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

DESCRIPTIVE REPORT

Type of Survey Hydrographic Survey

Field No. H11839

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)

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

REGISTRY No

HYDROGRAPHIC TITLE SHEET

OPR-P385-TE-08

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. **H11839**

State Alaska

General Locality Northern Cook Inlet

Sub-Locality Beluga Shoal

Scale N/A **Date of Survey** July 10 – August 7, 2008

Instructions dated March 3, 2008 **Project No.** OPR-P385-TE-08

Vessel *R/V Mt. Mitchell and R/V Mt. Augustine*

Chief of party Katie Mildon

Surveyed by TerraSond Ltd.

Soundings by echo sounder, lead line, pole Multibeam Echosounder, Side Scan Sonar

Graphic record scaled by N/A

Graphic record checked by N/A **Automated Plot** N/A

Verification by ***Atlantic Hydrographic Branch. H-Cell Compilation units in: Feet at MLLW***

Soundings in fathoms feet at MLW MLLW Meters at MLLW

Bold italic red notes in the Descriptive Report were made during office processing.

REMARKS: Contract No.: DG133C-05-CQ-1079

Contractor: TerraSond Ltd. All times recorded in UTC

1617 South Industrial Way, Suite 3

Palmer, AK 99645

DESCRIPTIVE REPORT

OPR-P358-TE-08

Mt. Augustine Volcano

Registry Number: **H11839**

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

Survey: **C**

State: **Alaska**

General Locality: **Northern Cook Inlet**

Sublocality: **Beluga Shoal**

Survey Dates: **July 10 – August 7, 2008**

Lead Hydrographer: **Kathleen Mildon**

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APPENDICES

SEPARATES

All comments in red, bold, italics were made during office processing.

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***

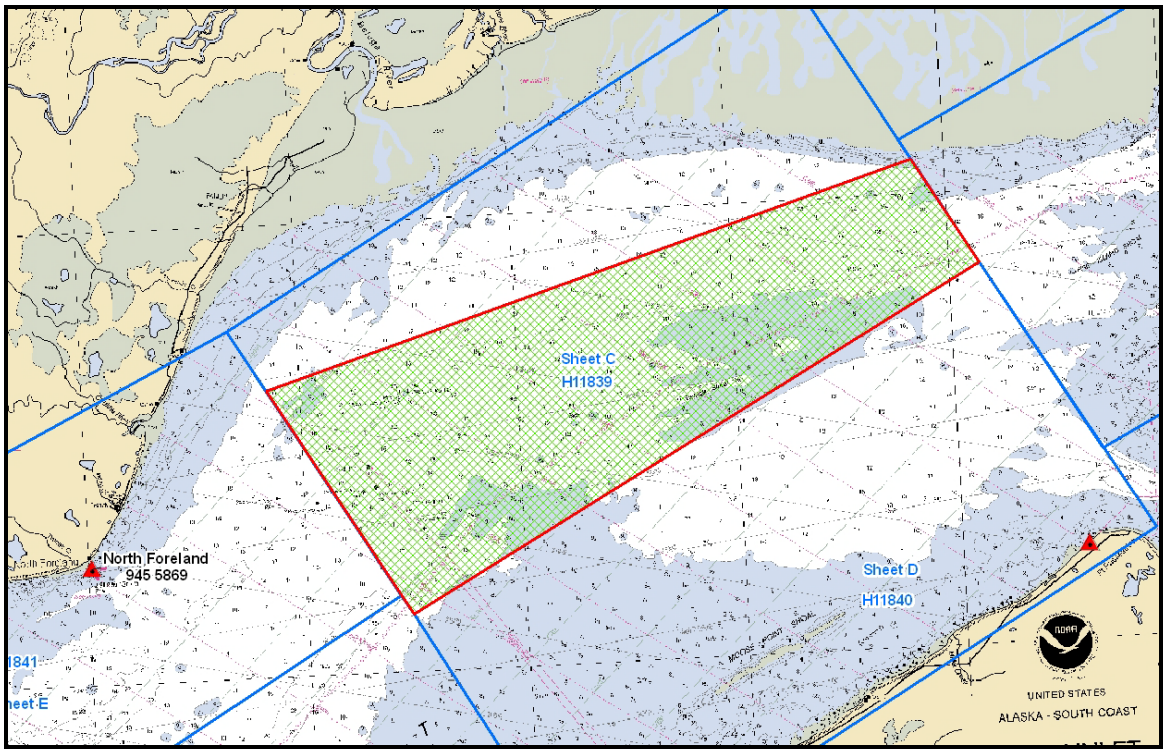


Figure 1 – Overview of H11839 with Chart 16663, 8th Edition, March 2006. Soundings in fathoms.

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 47.5 meters and a minimum depth of 3.1 meters below the Mean Lower Low Water (MLLW) tidal datum. There were a total of 59 bottom samples collected 2,000 meters apart. ***Concur***

For H11839 survey limits, refer to Figure 1 on the preceding page. ***Concur***

B. DATA ACQUISTION 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 *R/V Mt. Mitchell* 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 *R/V Mt. Augustine* LOA: 10.2m, BEAM 3.3m, DRAFT: 0.9m	
Equipment	**Manufacturer & Model**

VESSEL *R/V Mt. Augustine* LOA: 10.2m, BEAM 3.3m, DRAFT: 0.9m	
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. trawl scars, 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. Very little data did not meet the IHO Order 1 specifications. These were generally single outer beams and were not grouped in areas. Upon review they were kept as acceptable data. ***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. No data quality issues related to speed of sound measurements were encountered during the survey. ***Do not***

concur. Sound velocity issues and artifacts are evident in the data, and are further expounded upon in this survey's SAR section 6.

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

B.2.3. Crosslines

171 mainscheme lines totaling 1389.9 linear nautical miles and 20 lines totaling 78 linear nautical miles of crosslines were run during the 2008 survey of H11839. The ratio of the linear nautical miles of crosslines to the lineal nautical miles of mainscheme lines, at 5.6%, 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***

The majority of 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 four other surveys. The easterly limits of this survey junctions with the westerly limits of H 11838 (OPR-P385-TE-08). The westerly limits of this survey junctions with H11841 and H11842 (OPR-P385-TE-08). The southerly limits of this survey junctions with the northerly limits of H11840 (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***

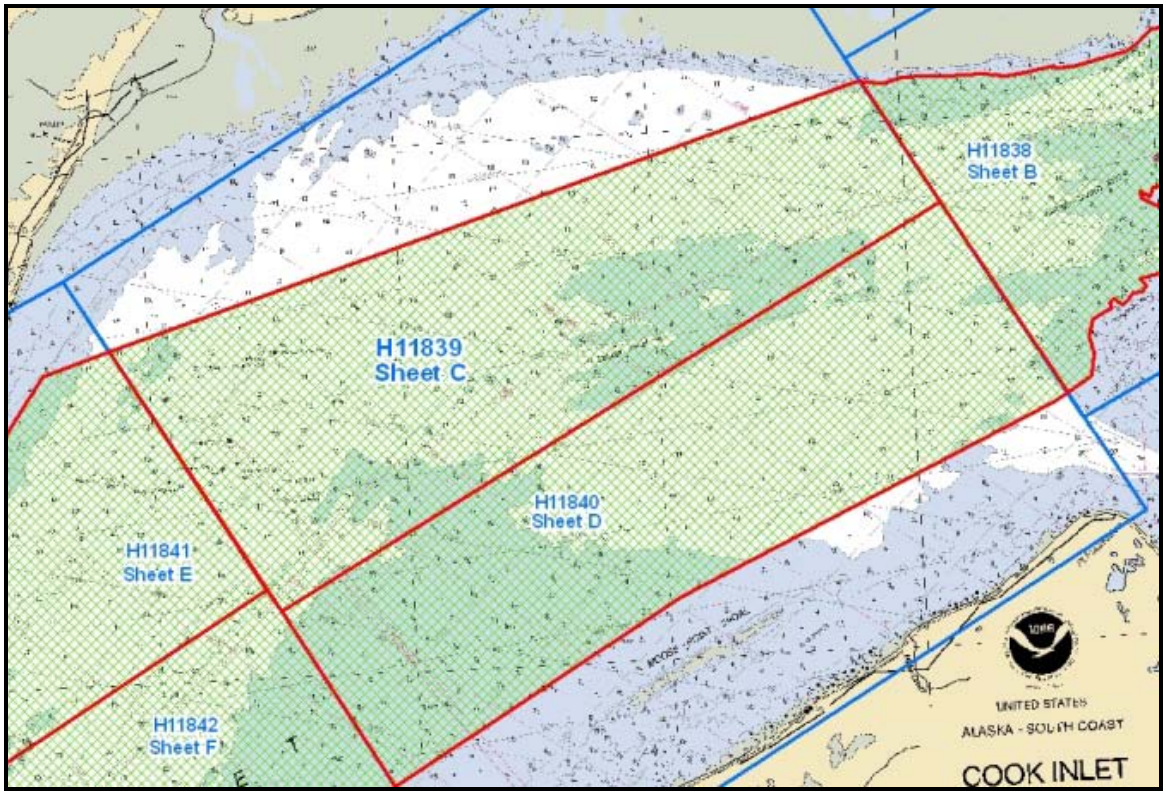


Figure 2 – Overview of survey area showing the junction locations of H11839 with H11838, H11840, H11841, and H11842 (OPR-P385-TE-08).

B.3. Corrections to Echo Soundings

Survey H11839 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) 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 tidal zoning 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 H11839 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 project area at a 2 m resolution) were submitted for the 2008 survey. The 2 variable BASE surfaces were combined to create a CARIS BASE uncertainty surface which covered the entire survey area in which the finalized uncertainty was the greater of the standard deviation and *a priori* uncertainty. A sun-illuminated DTM and an uncertainty DTM were created for each of the variable BASE surfaces and were submitted with the BASE surfaces. The naming conventions for each grid are: ***Concur***

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: H11839_Coverage.tif
Uncertainty DTM: H11839_Uncertainty.tif

A dataset 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 tidal zoning 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 H11839 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 Through
16665	RNC	1:50,000	9th	2006-03-01	2006-03-04 2006-02-21
16663	RNC	1:100,000	8th	2006-03-01	2006-03-18 2006-03-07
16662	RNC	1:100,000	8th	2007-09-01	2007-09-15 2007-09-04
16660	RNC	1:194,154	30th	2006-06-01	2006-06-17 2006-06-06
16013	RNC	1:969,761	30th	2006-07-01	2006-07-15 2006-07-04
531	RNC	1:2,100,000	24th	2007-07-01	2007-07-21 2007-07-03
500	RNC	1:3,500,000	8th	2003-06-01	2003-05-31 2003-05-13
50	RNC	1:10,000,000	6th	2003-06-01	2003-05-31 2003-05-13
US3AK1DM (16660)	ENC	N / A	8th	2009-06-04	2009-05-26

US~~3~~4AK15M (16663)	ENC	N / A	10th	2009-06-05	2006-06-05
US5AK16M (16665)	ENC	N / A	10th	2009-06-03	2009-06-03

Table 4 – Charts used during chart comparisons

Notices to Mariners (NM) 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 (17th District). No discrepancies were found. ***Concur***

