H12351

NOAA Form 76-35A

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

DESCRIPTIVE REPORT

Type of Survey:	Basic Hydrographic Survey
Registry Number:	H12351

LOCALITY

State:	Alaska
General Locality:	Kotzebue Sound, AK
Sub-locality:	15 NM West of Kotzebue Harbor

2011

CHIEF OF PARTY
CAPT David O. Neander, NOAA

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET		**H12351**

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:	**Kotzebue Sound, AK**
Sub-Locality:	**15 NM West of Kotzebue Harbor**
Scale:	**40000**
Dates of Survey:	**07/13/2011 to 08/27/2011**
Instructions Dated:	**06/07/2011**
Project Number:	**OPR-S327-FA-11**
Field Unit:	**NOAA Ship *Fairweather***
Chief of Party:	**CAPT David O. Neander, NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Side Scan Sonar**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean lower low water**
H-Cell Compilation Units:	***feet 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. Revisions and end notes (in red) were generated during office processing. The processing branch concurs with all information and recommendations in the DR unless otherwise noted. Page numbering may be interrupted or non-sequential. All pertinent records for this survey, including the Descriptive Report, are archived at the National Geophysical Data Center (NGDC) and can be retrieved via http://www.ngdc.noaa.gov/.

Descriptive Report to Accompany Survey H12351

Project: OPR-S327-FA-11

Locality: Kotzebue Sound, AK

Sublocality: 15 NM West of Kotzebue Harbor

Scale: 1:40000

July 2011 - August 2011

NOAA Ship *Fairweather*

Chief of Party: CAPT David O. Neander, NOAA

A. Area Surveyed

The survey area includes the anchorage areas and approaches to the channel for deep draft vessels approximately 15 nautical miles west and to the south of Kotzebue Harbor

A.1 Survey Limits

Data was acquired within the following survey limits:

Northeast Limit	Southwest Limit
66.9092083333 N 163.038675 W	66.7912944444 N 163.472719444 W

Table 1: Survey Limits

Survey Limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The primary purpose of this survey is to address a request for bathymetry to support navigation and installation for an offshore lightering facility utilized for fuel oil. The approaches to Kotzebue Sound cannot currently accommodate deep draft vessels, which therefore anchor fifteen miles out, and cargo is lightered to shore by shallow draft barges. This survey is also part of the Combined Arctic Request (#090007) addressing the prioritization of Northwest Alaska for hydrographic survey. This survey also supports MCD efforts in producing a new large scale Arctic Chart of this area.

A.3 Survey Quality

The survey is partially adequate to supersede previous data.

While all soundings within H12351 are adequate to supersede previous data, reference B.2.10 (Coverage Assessment) of this document for more information regarding quality.

The data is adequate for charting despite the refraction issues caused by the pycnocline.

A.4 Survey Coverage

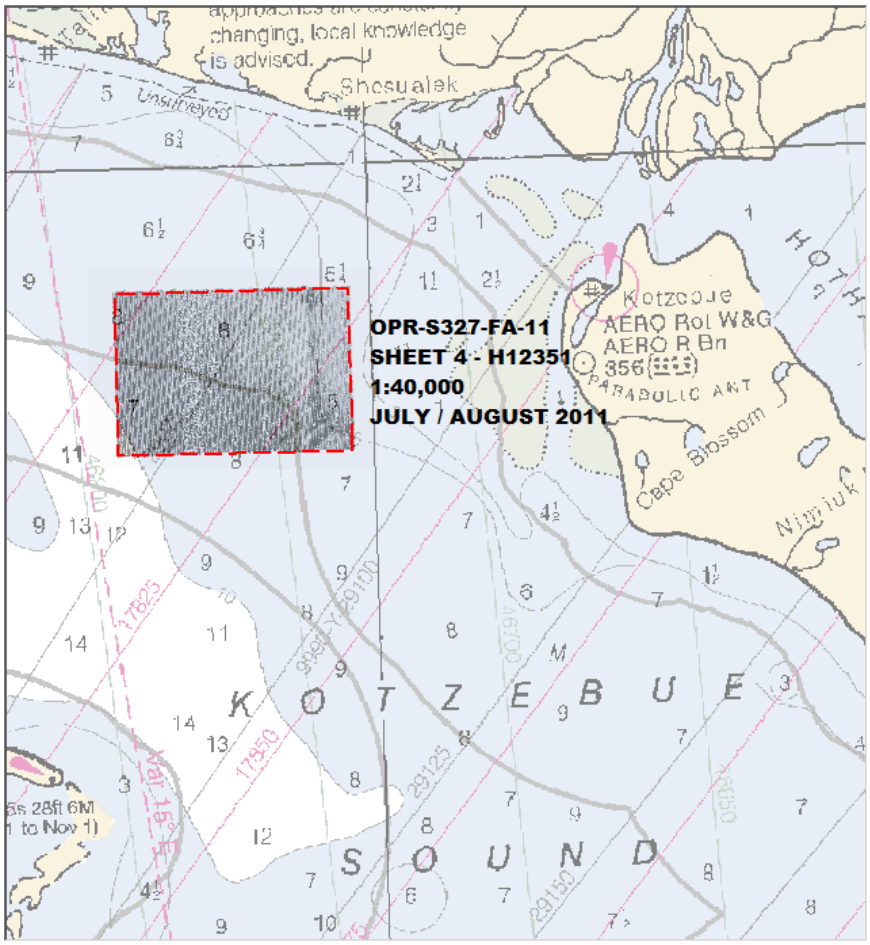


Figure 1: H12351 Survey Coverage

100% sidescan was not achieved as specified in OPR-S327-FA-11 Project Instructions. Refer to section B.2.10 (Coverage Assessment) of this document for more information.

A.5 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	*2805*	*2806*	*2808*	*S220*	*Total*
LNM	**SBES Mainscheme**	0	1.18	0	4.15	5.33
	MBES Mainscheme	0	0.11	0	0	0.11
	Lidar Mainscheme	0	0	0	0	0
	SSS Mainscheme	0	0	0	0	0
	SBES/MBES Combo Mainscheme	0	0	0	0	0
	SBES/SSS Combo Mainscheme	0	0	0	0	0
	MBES/SSS Combo Mainscheme	85.86	0	79.37	760.09	925.32
	SBES/MBES Combo Crosslines	6.87	1.33	0	72.46	80.66
	Lidar Crosslines	0	0	0	0	0
Number of Bottom Samples						10
Number of DPs						0
Number of Items Items Investigated by Dive Ops						0
Total Number of SNM						170

Table 2: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates
07/13/2011
07/18/2011
07/19/2011
07/20/2011
07/21/2011
07/22/2011
07/23/2011
07/24/2011
08/14/2011
08/15/2011
08/27/2011

Table 3: Dates of Hydrography

Multibeam and Sidescan data were acquired concurrently, due to manual logging techniques the mileage between the two systems were close but not exactly the same and therefore, only the multibeam mileage was used for the Mainscheme MBES/SSS Combo entry. The Mainscheme SBES row was used to record mileage of acquired data for developments.

Mileages between CARIS HIPS and Pydro disagree due to calculation and rounding methods, Pydro was used for all the above mileages.

A.6 Shoreline

No shoreline existed within the limits of H12351.

A.7 Bottom Samples

Ten bottom samples were collected during acquisition on sheet H12351. Due to time constraints while at the project area the SSS Mosaic was analyzed and bottom samples were reduced to reflect changes, or lack thereof, seen on the sea floor. Figure 2 shows the mosaic image of a location where an additional bottom sample was warranted.

