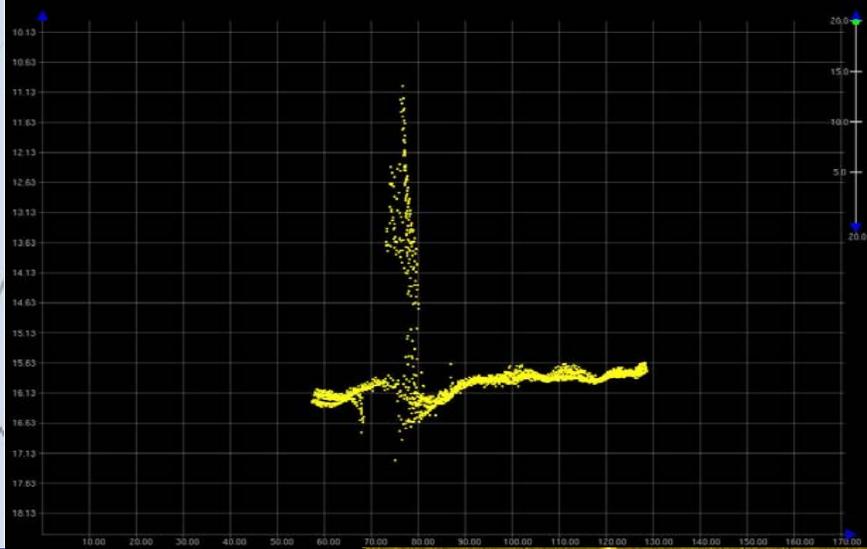
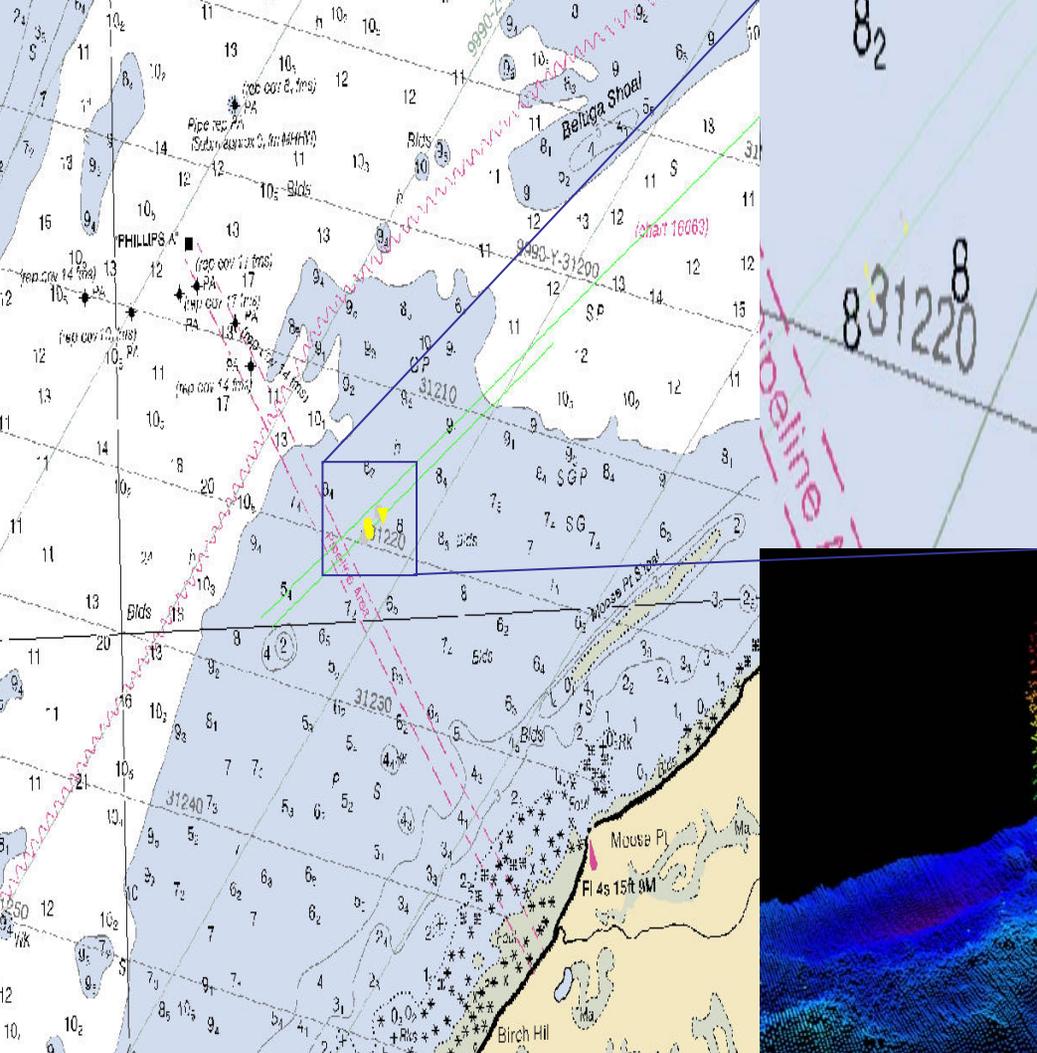
State: Alaska
General Locality: Northern Cook Inlet
Sublocality: n/a
Project Number: OPR-P385-TE-08

The following item was found during hydrographic survey operations:

Object Discovered: Rock
Contact observed 5 meters off floor corrected to Mean Lower Low Water using predicted tide correctors.

Affected nautical charts:

Chart Number	Edition		Reported Depth	Charted Horiz. Datum	Geographic Position	
	No.	Date			Latitude	Longitude
16660	30	6/1/2006	11.001 m	NAD 83	61° 01' 05.62" N	150° 49' 48.57" W
16662	8	9/1/2007				
16663	8	3/1/2006				



Rock with 36ft least depth in charted 48ft

NOT FOR NAVIGATION

Sheet D

H11840 Danger to Navigation #01

Registry Number: H11840
State: Alaska
Locality: Northern Cook Inlet
Sub-locality: n/a
Project Number: OPR-P385-TE-08
Survey Dates: 07/21/2008 - 08/16/2008

Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
16665	9th	03/01/2006	1:50,000 (16665_1)	USCG LNM: 10/16/2007 (11/03/2009) NGA NTM: 02/16/2002 (11/07/2009)
16662	8th	09/01/2007	1:100,000 (16662_1)	[L]NTM: ?
16663	8th	03/01/2006	1:100,000 (16663_1)	USCG LNM: 09/02/2008 (11/03/2009) NGA NTM: 02/16/2002 (11/07/2009)
16660	30th	06/01/2006	1:194,154 (16660_1)	[L]NTM: ?
16013	30th	07/01/2006	1:969,761 (16013_1)	[L]NTM: ?
531	24th	07/01/2007	1:2,100,000 (531_1)	[L]NTM: ?
500	8th	06/01/2003	1:3,500,000 (500_1)	[L]NTM: ?
50	6th	06/01/2003	1:10,000,000 (50_1)	[L]NTM: ?

* Correction(s) - source: last correction applied (last correction reviewed--"cleared date")

Features

No.	Name	Feature Type	Survey Depth	Survey Latitude	Survey Longitude	AWOIS Item
1.1	Rock	Rock	7.68 m	60° 57' 53.4" N	150° 51' 06.5" W	---
1.2	52ft Shoal	Shoal	15.92 m	61° 04' 47.3" N	150° 41' 40.6" W	---
1.3	49ft Shoal	Shoal	15.02 m	61° 04' 57.5" N	150° 40' 48.7" W	---
1.4	48ft Shoal	Shoal	14.84 m	61° 05' 15.2" N	150° 39' 53.6" E	---
1.5	46ft Shoal	Shoal	13.95 m	61° 05' 25.4" N	150° 38' 52.1" W	---
1.6	54ft Shoal	Shoal	16.57 m	61° 05' 35.8" N	150° 37' 59.1" W	---
1.7	58ft Shoal	Shoal	17.86 m	61° 05' 52.2" N	150° 36' 48.6" W	---

1 - Danger To Navigation

1.1) GP No. - 1 from H11840_DtoN#01.xls**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 60° 57' 53.4" N, 150° 51' 06.5" W
Least Depth: 7.68 m (= 25.20 ft = 4.199 fm = 4 fm 1.20 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp: 2008-229.10:11:00.000 (08/16/2008)
GP Dataset: H11840_DtoN#01.xls
GP No.: 1
Charts Affected: 16662_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

Rock with 4 fathoms 1 foot least depth in charted 5 fathoms 2 feet.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11840_DtoN#01.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 4 fathoms Rock at current survey location.

Cartographically-Rounded Depth (Affected Charts):

4 ¼fm (16660_1, 16013_1)

4fm 1ft (16662_1, 16663_1, 531_1)

7.7m (500_1, 50_1)

S-57 Data

Geo object 1: Underwater rock / awash rock (UWTROC)
Attributes: OBJNAM - Rock
 QUASOU - 1:depth known
 SORDAT - 20080816
 SORIND - US,US,survey,H11840

TECSOU - 2,3:found by side scan sonar,found by multi-beam

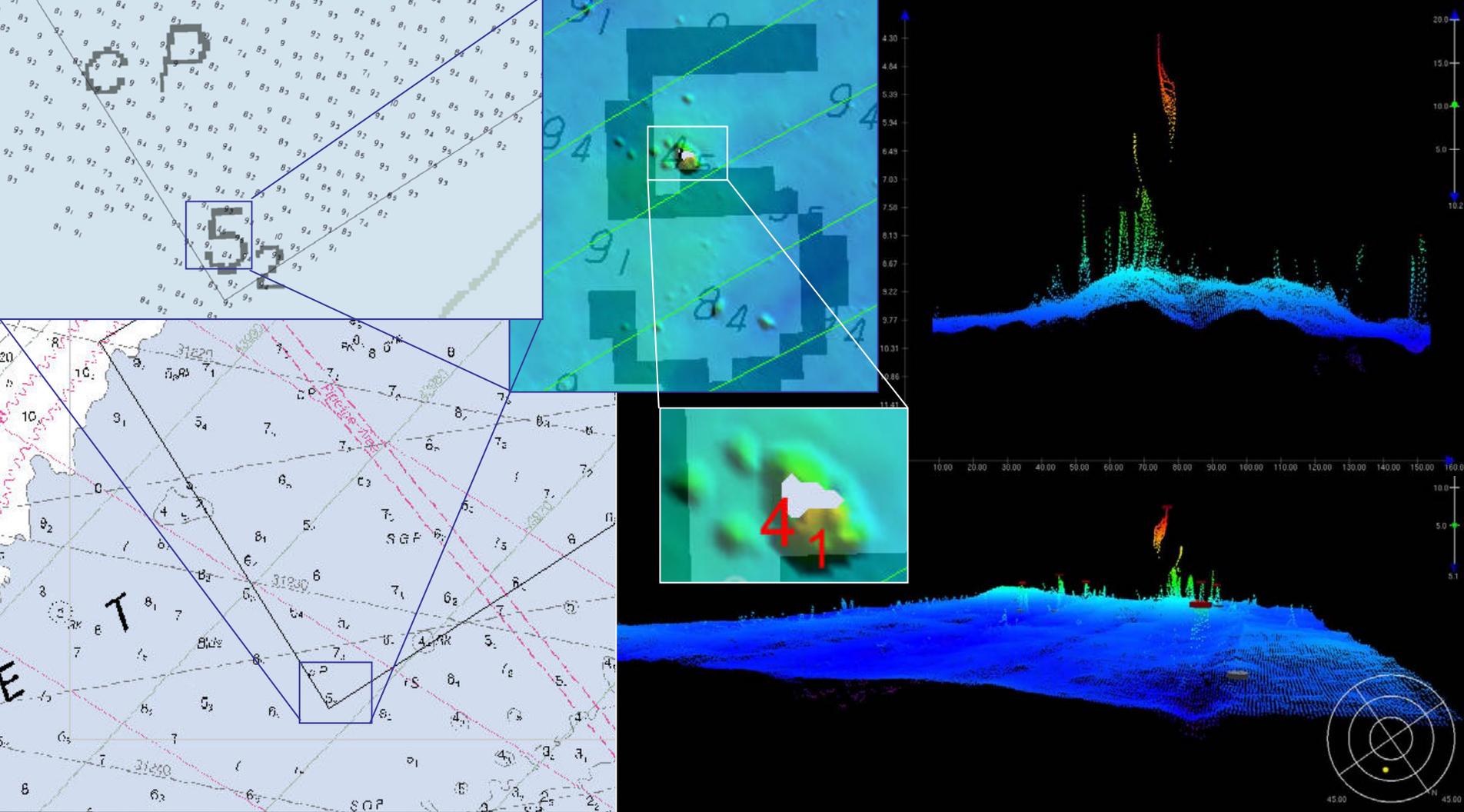
VALSOU - 7.68 m

VERDAT - 12:Mean lower low water

WATLEV - 3:always under water/submerged

Office Notes

Concur with clarification. Shown on chart 16663; 8th Ed., and smaller scale charts as a dangerous rock, least depth 4 fathoms 1 foot. Office processing determined that the position and least depth are different from the initial DToN submission to MCD. Delete charted dangerous rock, least depth 25 feet. Chart dangerous rock, least depth 4 fathoms 1 foot, at the present survey position in Latitude 60°57' 53.3628" N, Longitude 150° 51'06.4512" W.