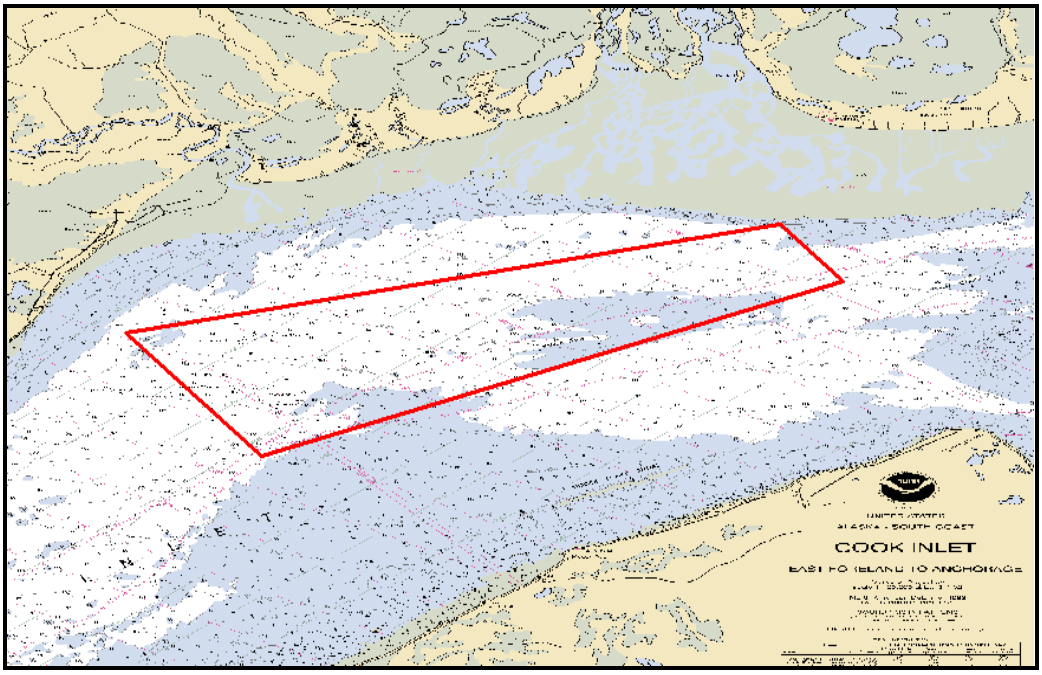


Figure 3 – Survey limits of H11839 shown on chart 16663

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 H11839 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 good. Significant differences are itemized in the sections below. ***Concur***

D.1.1. New Features

Two new DTON features were identified during H11839. ***Concur with clarification. The following DtoN should have been submitted directly to AHB. Additionally, six shoal soundings were excluded from the comments below, but were submitted to AHB (see Appendix I).***

1. A rock at 61-05-35.69N, 151-00-38.38W, with a depth of 12.510 meters (6 fathoms 5 feet in chart units of chart 16663). This was reported as a DTON (DTON report OPR_P385_TE_08_H11839_DtonReport_4) and included in LNM 08/09 (17th District) with a preliminary depth of 13.086 meters (7 fathoms 1 foot). Recommend updating chart to final depth of 12.510 meters (6 fathoms 5 feet). This feature also appears in the chart features section below, item number 5. ***Concur with clarification. Shown on chart 16663; 8th Ed., MAR 2006 and smaller scale charts as a submerged Rock, least depth 7 fathoms and 1 foot. Delete charted submerged Rock, least depth 7 fathoms and 1 foot. Chart a submerged Rock, least depth 6 fathoms and 5 feet at the present survey position.***

2. A rock at 61-05-30.87N, 151-00-31.69W, with a depth of 13.599 meters (7 fathoms 2 feet in chart units of chart 16663). This was reported as a DTON (DTON report OPR_P385_TE_08_H11839_DtonReport_5) but was not included in a LNM, likely due to its deeper depth and close proximity to the feature listed above. ***Concur with clarification. Feature was not charted by MCD and considered insignificant based on the close proximity to 6 fathom rock. No charting action required.***

D.1.2. Charted Features

Survey results regarding potentially hazardous features within the survey extents are itemized below.

1. Charted Wellhead "cov 14 fms" (chart 16663) at 61-03-34.70N, 150-55-09.60W was confirmed by this survey (survey position 61-03-33.90N, 150-55-08.75W) with complete multibeam coverage and 100% sidescan (SSS contact 198-171712S). Survey position is approximately 25 meters south of charted position. Survey least depth was 26.916 meters (14 fathoms). Recommend updating feature to survey position. Recommend updating AWOIS database (record ID 52421) with survey data. ***Concur with clarification. Delete charted feature and add survey feature at the survey position.***

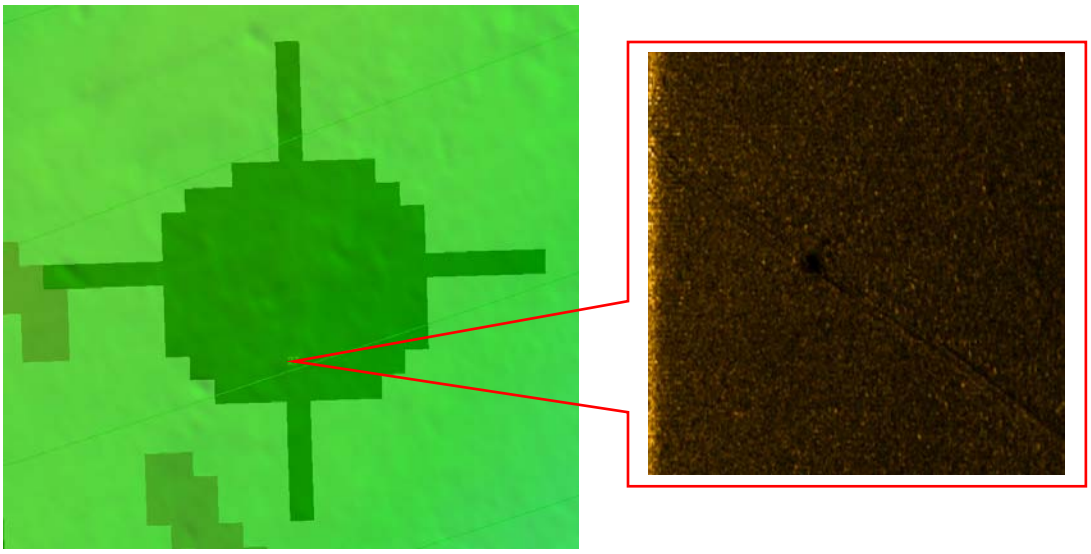


Figure 4 – Item 1: Charted wellhead with multibeam and sidescan sonar coverage

2. Charted Wellhead "cov 14 fms" (chart 16663) at 61-03-10.80N, 150-54-34.60W was not confirmed by this survey. The area received 100% multibeam and sidescan coverage. Small features exist in the multibeam and sidescan records in the vicinity of the charted feature but it cannot be determined from the data with any degree of certainty whether or not any of these contacts are the wellhead. Recommend the feature be retained as charted. Recommend updating the AWOIS database (record ID 52422). ***Concur with clarification. Delete charted feature and add survey feature at the survey position.***

3. Charted Rk (chart 16665) at 61-07-57.49N, 150-30-51.34W, depth 63 feet, was confirmed by this survey (survey position 61-07-56.86N, 150-30-50.72W) with complete multibeam coverage but with a deeper depth of 65 feet. Feature received complete multibeam coverage. Recommend updating charted Rk to survey position and depth. ***Do not concur. Sounding is insignificant due to surrounding depths. Chart as CS sounding.***

4. Beluga Shoal (chart 16665) in the vicinity of 61-05-25.92N, 150-40-32.08W, was found by this survey to be significantly deeper than charted. The shoal is discussed in more detail in section D.1.4. Recommend updating shoal extents using survey data. ***Concur***

5. Charted Rk (chart 16663) at 61-05-35.71N, 151-00-38.30W, was a product of a DTON submittal of this survey (DTON report OPR_P385_TE_08_H11839_DtonReport_4, reported in LNM 08/09 17th District). Final depth is 12.510 meters (6 fathoms 5 feet) from multibeam data. Recommend updating chart to survey position and depth. ***Concur***

6. "Strong current" conditions indicated by the chart notes were confirmed by the survey vessel during survey operations. Recommend retaining as charted. ***Concur***

D.1.3. Soundings

There is good agreement between soundings from this survey and the charts over most of the survey area. ***Concur***

There are two exceptions: 1) the south side of Beluga Shoal has significantly deepened and 2) the northeastern corner of the survey area has significantly shoaled. See section D.1.4 for more discussion concerning these areas. ***Concur***

Significant differences (generally those greater then +/- 10% of charted depth) are itemized in the table below. It is recommended that soundings from H11839 supersede previously charted soundings. ***Concur with clarification. See Comments made within the Table below.***

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
16665	76 feet	54 feet	61-10-31.18N, 150-33-17.91W	DTONs found during chart comparison; reported to AHB 10/22/09 (OPR_P385_TE_08_H 11839 DtonReport_11)
16665	73 feet	53 feet	61-10-29.99N, 150-32-37.16W	
16665	71 feet	53 feet	61-10-21.42N, 150-31-28.81W	
16665	74 feet	58 feet	61-10-19.96N, 150-32-08.99W	
16665	75 feet	61 feet	61-10-14.65N, 150-32-49.62W	
16665	77 feet	65 feet	61-10-17.78N, 150-33-28.65W	
16665	32 feet	41 feet	61-10-40.90N, 150-31-16.82W	***Concur***
16665	43 feet	58 feet	61-07-34.76N, 150-33-33.90W	***Concur***
16665	36 feet	51 feet	61-07-25.53N, 150-34-23.16W	***Concur***
16665	52 feet	60 feet	61-07-29.45N, 150-35-06.18W	***Concur***
16665	42 feet	53 feet	61-07-12.46N, 150-34-52.83W	***Concur***
16665	51 feet	57 feet	61-07-11.17N, 150-33-54.09W	***Concur***
16665	45 feet	54 feet	61-07-04.14N, 150-35-46.88W	***Concur***
16665	44 feet	52 feet	61-06-43.79N, 150-36-13.57W	***Concur***
16665	39 feet	54 feet	61-06-29.63N, 150-36-41.25W	***Concur***
16665	43 feet	60 feet	61-06-16.87N, 150-37-07.72W	***Concur with clarification. Survey depth in vicinity is 59 feet.***
16665	51 feet	65 feet	61-06-08.23N, 150-36-42.32W	***Concur***

Chart	Charted Depth	Survey Depth in Vicinity	Charted Position	Comments
16665	36 feet	65 feet	61-06-03.53N, 150-37-26.37W	***Concur***
16665	35 feet	65 feet	61-05-54.23N, 150-38-09.01W	***Concur with clarification. Survey depth in vicinity is 63 feet.***
16665	47 feet	61 feet	61-05-55.54N, 150-38-55.35W	***Concur***
16665	40 feet	56 feet	61-05-41.43N, 150-38-40.40W	***Concur***
16665	25 feet	67 feet	61-05-42.62N, 150-39-15.18W	***Concur***
16665	25 feet	68 feet	61-05-34.18N, 150-39-53.64W	***Concur***
16665	24 feet	67 feet	61-05-25.80N, 150-40-27.14W	***Concur***
16665	30 feet	71 feet	61-05-19.16N, 150-41-06.84W	***Concur***
16665	43 feet	55 feet	61-05-09.62N, 150-40-54.39W	***Concur***
16665	42 feet	58 feet	61-05-21.29N, 150-40-04.33W	***Concur with clarification. Survey depth in vicinity is 53 feet.***
16665	42 feet	58 feet	61-05-31.50N, 150-39-25.56W	***Concur***
16665	46 feet	59 feet	61-05-38.51N, 150-40-27.70W	***Concur***
16665	48 feet	85 feet	61-05-25.89N, 150-41-34.30W	***Concur***
16665	32 feet	66 feet	61-05-08.63N, 150-41-36.87W	***Concur***
16665	38 feet	81 feet	61-05-02.48N, 150-42-21.03W	***Concur***
16665	46 feet	53 feet	61-04-54.20N, 150-41-57.00W	***Concur***
16665	54 feet	72 feet	61-04-57.58N, 150-43-07.16W	***Concur***
16665	56 feet	64 feet	61-07-41.87N, 150-31-39.85W	***Concur***
500	32 fathoms	17 fathoms	61-02-40.52N, 150-55-43.36W	Extremely small scale chart; depths in vicinity of sounding surveyed at 13 to 20 fathoms ***Concur***

