W00261

NOAA Form 76-35A

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey: Investigation

Registry Number: W00261

LOCALITY

State: Alaska

General Locality: Bering Sea

Sub-locality: Bering Sea

2012

CHIEF OF PARTY
Sandra D. Hernandez

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**W00261**

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

State:	**Alaska**
General Locality:	**Bering Sea**
Sub-Locality:	**Bering Sea**
Scale:	**N/A**
Dates of Survey:	**8/10/2012 to 9/10/2012**
Instructions Dated:	**09/12/2011**
Project Number:	**OSD-PHB-12**
Field Unit:	**US Navy**
Chief of Party:	**Sandra D. Hernandez**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**
H-Cell Compilation Units:	***meters at Mean Lower Low Water***

Remarks:

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

LEAD NP4 REPORT
SURVOP 6107-12
10 August – 10 September 2012
Sandra D. Hernandez

1.0. OVERVIEW

1.1. GENERAL

This survey was UNCLASSIFIED and conducted in the Bering Sea. All surveying was done within oparea one as detailed in CONOPS message DTG050541ZMAR12 and 'Technical Specifications, Bering Sea, 24 May 2012'. Archive No. 12B5R01. The primary survey systems used was the Kongsberg EM710. Digital Nautical Charts employed were GEN27B and COA27b.

1.2. TASKED DATA COLLECTION

The primary mission of 610712 was to collect high resolution multibeam bathymetry to IHO Order 1b in depths < 100m and Order 2 in depths > 100m. Additionally, all areas dangerous to both surface and subsurface navigation including doubtful soundings, shoals, wrecks and other hazards larger than 2 cubic meters ($2m^3$) were to be located and positioned. Additional data collected included Acoustic Doppler Current Profiler (ADCP), Biolite Underway Survey, Sea Surface Temperature (SST), Expendable Bathythermograph (XBT) and Conductivity Temperature and Depth (CTD).

1.3. SURVEY PLANNING

The ship departed Kodiak, Alaska on JD 223 and arrived in Area 8 to survey from JD 228 - 240. After three days of survey and 80% completed, on JD 230 we received new instruction from the office to extend the box from 3 x 3 to 7 x 7. A new survey plan was created around the 3 x 3 box. On JD 237 bad weather forced us to create a new survey plan with different line orientation. Depths in the area ranged from 31 to 58 meters. On completion of Area 8 the ship transited to Area 9 and surveyed from JD 240 - 247. Depths in the area ranges from 33 to 54 meters. After completion the ship transited to Area T3 and surveyed from JD 247 to 252. Area T3 was partially completed and had a depth range from 33 to 55 meters.

Survey Plan: 61072.pln	**Zone:** 02	**Datum:** WGS-84	**Projection:** UTM
OP Area: ONE_POINT 8	**Area:** 8_3nm.ARE 8.ARE 8_SWcorner.ARE	**Surveys:** 8_3nm_ALT.srv 8_ALT.srv 8_SW_corner.srv	**Coverage:** 8_3nm.cov COV_8-T3.cov COV_8-T3.cov
ONE_POINT 9	9.ARE	9_survey.srv	COV_9-T3.cov
ONE_POINT T3	T3.ARE T3_2NM.ARE	T3_SURVEY.srv T3_SUR_ALT.srv	COV_9-T3.cov COV_8_T3.cov

Table 1: Survey Files used.

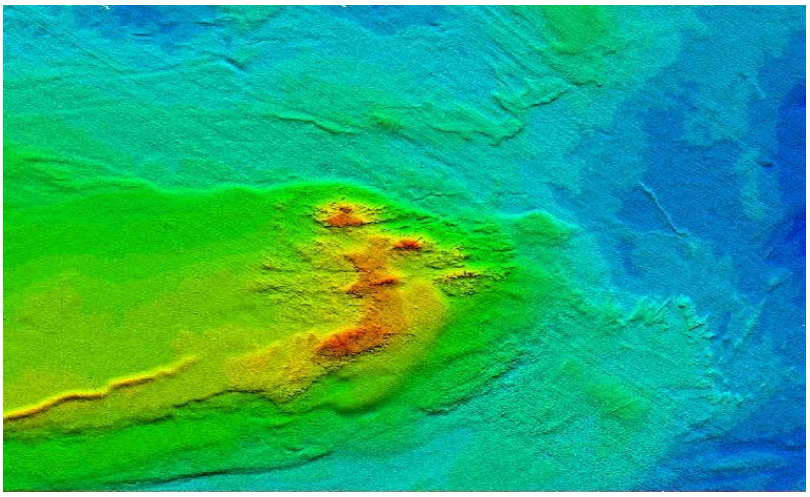

Figure 1: OPAREA ONE Point 8.