Rock with 4 fathoms 1 foot ft least depth in charted 5 fathoms 2 feet

NOT FOR NAVIGATION

Sheet D

Shown on chart 16663

Chart units in fathoms and feet



Project: OPR-P385-TE-08
 Survey: H11840
 State: Alaska
 Locality: Northern Cook Inlet
 Sub-locality: Moose Point Shoal
 Survey Scale: 1:20,000

Sounding Units: Meters
 Sounding Datum: MLLW
 Horizontal Datum: NAD 83
 Projection: UTM 5N
 Central Meridian: -153° 00 00
 Scale Factor: 0.9996

R/V Mt. Mitchell

November 16, 2009

1.2) GP No. - 2 from H11840_DtoN#01.xls**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 61° 04' 47.3" N, 150° 41' 40.6" W
Least Depth: 15.92 m (= 52.22 ft = 8.703 fm = 8 fm 4.22 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp: 2008-203.10:17:00.000 (07/21/2008)
GP Dataset: H11840_DtoN#01.xls
GP No.: 2
Charts Affected: 16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

Soundings in area found to be significantly shoaler than charted Depths corrected to Mean Lower Low Water using GPSTide-derived correctors

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11840_DtoN#01.xls	2	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 52ft Shoal Sounding at current survey location.

Cartographically-Rounded Depth (Affected Charts):

52ft (16665_1)
8 ¾fm (16660_1, 16013_1)
8fm 4ft (16663_1, 531_1)
15.9m (500_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: OBJNAM - 52ft Shoal
QUASOU - 1:depth known

SORDAT - 20080721

SORIND - US,US,survey,H11840

TECSOU - 2,3:found by side scan sonar,found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Concur with clarification. Shown on chart 16665; 9th Ed., and smaller scale charts with least depth 52 feet. Office processing determined that the position and least depth are different from the initial DTON submission to MCD. Chart as shoal sounding, least depth 49 feet, at the present survey position in Latitude 61°04' 52.0774" N, Longitude 150°41'45.2454" W.

1.3) GP No. - 3 from H11840_DtoN#01.xls**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 61° 04' 57.5" N, 150° 40' 48.7" W
Least Depth: 15.02 m (= 49.28 ft = 8.213 fm = 8 fm 1.28 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp: 2008-203.12:13:00.000 (07/21/2008)
GP Dataset: H11840_DtoN#01.xls
GP No.: 3
Charts Affected: 16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

Soundings in area found to be significantly shoaler than charted Depths corrected to Mean Lower Low Water using GPSTide-derived correctors

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11840_DtoN#01.xls	3	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 49ft Shoal Sounding at current survey location.

Cartographically-Rounded Depth (Affected Charts):

49ft (16665_1)
8 ¼fm (16660_1, 16013_1)
8fm 1ft (16663_1, 531_1)
15.0m (500_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: OBJNAM - 49ft Shoal
QUASOU - 1:depth known

SORDAT - 20080721

SORIND - US,US,survey,H11840

TECSOU - 2,3:found by side scan sonar,found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Concur with clarification. Shown on chart 16665; 9th Ed., and smaller scale charts with least depth 49 feet. Office processing determined that the position is different from the initial DToN submission to MCD. Chart as shoal sounding, least depth 49 feet, at the present survey position in Latitude 61°04'57.4903"N, Longitude 150°40'48.6502" W.

1.4) GP No. - 4 from H11840_DtoN#01.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 61° 05' 15.2" N, 150° 39' 53.6" E
Least Depth: 14.84 m (= 48.70 ft = 8.116 fm = 8 fm 0.70 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) [None] ; TVU (TPEv) [None]
Timestamp: 2008-203.10:10:00.000 (07/21/2008)
GP Dataset: H11840_DtoN#01.xls
GP No.: 4
Charts Affected: [no CHAPP data available]

Remarks:

Soundings in area found to be significantly shoaler then charted Depths corrected to Mean Lower Low Water using GPSTide-derived correctors

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11840_DtoN#01.xls	4	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 48ft Shoal Sounding at current survey location.

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: OBJNAM - 48ft Shoal
 QUASOU - 1:depth known
 SORDAT - 20080721
 SORIND - US,US,survey,H11840
 TECSOU - 2,3:found by side scan sonar,found by multi-beam
 VERDAT - 12:Mean lower low water

Office Notes

Concur with clarification. Shown on chart 16665; 9th Ed., and smaller scale charts with least depth 48 feet. Office processing determined that the position and least depth are different from the initial DToN submission to MCD. Chart as shoal sounding, least depth 47 feet, at the present survey position in Latitude 61°05'10.1108" N, Longitude 150°40'03.1962" W.

1.5) GP No. - 5 from H11840_DtoN#01.xls**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 61° 05' 25.4" N, 150° 38' 52.1" W
Least Depth: 13.95 m (= 45.78 ft = 7.630 fm = 7 fm 3.78 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp: 2008-203.22:28:00.000 (07/21/2008)
GP Dataset: H11840_DtoN#01.xls
GP No.: 5
Charts Affected: 16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

Soundings in area found to be significantly shoaler than charted Depths corrected to Mean Lower Low Water using GPSTide-derived correctors

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11840_DtoN#01.xls	5	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 46ft Shoal Sounding at current survey location.

Cartographically-Rounded Depth (Affected Charts):

46ft (16665_1)
 7 ½fm (16660_1, 16013_1)
 7fm 4ft (16663_1, 531_1)
 14.0m (500_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: OBJNAM - 46ft Shoal
 QUASOU - 1:depth known

SORDAT - 20080721

SORIND - US,US,survey,H11840

TECSOU - 2,3:found by side scan sonar,found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Concur with clarification. Shown on chart 16665; 9th Ed., and smaller scale charts with least depth 46 feet. Office processing determined that the position and least depth are different from the initial DToN submission to MCD. Chart as shoal sounding, least depth 45 feet, at the present survey position in Latitude 61°05' 26.5304" N, Longitude 150°38'48.2608" W.

1.6) GP No. - 6 from H11840_DtoN#01.xls**DANGER TO NAVIGATION****Survey Summary**

Survey Position: 61° 05' 35.8" N, 150° 37' 59.1" W
Least Depth: 16.57 m (= 54.35 ft = 9.059 fm = 9 fm 0.35 ft)
TPU ($\pm 1.96\sigma$): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp: 2008-204.00:54:00.000 (07/22/2008)
GP Dataset: H11840_DtoN#01.xls
GP No.: 6
Charts Affected: 16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

Soundings in area found to be significantly shoaler than charted Depths corrected to Mean Lower Low Water using GPSTide-derived correctors

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11840_DtoN#01.xls	6	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 54ft Shoal Sounding at current survey location.

Cartographically-Rounded Depth (Affected Charts):

54ft (16665_1)
 9fm (16660_1, 16013_1)
 9fm 0ft (16663_1, 531_1)
 16.6m (500_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: OBJNAM - 54ft Shoal
 QUASOU - 2:depth unknown

SORDAT - 20080721

SORIND - US,US,survey,H11840

TECSOU - 2,3:found by side scan sonar,found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Concur with clarification. Shown on chart 16665; 9th Ed., and smaller scale charts with least depth 54 feet. Office processing determined that the position and least depth are different from the initial DToN submission to MCD. Chart as shoal sounding, least depth 54.2520 feet, at the present survey position in Latitude 61°05' 33.5494" N, Longitude 150°38'05.2520" W.

1.7) GP No. - 7 from H11840_DtoN#01.xls

DANGER TO NAVIGATION

Survey Summary

Survey Position: 61° 05' 52.2" N, 150° 36' 48.6" W
Least Depth: 17.86 m (= 58.60 ft = 9.766 fm = 9 fm 4.60 ft)
TPU ($\pm 1.96\sigma$): THU (TPEh) [None]; TVU (TPEv) [None]
Timestamp: 2008-204.08:08:00.000 (07/22/2008)
GP Dataset: H11840_DtoN#01.xls
GP No.: 7
Charts Affected: 16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

Soundings in area found to be significantly shoaler than charted Depths corrected to Mean Lower Low Water using GPSTide-derived correctors

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11840_DtoN#01.xls	7	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 58ft Shoal Sounding at current survey location.

Cartographically-Rounded Depth (Affected Charts):

58ft (16665_1)
 9 ¾fm (16660_1, 16013_1)
 9fm 4ft (16663_1, 531_1)
 17.9m (500_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)
Attributes: OBJNAM - 58ft Shoal
 QUASOU - 1:depth known

SORDAT - 20080721

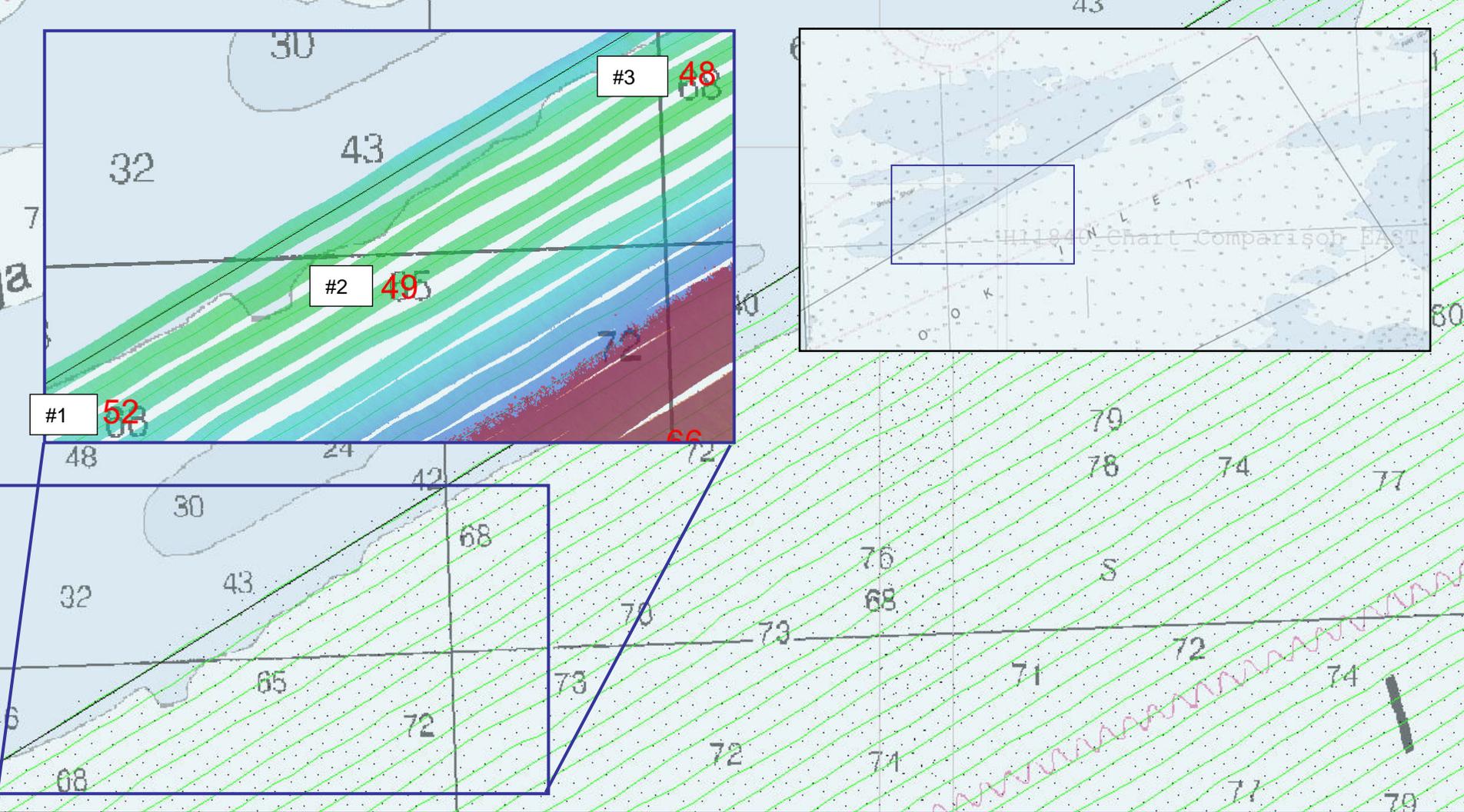
SORIND - US,US,survey,H11840

TECSOU - 2,3:found by side scan sonar,found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Concur with clarification. Shown on chart 16665; 9th Ed., and smaller scale charts with least depth 58 feet. Office processing determined that the position and least depth are different from the initial DToN submission to MCD. Chart as shoal sounding, least depth 57.8339 feet, at the present survey position in Latitude 61°05' 54.8448" N, Longitude 150°36'49.6602" W.