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 between contours is good in most of the survey area, with the west and the north parts of the survey showing very little change from the charts. Three areas of significant change are detailed below. ***Concur***

1. 10 fathom (60 foot) contour in the southwest part of the survey area has receded on its western half, with the area deepening by an average of 1 fathom. ***Concur***

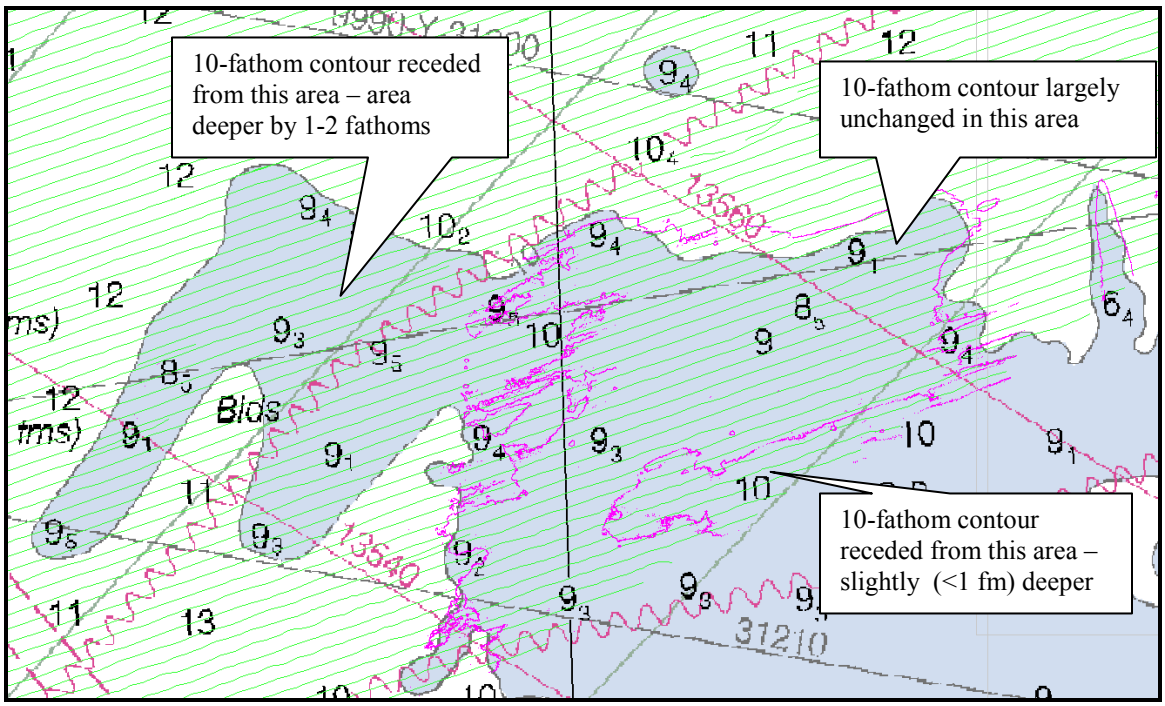


Figure 5 – Contours from H11839 (purple) overlaid on chart 16663

2. Beluga shoal has dramatically deepened on its south side; shifting the 60-foot contour there and removing the 30-foot contour altogether, while the north side has remained relatively unchanged. The 60-foot contour has also receded on its eastern side. ***Concur***

   Of particular note is the area within the charted 30-foot contour on the south side of Beluga Shoal; the area is charted with least depths of 24-30 feet while this survey found depths of 62-78 feet -- a deepening of 32 to 54 feet. ***Concur***

   Most of the individual sounding discrepancies itemized in section D.1.3 for H11839 were located along the southern and eastern part of Beluga Shoal. ***Concur***

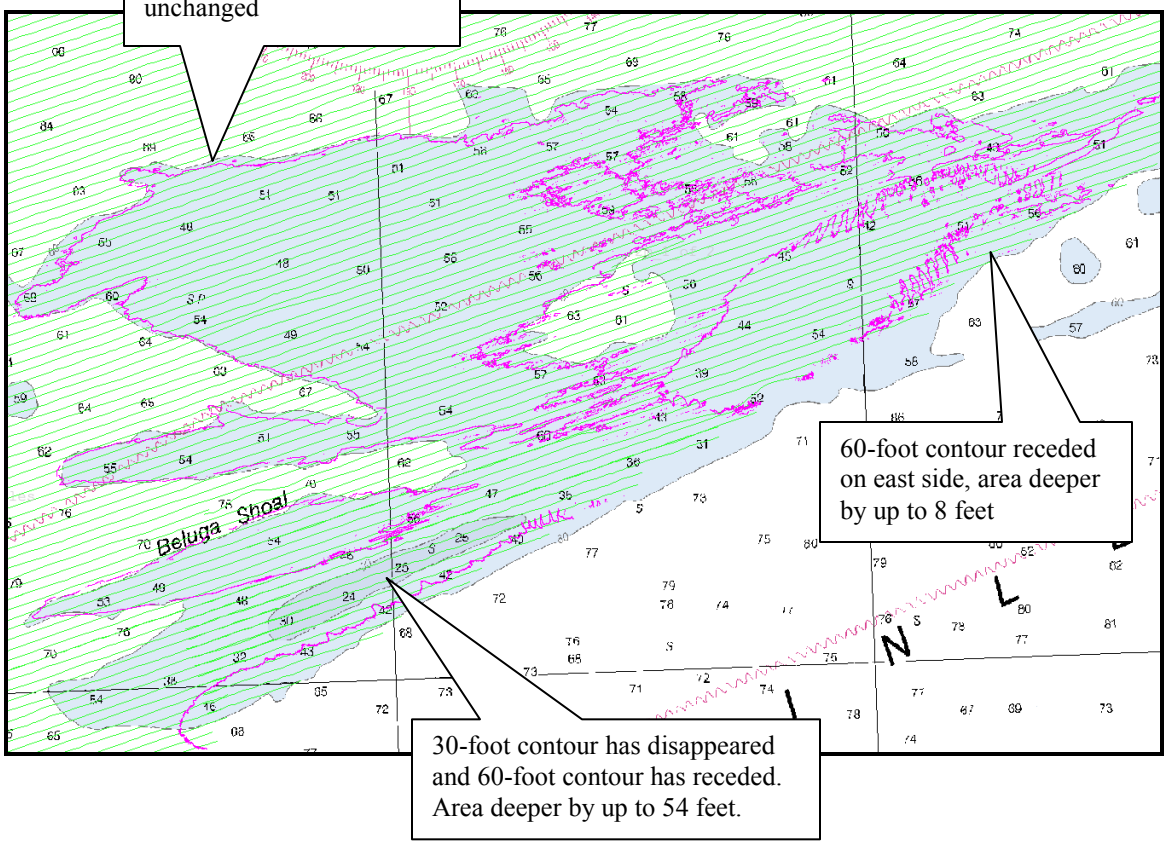


Figure 6 – Beluga Shoal: Contours from H11839 (purple) overlaid on chart 16665

3. The northeastern corner of the survey area has shoaled by up to 20 feet, with the 60-foot contour shifting approximately 700 meters further seaward. ***Concur***

   Soundings in this area were reported as a DTON to AHB on 10/22/09 (OPR_P385_TE_08_H11839 DtonReport_11). ***Concur***

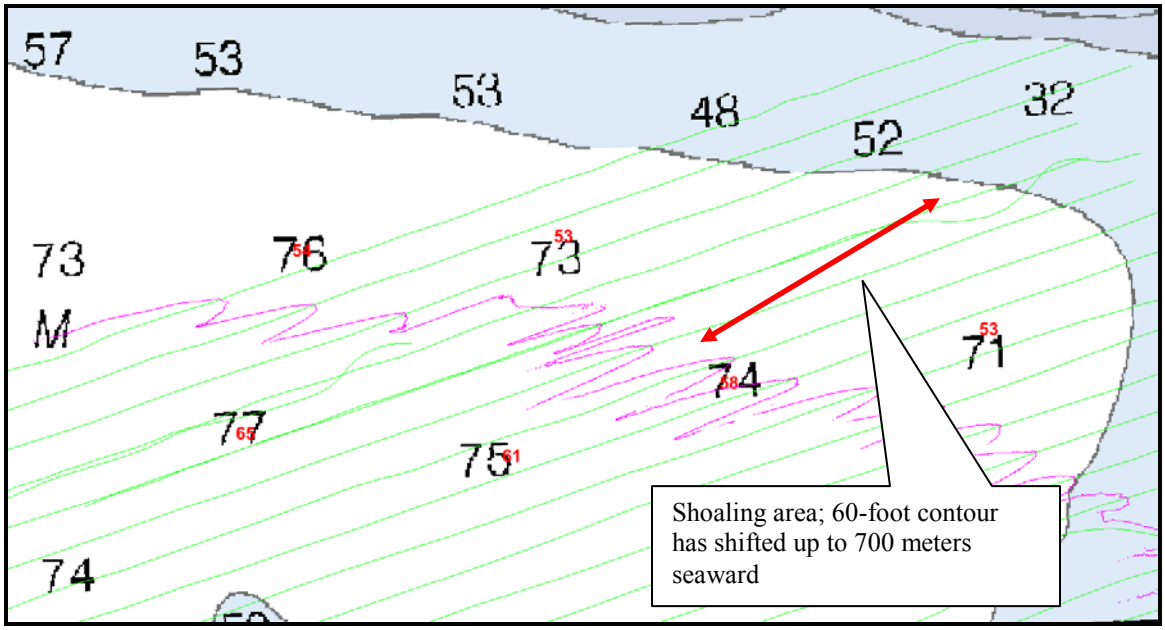


Figure 7 –Contours from H11839 (purple) overlaid on chart 16665. DTON soundings are red.

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. ***Concur***

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

There are four features labeled "PA rep." within the survey extents. They are itemized below.

1. PA Obstruction feature "Pipe rep Subm approx 0_1 fm at MHHW" on chart 16663 at 61-06-09.60N, 150-55-07.77W was not found by this survey. The area received 100% multibeam and sidescan coverage with no indication of features or obstructions in the area. Recommend removal. ***Concur***
2. PA Wellhead feature "rep cov 8 fms 1 ft" on chart 16663 at 61-06-11.28N, 150-55-00.46W was confirmed by this survey, with a slightly different position and depth. The area received 100% multibeam and sidescan coverage and a wellhead-like contact (SSS feature 194-090547P, height off seafloor of 4.328 meters) was detected at 61-06-11.01N, 150-55-02.13W with a multibeam least depth of 23.487 meters (12 fathoms). ***Concur with clarification. Delete charted feature and add survey feature at the survey position.***

Recommend updating to survey position. Recommend removal of "PA" text from chart and recommend "rep cov 8 fms 1 ft" be retained as it is possible multibeam did not capture the least depth over the feature. ***Concur***