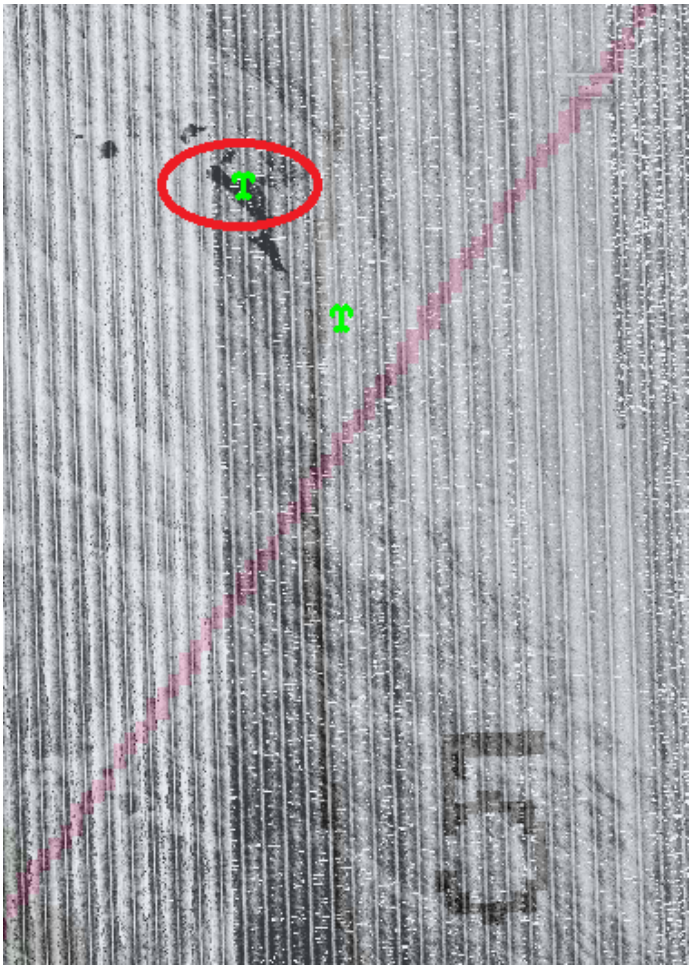


Figure 2: Additional bottom sample (66-52.05N, 163-06.81W)

All 10 bottom samples collected during H12351 are included in the HCell.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	*2805*	*2806*	*2808*	*S220*
LOA	28.83 feet	28.83 meters	28.83 feet	231 feet
Draft	4.0 feet	4.0 feet	4.0 feet	15.5 feet

Table 4: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Reson	7125	MBES
Reson	7111	MBES
Klein	5K	SSS
Applanix	POS/MV V4	Vessel Attitude System
Applanix	POS/MV V4	Positioning System
Reson	SVP70	Sound Speed System
Brooke Ocean	MVP 200	Sound Speed System
SeaBird	SBE 19plus	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines were collected, processed and compared in accordance with section 5.2.4.3 of the HSSD. Crossline mileage obtained equaled 8.72% of mainscheme mileage.

Surface differencing in CARIS Bathy DataBASE was used to assess crossline agreement with main scheme lines. A 1-meter resolution surface was created of these differenced surfaces and is submitted digitally in the Separates II folder. Running some simple statistics on the surface it was found that the two surfaces agree

with 99.99% of nodes within 0.5 meters, therefore crosslines agree with main scheme lines within the total allowable vertical uncertainty in their common areas.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0.01	0.1

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
2805	2.0		0.5
2806	2.0		0.5
2808	2.0		0.5
S220	0.5	0.5	0.5

Table 7: Survey Specific Sound Speed TPU Values

The Tide TPU values are in meters and the Sound Speed TPU values are in meters per second.

B.2.3 Junctions

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12349	1:15000	2011	NOAA Ship FAIRWEATHER	E
H12350	1:40000	2011	NOAA Ship FAIRWEATHER	SE
H12352	1:40000	2011	NOAA Ship FAIRWEATHER	S

Table 8: Junctioning Surveys

H12349

The areas of overlap for all sheets, shown in figure 5, are reviewed in CARIS Subset Editor for sounding consistency as well as by surface differencing in CARIS HIPS and SIPS and CARIS Bathy DataBase, the one-meter surfaces to assess surface agreement. The soundings and surfaces are in general agreement within half a meter, this being within the total allowable vertical uncertainty in the common areas. More details for each junction analysis are provided in the following paragraphs.

Figure 3 depicts a difference surface between a one-meter surface for the area of overlap between H12351 and H12349, highlighting the areas that fall outside of IHO vertical uncertainty. On average the difference is 0.03 where 99.93% of nodes fall with IHO vertical uncertainty of 0.5 meters.

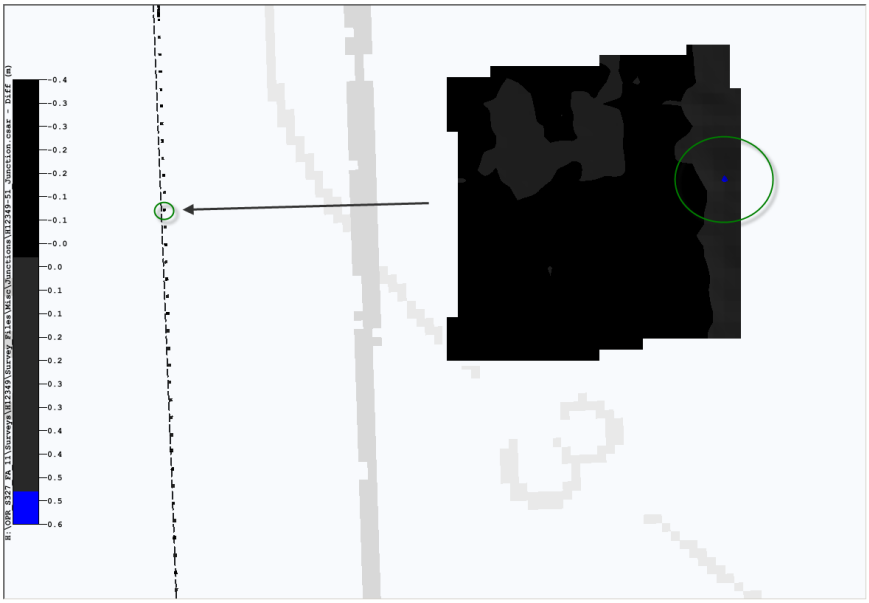


Figure 3: Difference surface between H12351 and H12349 highlighting node outside of IHO tolerance

Upon application of final tides and re-creating surfaces during office review, the SAR reviewer has found that on average the difference is -0.032 where 100% of nodes fall within IHO vertical uncertainty of 0.5 meters.

H12350

Surface differencing was used to assess junction agreement between one-meter surfaces on sheets H12350 and H12351, on average the difference is -0.004 where 100% of nodes fall with IHO vertical uncertainty of 0.5 meters.

Surface differencing was used to assess junction agreement between the one meter surfaces of H12351 and H12350. On average the difference is .25 meters where 100% of nodes fall with IHO vertical uncertainty of 0.5 meters.

H12352

Surface differencing was used to assess junction agreement between a one-meter surface on sheet H12351 and a one-meter surface on sheet H12352. The average difference is -0.03 meters with 100% of nodes having IHO vertical uncertainty within 0.5 meters. See Figure 4 for more statistical information.

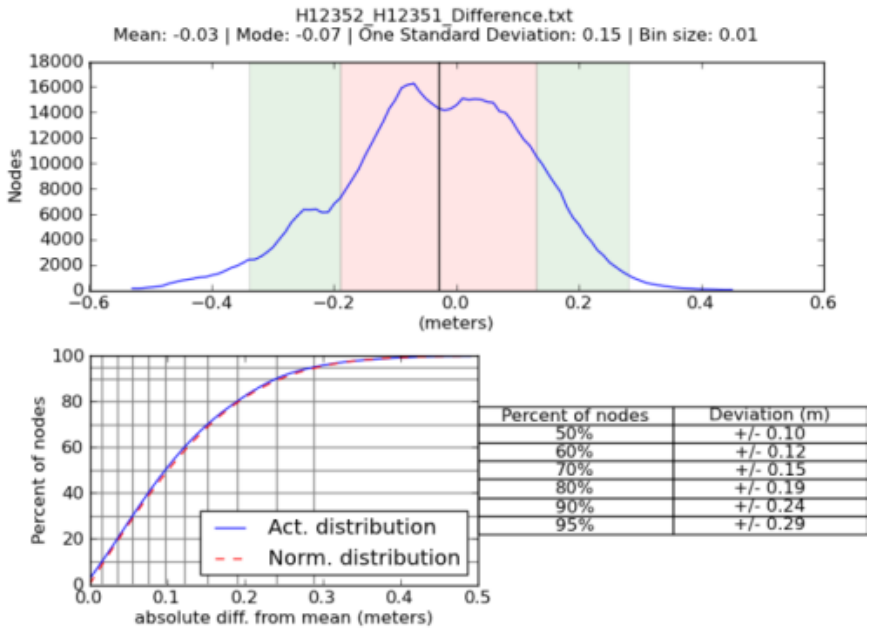


Figure 4: Statistical information for junction differencing between H12351 and H12352