Shoaling areas

NOT FOR NAVIGATION

Chartlet 1 of 2

Shown on Chart 16665

Chart units in feet

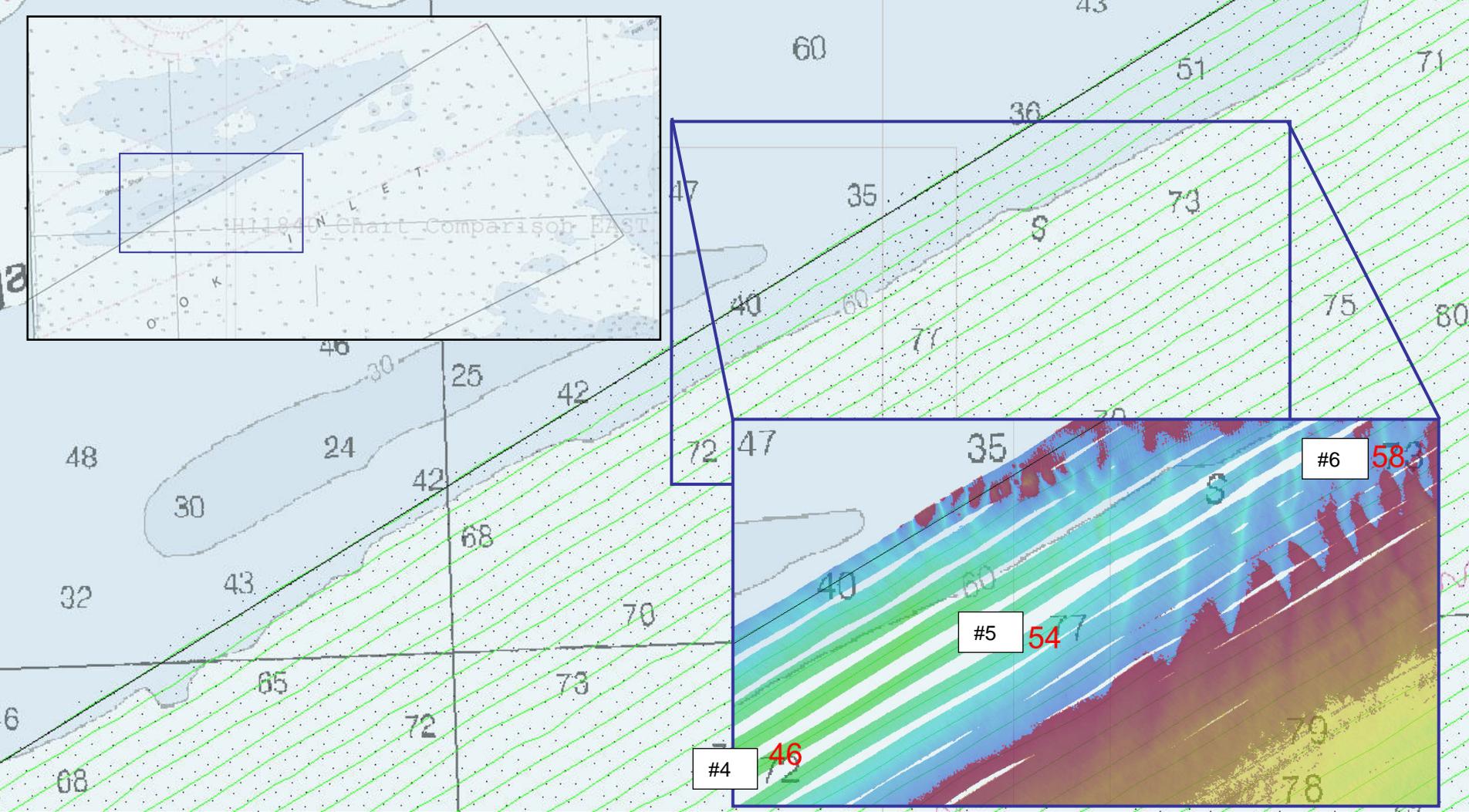


Project: OPR-P385-TE-08
 Survey: H11840 (Sheet D)
 State: Alaska
 Locality: Northern Cook Inlet
 Sub-locality: n/a
 Survey Scale: 1:20,000

Sounding Units: Meters
 Sounding Datum: MLLW
 Horizontal Datum: NAD 83
 Projection: UTM 5N
 Central Meridian: 153° 00 00
 Scale Factor: 0.9996

R/V Mt. Mitchell

 November 17, 2009



Shoaling areas

NOT FOR NAVIGATION

Chartlet 2 of 2

Shown on Chart 16665

Chart units in feet



APPENDIX II

Survey Feature Report

AWOIS

There were no Automated Wrecks and Obstructions (AWOIS) assigned in survey area H11840. **Do not concur. Chart AWOIS Item #50174 at present survey position at Latitude 60° 58' 22.7388" N, Longitude 150°49'17.3928"W.**

Platforms

There were no Platforms in survey area H11840. **Concur.**

Uncharted Wrecks

There were no Uncharted Wrecks in survey area H11840. **Concur.**



APPENDIX III

Progress Sketch and Final Survey Limits

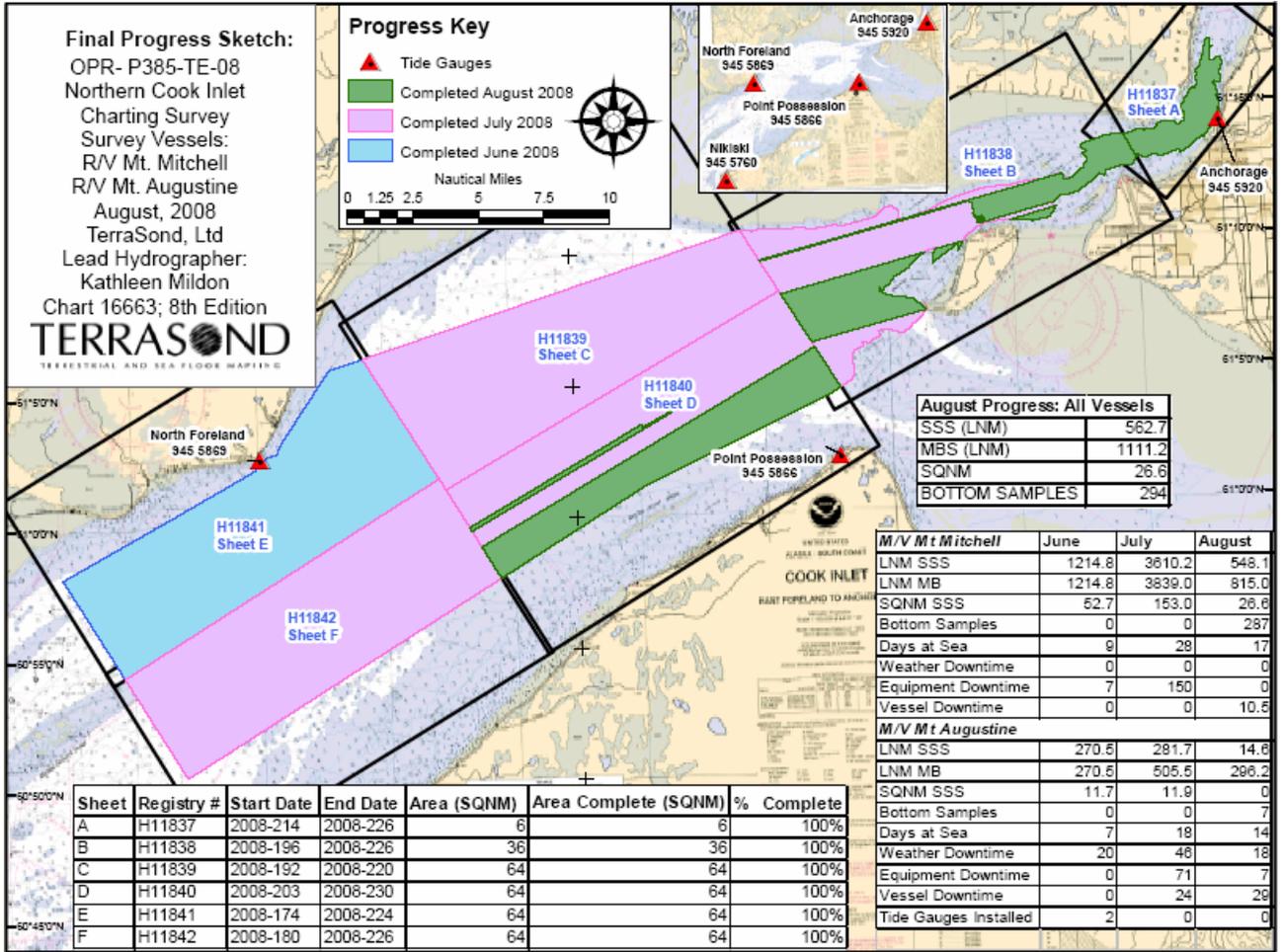


Figure 1: Final Progress Sketch for OPR-P385-TE-08

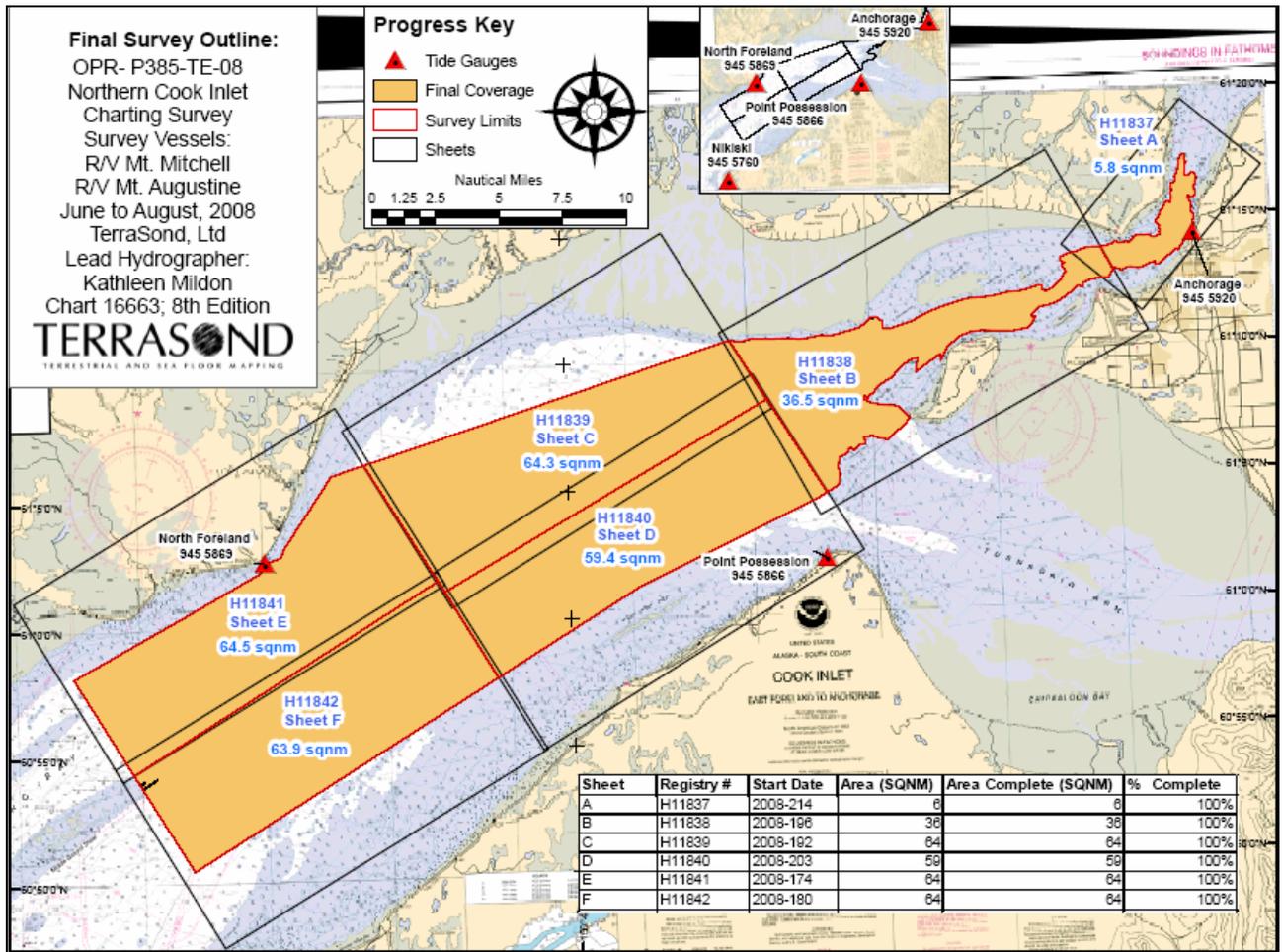


Figure 2: Final Survey Outline for OPR-P385-TE-08



APPENDIX IV

**Tides and Water Levels
Field Tide Notes**

OPR-P385-TE-08
Northern Cook Inlet, Alaska
H11840, Sheet D

Abstract of Times Hydrography

Project: OPR-P385-TE-08

Registry No.: H11840

Table 1 – Sheet D Times of Hydrography: Inclusive Dates: July 21st, 2008 – August 16th, 2008. This Survey ran 24 hours a day.