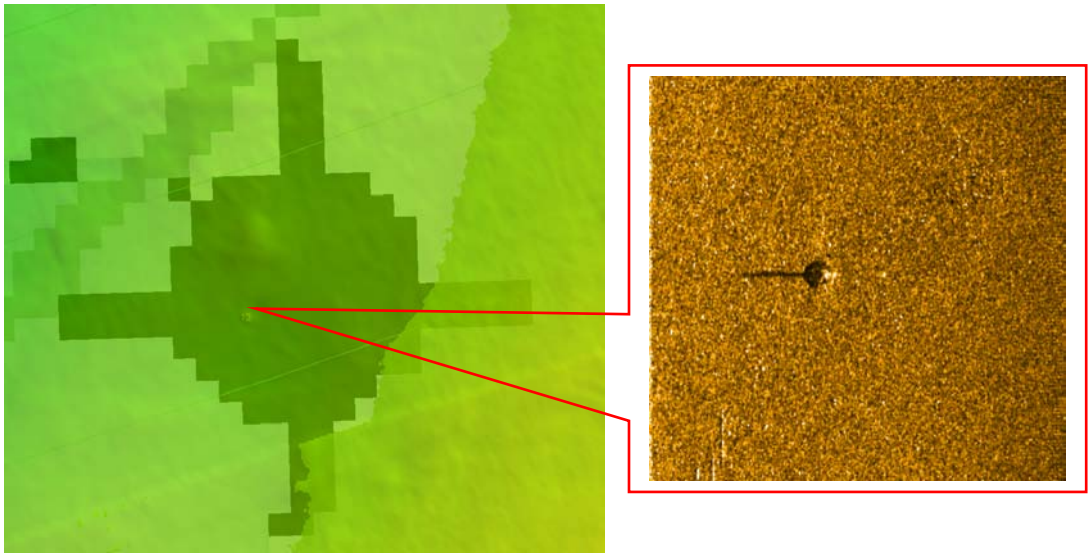


Figure 8 – Item 2: Charted wellhead with multibeam and sidescan sonar coverage

3. PA Wellhead feature "rep cov 17 fms" on chart 16663 at 61-04-02.22N, 150-57-16.32W was not confirmed by this survey. The area received 100% multibeam and sidescan coverage. Features exist in the multibeam and sidescan records in the vicinity of the charted feature but it cannot be determined from the data with any degree of certainty whether or not any of these contacts are the wellhead. Recommend the feature be retained as charted. ***Concur with clarification. Feature does exist in multibeam and side scan data. Delete charted feature and add survey feature at the survey position.***

4. PA Wellhead feature "rep cov 17 fms" on chart 16663 at 61-04-07.20N, 150-56-41.64W was confirmed by this survey. The area received 100% multibeam and sidescan coverage. Sidescan records (contact 197-085202P) indicate a wellhead-like feature at 61-04-07.05N, 150-56-42.20W (height off seafloor 3.516 meters). Multibeam acquired no hits on the contact but did indicate scour in the area. Least depth from sidescan sonar is 28.184 meters (15 fathoms). Recommend updating to surveyed position and depth. ***Concur with clarification. Side scan does display a contact at the survey position, and the multibeam data only indicates a scour at the survey position. See SAR Additional Verification Notes section. Retain as charted.***

   Recommend removal of "PA" and "rep" text from chart. ***See above.***

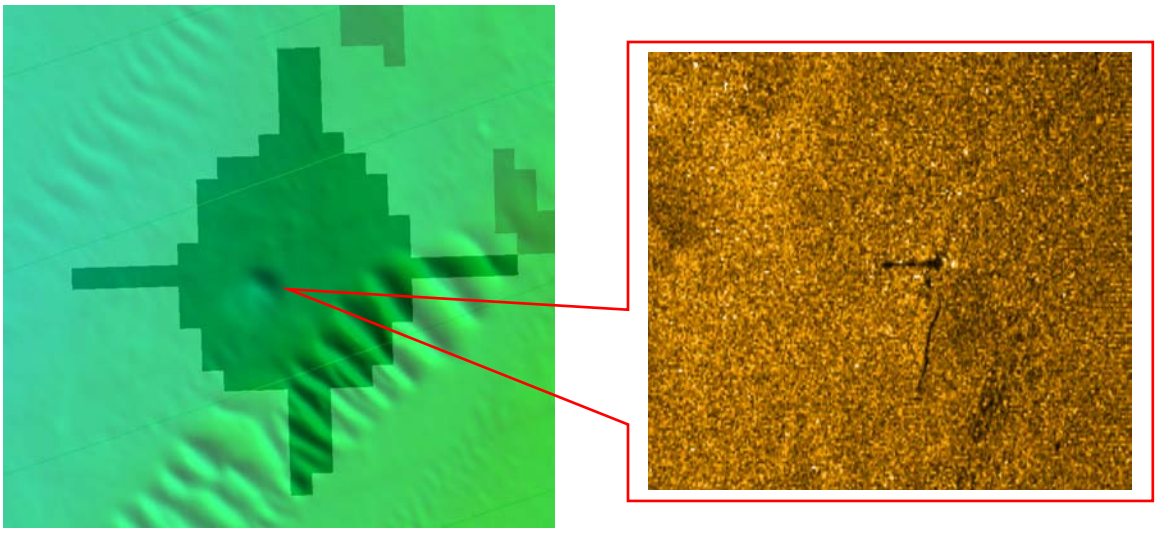


Figure 9 – Item 4: Charted wellhead with multibeam and sidescan sonar coverage

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***

However, during survey operations, the "PHILLIPS-A" platform shown on chart 16663 at 61-04-34.60N, 150-57-03.0W was confirmed to exist at its charted position. Recommend retain as charted. ***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

59 bottom samples were collected in support of the 2008 survey (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***

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

Two charted submarine cables intersect the survey area. The 2008 survey data does not support nor disprove the existence or location of these cables. 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 does not support nor disprove the existence or location of this pipeline. Recommend retain as charted. ***Concur***

LETTER OF APPROVAL

REGISTRY NO. H11839

This report and the accompanying digital data are respectfully submitted.

Field operations contributing to the accomplishment of survey H11839 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_____

TERRASOND

APPENDIX I

Danger To Navigation Reports

Danger to Navigation Report

Registry No.: H11839

State: Alaska

General Locality: Northern Cook Inlet

Sub Locality: Point Beluga Shoal

Project Number: OPR-P385-TE-08

Survey Dates: 07/10/2008 – 08/07/2008

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 H11839, 6 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 H11839.

Feature Number	Feature Name	Feature Type	Latitude	Longitude	Sounding Value (m)
1.1	#1: 54 feet	Shoal	61° 10' 31.4" N	150° 33' 17.7" W	16.39
1.2	#2: 53 feet	Shoal	61° 10' 31.7" N	150° 32' 35.7" W	16.16
1.3	#3: 53 feet	Shoal	61° 10' 23.3" N	150° 31' 28.0" W	16.27
1.4	#4: 58 feet	Shoal	61° 10' 19.9" N	150° 32' 10.0" W	17.70
1.5	#5: 61 feet	Shoal	61° 10' 14.9" N	150° 32' 45.4" W	18.67
1.6	#6: 65 feet	Shoal	61° 10' 17.4" N	150° 33' 27.8" W	19.91
TSL #4	7_1 Rk	Rock	61° 05' 35.7" N	151° 00' 38.3" W	13.08

Table 2 – Uncharted features in H11839 identified by the 2008 survey.

DTONs TSL#4 was submitted to NOAA previously, but no responses were received. It has been added to the charts in Local Notice to Mariners 08/09

Attachments:

NOAA Response for DTONs 1.1 – 1.6

H11839_DtoN_#01.pdf

Local Notice to Mariners 08/09

lnm17082009.pdf

Terrasond Report for TSL #4

2008-008_NOAA_CookInlet_DtonReport_4.pdf

Digital Data:

NOAA Response for DTONs 1.1 – 1.6

H11839_DtoN_#01.xml

H11839 Danger to Navigation #01

Registry Number: H11839

State: Alaska

Locality: Northern Cook Inlet

Sub-locality: Beluga Shoal

Project Number: OPR-P385-TE-08

Survey Date: 07/10/2008

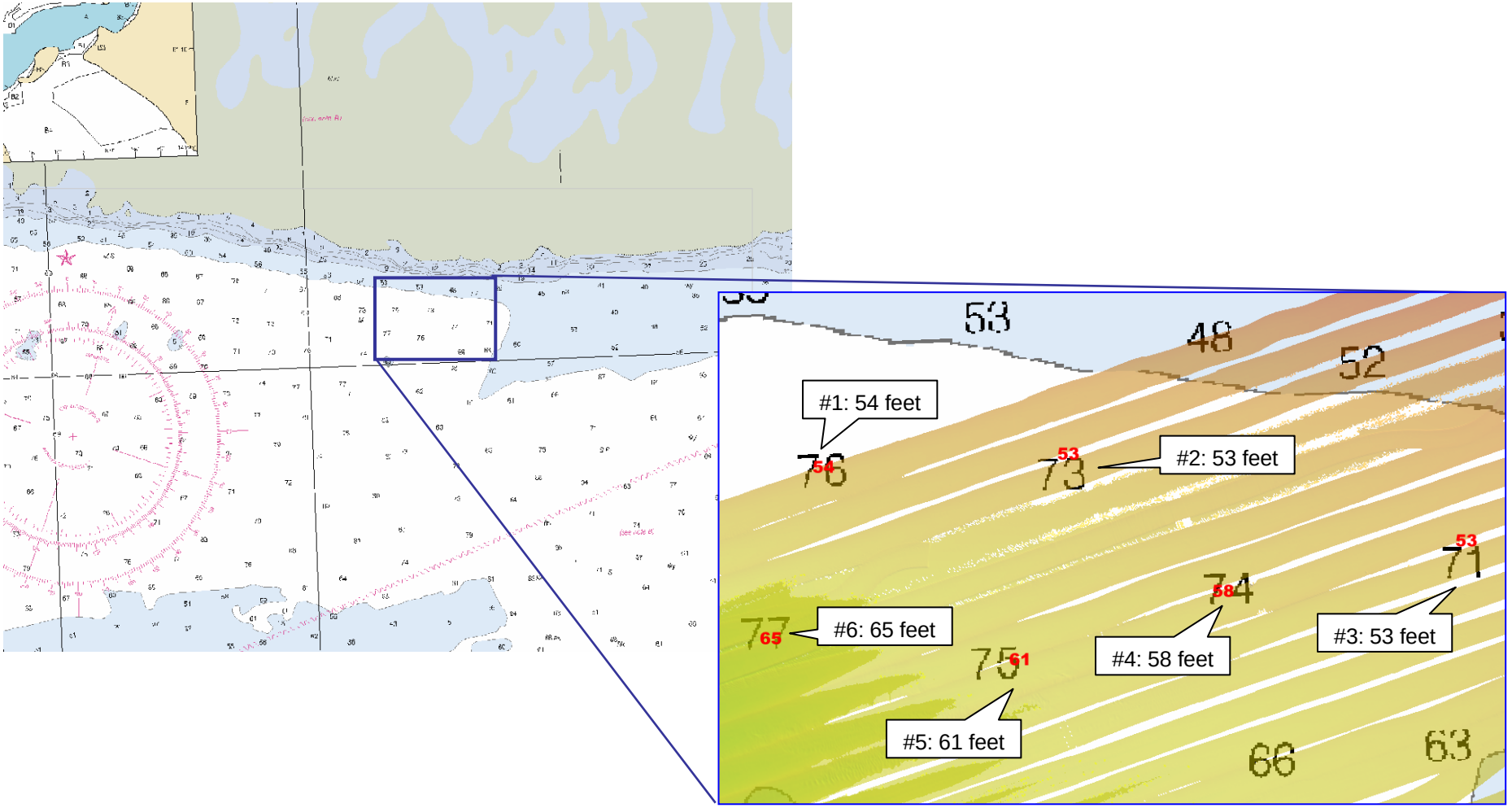
Charts Affected

Number	Edition	Date	Scale (RNC)	RNC Correction(s)*
16665	9th	03/01/2006	1:50,000 (16665_1)	USCG LNM: 10/16/2007 (10/13/2009) CHS NTM: None (09/25/2009) NGA NTM: 02/16/2002 (10/24/2009)
16663	8th	03/01/2006	1:100,000 (16663_1)	[L]NTM: ?
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	#1: 54 feet	Shoal	16.39 m	61° 10' 31.4" N	150° 33' 17.7" W	---
1.2	#2: 53 feet	Shoal	16.16 m	61° 10' 31.7" N	150° 32' 35.7" W	---
1.3	#3: 53 feet	Shoal	16.27 m	61° 10' 23.3" N	150° 31' 28.0" W	---
1.4	#4: 58 feet	Shoal	17.70 m	61° 10' 19.9" N	150° 32' 10.0" W	---
1.5	#5: 61 feet	Shoal	18.67 m	61° 10' 14.9" N	150° 32' 45.4" W	---
1.6	#6: 65 feet	Shoal	19.91 m	61° 10' 17.4" N	150° 33' 27.8" W	---



Shoaling area

NOT FOR NAVIGATION

Sheet C

Shown on Chart 16665

Chart units in feet

TERRASOND
TERRESTRIAL AND SEA FLOOR MAPPING

Project:	*OPR-P385-TE-08*
Survey:	*H11839*
State:	*Alaska*
Locality:	*Northern Cook Inlet*
Sub-locality:	*Beluga 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

R/V Mt. Augustine

October 22, 2009

1.1) #1: 54 feet

DANGER TO NAVIGATION

Survey Summary

Survey Position:	61° 10' 31.4" N, 150° 33' 17.7" W
Least Depth:	16.39 m (= 53.78 ft = 8.963 fm = 8 fm 5.78 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2008-192.07:33:33.883 (07/10/2008)
GP Dataset:	H11839_DtoN#01.xls
GP No.:	1
Charts Affected:	16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

54 feet Sounding in area found to be significantly shoaler then charted.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11839_DtoN#01.xls	1	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 54 ft Sounding at survey location.