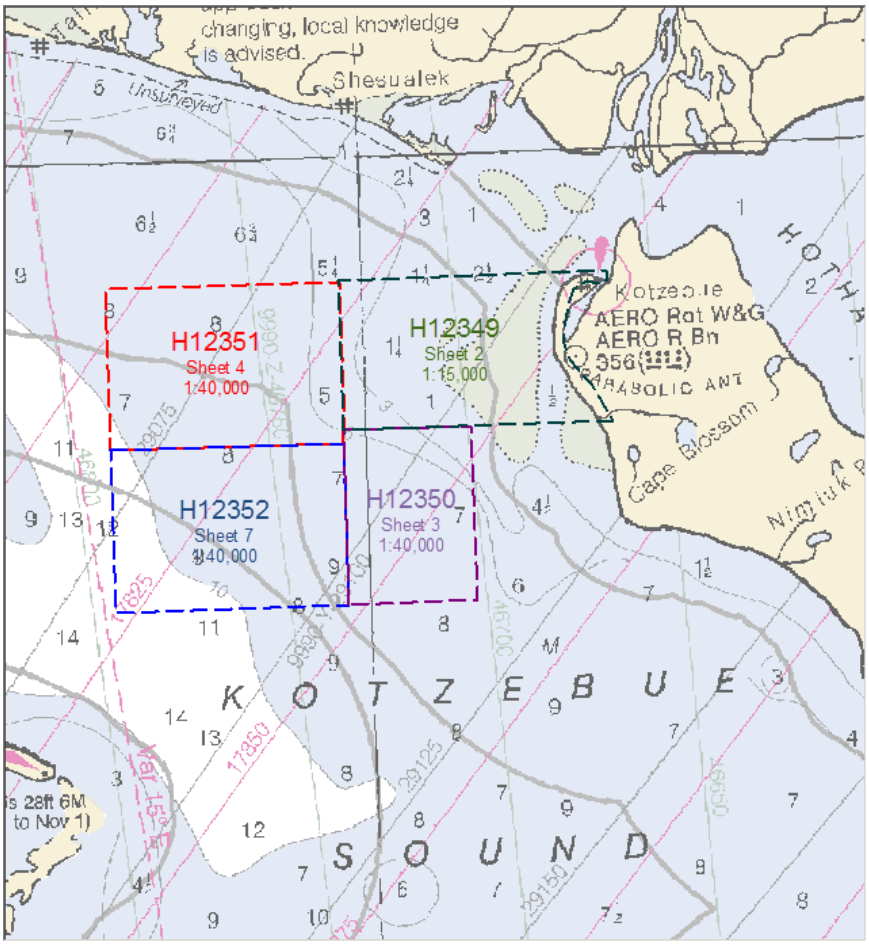


Figure 5: OPR-S327-FA-11 H12351 Junction Surveys

Surface differencing was used to assess junction agreement between the one meter surface of H12351 and the two meter combined surface H12352. On average the difference is .198 meters where 99.9% of nodes fall with IHO vertical uncertainty of 0.5 meters.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

B.2.6 Factors Affecting Soundings

B.2.6.1 Kotzebue Sound Arctic Pycnocline

It was noticed early during acquisition that Kotzebue Sound contains an extremely cold and salty layer of water ranging from a depth of 6 to 10 meters which in turn greatly affects the density. Figures 6 and 7 show two CTD casts which were taken within the limits of H12351. This layer contributed to numerous data quality issues during the acquisition of H12351, most notably sound velocity and sidescan refraction. These issues are discussed in further detail in the following sections.

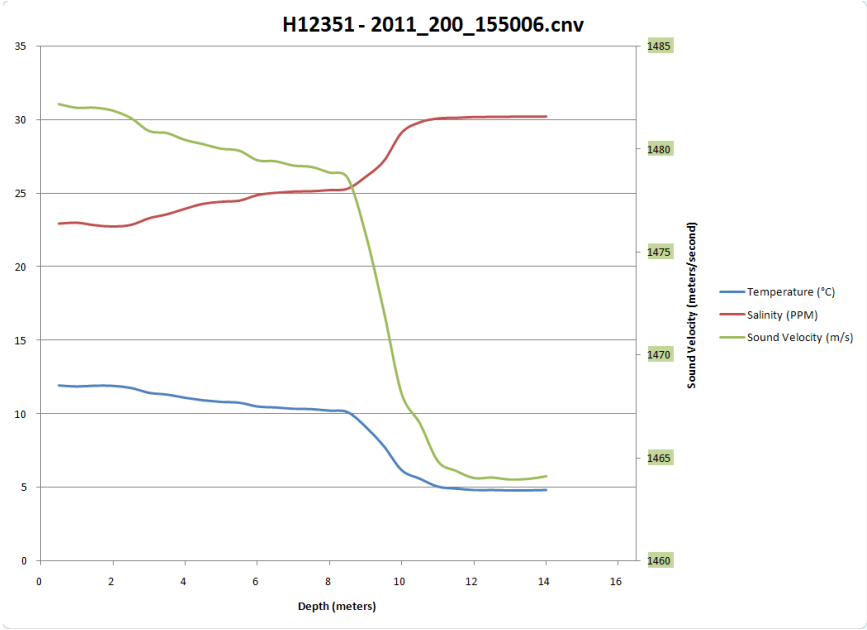


Figure 6: Multiaxis plot showing SV and Temp/Salinity vs Depth

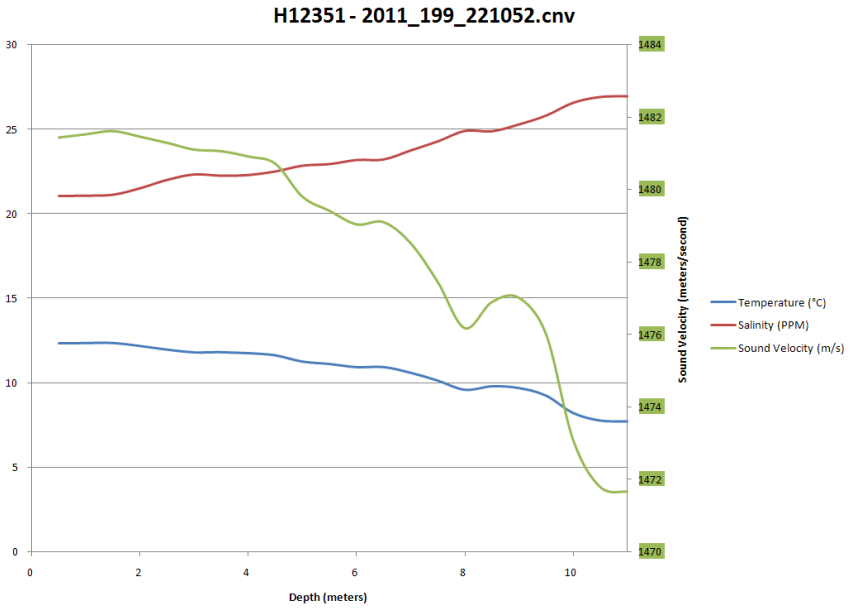


Figure 7: Multiaxis plot showing SV and Temp/Salinity vs Depth

The data is adequate for charting despite the refraction issues caused by the pycnocline.

B.2.6.2 Sound Velocity

Sound velocity was constantly changing during the acquisition of H12351, most noticeable in S220's 7111 data. To help account for this all ship MBES data was filtered 50 degrees from nadir. In addition to this, MVP casts which were not made to an appropriate depth to accurately model the water column were deleted from the master concatenated list. This included casts 2011-199 at 1707, 2011-201 at 1302 and 2011-202 at 0113. Figure 8 shows a typical 7111 swath with poor sound velocity, notice rejected gray soundings 50 degrees from nadir.

Another contributing factor to SV issues with the 7111 can be profile method. For most of the entirety of the project Nearest in Distance within Time of 2 hours was chosen. Figure 9 shows an example of when the nearest in distance changed from an accurate cast to an inaccurate one. The majority of data affected by SV is early in the project before it was determined that manual MVP operations could be completed without interfering with towed side scan equipment.

In addition, cast 2011_203_175638 taken by launch 2805 on Dn203 was deleted from the master concatenated file because of geographic location on an adjacent sheet, reference relevant acquisition and processing logs submitted in Separates folder for additional information.