START		END	
Day (Julian)	Time (UTC)	Day (Julian)	Time (UTC)
203	5:45	230	04:47

Attachments:

Site Reports and Closeout Reports for:
945-5866 Point Possession
945-5869 North Foreland

Site Report

945-5869 North Foreland, Alaska

Site Visit	Purpose of Visit	Installation	Team Leader	Mike Zieserl, JOA	Date of Visit	6/12 - 13/2008	
Tertiary Station	Installation	June 12, 2008	Removal		Number of Days		
Project	OCS	OPR-P385-TE-08			JOA	122	
Position (NAD83)	Latitude (N)	61° 02' 34"	Longitude (W)	151° 09' 49"	Time Meridian	0° (UTC)	
Local Values	Gravity (milligals)	n/a	GOES Angles	Elev 20°/ Az 162°	Magnetic Declination	19° E, +0°16' W/year	
Contractor	Prime			Tide Consultant			
	Terrasond 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Anne Dollard			John Oswald & Associates, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: John Oswald			
Owner	Uplands (and dock)			Tidelands			
	Tyonek Native Corporation 1689 C Street, Suite #219 Anchorage, AK 99501-5131 Phone (907) 272-0707 ATTN: Chuck Akers cakers@tyonek.com			State of Alaska			
Local Info	Contact Chuck Akers prior to traveling to Tyonek. He will coordinate permission with Tyonek Village Council. He may be able to coordinate someone to meet you at the airstrip and drive you to the dock. Debbie Standifer and her son Josh Bartels assisted with the station installation. Debbie has a Ford Expedition she rents. Her cell phone is 830-6929 and home phone is 583-2265. Josh's cell phone is 830-4854 and his email is dreamkeeper07@yahoo.com. Prior to the installation of the tide gauges, access was blocked by a large tank set by heavy equipment across the pier. Chuck Akers had the tank moved.						
Location	This tertiary station is located on the Tyonek Pier, approximately 1.5 miles SW of the village of Tyonek, on the west side of Cook Inlet. The station is approximately 40 miles SW of the Ted Stevens Anchorage International Airport and 26 mile NE of Nikiski. The station was reached by fixed wing aircraft from Merrill Field in Anchorage.						
Tide House	The tide gauges are housed in an existing wooden shed at the end of the Tyonek Pier. The shed is used to house the batteries and charge controller for a wind generator on the dock. The tide gauges are mounted on the north wall of the shed. The shed appears weatherproff and the door is not locked.						
Primary DCP Gauge 1 94558691	Installed	6/12/2008	Removed				
	Radar Sensor	DAA H3611i	Serial No.	1582	Level Point to Sensor "0"	4mm below bottom of plate	
	Data Logger	DAA H522+	Serial No.	2414	Firmware	2.12	
	GOES Radio	combined in H522+			GPS timing	Yes	
	GOES Address	90700540	Channel	170	Format	Binary (9 byte)	
	Interval	1 hour	Offset	0:00:20	Transmit Window	10 seconds	
	Power	1 battery with 20W solar panel and Sun saver 6 solar regulator					
	Radar Mount	The radar was hung with a unistrut bracket from the metal bull rail on the east side of the dock.					
Comments	The H522+ may perform a reset when a flash card is inserted into PCMCIA slot. The side button was broken and has been disconnected from the circuit board.						
Secondary DCP Gauge 2 94558692	Installed	6/12/2008	Removed				
	Radar Sensor	DAA H3611i	Serial No.	1618	Level Point to Sensor "0"	Even with bottom of plate	
	Data Logger	DAA H522+	Serial No.	2413	Firmware	2.11	
	GOES Radio	combined in H522+			GPS timing	Yes	
	GOES Address	90701636	Channel	170	Format	Binary (9 byte)	
	Interval	1 hour	Offset	0:00:30	Transmit Window	10 seconds	
	Power	1 battery with 20W solar panel and Sun saver 6 solar regulator					
	Radar Mount	The radar was hung with a unistrut bracket from the metal bull rail on the east side of the dock. This radar is closer to the tide shed than the primary radar.					
Comments	On 6/24, this radar was rotated on its mount to try to decrease the noise in its measurements. The offset from the measure down point on the dock to the bottom of the mounting plate of the radar did not change.						
Tide Staff	None. Performed "measure downs", lowering weighted steel tape to the surface of the water and recording distance up to stamped TBM on the dock. Also performed "staff shots", leveling from a tidal bench mark to the water surface. The water height was measured with the aid of a stilling well on the survey rod. The traditional "staff shots" seem to be accurate and consistent than the measure downs. Josh Bartels is the local contact and he performs weekly measure downs.						
Tidal Bench Marks	Primary	Recovered	Established	Designations			
	9455869 H	5	0	9455869 D, 9455869 E, 9455869 H, 9455869 J, 9455869 K			
Leveling	Date	Order	Type	Bench Marks Connected			
	6/12/2008	Third	Optical	9455869 D, 9455869 E, 9455869 H, 9455869 J, 9455869 K			
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).					
	Comments	Also ran levels through 5 marks which are just stamped into the metal dock surface: L, M, N, G and F					
GPS & OPUS	Bench Mark	Date	Session Length	Latitude (N)	Longitude (W)	Ellipsoid Height (m)	
	9455866 H	6/12/2008	29 hrs	61° 02' 46.29651"	151° 10' 3.08016"	13.903	
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.					
Comments	Most suitable mark for GPS, but there is a metal conveyor that partially obstructs view of sky.						
Station History	6/13/08 Mike Zieserl - completed installation staff shots						
	6/24/08 Mike Zieserl - rotated Radar 2 on mounting bracket to try to reduce measurement noise. Performed measure downs and staff shots.						
	7/1/08 Mike Zieserl - Upgraded firmware for both gauges to 2.12. Removed side button from Gauge 1 H522+. Remapped radar 2 (had not been measuring water height for several days). Performed measure downs.						
	7/10/08 Cody Mayfield - performed traditional staff shots and set up GPS receiver on bench mark 9455869 H for Terrasond GPS network observation.						
	8/7/08 Cody Mayfield - performed traditional staff shots						

Site Report

945-5869 North Foreland, Alaska

Site Visit	Purpose of Visit	Closeout	Team Leader	Mike Zieserl, JOA	Date of Visit	9/4/2008, 10/8/2008	
Tertiary Station	Installation	June 12, 2008	Removal	September 4, 2008	Number of Days	84	
Project	OCS	OPR-P385-TE-08			JOA	122	
Position (NAD83)	Latitude (N)	61° 02' 34"	Longitude (W)	151° 09' 49"	Time Meridian	0° (UTC)	
Local Values	Gravity (milligals)	n/a	GOES Angles	Elev 20°/ Az 162°	Magnetic Declination	19° E, +0°16' W/year	
Contractor	Prime			Tide Consultant			
	Terrasond 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Anne Dollard			John Oswald & Associates, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: Mike Zieserl			
Owner	Uplands (and dock)			Tidelands			
	Tyonek Native Corporation 1689 C Street, Suite #219 Anchorage, AK 99501-5131 Phone (907) 272-0707 ATTN: Chuck Akers cakers@tyonek.com			State of Alaska			
Local Info	Contact Chuck Akers prior to traveling to Tyonek. He will coordinate permission with Tyonek Village Council. He may be able to arrange someone to meet you at the airstrip and drive you to the dock. Debbie Standifer and her son Josh Bartels assisted with the station installation. Prior to the installation of the tide gauges, access was blocked by a large tank set by heavy equipment across the pier. Chuck Akers had the tank moved. Debbie's daughter Gena assisted with station removal.						
Location	This tertiary station is located on the Tyonek Pier, approximately 1.5 miles SW of the village of Tyonek, on the west side of Cook Inlet. The station is approximately 40 miles SW of the Ted Stevens Anchorage International Airport and 26 mile NE of Nikiski. The station was reached by fixed wing aircraft from Merrill Field in Anchorage.						
Tide House	The tide gauges are housed in an existing wooden shed at the end of the Tyonek Pier. The shed is used to house the batteries and charge controller for a wind generator on the dock. The tide gauges are mounted on the north wall of the shed. The shed appears weatherproof and the door is not locked.						
Primary DCP Gauge 1 94558691	Installed	6/12/2008	Removed	9/4/2008			
	Radar Sensor	DAA H3611i	Serial No.	1582	Level Point to Sensor "0"	4mm below bottom of plate	
	Data Logger	DAA H522+	Serial No.	2414	Firmware	2.12	
	GOES Radio	combined in H522+			GPS timing	Yes	
	GOES Address	90700540	Channel	170	Format	Binary (9 byte)	
	Interval	1 hour	Offset	0:00:20	Transmit Window	10 seconds	
	Power	1 battery with 20W solar panel and SunSaver 6 solar regulator					
	Radar Mount	The radar was hung with a unistrut bracket from the metal bull rail on the east side of the dock.					
	Comments	The H522+ may perform a reset when a flash card is inserted into PCMCIA slot. The side button was broken and has been disconnected from the circuit board.					
	Secondary DCP Gauge 2 94558692	Installed	6/12/2008	Removed	8/26/2008		
Radar Sensor		DAA H3611i	Serial No.	1618	Level Point to Sensor "0"	Even with bottom of plate	
Data Logger		DAA H522+	Serial No.	2413	Firmware	2.11	
GOES Radio		combined in H522+			GPS timing	Yes	
GOES Address		90701636	Channel	170	Format	Binary (9 byte)	
Interval		1 hour	Offset	0:00:30	Transmit Window	10 seconds	
Power		1 battery with 20W solar panel and SunSaver 6 solar regulator					
Radar Mount		The radar was hung with a unistrut bracket from the metal bull rail on the east side of the dock. This radar is closer to the tide shed than the primary radar.					
Comments		On 6/24, this radar was rotated on its mount to try to decrease the noise in its measurements. The offset from the measure down point on the dock to the bottom of the mounting plate of the radar did not change. This radar was "remapped" on 7/1/08, after which it worked reliably.					
Tide Staff		None. Performed "measure downs", lowering weighted steel tape to the surface of the water and recording distance up to stamped TBM on the dock. Also performed "staff shots", leveling from a tidal bench mark to the water surface. The water height was measured with the aid of a stilling well on the survey rod. The traditional "staff shots" seem to be more accurate and consistent than the measure downs. Josh Bartels was the local contact and he performed semi-weekly measure downs. Staff shots were performed by JOA personnel.					
Tidal Bench Marks	Primary	Recovered	Established	Designations			
	9455869 H	5	0	9455869 D, 9455869 E, 9455869 H, 9455869 J, 9455869 K			

Site Report

945-5869 North Foreland, Alaska

Leveling	Date	Order	Type	Bench Marks Connected		
	6/12/2008	Third	Optical	9455869 D, 9455869 E, 9455869 H, 9455869 J, 9455869 K		
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).				
	Comments	Also ran levels through 5 marks which are just stamped into the metal dock surface: L, M, N, G and F				
	Date	Order	Type	Bench Marks Connected		
	9/4/2008	Third	Optical	9455869 D, 9455869 E, 9455869 H, 9455869 J, 9455869 K		
	Comments	Ran levels through 5 marks which are just stamped into the metal dock surface: L, M, N, G and F. Ran levels on dock twice because elevations changed from installation (3 wire in the morning, then single wire later in the day). Dock elevations seem to change as the tide changes.				
GPS & OPUS	Date	Order	Type	Bench Marks Connected		
	10/8/2008	Third	Optical	9455869 D, 9455869 E, 9455869 H, 9455869 J, 9455869 K		
	Comments	Reran closeout levels because of movement in marks on dock, including sensor "0". Ran levels on dock twice because elevations changed from installation (3 wire in the morning, then 3 wire later in the day). Dock elevations seem to change as the tide changes.				
GPS & OPUS	Bench Mark	Date	Session Length	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
	9455866 H	6/12/2008	29 hrs	61° 02' 46.29651"	151° 10' 3.08016"	13.903
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.				
	OPUSDB	http://beta.ngs.noaa.gov/CORS-Proxy/oraOpusDbWeb/getDdatasheet.jsp?PID=BBBF25&style=modern				
Comments	Most suitable mark for GPS, but there is a metal conveyor that partially obstructs view of sky.					
Station History	6/13/08 Mike Zieserl - completed installation staff shots					
	6/24/08 Mike Zieserl - rotated Radar 2 on mounting bracket to try to reduce measurement noise. Performed measure downs and staff shots.					
	7/1/08 Mike Zieserl - Upgraded firmware for both gauges to 2.12. Removed side button from Gauge 1 H522+. Remapped radar 2 (had not been measuring water height for several days). Performed measure downs.					
	7/10/08 Cody Mayfield - performed traditional staff shots and set up GPS receiver on bench mark 9455869 H for Terrasond GPS network observation.					
	8/26/08 Mike Zieserl - performed traditional staff shots, removed Radar #2 to send to another project. Measured distance between Radar #2 LP and leveling point on the dock before removal. Calibration test not performed before the radar was shipped to another project.					
	9/04/08 Mike Zieserl - closeout levels and staff shots, removed tide station.					
	10/08/08 Mike Zieserl - reran closeout levels because of movement of marks on dock. Movement was again confirmed.					