Cartographically-Rounded Depth (Affected Charts):

54ft (16665_1)

9fm (16660_1, 16013_1)

7fm 0ft (16663_1, 531_1)

16.4m (500_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	OBJNAM - #1: 54 feet
	QUASOU - 6:least depth known
	SORDAT - 20080807

SORIND - US,US,graph,H11839

TECSOU - 3:found by multi-beam

Office Notes

Do not concur. Delete the shoal sounding based on the lack of data integrity due to significant SV issues. Entire area is significantly shoaler than previously charted. Bathymetry is captured in CS sounding selection and contours.

1.2) #2: 53 feet

DANGER TO NAVIGATION

Survey Summary

Survey Position: 61° 10' 31.7" N, 150° 32' 35.7" W

Least Depth: 16.16 m (= 53.03 ft = 8.839 fm = 8 fm 5.03 ft)

TPU (±1.96σ): **THU (TPEh)** [None] ; **TVU (TPEv)** [None]

Timestamp: 2008-192.11:05:04.333 (07/10/2008)

GP Dataset: H11839_DtoN#01.xls

GP No.: 2

Charts Affected: 16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

53 feet Sounding in area found to be significantly shoaler then charted.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11839_DtoN#01.xls	2	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 53 ft Sounding at survey location.

Cartographically-Rounded Depth (Affected Charts):

53ft (16665_1)

8 ¾fm (16660_1, 16013_1)

8fm 5ft (16663_1, 531_1)

16.2m (500_1, 50_1)

S-57 Data

Geo object 1: Sounding (SOUNDG)

Attributes: OBJNAM - #2: 53 feet

QUASOU - 6:least depth known

SORDAT - 20080807

SORIND - US,US,graph,H11839

TECSOU - 3:found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Do not concur. Delete the shoal sounding based on the lack of data integrity due to significant SV issues. Entire area is significantly shoaler than previously charted. Bathymetry is captured in CS sounding selection and contours.

1.3) #3: 53 feet

DANGER TO NAVIGATION

Survey Summary

Survey Position:	61° 10' 23.3" N, 150° 31' 28.0" W
Least Depth:	16.27 m (= 53.36 ft = 8.894 fm = 8 fm 5.36 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2008-192.23:13:18.689 (07/10/2008)
GP Dataset:	H11839_DtoN#01.xls
GP No.:	3
Charts Affected:	16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

53 feet Sounding in area found to be significantly shoaler then charted.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11839_DtoN#01.xls	3	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 53 ft Sounding at survey location.

Cartographically-Rounded Depth (Affected Charts):

53ft (16665_1)

8 ¾fm (16660_1, 16013_1)

8fm 5ft (16663_1, 531_1)

16.3m (500_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	OBJNAM - #3: 53 feet
	QUASOU - 6:least depth known
	SORDAT - 20080807

SORIND - US,US,graph,H11839

TECSOU - 3:found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Do not concur. Delete the shoal sounding based on the lack of data integrity due to significant SV issues. Entire area is significantly shoaler than previously charted. Bathymetry is captured in CS sounding selection and contours.

1.4) #4: 58 feet

DANGER TO NAVIGATION

Survey Summary

Survey Position:	61° 10' 19.9" N, 150° 32' 10.0" W
Least Depth:	17.70 m (= 58.05 ft = 9.676 fm = 9 fm 4.05 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2008-192.23:10:28.097 (07/10/2008)
GP Dataset:	H11839_DtoN#01.xls
GP No.:	4
Charts Affected:	16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

58 feet Sounding in area found to be significantly shoaler then charted.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11839_DtoN#01.xls	4	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 58 ft Sounding at survey location.

Cartographically-Rounded Depth (Affected Charts):

58ft (16665_1)

9 ½fm (16660_1, 16013_1)

9fm 4ft (16663_1, 531_1)

17.7m (500_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	OBJNAM - #4: 58 feet
	QUASOU - 6:least depth known
	SORDAT - 20080807

SORIND - US,US,graph,H11839

TECSOU - 3:found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Do not concur. Delete the shoal sounding based on the lack of data integrity due to significant SV issues. Entire area is significantly shoaler than previously charted. Bathymetry is captured in CS sounding selection and contours.

1.5) #5: 61 feet

DANGER TO NAVIGATION

Survey Summary

Survey Position:	61° 10' 14.9" N, 150° 32' 45.4" W
Least Depth:	18.67 m (= 61.25 ft = 10.208 fm = 10 fm 1.25 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2008-192.23:08:05.845 (07/10/2008)
GP Dataset:	H11839_DtoN#01.xls
GP No.:	5
Charts Affected:	16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

61 feet Sounding in area found to be significantly shoaler then charted.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11839_DtoN#01.xls	5	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 61 ft Sounding at survey location.

Cartographically-Rounded Depth (Affected Charts):

61ft (16665_1)

10 ¼fm (16660_1, 16013_1)

10fm 1ft (16663_1, 531_1)

18.7m (500_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	OBJNAM - #5: 61 feet
	QUASOU - 6:least depth known
	SORDAT - 20080807

SORIND - US,US,graph,H11839

TECSOU - 3:found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Do not concur. Delete the shoal sounding based on the lack of data integrity due to significant SV issues. Entire area is significantly shoaler than previously charted. Bathymetry is captured in CS sounding selection and contours.

1.6) #6: 65 feet

DANGER TO NAVIGATION

Survey Summary

Survey Position:	61° 10' 17.4" N, 150° 33' 27.8" W
Least Depth:	19.91 m (= 65.31 ft = 10.885 fm = 10 fm 5.31 ft)
TPU (±1.96σ):	**THU (TPEh)** [None] ; **TVU (TPEv)** [None]
Timestamp:	2008-192.15:18:44.290 (07/10/2008)
GP Dataset:	H11839_DtoN#01.xls
GP No.:	6
Charts Affected:	16665_1, 16663_1, 16660_1, 16013_1, 531_1, 500_1, 50_1

Remarks:

65 feet Sounding in area found to be significantly shoaler then charted.

Feature Correlation

Address	Feature	Range	Azimuth	Status
H11839_DtoN#01.xls	6	0.00	000.0	Primary

Hydrographer Recommendations

Recommend charting 65 ft Sounding at survey location.

Cartographically-Rounded Depth (Affected Charts):

65ft (16665_1)

10 ¾fm (16660_1, 16013_1)

10fm 5ft (16663_1, 531_1)

19.9m (500_1, 50_1)

S-57 Data

Geo object 1:	Sounding (SOUNDG)
Attributes:	OBJNAM - #6: 65 feet
	QUASOU - 6:least depth known
	SORDAT - 20080807

SORIND - US,US,graph,H11839

TECSOU - 3:found by multi-beam

VERDAT - 12:Mean lower low water

Office Notes

Do not concur. Delete the shoal sounding based on the lack of data integrity due to significant SV issues. Entire area is significantly shoaler than previously charted. Bathymetry is captured in CS sounding selection and contours.

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APPENDIX II

Survey Feature Report

AWOIS

There were no Automated Wrecks and Obstructions (AWOIS) assigned in survey area H11839.

Platforms

1 platform was found with in the limits of this survey.

Point #	Date	Latitude	Longitude	Category of Platform	Condition	Object Name
4	7/13/2008	61° 04' 34.6" N	150° 57' 3.0" W	Oil derrick/rig	Normal	Phillips A

Table 1 – Platform with in limits of survey H11839 (2008).

Concur

Uncharted Wrecks

There were no Uncharted Wrecks in survey area H11839.

Concur

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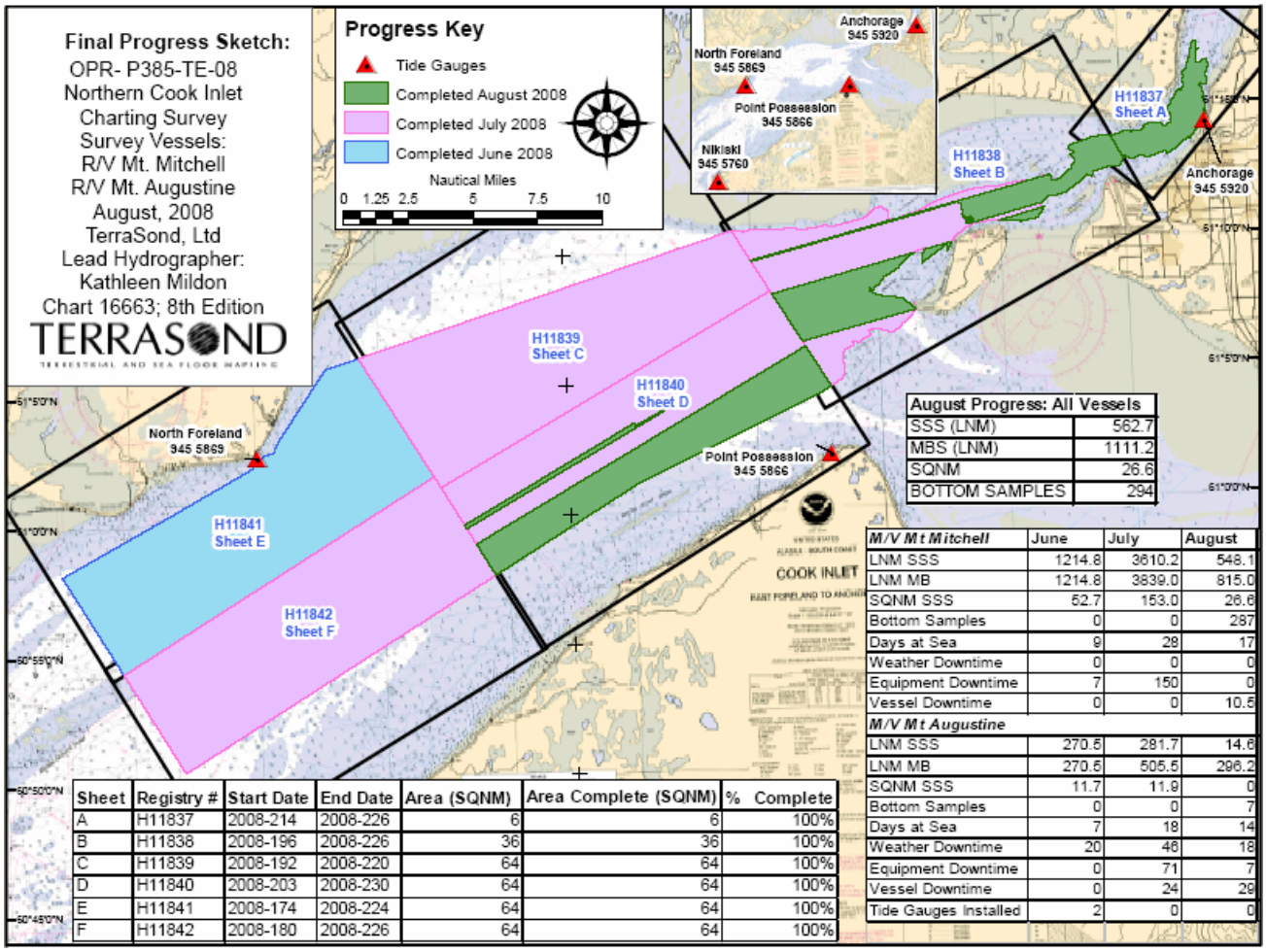
APPENDIX III