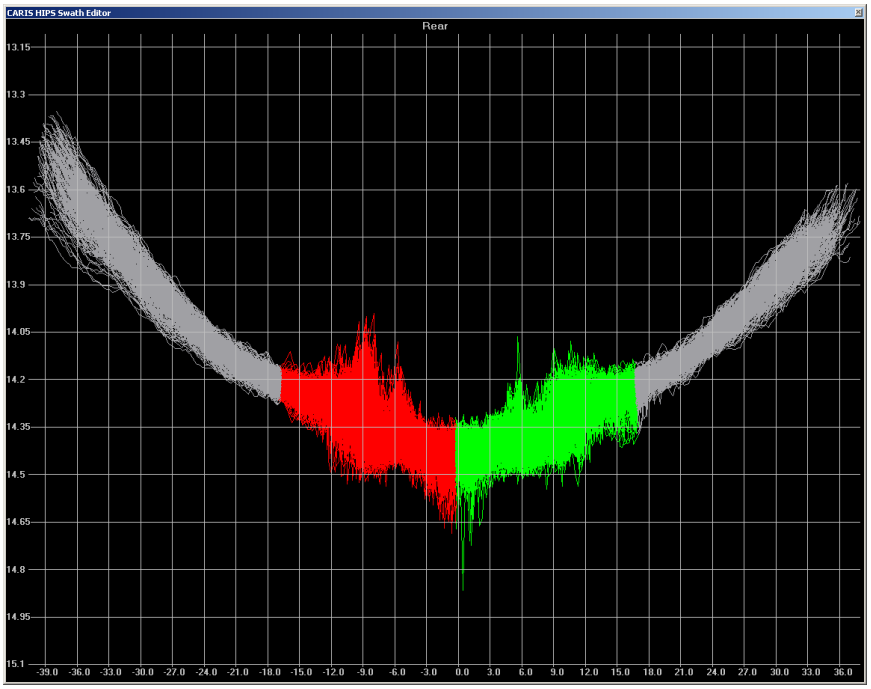


Figure 8: Sound velocity issues "smile" in 7111 data. Note that grayed soundings have been rejected.

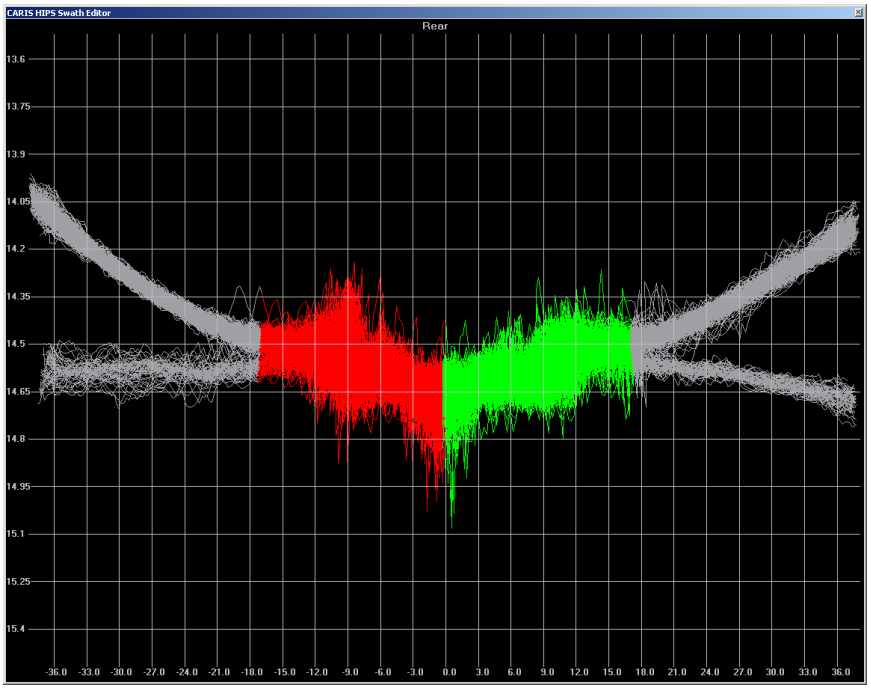


Figure 9: Sound velocity issues showing that an improper SVP correction method may have been chosen. ***The data is adequate for charting after the data with SV errors were filtered and improper SV casts were removed from the concatenated list and, therefore, not applied to the data.***

B.2.6.3 Sidescan Sonar refraction

Per the project instructions the SSS was run with a 100-meter range scale at a field decided, conservative, 150-meter set line spacing to complete the 100% SSS coverage required. This was not changed for the duration of the survey. Due to the presence of the arctic pycnocline the effective range of the side scan was greatly diminished. Refraction would appear anywhere along the image, at times limiting the effective range for object detection to forty meters. Figure 10 below shows the refraction during acquisition while figure 11 shows the processed image. This refraction makes it impossible for complete and accurate 100% SSS coverage per the project instructions. The changing of towfish altitude was performed to mitigate this issue and when possible, flying under the pycnocline was found to return the cleanest data. However, due to altitude of the density layer being variable and not always being able to safely fly beneath the pycnocline, the towfish was usually flown at a high altitude by which increasing the angle that sound was penetrating the dense layer returned best results.

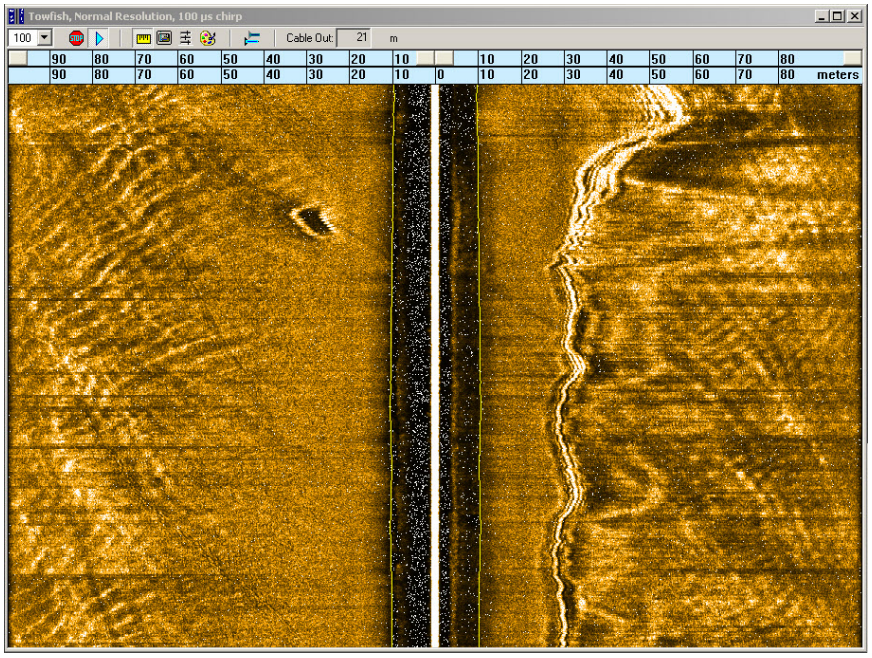


Figure 10: SSS Refraction Real-Time

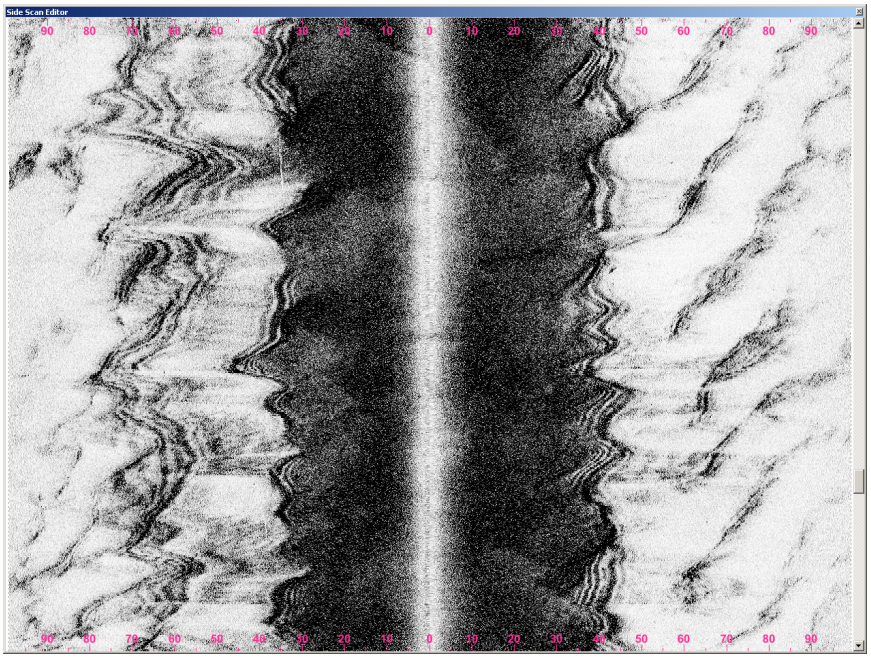


Figure 11: SSS Refraction Processed

Due to the pycnocline limiting the effective range of the side scan, 100% coverage was not obtained over the survey area. The data is adequate for charting, even in the areas where 100% coverage was not obtained.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound speed measurements were conducted and applied as discussed in the Corrections to Echo Soundings section of the DAPR.