Site Report

945-5866 Point Possession, Alaska

Site Visit	Purpose of Visit	Installation	Team Leader	Lamar Gates, Terrasond	Date of Visit	6/8 - 11/2008
Tertiary Station	Installation	June 9, 2008	Removal		Number of Days	
Project	OCS	OPR-P385-TE-08			JOA	122
Position (NAD83)	Latitude (N)	61° 02' 02"	Longitude (W)	150° 24' 20"	Time Meridian	0° (UTC)
Local Values	Gravity (milligals)	981869	GOES Angles	Elev 20°/ Az 162°	Magnetic Declination	19° E, +0°16' W/year
Contractor	Prime			Tide Consultant		
	Terrasond 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Anne Dollard			John Oswald & Associates, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: John Oswald		
Owner	Betty J. Gilchrist, PO Box 4256, Soldotna, AK 99669 (uplands) State of Alaska (tidelands)					
Location	This tertiary tide station is located on the NW shore of Point Possession, on the east side of Cook Inlet on the Kenai Peninsula. It is at the base of a 60 ft high bluff. There is an open field at the top of the bluff and an abandoned day marker on a skeleton steel tower. The station is approximately 16 mi SW of Ted Stevens Anchorage International Airport, and 22 miles SW of the Port of Anchorage. The station was accessed by helicopter and fixed-wing from Anchorage.					
Tide House	The tide gauges are housed inside of a Weather Port tent erected above the gravel beach among the alder trees.					
Primary DCP Gauge 1 94558661	Installed	6/10/2008	Removed			
	Pressure Sensor	DAA H350XL	Serial No.	1354	Vent Value, tubing attached (m)	0.037
	Data Logger	combined in H350XL	Firmware	2.12H	Slope Constant in Gauge	0.68980
	Pump	DAA H355	Serial No.	1899		
	GOES Radio	DAA H222	Serial No.	1705	GPS timing	Yes
	GOES Address	9070B6CE	Channel	170, 300 baud	Format	NGWLMS
	Interval	1 hour	Offset	00:02:10	Transmit Window	10 seconds
	Power	Powered by 2 blue top Optima batteries with 75W solar panel (on top of bluff) for recharging				
	Orifice	Orifice is attached to anchor constructed from pieces of railroad track with 70ft buoy line and Norwegian buoy. The orifice line is 460 m (1500 ft) long, paired with 3/8" galvanized aircraft cable and secured to beach with rebar.				
	Comments					
Secondary DCP Gauge 2 94558662	Installed	6/10/2008	Removed			
	Pressure Sensor	DAA H350XL	Serial No.	1051	Vent Value, tubing attached (m)	0.044
	Data Logger	combined in H350XL	Firmware	2.12H	Slope Constant in Gauge	0.68980
	Pump	DAA H355	Serial No.	2882		
	GOES Radio	DAA H222	Serial No.	1699	GPS timing	Yes
	GOES Address	907060A6	Channel	170, 300 baud	Format	NGWLMS
	Interval	1 hour	Offset	0:01:20	Transmit Window	10 seconds
	Power	Powered by 2 blue top Optima batteries with 75W solar panel (on top of bluff) for recharging				
	Orifice	Orifice is attached to anchor constructed from pieces of railroad track with 70ft buoy line and Norwegian buoy. The orifice line is 460 m (1500 ft) long, paired with 3/8" galvanized aircraft cable and secured to beach with rebar.				
	Comments					
Tide Staff	None. Performed "staff shots", leveling from tidal bench mark to rod with stilling well in the water.					
Tidal Bench Marks	Primary	Recovered	Established	Designations		
	9455866 D	10	0	945 5866 B, C, D, E, F, 1, 2, 3, 4 and 5		
	Comments	945 5866 A was searched for but not found.				
Leveling	Date	Order	Type	Bench Marks Connected		
	6/8 - 11/08	Third	Optical	945 5866 B, C, D, E, F, 2, 3, and 4		
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).				
Comments	Bench marks 945 5866 1 and 5 were not leveled to because only the stems of the monuments were recovered.					
GPS & OPUS	Bench Mark	Date	Session Length	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.				
	Comments	No GPS performed during install. Terrasond will complete before station removal.				
Station History	6/11/2008 Cody Mayfield - fixed leak in gauge 2. Finished tide station installation.					

Site Report

945-5866 Point Possession, Alaska

Site Visit	Purpose of Visit	Closeout	Team Leader	W Bowen, Terrasond	Date of Visit	9/3 - 4/2008	
Tertiary Station	Installation	June 9, 2008	Removal	September 4, 2008	Number of Days	87	
Project	OCS	OPR-P385-TE-08			JOA	122	
Position (NAD83)	Latitude (N)	61° 02' 02"	Longitude (W)	150° 24' 20"	Time Meridian	0° (UTC)	
Local Values	Gravity (milligals)	981869	GOES Angles	Elev 20°/ Az 162°	Magnetic Declination	19° E, +0°16' W/year	
Contractor	Prime Terrasond, Ltd 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Anne Dollard			Tide Consultant John Oswald & Associates, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: Mike Zieserl			
Owner	Betty J. Gilchrist, PO Box 4256, Soldotna, AK 99669 (uplands) State of Alaska (tidelands)						
Location	This tertiary tide station is located on the NW shore of Point Possession, on the east side of Cook Inlet on the Kenai Peninsula. It is at the base of a 60 ft high bluff. There is an open field at the top of the bluff and an abandoned day marker on a skeleton steel tower. The station is approximately 16 mi SW of Ted Stevens Anchorage International Airport, and 22 miles SW of the Port of Anchorage. The station was accessed by helicopter and fixed-wing from Anchorage.						
Tide House	The tide gauges are housed inside of a Weather Port tent erected above the gravel beach among the alder trees.						
Primary DCP Gauge 1 94558661	Installed	6/10/2008	Removed	9/4/2008			
	Pressure Sensor	DAA H350XL	Serial No.	1354	Vent Value, tubing attached (m)	0.037	
	Data Logger	combined in H350XL		Firmware	2.12H	Slope Constant in Gauge	0.68980
	Pump	DAA H355	Serial No.	1899			
	GOES Radio	DAA H222	Serial No.	1705	GPS timing	Yes	
	GOES Address	9070B6CE	Channel	170, 300 baud	Format	NGWLMS	
	Interval	1 hour	Offset	00:02:10	Transmit Window	10 seconds	
	Power	Powered by 2 blue top Optima batteries with 75W solar panel (on top of bluff) for recharging					
	Orifice	Orifice is attached to anchor constructed from pieces of railroad track with 70ft buoy line and Norwegian buoy. The orifice line is 460 m (1500 ft) long, paired with 3/8" galvanized aircraft cable and secured to beach with rebar.					
	Comments						
Secondary DCP Gauge 2 94558662	Installed	6/10/2008	Removed	9/4/2008			
	Pressure Sensor	DAA H350XL	Serial No.	1051	Vent Value, tubing attached (m)	0.044	
	Data Logger	combined in H350XL		Firmware	2.12H	Slope Constant in Gauge	0.68980
	Pump	DAA H355	Serial No.	2882			
	GOES Radio	DAA H222	Serial No.	1699	GPS timing	Yes	
	GOES Address	907060A6	Channel	170, 300 baud	Format	NGWLMS	
	Interval	1 hour	Offset	0:01:20	Transmit Window	10 seconds	
	Power	Powered by 2 blue top Optima batteries with 75W solar panel (on top of bluff) for recharging					
	Orifice	Orifice is attached to anchor constructed from pieces of railroad track with 70ft buoy line and Norwegian buoy. The orifice line is 460 m (1500 ft) long, paired with 3/8" galvanized aircraft cable and secured to beach with rebar.					
	Comments						
Tide Staff	None. Performed "staff shots", leveling from tidal bench mark to rod with stilling well in the water.						
Tidal Bench Marks	Primary	Recovered	Established	Designations			
	9455866 D	10	0	945 5866 B, C, D, E, F, 1, 2, 3, 4 and 5			
	Comments	945 5866 A was searched for but not found.					
Leveling	Date	Order	Type	Bench Marks Connected			
	6/8 - 11/08	Third	Optical	945 5866 B, C, D, E, F, 2, 3, and 4			
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).					
	Comments	Bench marks 945 5866 1 and 5 were not leveled to because only the stems of the monuments were recovered and confirmation of their identity is uncertain.					
GPS & OPUS	Bench Mark	Date	Session Length	Latitude (N)	Longitude (W)	Ellipsoid Height (m)	
	9455866 D	7/12/2008	8hrs	61° 2' 2.19192"	150° 24' 21.55615"	9.424	
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.					
	OPUSDB	http://beta.ngs.noaa.gov/CORS-Proxy/oraOpusDbWeb/getDatasheet.jsp?PID=BBBF49&style=modern					
	Comments	Original GPS observation was 32hrs in length, but the quality of the solution during a couple segments of the observation were poor, and the data was trimmed back to 8hrs.					
Station History	6/11/2008 Terrasond & JOA - fixed leak in gauge 2. Finished tide station installation.						
	7/16/08 Terrasond - Gauge 2 does not seem to be working properly. Purged tide gauges.						
	7/24/08 Terrasond & JOA - Purged tide gauges, investigated Gauge 2 problems. Did not resolve.						
	7/31/08 Terrasond - Both orifice anchors found upside down underwater. Flipped anchors right side up.						
	9/4/08 Terrasond - Closeout staff observations, leveling. Demobilize tide station.						



APPENDIX V

Supplemental Survey Records and Correspondence

Bottom Samples

55 bottom samples were collected in support of the 2008 survey. The samples were distributed geographically to obtain a full representation of the bottom characteristics as specified in NOAA Hydrographic Surveys Specifications and Deliverables, Section 7.1.

Concur with clarification. 29 out of 55 bottom samples included in H-cell for full representation of bottom characteristics and are denoted with an asterisk

Point #	Date	Time UTC	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface
D01*	8/13/2008	0:44	24.6	61° 2' 18.118" N	150° 35' 4.44" W	grey	medium	silt, cobbles
D02	8/13/2008	0:57	24	61° 2' 45.026" N	150° 33' 8.709" W	grey		silt
D03*	8/13/2008	1:14	23.8	61° 3' 9.737" N	150° 31' 0.027" W		medium	silt, cobbles
D04	8/13/2008	1:30	20.9	61° 3' 35.76" N	150° 29' 1.852" W		medium, coarse	pebbles
D05*	8/13/2008	1:43	20.5	61° 4' 5.046" N	150° 27' 5.064" W		coarse	cobbles
D06	8/13/2008	2:01	22.6	61° 4' 37.992" N	150° 25' 12.356" W		medium	sand
D07*	8/13/2008	2:18	26.6	61° 5' 32.975" N	150° 26' 19.06" W		fine	sand
D08	8/13/2008	2:31	27.1	61° 5' 1.841" N	150° 28' 14.563" W		fine	sand
D09*	8/12/2008	23:54	26	61° 4' 28.207" N	150° 30' 8.749" W	grey	fine	sand
D10*	8/13/2008	0:11	27.4	61° 3' 54.968" N	150° 32' 2.508" W		fine, coarse	sand, pebbles
D11*	8/8/2008	2:20	24.4	61° 3' 18.413" N	150° 34' 0.618" W	grey	medium	pebbles
D12	8/8/2008	2:40	23.1	61° 2' 46.809" N	150° 36' 1.863" W	grey	medium	pebbles
D13	8/8/2008	2:58	18.8	61° 2' 16.074" N	150° 37' 45.327" W	grey	medium	cobbles
D14*	8/8/2008	3:14	15.7	61° 1' 42.672" N	150° 40' 5.995" W	grey	medium	cobbles, pebbles
D15*	8/8/2008	3:30	15.5	61° 1' 9.921" N	150° 41' 33.516" W	grey	fine	pebbles
D16*	8/8/2008	3:44	15.8	61° 0' 36.668" N	150° 43' 28.411" W	grey	coarse, fine	pebbles, cobbles
D17	8/8/2008	4:00	16.5	61° 0' 3.375" N	150° 45' 22.33" W	grey	coarse, fine	pebbles, cobbles
D18*	8/8/2008	4:15	16.8	60° 59' 30.357" N	150° 47' 15.907" W	grey	medium, coarse	gravel, pebbles
D19	8/8/2008	4:30	15.3	60° 58' 56.549" N	150° 49' 11.682" W	grey	medium, coarse	cobbles, pebbles

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Point #	Date	Time UTC	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface
D20*	8/8/2008	4:51	16.7	60° 58' 23.788" N	150° 51' 4.551" W	grey	fine, medium	cobbles, pebbles
D21	8/8/2008	11:37	14.4	60° 59' 17.848" N	150° 52' 16.905" W			cobbles
D22*	8/8/2008	12:12	12.8	60° 59' 51.002" N	150° 50' 21.929" W			cobbles
D23	8/8/2008	12:28	12.9	61° 0' 24.581" N	150° 48' 28.666" W			pebbles, cobbles
D24*	8/8/2008	12:46	13.7	61° 0' 58.25" N	150° 46' 35.061" W			gravel
D25	8/8/2008	13:03	12.9	61° 1' 31.351" N	150° 44' 40.893" W			pebbles
D26	8/8/2008	13:28	14.1	61° 2' 4.453" N	150° 42' 46.789" W			cobbles
D27	8/8/2008	13:43	18.4	61° 2' 37.39" N	150° 40' 51.545" W			pebbles
D28*	8/8/2008	1:32	19.7	61° 3' 10.972" N	150° 38' 57.626" W	grey	medium	cobbles
D29	8/8/2008	1:47	22.7	61° 3' 44.548" N	150° 37' 0.025" W	grey	medium	sand
D30	8/8/2008	1:59	19.7	61° 4' 16.628" N	150° 35' 6.179" W	grey	medium	sand
D31*	8/9/2008	10:38	23.9	61° 4' 50.102" N	150° 33' 13.873" W			sand
D32	8/9/2008	10:57	26.7	61° 5' 22.916" N	150° 31' 18.338" W			sand
D33*	8/9/2008	11:16	24.6	61° 5' 56.189" N	150° 29' 24.266" W			sand
D34	8/9/2008	11:32	18.9	61° 6' 29.093" N	150° 27' 29.017" W			sand
D35*	8/7/2008	22:50	18.5	61° 7' 26.525" N	150° 28' 36.663" W	grey	medium	sand, pebbles
D36	8/7/2008	23:03	18	61° 6' 53.16" N	150° 30' 31.3" W	grey	fine	sand
D37*	8/7/2008	23:18	19.5	61° 6' 17.825" N	150° 32' 31.691" W	grey	fine	sand
D38	8/7/2008	23:29	21.1	61° 5' 46.61" N	150° 34' 23.769" W	grey	medium	sand
D39*	8/7/2008	23:54	21.1	61° 5' 13.09" N	150° 36' 18.26" W	grey	medium	sand
D40	8/8/2008	0:15	18.5	61° 4' 38.377" N	150° 38' 8.401" W	grey	medium	sand
D41*	8/8/2008	0:33	21.4	61° 4' 6.065" N	150° 40' 5.995" W	grey	medium	sand, pebbles
D42	8/8/2008	0:56	18.9	61° 3' 33.208" N	150° 42' 0.971" W	grey	medium	sand

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Point #	Date	Time UTC	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface
D43*	8/8/2008	14:02	16	61° 2' 59.631" N	150° 43' 53.818" W			gravel
D44*	8/8/2008	14:36	13.9	61° 2' 27.368" N	150° 45' 45.393" W			cobbles
D45	8/8/2008	14:48	12.9	61° 1' 54.167" N	150° 47' 42.126" W			pebbles
D46*	8/8/2008	15:00	12.6	61° 1' 20.6" N	150° 49' 33.199" W			pebbles
D47	8/8/2008	15:12	10.9	61° 0' 47.857" N	150° 51' 27.749" W			stone
D48*	8/8/2008	15:38	9.1	61° 0' 13.948" N	150° 53' 20.361" W			cobbles
D49	8/9/2008	19:40	18	61° 1' 9.225" N	150° 54' 31.731" W			pebbles
D50*	8/9/2008	19:28	16	61° 1' 42.208" N	150° 52' 39.114" W			sand, pebbles
D51*	8/9/2008	19:16	18.3	61° 2' 15.784" N	150° 50' 43.497" W			gravel, pebbles
D52*	8/9/2008	19:04	17.2	61° 2' 49.197" N	150° 48' 50.578" W			cobbles, pebbles
D53	8/9/2008	18:52	17.4	61° 3' 22.445" N	150° 46' 54.736" W			gravel, pebbles
D54*	8/8/2008	14:16	15.1	61° 3' 55.58" N	150° 43' 53.81" W			cobbles, pebbles
D55	8/9/2008	18:31	21.6	61° 4' 29.417" N	150° 43' 4.649" W			pebbles, sand

Table 1 – Bottom samples obtained in conjunction with survey H11840.