Progress Sketch and Final Survey Limits



August Progress: All Vessels	
SSS (LNM)	562.7
MBS (LNM)	1111.2
SQNM	26.6
BOTTOM SAMPLES	294

M/V Mt Mitchell	June	July	August
LNM SSS	1214.8	3610.2	548.1
LNM MB	1214.8	3839.0	815.0
SQNM SSS	52.7	153.0	26.6
Bottom Samples	0	0	287
Days at Sea	9	28	17
Weather Downtime	0	0	0
Equipment Downtime	7	150	0
Vessel Downtime	0	0	10.5
M/V Mt Augustine			
LNM SSS	270.6	281.7	14.6
LNM MB	270.6	505.5	296.2
SQNM SSS	11.7	11.9	0
Bottom Samples	0	0	7
Days at Sea	7	18	14
Weather Downtime	20	46	18
Equipment Downtime	0	71	7
Vessel Downtime	0	24	29
Tide Gauges Installed	2	0	0

Sheet	Registry #	Start Date	End Date	Area (SQNM)	Area Complete (SQNM)	% Complete
A	H11837	2008-214	2008-226	6	6	100%
B	H11838	2008-196	2008-226	36	36	100%
C	H11839	2008-192	2008-220	64	64	100%
D	H11840	2008-203	2008-230	64	64	100%
E	H11841	2008-174	2008-224	64	64	100%
F	H11842	2008-180	2008-226	64	64	100%

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

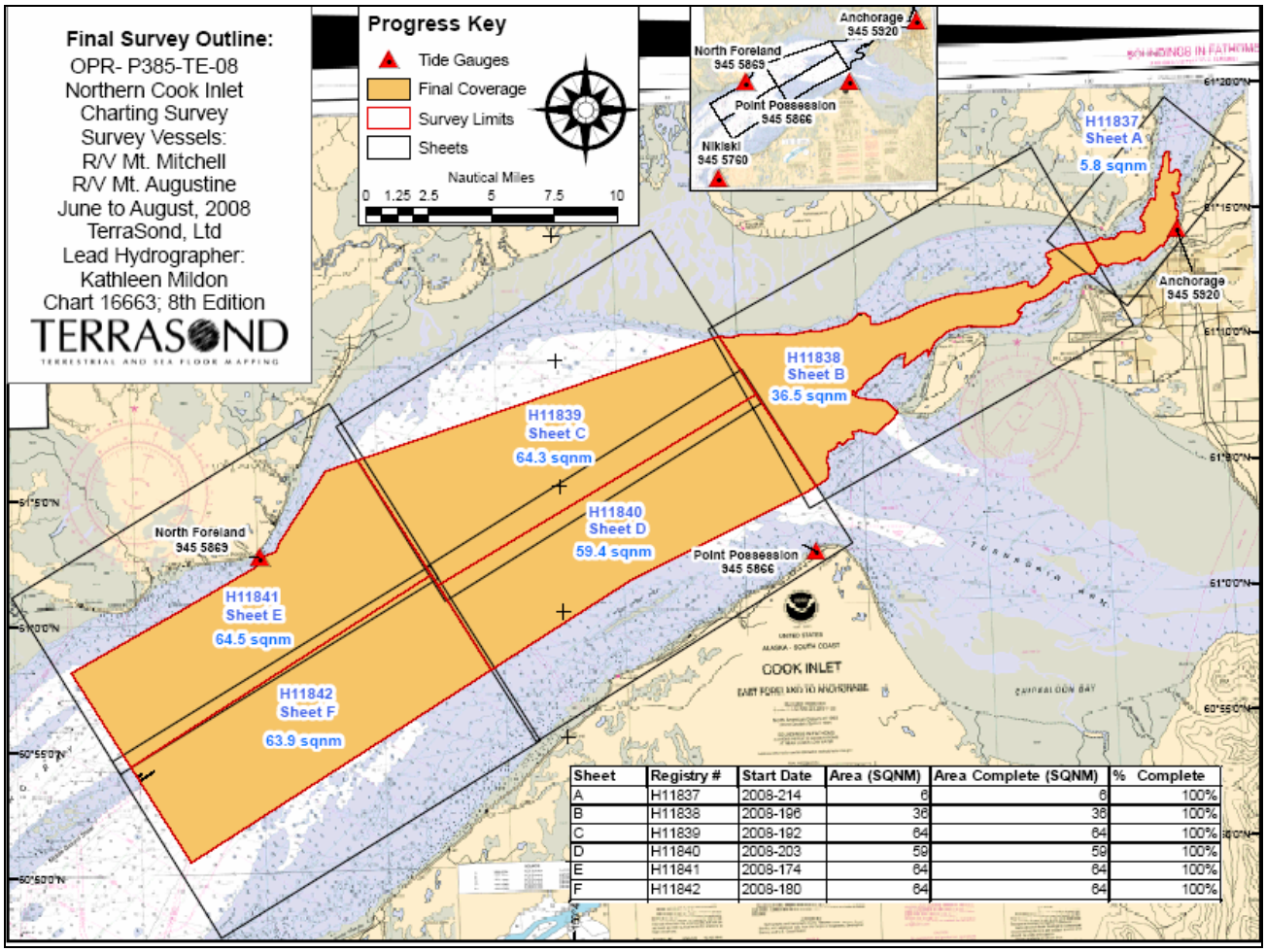


Figure 2: Final Survey Outline for OPR-P385-TE-08

TERRASOND

APPENDIX IV

Tides and Water Levels
Field Tide Notes

Abstract of Times Hydrography

Project: OPR-P385-TE-08

Registry No.: H11839

Table 1 – Sheet C Times of Hydrography: Inclusive Dates: July 10th, 2008 – August 7th, 2008. This Survey ran 24 hours a day.

START		END	
Day (Julian)	Time (UTC)	Day (Julian)	Time (UTC)
192	07:21:37	220	09:21:51

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	**Installed**	6/12/2008	**Removed**			
Gauge 1	**Radar Sensor**	DAA H3611i	Serial No.	1582	Level Point to Sensor "0"	4mm below bottom of plate
94558691	**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	**Installed**	6/12/2008	**Removed**			
Gauge 2	**Radar Sensor**	DAA H3611i	Serial No.	1618	Level Point to Sensor "0"	Even with bottom of plate
94558692	**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.				

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 weatherproff and the door is not locked.

Primary DCP	**Installed**	6/12/2008	**Removed**	9/4/2008		
Gauge 1	**Radar Sensor**	DAA H3611i	Serial No.	1582	Level Point to Sensor "0"	4mm below bottom of plate
94558691	**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	**Installed**	6/12/2008	**Removed**	8/26/2008		
Gauge 2	**Radar Sensor**	DAA H3611i	Serial No.	1618	Level Point to Sensor "0"	Even with bottom of plate
94558692	**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.				
	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/getDatasheet.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	**Installed**	6/10/2008	**Removed**			
94558661	**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	**Installed**	6/10/2008	**Removed**			
94558662	**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	Tide Consultant
	Terrasond, Ltd 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	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	**Installed**	6/10/2008	**Removed**	9/4/2008		
94558661	**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	**Installed**	6/10/2008	**Removed**	9/4/2008		
94558662	**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 Terrrasond - Gauge 2 does not seem to be working properly. Purged tide gauges.
	7/24/08 Terrrasond & JOA - Purged tide gauges, investigated Gauge 2 problems. Did not resolve.
	7/31/08 Terrrasond - Both orifice anchors found upside down underwater. Flipped anchors right side up.
	9/4/08 Terrrasond - Closeout staff observations, leveling. Demobilize tide station.

TERRASOND

APPENDIX V

Supplemental Survey Records and Correspondence

Bottom Samples

59 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.

Point #	Date	Time UTC	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface
C01	8/10/2008	18:23	16.7	61° 10' 11.207" N	150° 32' 3.078" W			silt, clay
C02	8/10/2008	2:15	18.3	61° 9' 15.598" N	150° 30' 54.849" W			silt
C03	8/9/2008	16:47	19.6	61° 8' 20.618" N	150° 29' 42.253" W			sand
C04	8/9/2008	17:11	17.2	61° 7' 47.607" N	150° 31' 40.744" W		coarse	sand
C05	8/10/2008	2:02	21.1	61° 8' 42.633" N	150° 32' 50.109" W		fine	silt, cobbles
C06	8/10/2008	2:32	18.4	61° 9' 38.553" N	150° 33' 54.322" W			silt
C07	8/10/2008	18:06	18.7	61° 9' 45.791" N	150° 36' 39.861" W			pebbles, clay
C08	8/10/2008	3:00	21.1	61° 9' 6.853" N	150° 35' 51.241" W		medium	pebbles
C09	8/10/2008	1:02	24.4	61° 8' 9.097" N	150° 34' 25.398" W		medium	pebbles
C10	8/9/2008	17:26	16.6	61° 7' 14.854" N	150° 33' 31.495" W	grey		sand
C11	8/9/2008	17:40	14.9	61° 6' 41.487" N	150° 35' 25.535" W	grey	medium	sand
C12	8/10/2008	0:38	18.2	61° 7' 36.064" N	150° 36' 37.753" W		fine	cobbles
C13	8/10/2008	3:12	20.4	61° 8' 32.362" N	150° 37' 45.039" W		medium	gravel, pebbles
C14	8/10/2008	17:53	17.6	61° 9' 26.82" N	150° 38' 54.566" W			cobbles
C15	8/10/2008	17:43	18.8	61° 8' 53.332" N	150° 40' 48.521" W			pebbles
C16	8/10/2008	3:25	19.1	61° 7' 59.7" N	150° 39' 43.138" W		coarse, fine	pebbles
C17	8/10/2008	0:23	17.4	61° 7' 11.107" N	150° 38' 32.316" W		fine, coarse	pebbles
C18	8/9/2008	17:52	17.9	61° 6' 8.529" N	150° 37' 20.305" W	grey	medium	sand
C19	8/9/2008	18:05	18.1	61° 5' 35.651" N	150° 39' 15.055" W	grey	medium	sand, pebbles