More precisely, during acquisition of sheet H12351 launches would manually deploy a CTD approximately every 2-3 hours. When working in close proximity with other launches casts would be shared between launches as was the case on day number 204. The ship began the project by manually deploying the MVP once or twice per hour with an additional static CTD cast during the daily deployment and recovery of launches. Once it was determined that automatic MVP operation would not interfere with sidescan operations the rate of deployment was increased to one cast every 15 minutes. This latter technique includes days 203, 204, 205, 226 and 227.

B.2.8 Coverage Equipment and Methods

All Equipment and survey methods were used as detailed in the DAPR.

B.2.9 Coverage Assessment

Various factors contributed to making this survey challenging for 100% SSS coverage requirements. All data should be used to supplement existing data but in no way can the hydrographer confidently ensure that least depths of all objects are represented in survey H12351. A .hob file was created using CARIS Notebook for the area where the hydrographer is confident that 100% sidescan coverage is accurately represented and is included in the Separates digital data folder. Please reference Appendix V for correspondence regarding this issue.

Due to the pycnocline limiting the effective range of the side scan, 100% coverage was not obtained over the survey area. The areas are depicted in the HCell with the use of separate M_QUALs with different CATZOCs to indicate the relative coverage quality. The data is adequate for charting, even in the areas where 100% coverage was not obtained. See the attached waiver for the coverage requirement.

B.2.10 IHO Uncertainty

All data meet the data accuracy specifications as stated in the NOS Hydrographic Surveys Specifications and Deliverables (HSSD) dated April 2011, see Standards Compliance Review in Appendix V.

B.2.11 Density

Density requirements for H12351 were achieved with at least 97.84% of the 1-meter surface nodes containing five or more soundings, see Standards Compliance Review in Appendix V.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All Data reductions procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

A sidescan certification was conducted on both day numbers 213 in Dutch Harbor, AK. From the results of this certification a final HVF was computed to account for all factors affecting S220's towed sidescan offsets. The final HVF was created on 7/21/11 at which point all S220 side scan lines recomputed towfish navigation and contact positions. The certification is submitted in Vessel Offsets, Appendix II, of OPR-S327 DAPR.

B.4 Backscatter

Backscatter was logged as a 7k file and submitted directly to NGDC to be archived and to PHB where the data will be processed, for all lines except S220 on Julian date 199. Due to improper settings no 7k files were logged for said day.

B.5 Data Processing

B.5.1 Software Updates

The following software updates occurred after the submission of the DAPR:

Manufacturer	Name	Version	Service Pack	Hotfix	Installation Date	Use
Caris	HIPS/SIPS	7.1	0	1	05/09/2011	Processing
Caris	HIPS/SIPS	7.1	0	2	08/08/2011	Processing
Caris	Notebook	3.1	0	3	02/25/2011	Processing
Caris	Notebook	3.1	1	0	09/02/2011	Processing
Caris	Bathy DataBASE	3.2	0	1	07/15/2011	Processing
NOAA	Pydro	11.7-8	0	r3548 - r3585	07/15/2011	Processing
Applanix	PosPAC	5.4	1	0	07/15/2011	Processing

Table 9: Software Updates

The following Feature Object Catalog was used: Object catalog version #5

B.5.2 Surfaces

The following CARIS surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12351_1m_Final_0to20	CUBE	1.0 meters	0 meters - 20 meters	NOAA_1m	SBES Set Line Spacing
H12351_1m	CUBE	1.0 meters	0 meters - 20 meters	NOAA_1m	SBES Set Line Spacing
H12351_1m_Mosaic	SSS Mosaic	1.0 meters	-	N/A	100% SSS

Table 10: CARIS Surfaces

All field sheet extents were adjusted using the Base 16 Calculator tool to ensure coincident nodes among all bathymetric surfaces regardless of the field sheet in which they are contained given the standard surface

resolution of one meter. The NOAA CUBE parameters mandated in HSSD were used for the creation of all CUBE BASE surfaces in Survey H12351.

The surfaces have been reviewed where noisy data, or 'fliers' are incorporated into the gridded solution causing the surface to be shoaler than the true seafloor. Where these spurious soundings cause the gridded surface to be shoaler than the reliably measured seabed by greater than the maximum allowable TVU at that depth, the noisy data have been rejected and the surface recomputed.

A 1-meter finalized surface created during the SAR, H12351_Office_1m_Final.csar, was used as the basis for compilation.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs, and additional processing such as tide and sound velocity application is noted in the H12351 Data Log spreadsheet. All data logs are submitted digitally in the Separates I folder.

B.5.4 Critical Soundings

Designation of soundings followed procedures as outlined in section 5.1.1.3 of the HSSD.

Due to the smooth nature of the survey area no designated soundings were required. Three soundings are flagged outstanding which are the soundings Pydro submitted as significant bathymetry contacts. H12351 Side Scan Contact Listing is submitted digitally in the Separates folder.

B.5.5 TrueHeave

To enable the application of TrueHeave some POS/MV files were "fixed" using the fixTrueHeave.exe utility from CARIS. Fixed files were assigned an additional *.fixed suffix. This was performed for the following vessels and days:
Launch 2805 days 203, 204 and 205;
Launch 2808 days 199 and 204.

B.5.6 Data Processing Deviations

All Reson 7111 data was filtered 50 degrees off nadir on both port and starboard to remove poor quality data.

All development lines were filtered 50 degrees off nadir on both port and starboard to ensure only good soundings. Data were reaccepted in several locations on contacts if data was judged to be reliable.

After filtering, all remaining data is adequate for charting.

B.5.7 Recompute Cable Out

After the commencement of survey acquisition, issues with side scan positioning on S220 were identified. A subsequent calibration of the DWS winch cable out reading showed it to be the primary source of the issue. The calibration found that for each unit of cable out reported, a total of 1.26 meters (±0.05 m @ 95%) of cable was actually payed out. The report is included in the Separates.

To correct the scaling error the cable out readings were extracted from the SDF and recomputed using the calibrated conversion factor of 1.26 meters per unit. The original and recomputed readings were saved to comma separated ASCII files, which can be found in Separates, II Digital Data, S220 Cable Out Correctors. The corrected readings were then applied in CARIS HIPS/SIPS using the Generic Data Parser. After application, towfish navigation and contact positions were recomputed in CARIS HIPS/SIPS and the lines were (re)inserted into the Pydro PSS.

After the towfish position was recomputed, the data is adequate for charting.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

The vertical datum for this project is Mean lower low water.

Standard Vertical Control Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Red Dog Dock, AK	949-1094

Table 11: NWLON Tide Stations

The following subordinate water level stations were established for this survey:

Station Name	Station ID
Kotzebue, AK	949-0424
Deering, AK	946-9751
Cape Krusenstern, AK	949-0571

Table 12: Subordinate Tide Stations

File Name	Status
9491094.tid	Verified Observed

Table 13: Water Level Files (.tid)

File Name	Status
S327FA2011.tc	Preliminary

Table 14: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 09/03/2011. The final tide note was received on 12/06/2011.

Final tides were not received or applied to survey H12351 prior to submission. It will be necessary for the processing branch to apply Final tides upon receipt.

Verified Tides were received from CO-OPS on Friday, December 16, 2011 and applied at the Pacific Hydrographic Branch. HDCS data was re-merged, TPU values re-calculated, surfaces re-generated and all features were verified with new depth information. Tide Note can be found in Appendix IV and is appended to this report.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

Vessel kinematic data were post-processed using Applanix POSPac processing software, POSGNSS processing software and Precise Point Positioning (PPP) methods described in the DAPR. Smoothed Best Estimate of Trajectory (SBET) and associated error (RMS) data were applied to all data with the exception of the following lines.

2805
Dn204 2011M_2042133

S220
Dn201 2011X_2011242, 2011X_2011356, 2011X_2011527 and 2011M_2011703
Dn202 2011M_2022055

For further details regarding the processing and quality control checks performed see the H12351 POSPAC Processing Log spreadsheet located in the SBET folder with the GNSS data. See also the OPR-S327-FA-11 Horizontal and Vertical Control Report, submitted under separate cover.

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 WAAS Correctors

During acquisition, S220 and Launch 2805 received WAAS correctors for increased accuracies similar to USCG DGPS stations. Launch 2806 and 2808 were not equipped to receive these satellite correctors and therefore needed to be post processed to meet horizontal accuracies.