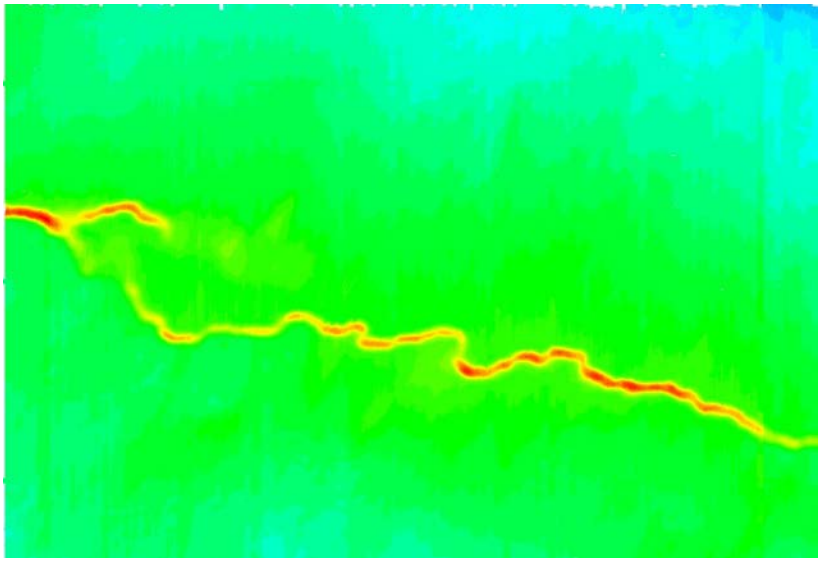

Figure 2: OPAREA ONE Point 9.

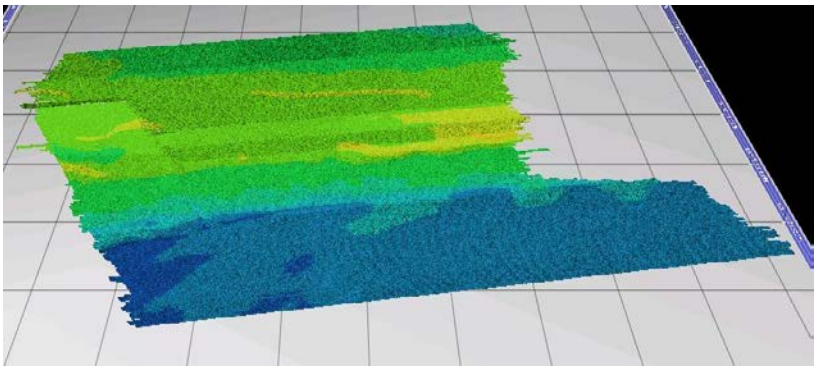

Figure 3: OPAREA ONE Point T3.

Enclosure 3

1.4. TIDE PLANNING:

The Earth Gravitational Model (EGM2008) was applied after data collection and ellipsoidal height merge. It is maintained by the National Geospatial-Intelligence Agency (NGA) and provides the WGS84 Ellipsoid to local Mean Sea Level Separation (SEP) value by interpolating from a 1 minute interval grid world model of SEP values. One GPS buoy was deployed and recovered.

Buoy	Latitude	Longitude	Deployed	Recovered
1	65° 19.80N	168° 56.00W	JD 228	JD 246

Table 2: Buoys Deployed.

2.0. GEODETIC CONTROL

2.1. DATASUMS

Horizontal Datum:	World Geodetic System of 1984
Projection:	UTM 02
Spheroid:	World Geodetic System of 1984
Grid:	Universal Transverse Mercator

2.2. SOUNDING DATUM

Predicted tide correctors were not utilized. Instead, SABER's *GPSZ* program was used to achieve geoid-referenced soundings utilizing the 1 minute EGM2008. EGM2008 is the vertical datum for all field-processed data.

Sounding Datum on BAGs submitted to PHB was MLLW.

3.0. (B/H) HYDROGRAPHY

3.1. (B/H) CALIBRATION REPORT

Waterline

The ship waterline value used during this survop was -2.65 m, and the draft value for EM710 sonar was 6.76. Waterline changes are also dynamic, changing slowly and linearly as fuel is consumed.