Point #	Date	Time UTC	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface
C20	8/10/2008	0:02	16.9	61° 6' 31.718" N	150° 40' 20.996" W		fine, medium	cobbles, pebbles
C21	8/10/2008	3:37	14.1	61° 7' 26.478" N	150° 41' 34.152" W		fine	cobbles
C22	8/10/2008	17:14	19.2	61° 8' 20.586" N	150° 42' 45.382" W			pebbles
C23	8/10/2008	19:35	29	61° 8' 32.949" N	150° 45' 28.347" W			gravel
C24	8/10/2008	17:04	19.2	61° 7' 48.45" N	150° 44' 36.484" W			pebbles
C25	8/10/2008	3:49	16.8	61° 6' 53.567" N	150° 43' 27.75" W		fine	cobbles
C26	8/9/2008	23:43	23.3	61° 5' 57.201" N	150° 42' 23.092" W		fine	cobbles
C27	8/9/2008	18:18	14.2	61° 5' 2.225" N	150° 41' 9.722" W	grey	medium	sand, pebbles
C28	8/9/2008	23:26	21.7	61° 5' 24.342" N	150° 44' 16.924" W		medium, fine	pebbles
C30	8/10/2008	4:02	19.3	61° 6' 19.509" N	150° 45' 24.26" W		coarse	pebbles, gravel
C31	8/10/2008	16:50	18.9	61° 7' 15.222" N	150° 46' 33.39" W			pebbles
C32	8/10/2008	19:51	26	61° 8' 10.408" N	150° 47' 38.9" W			pebbles
C33	8/10/2008	20:10	21.3	61° 7' 36.448" N	150° 49' 36.916" W		fine, coarse	cobbles, pebbles
C34	8/10/2008	16:38	21	61° 6' 41.496" N	150° 48' 28.095" W			pebbles
C35	8/10/2008	4:33	19.2	61° 5' 46.901" N	150° 47' 19.81" W			gravel
C36	8/9/2008	23:11	23.8	61° 4' 50.342" N	150° 46' 11.946" W		coarse, medium	cobbles, pebbles
C37	8/9/2008	22:45	20.9	61° 4' 17.096" N	150° 48' 6.444" W		medium	cobbles
C38	8/10/2008	4:51	21	61° 5' 13.71" N	150° 49' 12.468" W		medium	cobbles, pebbles
C39	8/10/2008	16:08	19.9	61° 6' 8.566" N	150° 50' 22.21" W			cobbles
C40	8/10/2008	20:22	19.6	61° 7' 4.647" N	150° 51' 29.857" W		coarse	cobbles
C41	8/11/2008	18:59	21.5	61° 7' 12.546" N	150° 54' 18.142" W			gravel
C42	8/10/2008	20:47	25	61° 6' 31.09" N	150° 53' 23.932" W		fine, coarse	pebbles, cobbles
C43	8/10/2008	15:47	17.8	61° 5' 34.914" N	150° 52' 13.348" W			cobbles

Point #	Date	Time UTC	Depth (m)	Latitude	Longitude	Color	Surface Description	Nature of Surface
C44	8/10/2008	5:10	23.8	61° 4' 39.944" N	150° 51' 7.783" W		coarse	pebbles
C45	8/9/2008	22:30	18.8	61° 3' 44.407" N	150° 49' 59.968" W	grey	medium	cobbles
C46	8/9/2008	22:15	24	61° 3' 11.1547" N	150° 51' 54.206" W		medium	cobbles
C47	8/10/2008	5:49	25.6	61° 4' 7.131" N	150° 53' 1.703" W		coarse	gravel, pebbles
C48	8/10/2008	15:20	19	61° 5' 3.513" N	150° 54' 17.232" W			cobbles
C49	8/10/2008	21:03	23.1	61° 5' 57.332" N	150° 55' 19.372" W		medium, fine	cobbles, pebbles
C50	8/11/2008	18:47	20.9	61° 6' 52.313" N	150° 56' 30.926" W		coarse	sand, pebbles
C51	8/11/2008	18:23	15.6	61° 6' 17.944" N	150° 58' 24.122" W			cobbles, clay
C52	8/10/2008	21:16	22	61° 5' 24.304" N	150° 57' 13.307" W		coarse, fine	pebbles
C53	8/10/2008	15:06	27.9	61° 4' 28.394" N	150° 56' 6.215" W			pebbles
C54	8/10/2008	6:14	30.5	61° 3' 33.418" N	150° 54' 54.95" W		medium	cobbles
C55	8/9/2008	22:01	23.4	61° 2' 50.569" N	150° 53' 34.482" W		coarse, medium	pebbles, cobbles
C56	8/9/2008	21:46	35.4	61° 2' 4.242" N	150° 55' 42.422" W		coarse, medium	pebbles, cobbles
C57	8/10/2008	6:31	32.6	61° 3' 0.296" N	150° 56' 51.525" W		medium, coarse	pebbles, cobbles
C58	8/10/2008	14:54	27.6	61° 3' 55.255" N	150° 58' 0.717" W			cobbles
C59	8/10/2008	21:39	22.4	61° 4' 47.448" N	150° 59' 18.857" W		fine	cobbles
C60	8/11/2008	18:08	15.3	61° 5' 44.763" N	151° 0' 16.306" W			cobbles, pebbles

Table 1 – Bottom samples obtained in conjunction with survey H11839.

OPR-P385_TE-08 Technical Notes

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:

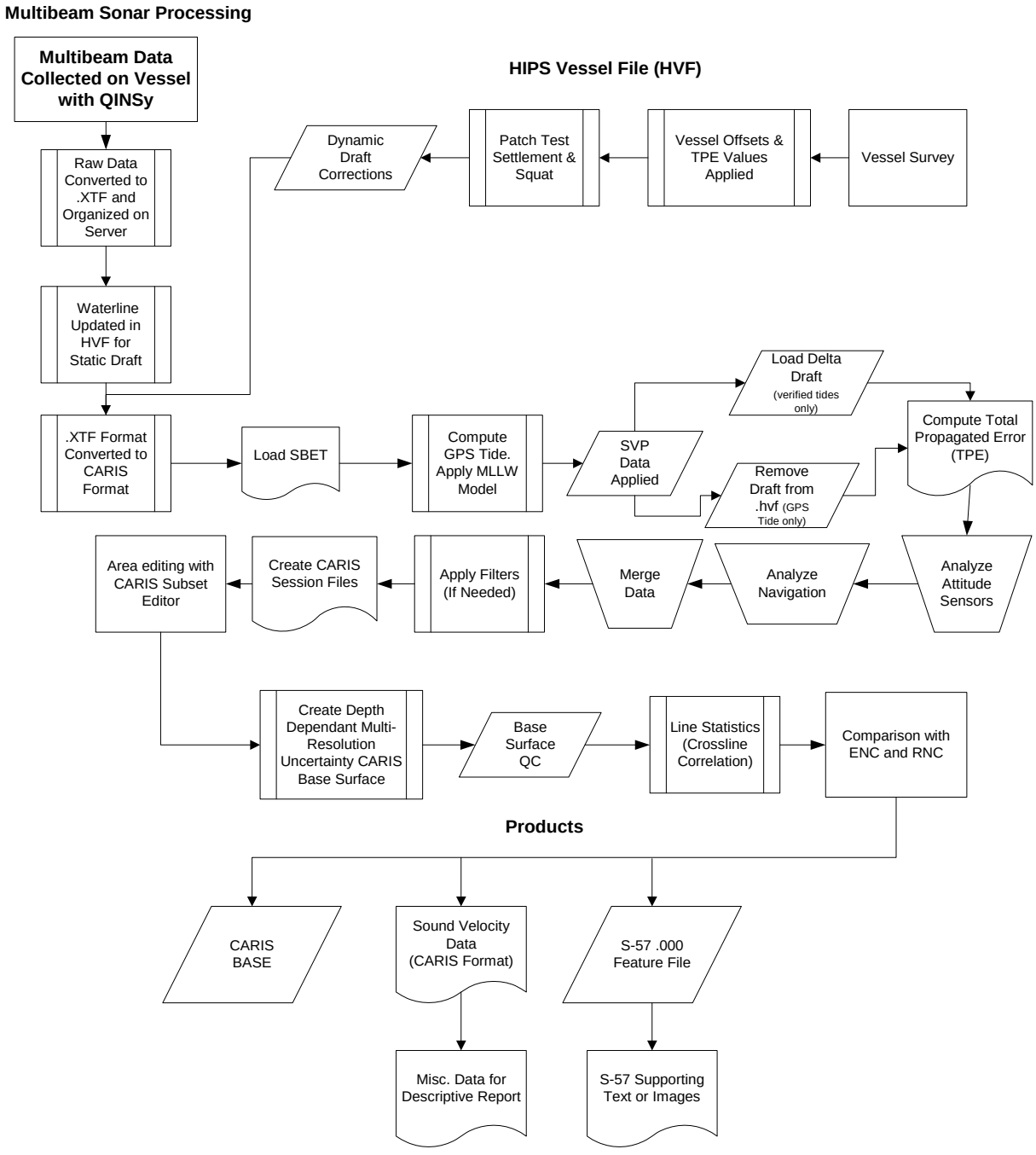
"Field collected sound speed data and delta draft were applied during final processing. All survey lines processed with PPK-based GPS tide used the vertical component of the GPS height to model dynamic draft; therefore no draft values exist in the vessel file nor was there an rpm-based delta draft table 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



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.hv*f

These lines are as follows:

Survey Lines with Verified Tide/Zone Applied

Sheet	Line Name	Vessel	Date
H11838			
	5331_-_9B-a	Augustine	2008-214
H11839			
	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

	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

	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

	_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
H11841			
	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

	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

	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

	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
H11842			
	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:

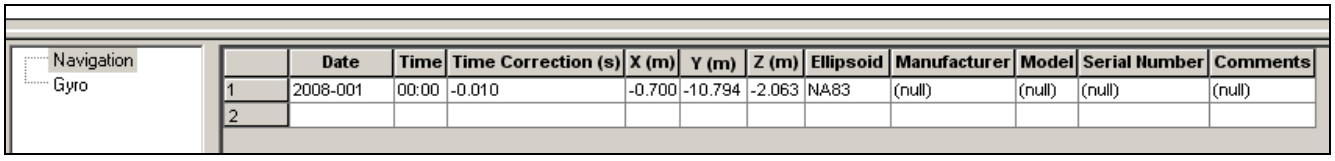
By inserting the reciprocal of the CRP- to- towfish XYZ offsets in the Navigation field of the .hvf, ship navigation is now relative to the towfish phase center and not the vessel CRP. Towfish navigation *is* ship navigation and therefore it is not necessary to recompute towfish navigation. The .hvf 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
Nav. Time Correction 2008-001: -0.01 sec	*Nav. Time Correction* 2008-001: 0.078

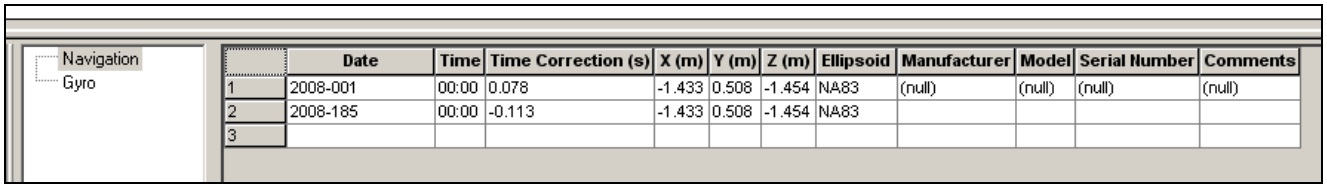
	2008-185: -0.113

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
1	2008-001	00:00	-0.010	-0.700	-10.794	-2.063	NA83	(null)	(null)	(null)	(null)
2											

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
1	2008-001	00:00	0.078	-1.433	0.508	-1.454	NA83	(null)	(null)	(null)	(null)
2	2008-185	00:00	-0.113	-1.433	0.508	-1.454	NA83				
3											

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.	H11839
PROJECT No.	OPR-P285-TE-08
FIELD UNIT	TERRASOND LTD.
DATE OF SURVEY	20080710-20080807
LARGEST SCALE CHART	***16665_1, edition 9, 20060301, 1:50,000***
ADDITIONAL CHARTS	***16060_1, edition 30, 20060601, 1:194,154*** ***16662_1, edition 8, 20070901, 1:100,000*** ***16663_1, edition 8, 20060301, 1:100,000*** ***16013_1, edition 30, 20060701, 1:969,761*** ***50_1, edition 6, 20030601, 1:10,000,000*** ***500_1, edition 8, 20030601, 1:3,500,000***
SOUNDING UNITS	**feet**
COMPILER	John Kidd