D. Results and Recommendations

D.1 Chart Comparison

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
16005	1:700000	10	10/2007	10/16/2007	10/27/2007

Table 15: Largest Scale Raster Charts

16005

Soundings from survey H12351 generally agreed within 1 fathom with charted depths on chart 16005, however, 1 fathom may be as much as 20% of the depth for survey H12351. Figures 12 and 13 show sounding comparison with the greatest difference between charted soundings from 16005 and surveyed soundings from H12351. Note that all surveyed soundings in figures are from verified tides with preliminary TCARI zoning applied. Figure 14 shows a generalized contour line along the 6-fathom curve compared to the charted 6-fathom depth contour. The SE corner of H12351 is the area with the greatest variance from chart 16005, in this case the chart is the conservative option for soundings and contours.

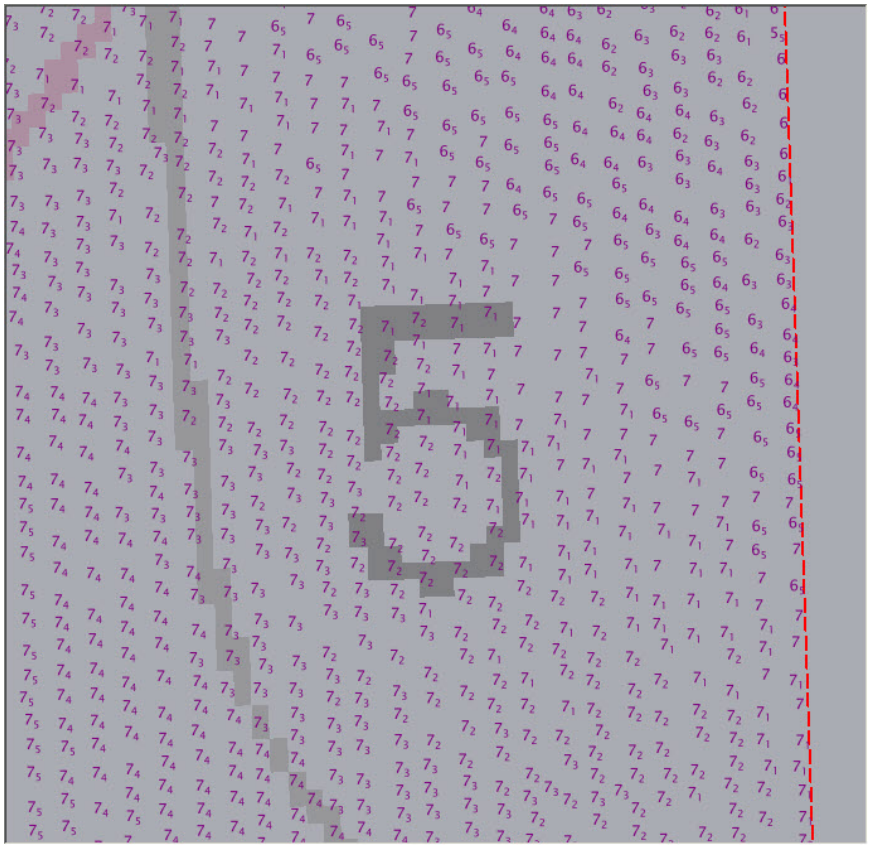


Figure 12: Charted 5-fathom sounding and surrounding surveyed soundings.

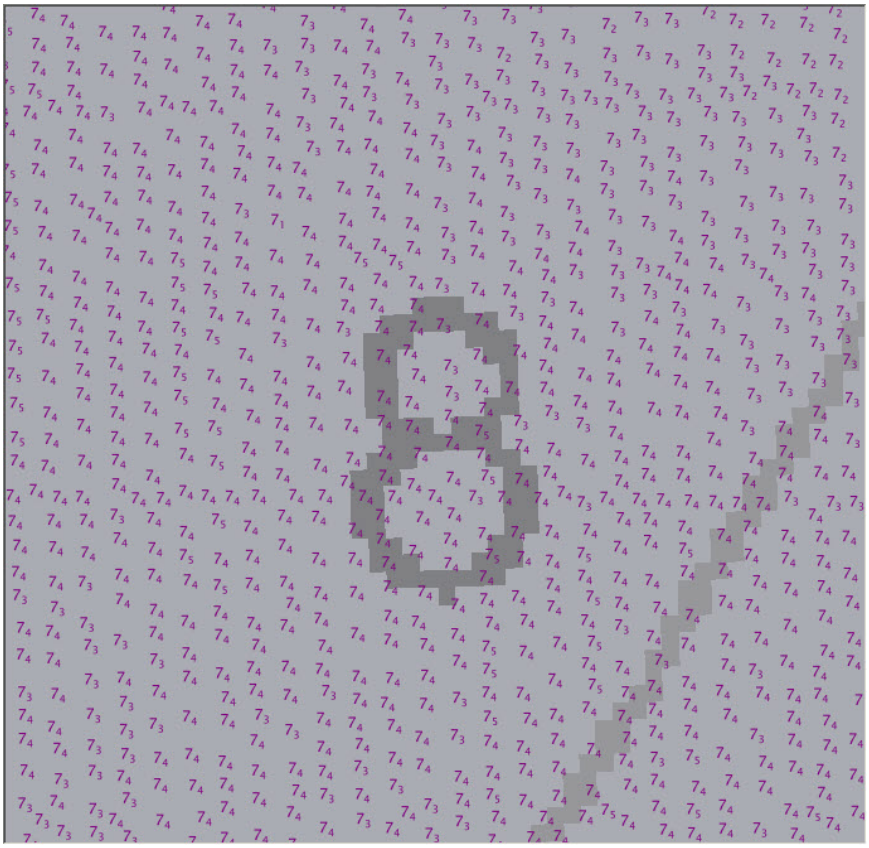


Figure 13: Charted 8-fathom sounding and surrounding surveyed soundings.

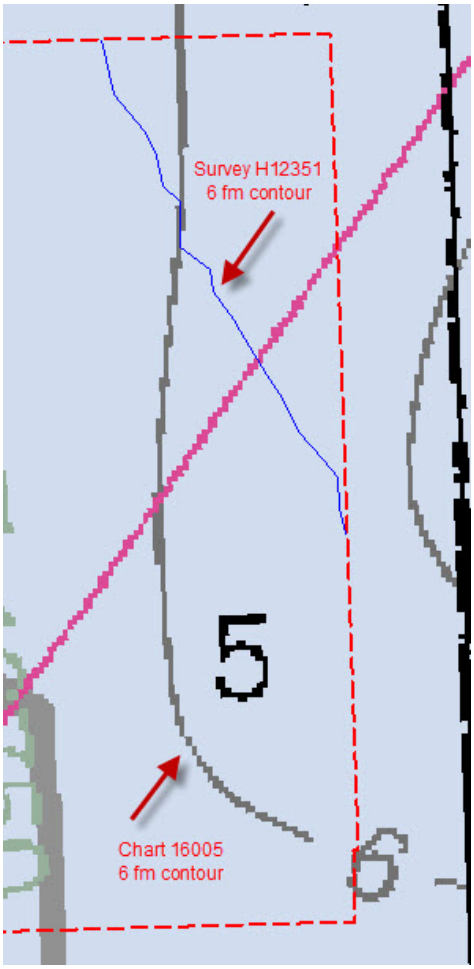


Figure 14: Charted 6-fathom depth contour compared to generalized survey 6-fathom contour.

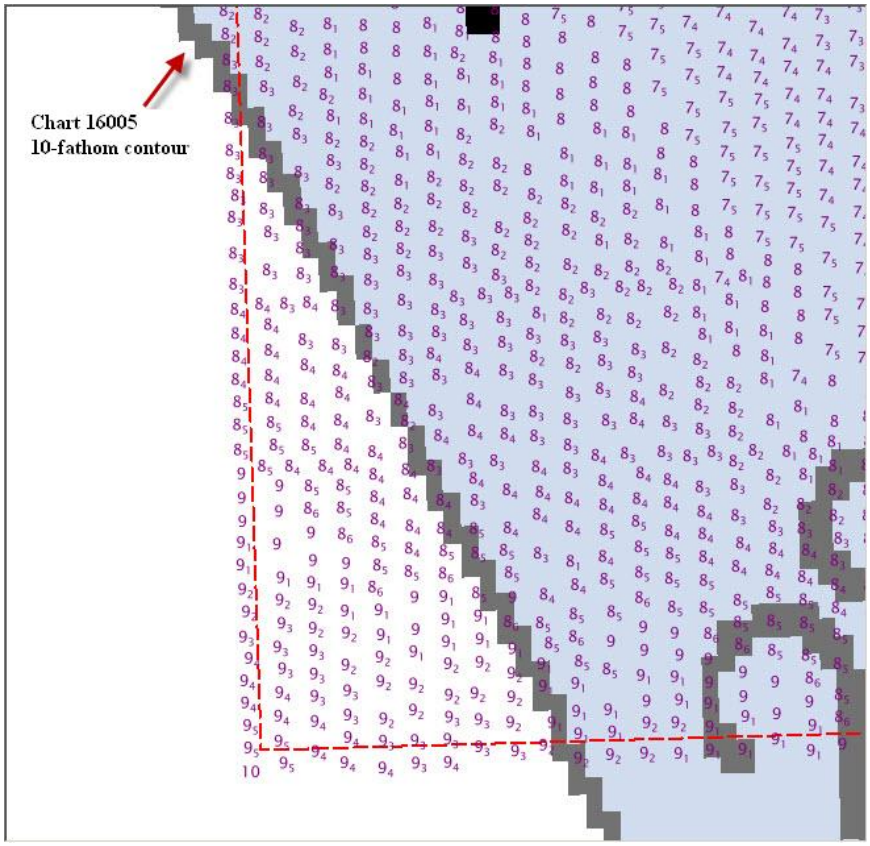


Figure 15: Charted 10-fathom depth contour compared to H12351 surveyed soundings.