Weather

JD / TIME	SKY	VISIBILITY	WIND	SEA TEMPERATURE
228 / 1316	Cloudy	5 NM	22-27 KT	44° F
228 / 2330	Cloudy	2.5 NM	17-27 KT	38° F

Table 3: Weather Report for JD 228

CALIBRATION FOR MULTIBEAM SYSTEMS					
VESSEL:	USNS SUMNER TAGS-61				
SYSTEM:	EM710				
DATE / JD:	August 15, 2012 / JD 228				
LOCATION:	Bering Sea				
SSSV Range During Testing: 1473.4 m/s				**Depth Range:** 34 - 55 meters	
CURRENT SETTINGS (TRANSDUCER)				**ADJUSTMENTS**	**FINAL SETTINGS**
Sensor Location		**Installation Angles**			
		Beam Angle:	55/55		
Forward (X):	.00	**Timing:**	N/A	none	N/A
Starboard (Y):	.00	**Pitch:**	0.00	none	0.00
Downward (Z):	.00	**Roll:**	0.08	none	0.08
Waterline:	-2.65	**Heading:**	0.00	none	0.00

Line #	1 – timing/pitch/roll	**Line #**	2 – pitch/roll
ISS_60 File #:	61mbn12228_u_84.d20	**ISS_60 File #:**	61mbn12228_u_84.d22
Heading (deg):	229	**Heading (deg):**	49
Speed (knots):	7.5	**Speed (knots):**	7.5
Start Time (Z):	1939	**Start Time (Z):**	1955
End Time (Z):	1943	**End Time (Z):**	1959
Line #	3 – timing		
ISS_60 File #:	61mbn121228_u_84.d24		
Heading (deg):	229		
Speed (knots):	4.0		
Start Time (Z):	2035		
End Time (Z):	2043		

Table 4: Calibration Parameters

3.2. SOUNDING DEVELOPMENT (OVERALL PLAN)

The multibeam sounding collection methodology was constructed in the 610712 plan. Development lines were based on depth and were adjusted accordingly with regard to the dynamic nature of the sea floor. See table below.

Area	Survey	Azimuth	Spacing
8_3nm.ARE	8_3nm_ALT.srv	135° / 315°	100
8.ARE	8_ALT.srv	135° / 315°	75
8_SWcorner.ARE	8_SW_corner.srv	0° / 180°	75
9.ARE	9_survey.srv	0° / 180°	75
T3.ARE	T3_SURVEY.srv	73° / 273°	70
T3_2NM.ARE	T3_SUR_ALT.srv	162° / 342°	70

Table 5: Survey Plan

3.3. (B/H) JUNCTION ANALYSIS

Junction Analysis:
OPAREA ONE: POINT 8

The depths range from approximately 31 to 58 meters. The calculated error for 31 meters is ± .64 and for 58 meters is ± .90. The junction analysis includes 4 crosscheck lines and 168 development lines.

File=/data1/datasets/610712/layers/1_8_XLines_min_0712_Dev_min.dif

Category	Percent
0-> 5cm	35.05
5-> 10cm	61.70
10-> 15cm	81.11
15-> 20cm	92.39
20-> 25cm	97.46
25-> 30cm	99.28
30-> 35cm	99.80
35-> 40cm	99.93
40-> 45cm	99.97
45-> 50cm	99.99
50-> 60cm	100.00
60-> 70cm	100.00
70-> 80cm	100.00
80-> 90cm	100.00
90-> 100cm	100.00
100-> 110cm	100.00
110-> 120cm	100.00
120-> 130cm	100.00
130-> 140cm	100.00
> 140cm	100.00

Table 6: Junction Analysis Table, 95% of data residuals fall between 15 and 25 cm

OPAREA ONE: POINT 9

The depths range from approximately 33 to 54 meters. The calculated error for 33 meters is ± .66 and for 54 meters is ± .86. The junction analysis includes 3 crosscheck lines and 170 development lines.