Source Grids	**File Name** H:\Compilation\H11839_P385_TERRA\AHB_H11839\Fieldsheets
	H11839_AHB_1m_unc_HF2_Finaltest.csar **H11839_AHB_2m_Unc_Final.csar**
Surfaces	**File Name** H:\Compilation\H11839_P385_TERRA\AHB_H11839\COMPILE\Working
Combined	**H11839_4m_Combined.csar**
Interpolated TIN	**\H11839_12m_Interface_InterpTIN.csar**
Shifted Interpolated TIN	**H11839_12m_InterpTIN_Shifted_ft.csar**
Final HOBs	**File Name** H:\Compilation\H11839_P385_TERRA\AHB_H11839\COMPILE\Final_Hobs
Survey Scale Soundings	**H11839_SS_Soundings.hob**
Chart Scale Soundings	**H11839_CS_Soundings.hob**
Contour Layer	**H11839_Contours.hob**
Feature Layer	**H11839_Features.hob**
Meta-Objects Layer	**H11839_Metaobjects.hob**
Blue Notes	**H11839_Bluenotes.hob**
ENC Retain Soundings	**NA**
Export HOBs	**File Name** H:\Compilation\H11839_P385_TERRA\AHB_H11839\COMPILE\Final_Hobs
Survey Scale Export	**H11839_SS_export.hob**
Chart Scale Export	**H11839_CS_export.hob**

Meta-Objects Attribution	
Acronym	**Value**
M_COVR	
CATCOV	1 – coverage available
SORDAT	20080807
SORIND	US,US,graph,H11839
M_QUAL	
CATZOC	6 – zone of confidence U (data not assessed)
INFORM	R/V Mt. Mitchell and Mt. Augustine
POSACC	10.0 m

SORDAT	20080807
SORIND	US,US,graph,H11839
SUREND	20080807
SURSTA	20080710
DEPARE	
DRVALV 1	34.000 ft
DRVALV2	123.000 ft
SORDAT	20080807
SORIND	US,US,graph,H11839
M_CSCL	
CSCALE	100,000
SORDAT	20080807
SORIND	US,US,graph,H11839

SPECIFICATIONS:

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

II. SURVEY SCALE SOUNDINGS (SS):
- a. Attribute Name: Depth
- b. Selection criteria: Radius, Shoal bias
- c. Radius value is: mm at map scale
  - i. Use single-defined radius: NA
  - ii. And/Or use radius table file: H11839_50K_SS_SSR.txt

0	9.1440	0.8
9.14401	18.2880	1.0
18.28801	45	1.2

H11839_100K_SS_SSR.txt

0	9.1440	0.6
9.14401	18.2880	0.8
18.28801	45	1.0

- d. Queried Depth of All Soundings
  - i. Minimum: 10.880 m
  - ii. Maximum: 37.289 m

III. INTERPOLATED TIN SURFACE:
- a. Resolution (m): 12 m
- b. Interpolation method: Natural Neighbor
- c. Shift value: -0.75 ft

IV. CONTOURS:
- a. Attribute Name: Depth
- b. Use a Depth List: H11839_depth_curves_list.txt
- c. Output Options: Create contour lines
  - i. Line Object: DEPCNT
  - ii. Value Attribute: VALDCO

V. FEATURES:
- a. Number of Chart Features: 72
- b. Number of Non-Chart Features: 204

VI. CHART SURVEY SOUNDINGS (CS):

a. Number of ENC CS Soundings: 361
b. Attribute Name: Depth
c. Selection criteria: Radius, Shoal bias
d. Radius value is: Distance on the ground (m)
   i. Use single-defined radius: NA
   ii. And/Or use radius table file: H11839_50K_CS_SSR.txt

18.2880	21.3360	600
21.3360	24.2940	650
24.2940	27.4320	700
H11839_100K_CS_SSR.txt		
0	18.2880	900
18.28801	36.5760	1000
Enable Filter:		Interpolated !=1

e. Number Survey CS Soundings: 334

VII. NOTES:

NA

ATLANTIC HYDROGRAPHIC BRANCH
H-CELL REPORT to ACCOMPANY
SURVEY H11839 (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 at the largest scale chart covering the respective area of the survey (Chart 16665 ~ 1:50,000; Chart 16663~ 1:100,000) and using a sounding spacing range (SSR) files. A TIN was created from the survey scale soundings, from which an interpolated surface of 12m resolution was generated. The chart scale soundings were selected using an SSR file 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 (60ft). 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 H11839 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, SBDARE, SNDWAV, OBSTRN, OFSPLF).

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 and fathoms using CARIS HOM ENC 3.3. Quality assurance and topology checks were conducted using CARIS S-57 Composer 2.2 validation tests 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:

TABLE 1 - Contents of H-Cell Files

H11839_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		
	UWTROC		
	OFSPLF		
H11839_SS.000			**Scale 1:20,000**
Object Class Types	**Geographic**		
S-57 Object Acronyms	DEPCNT		
	SOUNDG		

B.2.4 Junctions and Prior Surveys

Survey H11839 (2008) junctions with survey H11838 (2008) to the east, H11840 (2008) to the south, and H11841 to the west. Most present survey depths compare within 2 feet of junctioning survey depths to the east, within 2 feet of junctioning survey depths to the south, and within 2 feet of junctioning survey depths to the west. Most present survey depths compare within 4 feet of the charted hydrography to the north.

B.4 DATA PROCESSING

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

CARIS Bathy DataBASE version 3.0/HF8
CARIS Bathy DataBASE version 2.3/HF16
CARIS HIPS and SIPS version 7.0/SP2/HF5
CARIS S-57 Composer version 2.2/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, MAR/06)
Cook Inlet-Approaches to Anchorage
Corrected through NM 10/05/2010
Corrected through LNM 08/27/2010
Scale 1:50,000

16663 (8th Edition, MAR/06)
Cook Inlet- East Foreland to Anchorage
Corrected through NM 10/12/2010
Corrected through LNM 08/27/2010
Scale 1:100,000

ENC COMPARISON

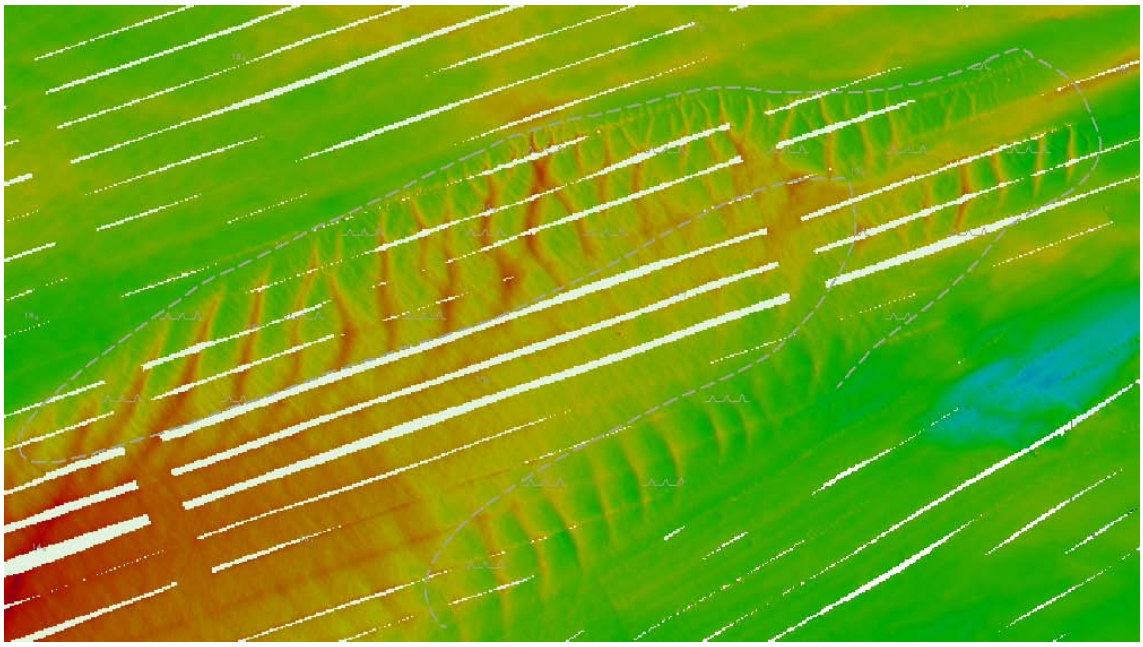
US3AK1DM
Cook Inlet-northern part
Edition 14
Application Date 2010/12/20
Issue Date 2010/12/20
Chart 16660

US4AK15M
Cook Inlet-East Foreland to Anchorage
Edition 13
Application Date 2010/12/16
Issue Date 2010/12/16
Chart 16663

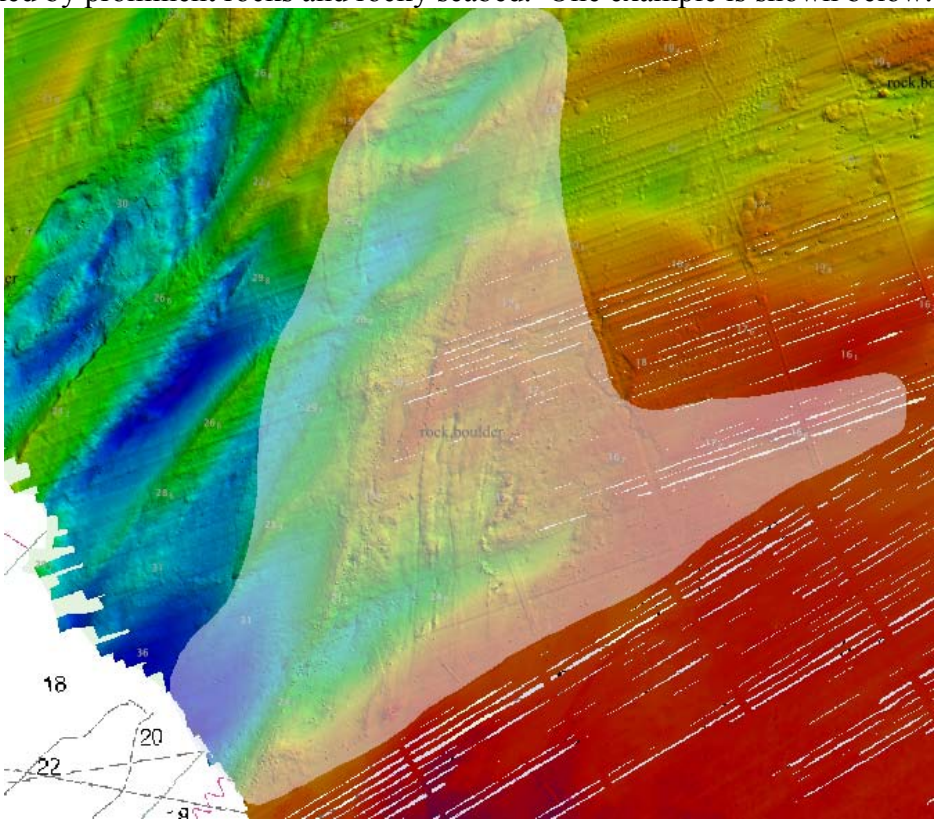
D.2 ADDITIONAL RESULTS

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. Two (2) sandwave (SNDWAV) areas were included with the H-Cell. These areas are defined by undulating sandwaves with an amplitude of 1m or more. One example is shown below.



b. Six rocky seabed areas (SBDARE) were included with the H-Cell. These areas are defined by prominent rocks and rocky seabed. One example is shown below.



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
H11839(2008)

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 disproval 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.

2011.01.26
16:12:47 -05'00'

John Kidd
Hydrographic 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.

Richard T. Brennan
I am approving this document
2011.01.31 15:34:15 -05'00'

Approved: _____

CDR Richard T. Brennan, NOAA
Chief, Atlantic Hydrographic Branch

Digitally signed by Mark Lathrop
DN: cn=Mark Lathrop, o=NOAA, ou=HSD, email=mark.t.lathrop@noaa.gov, c=US
Reason: AWOIS/Surf Check
Date: 2011.02.02 14:25:07 -05'00'