The following are additional information and/or edits to OPR-P385-TE-08 Data Acquisition and Processing Report and associated Descriptive Reports.

1. Draft Technical Note:

During final processing, all survey lines processed with PPK-based GPS tide used the vertical component of the GPS height to model dynamic draft. Therefore, no speed-based draft values exist in the vessel files nor was there an rpm-based delta draft table applied for these lines, which comprise the majority of the project. During the few occasions where PPK data quality was insufficient, lines were processed using verified tides and zones. For these lines the speed-based draft values were applied via the vessel file during field processing and an rpm-based delta draft file was applied during final processing.

Therefore, the following statements in the *DAPR Section B.7.1 Multibeam Data Processing* require additional text explaining the application of dynamic draft to lines processed with verified tides/zones.

Original text (Section B.7.1 Multibeam Data Processing pg. 24):

"A RPM-based delta draft file was loaded into the CARIS HIPS and SIPS projects for both vessels in lieu of the speed-based draft table in the vessel file. Measures were taken to ensure the delta draft file loaded properly and the correct draft values were used to calculate processed depths."

Amended text:

"A RPM-based delta draft file was loaded into the CARIS HIPS and SIPS projects for both vessels in lieu of the speed-based draft table in the vessel file. Measures were taken to ensure the delta draft file loaded properly and the correct draft values were used to calculate processed depths. All survey lines processed with PPK-based GPS tide used the vertical component of the GPS height to model dynamic draft, therefore,

no draft values exist in the .hvf nor was there an rpm-based delta draft table applied for these lines. During the few occasions where PPK data quality was insufficient, lines were processed using verified tides and zones, thus the rpm-based delta draft file was applied.

Original text (Section B.7.1 Multibeam Data Processing pg.23):

"Field collected sound speed data and delta draft were applied during final processing."

Amended text:

"Field collected sound speed data and delta draft were applied during final processing. All survey lines processed with PPK-based GPS tide used the vertical component of the GPS height to model dynamic draft; therefore no draft values exist in the vessel file nor was there an rpm-based delta draft table applied for these lines. During the few occasions where PPK data quality was insufficient, lines were processed using verified tides and zones, thus the rpm-based delta draft file was applied.

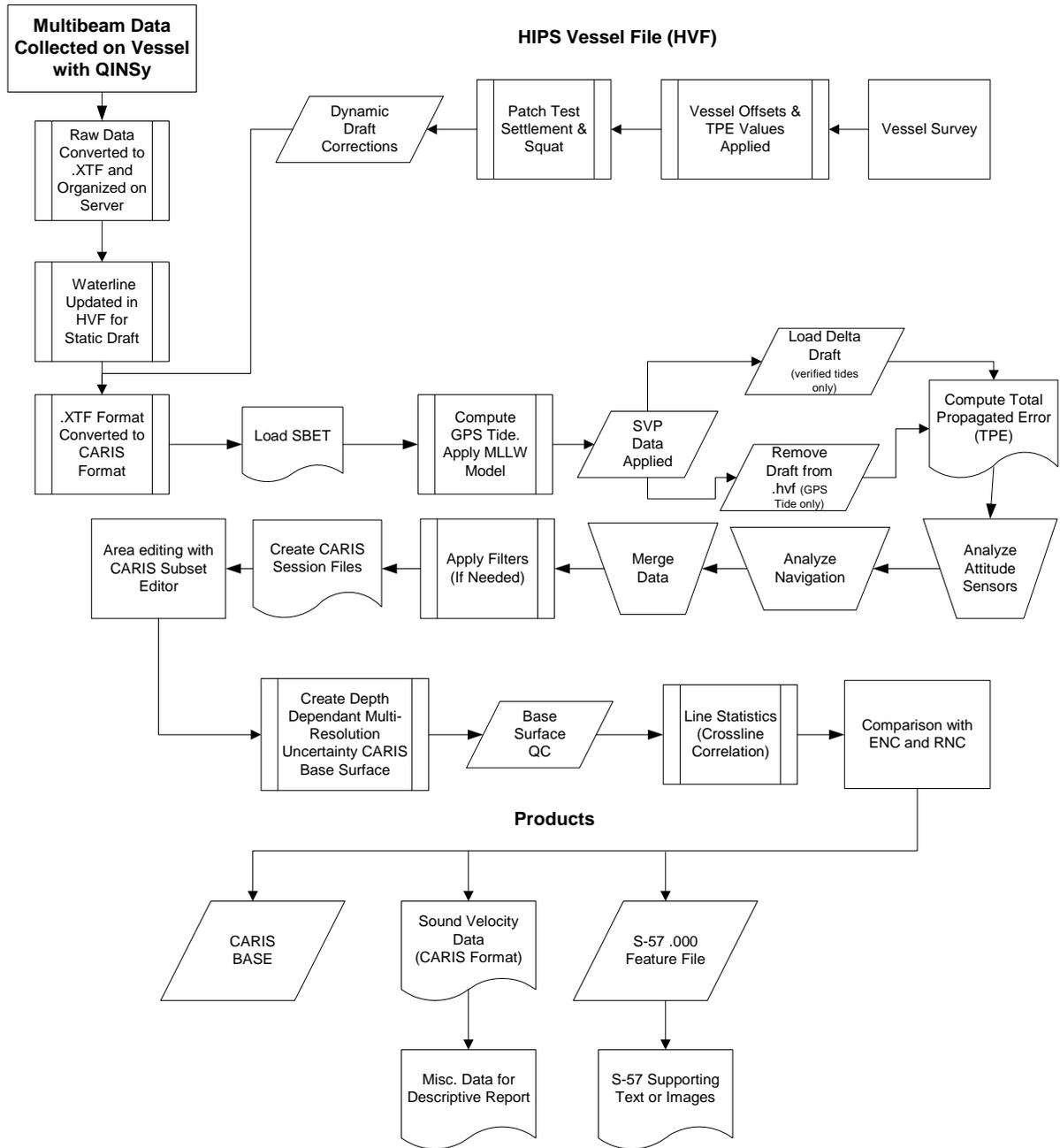
2. Processing Workflow Flowchart Technical Note

DAPR Section B.6 Field Data Processing (pg. 20) data acquisition and reduction flowchart needs to be amended to reflect the removal of speed-based dynamic draft values from the vessel file associated with survey lines processed with PPK-based GPS tide and the loading of rpm-based delta draft values for those lines processed with verified tides and zones.

The following diagram should replace *DAPR Section B.6 Field Data Processing (pg. 20)*:

Multibeam Survey Data Processing Workflow

Multibeam Sonar Processing



3. Lines Processed with Verified Tides Technical Note:

On occasions where post-processed PPK data was of insufficient quality to compute GPS tide, verified tides and zones were applied. The vessel files used for lines processed with verified tides are

Mitchell_Phase_1_Tides.hvf

Augustine_Phase_1_Tides.hvf

These lines are as follows:

Survey Lines with Verified Tide/Zone Applied

Sheet	Line Name	Vessel	Date
<i>H11838</i>			
	5331_-_9B-a	Augustine	2008-214
<i>H11839</i>			
	5201_-_106C	Augustine	2008-194
	5208_-_47C	Augustine	2008-194
	0409_-_70C	Mitchell	2008-198
	0422_-_75C	Mitchell	2008-198
	0423_-_76C	Mitchell	2008-198

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	0424_-_77C	Mitchell	2008-198
	0425_-_78C	Mitchell	2008-198
H11840			
	0527_-_15D	Mitchell	2008-210
	0528_-_16D	Mitchell	2008-210
	0529_-_17D	Mitchell	2008-210
	0530_-_18D	Mitchell	2008-211
	0531_-_19D	Mitchell	2008-211
	0532_-_20D	Mitchell	2008-211
	0533_-_21D	Mitchell	2008-211
	0534_-_22D	Mitchell	2008-211
	0536_-_23D	Mitchell	2008-211
	0538_-_24D	Mitchell	2008-211
	0539_-_25D	Mitchell	2008-211
	0540_-_26D	Mitchell	2008-211
	0541_-_27D	Mitchell	2008-211
	0542_-_28D	Mitchell	2008-211
	0542_-_28D_-_0002	Mitchell	2008-211

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	0543_-_29D	Mitchell	2008-211
	0543_-_29D_-_0002	Mitchell	2008-212
	0544_-_30D	Mitchell	2008-212
	0546_-_XL-14D	Mitchell	2008-212
	0548_-_30D	Mitchell	2008-212
	0549_-_31D	Mitchell	2008-212
	0549_-_31D_-_0002	Mitchell	2008-212
	0550_-_32D	Mitchell	2008-212
	0551_-_33D	Mitchell	2008-212
	0552_-_34D	Mitchell	2008-212
	0553_-_35D	Mitchell	2008-212
	0554_-_36D	Mitchell	2008-212
	0556_-_38D	Mitchell	2008-212
	0557_-_39D	Mitchell	2008-212
	0558_-_40D	Mitchell	2008-212
	0559_-_41D	Mitchell	2008-212
	0559_-_41D_-_	Mitchell	2008-213

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	_0002		
	0560_-_42D	Mitchell	2008-213
	0566_-_43D	Mitchell	2008-213
	0567_-_44D	Mitchell	2008-213
	0567_-_44D_-_0002	Mitchell	2008-213
	0568_-_45D	Mitchell	2008-213
	0569_-_46D	Mitchell	2008-213
	0570_-_47D	Mitchell	2008-213
	0572_-_48D	Mitchell	2008-213
	0573_-_49D	Mitchell	2008-213
	0574_-_50D	Mitchell	2008-213
	0576_-_52D	Mitchell	2008-213
<i>H11841</i>			
	0069_-_70E	Mitchell	2008-174
	0070_-_69E	Mitchell	2008-175
	0071_-_68E	Mitchell	2008-175
	0072_-_67E	Mitchell	2008-175
	0073_-_66E	Mitchell	2008-175

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	0073_-_66E_-_0002	Mitchell	2008-175
	0074_-_65E	Mitchell	2008-175
	0075_-_64E	Mitchell	2008-175
	0076_-_63E	Mitchell	2008-175
	0077_-_62E	Mitchell	2008-175
	0077_-_62E_-_0002	Mitchell	2008-175
	0078_-_61E	Mitchell	2008-176
	0078_-_61E_-_0002	Mitchell	2008-176
	0079_-_60E	Mitchell	2008-176
	0080_-_59E	Mitchell	2008-176
	0081_-_58E	Mitchell	2008-176
	0081_-_58E_-_0002	Mitchell	2008-176
	0082_-_57E	Mitchell	2008-176
	0082_-_57E_-_0002	Mitchell	2008-176
	0083_-_56E	Mitchell	2008-176
	0084_-_55E	Mitchell	2008-176

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	0085_-_54E	Mitchell	2008-176
	0086_-_53E	Mitchell	2008-176
	0086_-_53E_- _0002	Mitchell	2008-176
	0087_-_52E	Mitchell	2008-176
	0087_-_52E_- _0002	Mitchell	2008-176
	0087_-_52E_- _0003	Mitchell	2008-176
	0088_-_51E	Mitchell	2008-177
	0088_-_51E_- _0002	Mitchell	2008-177
	0089_-_50E	Mitchell	2008-177
	0089_-_50E_- _0002	Mitchell	2008-177
	0090_-_49E	Mitchell	2008-177
	0090_-_49E_- _0002	Mitchell	2008-177
	0091_-_48E	Mitchell	2008-177
	0091_-_48E_- _0002	Mitchell	2008-177
	0092_-_47E	Mitchell	2008-177

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	0093_-_46E	Mitchell	2008-177
	0094_-_46E	Mitchell	2008-177
	0094_-_46E_- _0002	Mitchell	2008-177
	0095_-_45E	Mitchell	2008-177
	0095_-_45E_- _0002	Mitchell	2008-177
	0096_-_44E	Mitchell	2008-177
	0096_-_44E_- _0002	Mitchell	2008-177
	0097_-_44E	Mitchell	2008-177
	0098_-_43E	Mitchell	2008-177
	0098_-_43E_- _0002	Mitchell	2008-177
	0099_-_42E	Mitchell	2008-177
	0099_-_42E_- _0002	Mitchell	2008-177
	0100_-_41E	Mitchell	2008-177
	0100_-_41E_- _0002	Mitchell	2008-178
<i>H11842</i>			
	5619_-_46F	Augustine	2008-225

	5620_-_46F	Augustine	2008-225
	0296_-_25F	Mitchell	2008-190
	0522_-_64F	Mitchell	2008-210
	0767_-_3F_MB_dev	Mitchell	2008-225

4. Sound Velocity technical Note

DR Section B.2.2 *Quality Control (all surveys): Shallow Water Multibeam* requires additional text to provide detail regarding sound velocity influences and mitigation efforts.