Survey H12351 was compared with Chart 16005 and ENC US2AK92M, however depths and features were compiled to the scale of a new raster chart (1:50,000) that will be created using the data from this project.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US2AK92M	1:700000	6	01/25/2011	01/25/2011	NO

Table 16: Largest Scale ENCs

US2AK92M

Comparison results same as raster chart 16005.

D.1.3 AWOIS Items

None Exist

D.1.4 Charted Features

None Exist

D.1.5 Uncharted Features

None Exist

D.1.6 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.7 Shoal and Hazardous Features

None Exist

D.1.8 Channels

None Exist

D.2 Additional Results

D.2.1 Shoreline

None Exist

H12351 was an offshore survey, therefore, no shoreline verification was conducted.

D.2.2 Prior Surveys

None Exist

D.2.3 Aids to Navigation

None Exist

D.2.4 Overhead Features

None Exist

D.2.5 Submarine Features

None Exist

D.2.6 Ferry Routes and Terminals

None Exist

D.2.7 Platforms

None Exist

D.2.8 Significant Features

Numerous scours and mounds along the seafloor were observed in the side scan imagery and concurrent multibeam bathymetry. These are most likely the result of compressed ice flows resulting in large bergs that extend from the surface to the seafloor.

D.2.9 Construction and Dredging

None Exist

E Approval Sheet

As Chief of Party, Field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Report Name	Report Date Sent
Hydrographic Systems Readiness Review	2011-08-26
Data Acquisition and Processing Report	2011-10-14
Horizontal and Vertical Control Report for OPR-S327-FA-11	2011-10-14
Tides and Water Levels Package for OPR-S327-FA-11	2011-10-12

Approver Name	Approver Title	Approval Date	Signature
CAPT David O. Neander, NOAA	Chief of Party	10/14/2011	2011.10.14 11:32:08 -07'00'
SST David T. Moehl	Sheet Manager	10/14/2011	Digitally signed by David Moehl Date: 2011.10.13 22:52:32 Z
CST Weston J. Renoud	Chief Survey Technician	10/14/2011	Digitally signed by Weston Renoud Date: 2011.10.14 10:48:44 -07'00'
LT Caryn M. Zacharias, NOAA	Field Operations Officer	10/14/2011	Caryn M. Zacharias 2011.10.14 11:14:40 -07'00'

F. Table of Acronyms

Acronym	Definition
AFF	Assigned Features File
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Discrete Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSDM	Hydrographic Survey Specifications and Deliverables Manual

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Exectutive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

Subject: OPR-S327-FA-11 Coverage Requirements
From: "james.m.crocker" <James.M.Crocker@noaa.gov>
Date: Tue, 09 Aug 2011 12:16:40 -0400
To: _NMAO MOP CO Fairweather <CO.Fairweather@noaa.gov>, "ops.fairweather" <OPS.Fairweather@noaa.gov>, Gary Nelson <Gary.Nelson@noaa.gov>, Crescent Moegling <Crescent.Moegling@noaa.gov>, Jeffrey Ferguson <Jeffrey.Ferguson@noaa.gov>, Kyle Ward <Kyle.Ward@noaa.gov>, Rachel Medley <Rachel.Medley@noaa.gov>

CO,

This is to provide additional guidance to the coverage requirements defined in the project instructions for OPR-S327-FA-11, Approaches to Kotzebue Sound, AK. The project instructions set the requirement at complete coverage for water depths greater than 4 fathoms by method of 100% SSS coverage with concurrent bathymetry. As a result of the refraction issue the ship is experiencing due to a deep water thermocline, HSD is waving this requirement to focus the time and effort of this project on acquiring set line spaced MB for as much of the project area as possible, with concurrent SSS in depths greater than 4 fathoms. Side Scan Sonar coverage holidays created as a result of thermocline refraction do not need to be filled to meet full coverage requirements. You may fill them at your discretion to block off an area as complete coverage if it will not adversely impact bathymetric acquisition on the project.

Regards,
Jim

CDR James Crocker, NOAA <James.m.crocker@noaa.gov>
Chief, Operations Branch
Hydrographic Surveys Division
NOAA

UNITED STATES DEPARMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Silver Spring, Maryland 20910

TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : December 15, 2011

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-S327-FA-2011
HYDROGRAPHIC SHEET: H12351

LOCALITY: 15 NW West of Kotzebue Harbor, Kotzebue Sound, AK
TIME PERIOD: July 18 - August 15, 2011

TIDE STATION USED: 949-1094 Red Dog Dock, AK
Lat.67° 34.6' N Long. 164° 03.9' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.240 meters

TIDE STATION USED: 949-0571 Cape Krusenstern, AK
Lat. 67° 03.3' N Long. 163° 19.3' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.184 meters

Tide STATION USED: 949-0424 Kotzebue, AK
Lat.66° 54.1' N Long. 162° 34.9' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.174 meters

Tide STATION USED: 946-9751 Deering, AK
Lat.66° 05.8' N LONG. 162° 44.4' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.497 meters

REMARKS: RECOMMENDED GRID

Please use the TCARI grid "S327FA2011-TCARI-Revised.tc" as the final grid for project OPR-S327-FA-2011, H12351, during the time period between July 18 and August 15, 2011.

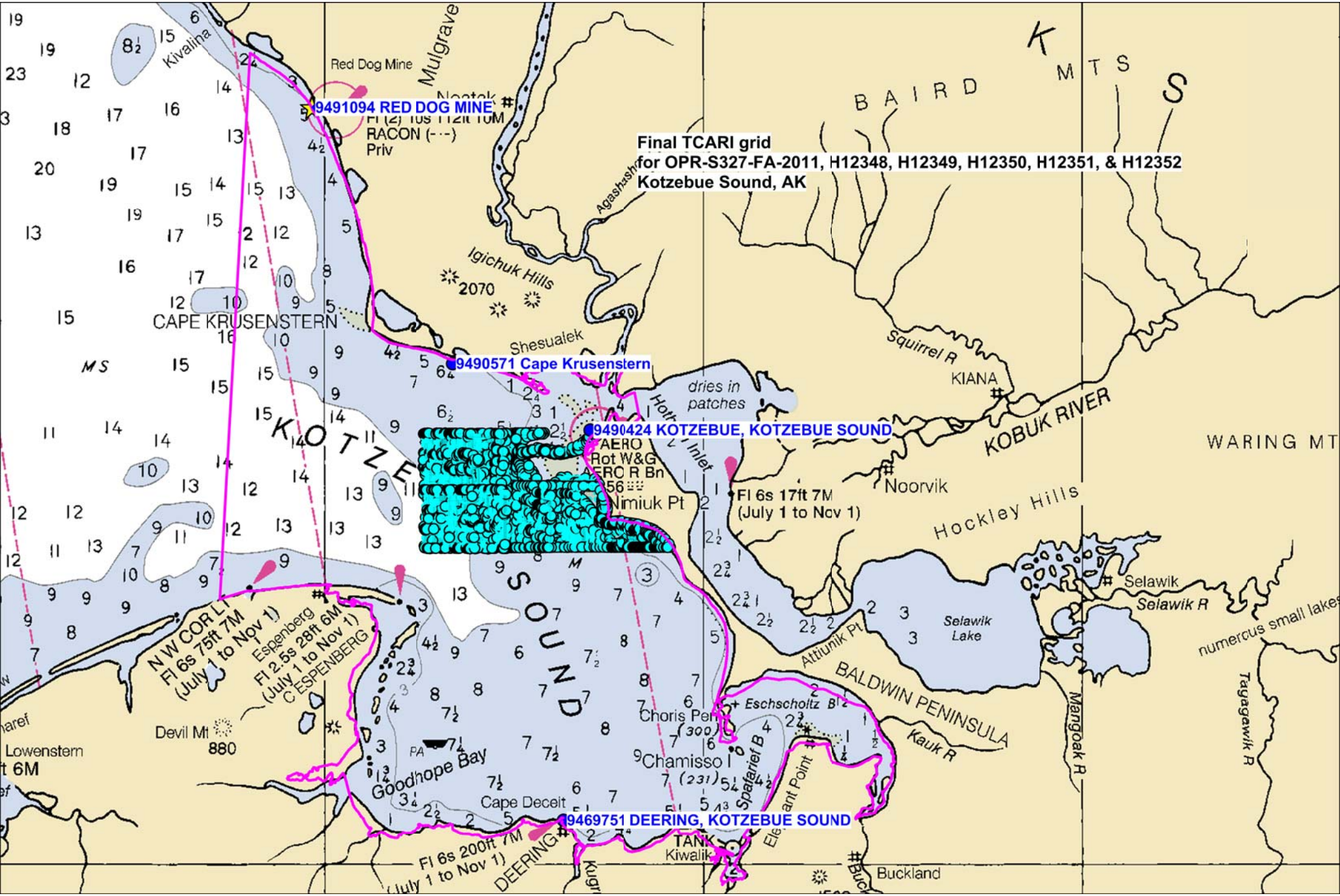
Refer to attachments for grid information.