File=/data1/datasets/610712/layers/XLines_PT9_min_DEV_PT9_min.dif

Category	Percent
0-> 5cm	48.19
5-> 10cm	65.18
10-> 15cm	78.02
15-> 20cm	87.13
20-> 25cm	93.14
25-> 30cm	96.37
30-> 35cm	97.94
35-> 40cm	98.82
40-> 45cm	99.35
45-> 50cm	99.65
50-> 60cm	99.87
60-> 70cm	99.99
70-> 80cm	100.00
> 80cm	100.00

Table 7: Junction Analysis Table, 95% of data residuals fall between 20 and 30 cm

OPAREA ONE: POINT T3

The depths range from approximately 33 to 55 meters. The calculated error for 33 meters is ± .66 and for 55 meters is ± .87. The junction analysis includes 3 crosscheck lines and 69 development lines.

File=/data1/datasets/610712/layers/XLines_T3_min_DEV_PT_T3_min.dif

Category	Percent
0-> 5cm	86.75
5-> 10cm	90.58
10-> 15cm	94.14
15-> 20cm	96.24
20-> 25cm	97.10
25-> 30cm	97.51
30-> 35cm	97.86
35-> 40cm	98.19
40-> 45cm	98.48
45-> 50cm	98.76
50-> 60cm	99.36
60-> 70cm	99.88
70-> 80cm	100.00
80-> 90cm	100.00
> 90cm	100.00

Table 8: Junction Analysis Table, 95% of data residuals fall between 10 and 20 cm

3.4. (B/H) AGREEMENT WITH EXISTING CHARTS

NGA nautical charts 16005, 16200, and 16220 are the primary charts available for this area. Some comparisons between our survey and this coastal chart were made and the contour tendencies determined during 610712 largely agreed with it.

3.5. (B/H) AGREEMENT WITH PRIOR SURVEYS

There are no prior surveys.

3.6. (B/H) OVERALL ACCURACY OF SOUNDINGS; EQUIPMENT AND PLATFORM LIMITATIONS; TIDAL MODEL EFFECTIVENESS

Survop 610712 (PT8, PT9, and PT T3) was conducted using the IHO accuracy parameters for an Order 1b survey. Horizontal Accuracy at 95% Confidence Level for depths shallower than 100 meters is 5m + 5% of depth with a Reduced Depth Accuracy as: a= .5m, b=.013m and d=depth: = $\sqrt{[a^2 + (b*d)^2]}$

The survey was conducted to meet IHO order 1b standards which do not require full seafloor coverage. Multiple coverage gaps exist throughout the survey.

3.7. (B/H) BATHY PROCESSING REPORT

PFM / GSF File Processing Log Sheets are located in the Documentation folder Under (Nas1) /home/common/datasets/610712_u_84/report_logs.

Processing programs used and version:

gsf_geoswath:	Version 2.3
SABER:	Version 4.4.0 Build13
Fledermaus:	Version 7.3.0
datasumm:	*September 30,2010*
exammb:	*Version 3.14 (SABER ver.)*
fmcommand:	Version 7.3.0
dmagic:	Version 7.3.0
mve:	-vMVE_5.15 (*SABER ver.)*
abe:	Version 1.10 September 20, 2011

Processing Standard:

TRANSIT DATA (JD 224 – 228):

EM710 (Transit Data)
All GSF files were transferred individually from NAS1 to the post processing workstation (WS12) and loaded into SABER where Datasumm, Delayed Heave, GPSZ, and Exammb were performed. GSF files were processed with MVE / gsf_geoswath to remove bad pings. Multiple PFMs were built each day using Dmagic. The PFM edits were unloaded to the GSF files and transferred to NAS1.

Transit Data have strong sound velocity error. We dropped numerous XBTs to keep the delta value down; however, this measure did not greatly reduce our sound velocity error.

The only way to reduce the sound velocity error was by performing CTD casts, but since we were in transit to our survey area, we were unable to do them.

We also had heavy penetration in some areas during the transit. We tried to fix this problem by using strong penetration filter and changing the along track tilt to 4 degrees on SIS. These measures significantly reduced the penetration.

NASCOM and POSMV were up and down during transit. See Data Manager for more information.

SURVEY DATA (JD 229 - 252)

All GSF files were transferred individually from NAS1 to the post processing workstation (WS12) and loaded into SABER where Datasumm, Delayed Heave, MergeNav, and GPSZ were performed. GSF files were pre-processed with MVE / gsf_geoswath to remove bad pings. Multiple PFMs were built each day using Dmagic and processed with Fledermaus. The PFM edits were unloaded to the GSF files and transferred to NAS1.

In order to keep up with the day to day processing, I was running the programs in the following order; Datasumm, Check Trackline, Delayed Heave, Set Beam Flags (Cut-Off Angles and Footprint, Dmagic / Fledermaus (Build, Edit and Unload PFM), Merge Nav., GPSZ, and Append to the Final PFM for QC.