Original text

"In this survey, the mixing of Turnagain Arm into Cook Inlet made sound speed modeling difficult. Data quality was closely monitored onboard the vessel and profiling frequency increased as necessary. No data quality issues related to speed of sound measurements were encountered during the survey."

Amended text:

"In this survey, freshwater influx from Turnagain Arm as well as several rivers which terminate in Cook Inlet made sound speed modeling difficult. Sound velocity influences became evident throughout the survey during data acquisition and efforts were taken to mitigate them. These efforts included increasing cast frequency by 100% to a two-hour interval during data acquisition as well as post-processing applications such as recomputation of steered beams and application of various sound speed profile selection methods (nearest in time, previous in time and nearest in distance). Despite these efforts, some sound velocity artifact in the form of outer beam "cupping" or "frowning" is apparent in the processed bathymetry."

5. SSS Vessel File and Conversion Technical Note

The towfish used to collect SSS data were either hull (Mt. Mitchell) or pole-mounted (Mt. Augustine) and therefore there are no cable out or sensor depth values in the raw data which CARIS SIPS requires to recompute towfish navigation and correct for layback. To convert raw SSS .xtf files to CARIS SIPS format, a vessel file is necessary which "moves" the ship navigation (which is inherently lever-armed to the vessel CRP via the IMU) to the

XYZ offset of the hull/pole-mounted towfish. This avoids the import of zero-value cable out and sensor depth sensors to SIPS via the Generic Data Parser and subsequent recomputation of towfish navigation.

The following procedure was reviewed and approved by CARIS Customer Support on 06.28.10:

By inserting the reciprocal of the CRP- to- towfish XYZ offsets in the Navigation field of the .hvf, ship navigation is now relative to the towfish phase center and not the vessel CRP. Towfish navigation *is* ship navigation and therefore it is not necessary to recompute towfish navigation. The .hvf used for this process only contains navigation and gyro fields. The navigation latency value derived from HIPS calibration should be entered in the navigation field as well.

Therefore, the vessel files used to convert sidescan data should contain the following:

Mt. Mitchell	Mt. Augustine
X:-0.700m	X:-1.433
Y: -10.794m	Y:0.508
Z: -2.063m	Z:-1.454
<i>Nav. Time</i>	<i>Nav. Time</i>

<i>Correction</i>	<i>Correction</i>
2008-001: -0.01 sec	2008-001: 0.078
	2008-185: -0.113

The Mt. Mitchell vessel file should appear as follows:

	Date	Time	Time Correction (s)	X (m)	Y (m)	Z (m)	Ellipsoid	Manufacturer	Model	Serial Number	Comments
Navigation Gyro	2008-001	00:00	-0.010	-0.700	-10.794	-2.063	NA83	(null)	(null)	(null)	(null)

The Mt. Augustine vessel file should appear as follows:

	Date	Time	Time Correction (s)	X (m)	Y (m)	Z (m)	Ellipsoid	Manufacturer	Model	Serial Number	Comments
Navigation Gyro	2008-001	00:00	0.078	-1.433	0.508	-1.454	NA83	(null)	(null)	(null)	(null)
	2008-185	00:00	-0.113	-1.433	0.508	-1.454	NA83				

Towfish altitude was not written to the raw SSS data and therefore altitude must be digitized and survey lines must be subsequently slant-range corrected.

6. Mt. Mitchell Multibeam Vessel File Technical Note

Three main factors influence the architecture of the Mt. Mitchell vessel file;

1. The sonar is treated as a dual head for merge and sound velocity corrections.
2. The shift of the raw bathymetry from the sonar XYZ offset to the vessel CRP) is inherent to the raw data. This is not typical for Reson systems.

3. The acquisition software used to collect raw bathymetry was QINSy and not SIS, the proprietary Kongsberg acquisition software typically used for the EM 710 sonar.

The following items are meant for use as a guide to understanding the vessel file necessary to process multibeam data collected with the Simrad EM 710:

A. Dual Head Vessel File: Because there is a separate transmitter and receiver unit, the EM710 .hvf is set up as dual head (transmit and receive). Swath1/SVP1 refers to the transmit head and Swath2/SVP2 refers to the receive head.

B. Mounting Angles: The mounting angles (roll and pitch) for transmit and receive are added to Svp1 and Svp2 respectively.

C. Sound Velocity Correction: Sound velocity correction was not applied to raw sounding data during acquisition and therefore must be applied in HIPS during post-processing. Because bathymetry was acquired using QINSy and not SIS, some of the assumptions made in the CARIS Technical Note "Sound Velocity Corrections for Simrad EM Data" are not applicable.

Points necessary to consider when performing sound velocity corrections in HIPS:

- The sonar XYZ offsets are zero in Swath1 and Swath2 because the Simrad data acquisition has already shifted the swath profile to the vessel reference point.
- Static draft was not applied during acquisition, therefore static draft values are applied in the .hvf.
- Compensation for heave, Pitch and Roll was not made to the recorded sounding data during acquisition. Therefore, Heave, Pitch and Roll are included as active sensors in the .hvf and their apply switches are set to "yes".
- The post processed SV correction (for flat face Tx) was set to "No" in the HIPS Sound Velocity Correction wizard. It was not necessary to replace the surface sound speeds collected during acquisition with interpolated sound speeds from the sound velocity profile.

D. Calibration:

- Although the EM710 was calibrated in SIS and the calibration values are applied to the raw sounding data, it was possible to refine these values by running the HIPS calibration tool and applying small adjustments to the SIS-derived calibration values during the HIPS Merge process.
- Although the vessel setup for the EM710 is for a dual head, for calibration purposes the data are treated as single head. This is accomplished by assigning a larger start

beam number in Swath2 than there are in the entire system. This way, HIPS will only calibrate Swath1. The swath1 calibration values are added to swath1 in the hvf and swath2 calibration values are set to zero.

E. TPU

- For TPU sensor offsets (Nav to Tx and MRU to Tx) an average of Swath1 and Swath2 XYZ offset values were used.

F. Dynamic Draft

- For all survey lines processed with PPK-based GPS tide (using Mitchell_Phase_2_PPK.hvf) the vertical component of the GPS height was used to model dynamic draft, therefore, no draft values exist in the .hvf nor was there a delta draft table applied.
- For all survey lines processed with conventional tides and zones (using Mitchell_Phase_2_PPK.hvf), a delta draft file was applied to model dynamic draft.

AHB COMPILATION LOG

General Survey Information	
REGISTRY No.	H11840
PROJECT No.	OPR-P385-TE-08
FIELD UNIT	TERRASOND LTD.
DATE OF SURVEY	JULY 21, 2008 – AUGUST 17, 2008
LARGEST SCALE CHART	<i>16665 1, edition 9, 20060301, 1:50,000</i>
ADDITIONAL CHARTS	<i>16663 1, edition 8, 20060301, 1:100,000</i>
SOUNDING UNITS	Feet
COMPILER	Rosemary P. Abbitt

Source Grids	File Name
	H:\Compilation\H11840_P385_TERRA\AHB_H11840\SAR Final Products\GRIDS
	H11840_1m_AHB_Unc_Final_0.csar
	H11840_2m_AHB_Unc_Final_0.csar
Surfaces	File Name
	H:\Compilation\H11840_P385_TERRA\AHB_H11840\COMPILE\Working
<i>Combined</i>	H11840_4m_Combined.hob
<i>Interpolated TIN</i>	\Interpolated TIN\H11840_12m_InterpTIN.hob
<i>Shifted Interpolated TIN</i>	\Shifted Surface\H11840_12m_InterpTIN_Shifted.hob
Final HOBs	File Name
	H:\Compilation\H11840_P385-TERRA\AHB_H11840\COMPILE\Final_Hobs\
<i>Survey Scale Soundings</i>	H11840_SS_Soundings.hob
<i>Chart Scale Soundings</i>	H11840_CS_Soundings.hob
<i>Contour Layer</i>	H11840_Contours.hob
<i>Feature Layer</i>	H11840_Features.hob
<i>Meta-Objects Layer</i>	H11840_MetaObjects.hob
<i>Blue Notes</i>	H11840_BlueNotes.hob
<i>ENC Retain Soundings</i>	N/A

Meta-Objects Attribution	
Acronym	Value
M_COVR	
CATCOV	Coverage available
SORDAT	20080817
SORIND	US,US,graph,H11840
M_QUAL	
CATZOC	Zone of confidence U (data not assessed)
INFORM	R/V Mt. Mitchell, R/V Mt. Augustine
POSACC	10.0 meters
SORDAT	20080817
SORIND	US,US,graph,H11840
SUREND	20080817
SURSTA	20080721
DEPARE	

[Type text]

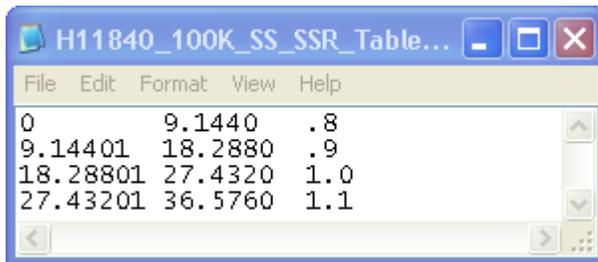
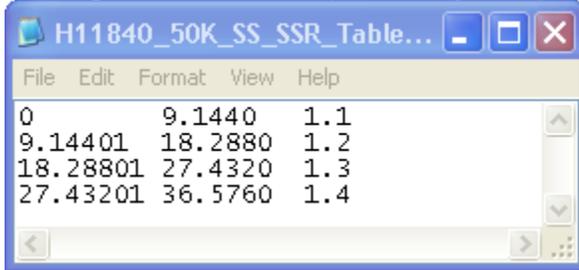
This Document is for Office Process use only and is intended to supplement, not supersede or replace, information/recommendations in the Descriptive or Evaluation Reports

DRVALV 1	25.1969 ft
DRVALV2	102.9439 ft
SORDAT	20080817
SORIND	US,US_graph,H11840
M_CSCL	
CSCALE	1:100,000
SORDAT	20080817
SORIND	US,US_graph,H11840

SPECIFICATIONS:

- I. COMBINED SURFACE:
 - a. Number of ESAR Final Grids: 2
 - b. Resolution of Combined (m): 4 m

- II. SURVEY SCALE SOUNDINGS (SS):
 - a. Radius
 - b. Shoal biased
 - c. Use Single-Defined Radius (mm at Map Scale): ; Radius Value = 1



- d. Queried Depth of All Soundings
 - i. Minimum: 25.1969 ft
 - ii. Maximum: 102.9439 ft

- III. INTERPOLATED TIN SURFACE:
 - a. Resolution (m): 12m
 - b. Shifted value: -0.75 ft *[-0.229m (feet), (\leq 11 fathoms)]*
[-1.372m (fathoms), ($>$ 11 fathoms)]

- IV. CONTOURS:
 - a. Use a Depth List: H11840_NOAA_depth_curves_list.txt
 - b. Line Object: DEPCNT
 - c. Value Attribute: VALDCO

- V. FEATURES:
 - a. Total Number of Features: 35

[all features included in H-cell]

[Type text]

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b. Number of Insignificant Features: 228 [\[all features submitted by field & not included in H-cell\]](#)

VI. CHART SURVEY SOUNDINGS (CS):

- a. Number of ENC CS Soundings: 396
- b. Radius
- c. Shoal biased
- d. Use Single-Defined Radius: m on the ground
 - i. Radius Value (m): 750 m
- e. Filter: Interpolated != 1
- f. Number Survey CS Soundings: 350

VII. Notes:

**ATLANTIC HYDROGRAPHIC BRANCH
H-CELL REPORT to ACCOMPANY
SURVEY H11840 (2008)**

This H-Cell Report has been written to supplement and/or clarify the original Descriptive Report (DR) and pass critical compilation information to the cartographers in the Marine Chart Division. Sections in this report refer to the corresponding sections of the Descriptive Report.

B. DATA ACQUISITION AND PROCESSING

B.2 QUALITY CONTROL

The AHB source depth grids for the survey's nautical chart update were 1m and 2m resolution BASE surfaces (*.CSAR), which were combined at 4m resolution. The survey scale soundings were created from the combined surface using a sounding spacing range (SSR) files. (Chart 16665 ~ 1:50,000; Chart 16663~ 1:100,000). A TIN was created from the survey scale soundings, from which an interpolated surface of 12 m resolution was generated. The chart scale soundings were selected using a single defined radius of 750 m on the ground from only the non-interpolated nodes of this surface to preserve absolute continuity between the charted depths, the survey scale soundings and the original source grid node. The chart scale soundings are a subset of the survey scale soundings. The surface model was referenced when selecting the chart scale soundings, to ensure that the selected soundings portray the bathymetry within the common area.