Note 1: Provided time series data are tabulated in metric units (meters), relative to MLLW and on Greenwich Mean Time on the 1983-2001 National Tidal Datum Epoch (NTDE).

Gerald Hovis

Digitally signed by Gerald Hovis
DN: cn=Gerald Hovis, o=Center for Operational Oceanographic Products and Services, ou=NOAA/NOS/CO-OPS/OD/PSB, email=gerald.hovis@noaa.gov, c=US
Date: 2011.12.16 15:38:52 -05'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Final TCARI grid
for OPR-S327-FA-2011, H12348, H12349, H12350, H12351, & H12352
Kotzebue Sound, AK
9491094 RED DOG MINE
9490571 Cape Krusenstern
9490424 KOTZEBUE, KOTZEBUE SOUND
9469751 DEERING, KOTZEBUE SOUND
Red Dog Mine
RACON (···)
Priv
Kivalina
Mulgrave
BAIRD MTS
Igichuk Hills
2070
CAPE KRUSENSTERN
Shesualek
dries in patches
Hotham Inlet
Squirrel R
KIANA
KOBUK RIVER
WARING MT
KOTZEBUE SOUND
AERO
Rot W&G
ERO R Bn
Nimiuk Pt
Fl 6s 17ft 7M
(July 1 to Nov 1)
Noorvik
Hockley Hills
Selawik
Selawik R
Selawik Lake
numerous small lakes
Attiunik Pt
BALDWIN PENINSULA
Kauk R
Mangoak R
Tayagawik R
Eschscholtz B
Choris Pen
Chamisso I
Spafarief B
Elephant Point
N W COR LT
Fl 6s 75ft 7M
(July 1 to Nov 1)
Espenberg
Fl 2.5s 28ft 6M
(July 1 to Nov 1)
C ESPENBERG
Devil Mt
880
Lowenstern
Goodhope Bay
Cape Deceit
Fl 6s 200ft 7M
(July 1 to Nov 1)
DEERING
TANK
Kiwalik
Buckland

PHB Compilation Log

General Survey Info

Survey Number	H12351	Field Unit	NOAA Ship Fairweather	State	AK	UTM Zone	3N
Project Number	OPR-S327-FA-11	Project Name (Locality)	Kotzebue Sound				
Start Date	07/13/2011	Sublocality	15 NM West of Kotzebue Harbor				
End Date	08/27/2011	Survey Scale	1:40,000	Compilation Scale	1:50,000		

Affected Raster Charts

Chart	KAPP	Scale	Edition	Date	NTM Date
16005	2410	1:700,000	10th	10/01/2007	01/07/2012

Add Chart | Remove Chart

Affected Electronic Charts

ENC	Scale
US2AK92M	1:700,000

Add ENC | Remove ENC

Spatial Reference

Horizontal Datum	WGS84
Coordinate System	LLDG
Sounding Datum	MLLW
Vertical Datum	MHW

Junction Surveys

Survey Number	Survey Date	Location Relative to Current Survey
H12349	08/29/2011	East
H12350	08/31/2011	Southeast
H12352	09/02/2011	South

Add Survey | Remove Survey

HCell Compiler	Katie Reser	QC Reviewer	Peter Holmberg	SAR Reviewer	Tyanne Faulkes

Source Surfaces

Resolution	File Name
1m	H12351_Office_1m_Final.csar

Add Surface | Remove Surface

PHB Compilation Log

Processing Info

Supporting Documents	
Name	Version
Specs and Deliverables	Aug 2011
HCell Specs	6.1

Add Doc | Remove Doc

Software Used		
Software	Version, HF	Used For
CARIS HIPS	7.1	SAR Review. Inspection of Combined BASE Surfaces.
Pydro	11.11	SAR Review. Generation of DTON and AWOIS Reports.
CARIS BASE Editor	3.2 SP1 HF2	Creation of soundings and bathy-derived features, meta area objects, and blue notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer	2.2 SP1 HF3	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS	4.4a	Set the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM	3.3 SP3 HF8	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS Plot Composer	5.1	Generate plots used for QC.
HydroService AS, dKart Inspector	6.0	Validation check of the HCell.
Fugawi Marine ENC	3.1.0.435	Independent inspection of final HCells using COTS viewer.

Product Info

Deliverables	
Chart Scale HCell	H12351_CS.000
Survey Scale HCell	H12351_SS.000
HCell Report for MCD	H12351_HR.pdf
Feature Listing	H12351_FL.txt
Descriptive Report	H12351_DR.pdf
Survey Outline	H12351_Outline.gml and .xsd

Horizontal and Vertical Units

During creation of the HCell all soundings and features are maintained in metric units with as high precision as possible. Depth units for soundings measured with sonar maintain millimeter precision. Depths on rocks above MLLW and heights on islets above MHW are typically measured with range finder, so precision is less.

Depth Units (DUNI)	Feet
Height Units (HUNI)	Feet
Positional Units (PUNI)	Meters

PHB Compilation Log

Radius Setting

A survey-scale sounding (SOUNDG) feature object layer was built from the Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at survey scale using a Radius Table file with values shown below.

Radius (mm)	Min. Depth (m)	Max Depth (m)
3	-5	10
4	10	20
4.5	20	50
5	50	500

Contours

Depth contours at the intervals on the largest scale chart are included in the SS HCell for MCD raster charting division to use for guidance in creating chart contours. With the exception of the zero contours included in the *_CS file, contours have not been deconflicted against shoreline features, soundings and hydrography.

Charted Contours	Metric Equivalent	Metric- NOAA Rounded	Chart Contours - NOAA Rounded
30 ft	9.144	9.3726	30.75 ft

Add Contour | Remove Contour

Additional Info

Contact Information

Inquiries regarding this HCell content or construction should be directed to:

HCell Compiler: Katie Reser

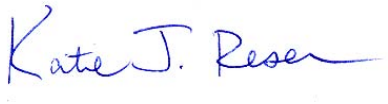
Phone Number: (206) 526-6864

Email: Katie.Reser@noaa.gov

Compilation Comments

APPROVAL SHEET
H12351

The survey evaluation and verification has been conducted according to branch processing procedures and the HCell compiled per the latest OCS HCell Specifications.



Katie Reser
2012.02.07
08:23:19 -08'00'

The survey and associated records have been inspected with regard to survey coverage, delineation of the depth curves, development of critical depths, S-57 classification and attribution of soundings and features, cartographic characterization, and verification or disproval of charted data within the survey limits. The survey records and digital data comply with OCS requirements except where noted in the Descriptive Report and are adequate to supersede prior surveys and nautical charts in the common area.

Digitally signed by Peter S. Holmberg
DN: cn=Peter S. Holmberg, o, ou, email=peter.holmberg@noaa.gov, c=US
Date: 2012.02.07 08:35:32 -08'00'

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

Digitally signed by Peter Holmberg signing for David J. Zezula
DN: cn=Peter Holmberg signing for David J. Zezula, o, ou, email=david.j.zezula@noaa.gov, c=US
Date: 2012.02.07 08:35:58 -08'00'