The above order was used to keep up with the processing for each day. When the PPP was ready, the data was edited and ready to append to the final pfm. Due to a delay of approximately 48 hours, the data of the last three days (JD 250 - 252) of survey was not included in the final pfm (T3_CENTER.pfm). The data of the last two days (JD 251 - 252) was edited but don't have PPP and tide corrector. Data is located under em710_proc/ OPAREA_T3/NOT_PPP.

Weather was a factor, with large swells resulting in lost pings and some bad data. Some holidays were considered insignificant by the SNR and were not covered.

In all areas, the largest problem was the sound velocity error. To mitigate much of the sound velocity error on the outer beams, the swath was pulled in to +/- 55 degrees and beams between 50-55 degrees were removed with the set beam flags program during post processing. See table below.

JULIAN DAY	FILES	CUT OFF
229 - 230	ALL	52%
231	d01 - d35	52%
231	d37-d77	50%
231 - 252	ALL	53%

Table 7: Beam Flags Program Set Up.

4.0. ASSESSMENT AND EVALUATION

Swath Coverage:

The majority of the EM710 data collected during this survop was done with a swath setting of +/- 55 degrees with approximately 100% overlap with adjacent lines. During normal data collection the High Density Equidistant mode setting was used.

4.1. DRAFT CORRECTION

A waterline value of -2.65 was computed on 10 August (JD 223) immediately before departure from Kodiak, AK. Draft values were not changed throughout the survey and will be read again in port.

4.2. SOUND VELOCITY CORRECTION

Sound speed observations were collected using a Seabird Electronics Model SBE-911 plus CTD (Conductivity, Temperature, and Depth) Instrument. In addition, synoptic XBT drops were collected every six hours to provide intermediate corrections to the SVP. Additional XBT/CTD casts were made in an attempt to lower the SSSV/SVPSSV delta when it and the EM122 / EM710 data quality profile indicated that the MB data quality was deteriorating.

See the NP3 Lead report for more information.

4.3. HEAVE CORRECTION

Heave corrections were applied real time during data collection utilizing FORCE5_1, which feeds the POSM/V and Delay Heave were applied during post-processing.

4.4. TIDE CORRECTION

GPS tidal corrections using the EGM2008 model were applied during post-processing to all GSF files. One GPS tidal buoys was deployed. The buoy was deployed at 63° 19.80N, 168° 56.00W from JD228 to JD 246. Data from this buoy will be use to produce a calibrated SEP model for the entire survey area. Precise Point Positioning (PPP) solutions were generated in the field from raw NAVCOM files (*.v??) and 30-second clocks/ephemerides as soon as available from (ftp://ftp.unibe.ch/aiub/CODE/COD<week><d>.CLK_R. PPP solutions (30s-type) were applied to all data before any further post-processing.

4.5. ROLL AND PITCH

Roll and Pitch corrections were applied real time during data collection.

5.0. OTHER:

I would like to thank the entire survey crew for their dedicated effort in editing the shallow bathy data.

6.0. PROBLEMS AND RECOMENDATIONS

On future SURVOPS, it is highly recommended that a survey vessel be equipped with a Moving Vessel Profiler.

I had the following problem with the fledermaus program: while trying to create a surface object the following message popped up “The application has encountered an error and must close. This is likely due to exceeding available or usable memory” and then the program exited. My final pfm file was created with a 1m bin size, since the survey was conducted in shallow water, I used it to QR the data.

As the survey did not meet NOAA specifications in several areas, a lowered category of coverage (CATZOC B) was assigned.

APPROVAL PAGE

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Data partially meet current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in specific areas as delineated during office processing.

The following products will be sent to NGDC for archive:

- W00261_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- W00261_GeoImage.pdf

The survey evaluation and verification has been conducted according current OCS Specifications.

Approved: Digitally signed by BARRY.CATHLEEN.JEANNETTE.1365891407 Date: 2015.10.22 08:13:50 -07'00'

Cathleen Barry
Cartographer, Pacific Hydrographic Branch

The survey has been approved for dissemination and limited usage of updating NOAA's suite of nautical charts.

Approved: Digitally signed by HOLMBERG.PETER.SCOTT.1365886101 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101 Date: 2015.10.22 08:17:07 -07'00'

Peter Holmberg, Cartographic Team Lead
Pacific Hydrographic Branch