The interpolated TIN surface of 12m resolution was shifted by the NOAA sounding rounding value of -0.75 feet. The shifted interpolated TIN was used to generate depth contours in feet (30, 60 ft). The depth contours are forwarded to MCD for reference only. The contours were utilized during chart scale sounding selection and quality assurance efforts at AHB. The depth contours are incorporated into the SS H-Cell product as per 2009 H-Cell Specifications.

The compilation products (Final *.HOB files) for this survey are detailed in the H11840 AHB Compilation Log contained within this document. The Final HOB files include depth areas (DEPARE), depth contours (DEPCNT), soundings (SOUNDG), meta-objects (M_COVR, M_QUAL, and M_CSCL), cartographic Blue Notes (\$CSYMB), and features (UWTROC, SNDWAV, SBDARE).

As dictated by Hydrographic Technical Directive 2008-8, the Final HOB files were combined into two separate H-Cell files in S-57 format. Both S-57 files were exported from CARIS Bathy DataBASE in meters, and then converted from metric units into feet using CARIS HOM ENC 3.3. Quality assurance and topology checks were conducted using CARIS S-57 Composer 2.1 and DKART Inspector 5.1 validation tests.

The final H-Cell products are two S-57 files, in Lat/Long NAD-83. The contents of these two H-Cell deliverables are listed in the table below:

<u>TABLE 1</u> - Contents of H-Cell Files			
H11840_CS.000		Scale 1:50,000	
Object Class Types	Geographic	Cartographic	Meta
S-57 Object Acronyms	DEPARE	\$CSYMB	M_COVR
	OBSTRN		M_QUAL
	SBDARE		M_CSCL
	SNDWAV		
	SOUNDG		
H11840_SS.000		Scale 1:20,000	
Object Class Types	Geographic		
S-57 Object Acronyms	DEPCNT		
	SOUNDG		

B.2.4 Junctions and Prior Surveys

Survey H11840 (2008) junctions with survey H11839 (2008) to the north and H11842 (2008) to the west and H1138 to the east. Most present survey depths compare within 3-4 feet of junctioning survey depths to the north, within 3-4 feet of junctioning survey depths to the west, and within 3-4 feet of junctioning survey depths to the east. Most present survey depths compare within 2-3 feet of the charted hydrography to the south.

B.4 DATA PROCESSING

The following software was used to process data at the Atlantic Hydrographic Branch:

CARIS Bathy DataBase version 2.3/HF16
 CARIS Bathy DataBase version 3.0/HF9
 CARIS HIPS and SIPS version 7.0/SP2/HF5
 CARIS S-57 Composer version 2.1/HF4
 CARIS HOM ENC version 3.3/SP3/HF8
 DKART Inspector version 5.1
 HSTP Pydro version 10.9 (r3020)

C. HORIZONTAL AND VERTICAL CONTROL

The hydrographer makes adequate mention of horizontal and vertical control used for this survey in section C of the DR. The sounding datum for this survey is Mean Lower Low Water (MLLW), and the vertical datum is Mean High Water (MHW). Horizontal control used for this survey during data acquisition is based upon the North American Datum of 1983 (NAD83), UTM projection zone 05 North.

D. RESULTS AND RECOMMENDATIONS

D.1 CHART COMPARISON

16665 (9th Edition, 03/01/2006)

Cook Inlet-Approaches to Anchorage; Anchorage
Corrected through NM 11/27/2010
Corrected through LNM 11/16/2010
Scale 1:50,000

16663 (8th Edition, 03/01/2006)

Cook Inlet-East Foreland to Anchorage; North
Foreland
Corrected through NM 11/27/2010
Corrected through LNM 11/16/2010
Scale 1:100,000

ENC COMPARISON

US5AK16M

Cook Inlet-Approaches to Anchorage; Anchorage
Edition 17
Application Date 2010/11/16
Issue Date 2010/11/16
Chart 16665

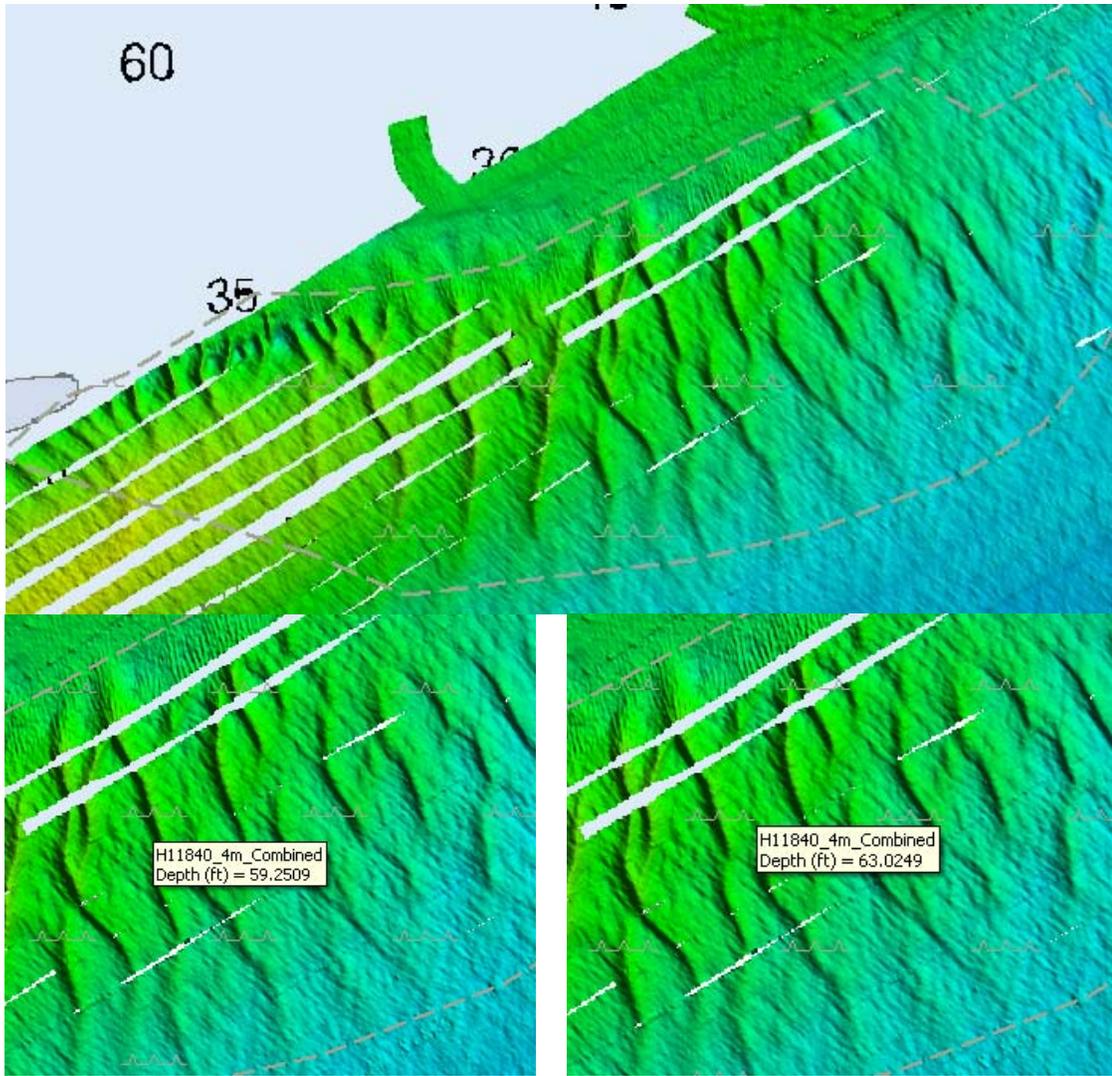
US4AK15M

Cook Inlet-East Foreland to Anchorage; North
Foreland
Edition 12
Application Date 2010/11/29
Issue Date 2010/11/29
Chart 16663

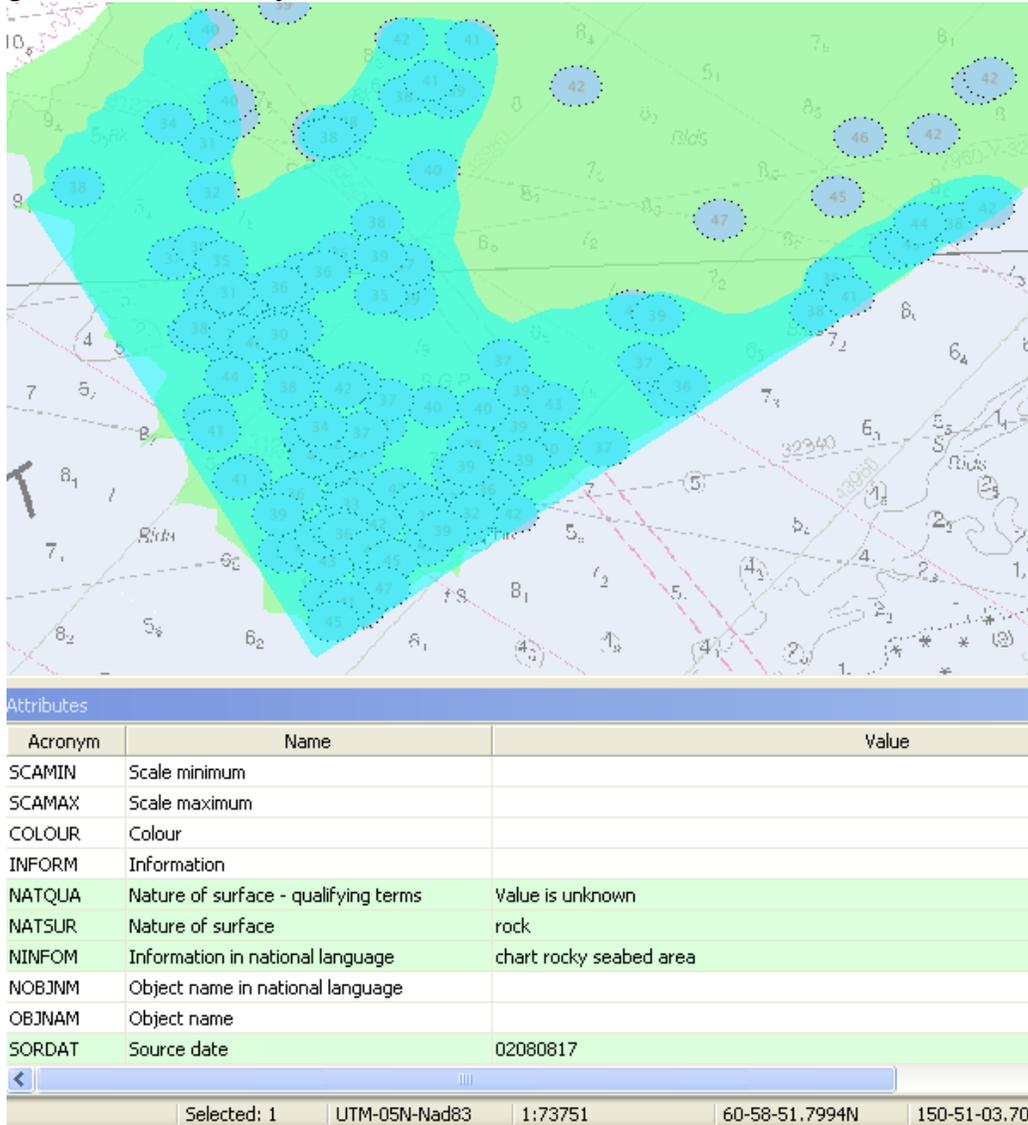
D.2 ADDITIONAL RESULTS

The charted hydrography originates with prior surveys and requires no further consideration. The hydrographer makes adequate chart comparisons in section D and Appendix I and II of the DR. The hydrographer recommends that any charted features not specifically addressed either in the H-Cell files or the Blue Notes should be retained as charted. The following exceptions are noted:

- a. The field unit collected a total of 55 bottom samples. Seabed characteristics were applied the chart appropriate to the chart scale and navigational requirements.



- c. One rocky seabed area (SBDARE) was included with the H-Cell. These areas are defined by prominent boulders, rocks and rocky seabed. 135 'rky' point features were generalized as a rocky seabed area.



d.

D.6 MISCELLANEOUS

Chart compilation was completed by Atlantic Hydrographic Branch personnel in Norfolk, Virginia. Compilation data will be forwarded to the Marine Chart Division in Silver Spring, Maryland. See section D.1 of this report for a list of the Raster Charts and Electronic Navigation Charts (ENC) used for compiling the present survey.

D.7 ADEQUACY OF SURVEY

The present survey is adequate to supersede the charted bathymetry within the common area. Any features not specifically addressed either in the H-Cell files or the Blue Notes should be retained as charted. Refer to section D and Appendix I and II of the DR for further recommendations by the hydrographer.

APPROVAL SHEET
H11840

Initial Approvals:

The completed survey has been inspected with regard to survey coverage, delineation of depth contours, disposition of critical depths, cartographic symbolization, and verification or disapproval of charted data. All revisions and additions made to the H-Cell files during survey processing have been entered in the digital data for this survey. The survey records and digital data comply with National Ocean Service and Office of Coast Survey requirements except where noted in the Descriptive Report and the H-Cell Report.

All final products have undergone a comprehensive review per the Hydrographic Surveys Division Office Processing Manual and are verified to be accurate and complete except where noted.



Rosemary P. Abbitt
Hydrographic Survey Intern
Atlantic Hydrographic Branch

I have reviewed the H-Cell files, accompanying data, and reports. This survey and accompanying Marine Chart Division deliverables meet National Ocean Service requirements and standards for products in support of nautical charting except where noted.

Approved: _____
CDR Richard T. Brennan, NOAA
Chief, Atlantic Hydrographic Branch