W00264

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey: Track line

Registry Number: W00264

LOCALITY

State: Alaska

General Locality: Bechevin Bay

Sub Locality: Bechevin Bay

2013

CHIEF OF PARTY
LCDR Michele L. Schallip
USCG

LIBRARY & ARCHIVES
DATE: 09 SEPTEMBER 2013

NOAA FORM 77-28 (11-72) U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER: W00264

HYDROGRAPHIC TITLE SHEET

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:	**Bechevin Bay**		
Sub-Locality:	**Bechevin Bay**		
Scale:	**1:80,660**	Date of Survey:	**05/13/13 to 05/19/13**
Instructions Dated:	**N/A**	Project Number:	**S-Q922-USCG-13**
Vessel:	**CGC SPAR (WLB 206)**		
Chief of Party:	**LCDR Michele L. Schallip, USCG**		
Surveyed by:	**USCGC *SPAR* Personnel**		
Soundings by:	**Furuno GP1850WF/NT vertical beam echo sounders.**		
Graphic record scaled by:	**N/A**		
Graphic record checked by:	**N/A**		
Protracted by:	**N/A**	Automated Plot:	**N/A**
Verification by:			
Soundings in:	**Feet uncorrected**		

Remarks:
1) All Times are in UTC unless otherwise specified.
2) This is a Navigable Area Hydrographic Survey. Do not concur, see attached signature page 19.
3) Projection is WGS84, UTM Zone 3.

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Descriptive Report to Accompany Hydrographic Survey W00264

Project USCG Hydrographic Project 2013 (S-Q922-USCG-13)
Bechevin Bay
Scale 1:80,660
May 13th – May 18th, 2013
USCGC SPAR

A. AREA SURVEYED

This hydrographic survey was completed as part of the annual Bechevin Bay Aids to Navigation Servicing trip.

Northern limit	Southern limit	Eastern limit	Western limit
55°05'54”	54°53'06”	-163°18'36”	-163°31'12”

Data acquisition was conducted from May 13th – May 18th, 2013.

The purpose of this project is to provide: awareness of current channel status to properly position channel buoys for the safest navigational route, contemporary reconnaissance surveys to update National Ocean Service (NOS) nautical charting products and to increase the USCG’s self-sufficiency in collecting valuable data while on patrol in these areas. The project will address the navigation channel and the status of known moving shoals in Bechevin Bay. Survey vintage in the Bechevin Bay area is from 1957 NOS surveys. Updated surveying will provide mariners transiting this area of current water depths and the location of migrating shoals. The Bechevin Bay waterway supports transiting Bristol Bay fishing vessels carrying a reported 500 million dollars in commerce annually.

	Linear Nautical Miles
LNM Single beam mainscheme only	66.2
LNM Multibeam mainscheme only	N/A
LNM Lidar mainscheme only	N/A
LNM Side Scan Sonar mainscheme only	N/A
Lineal nautical miles of any combination of the above techniques (SSS 200%, MBES)	66.2
LNM Crosslines singlebeam and multibeam combined	N/A
LNM Lidar Crosslines	N/A
LNM development lines non mainscheme	N/A
LNM shoreline/nearshore investigations	N/A
Number of Bottom Samples	N/A
Number of items investigated that required additional time/effort in the field beyond the above survey operations	N/A
Total number of square nautical miles	N/A

Table 1: Hydrographic Survey Statistics

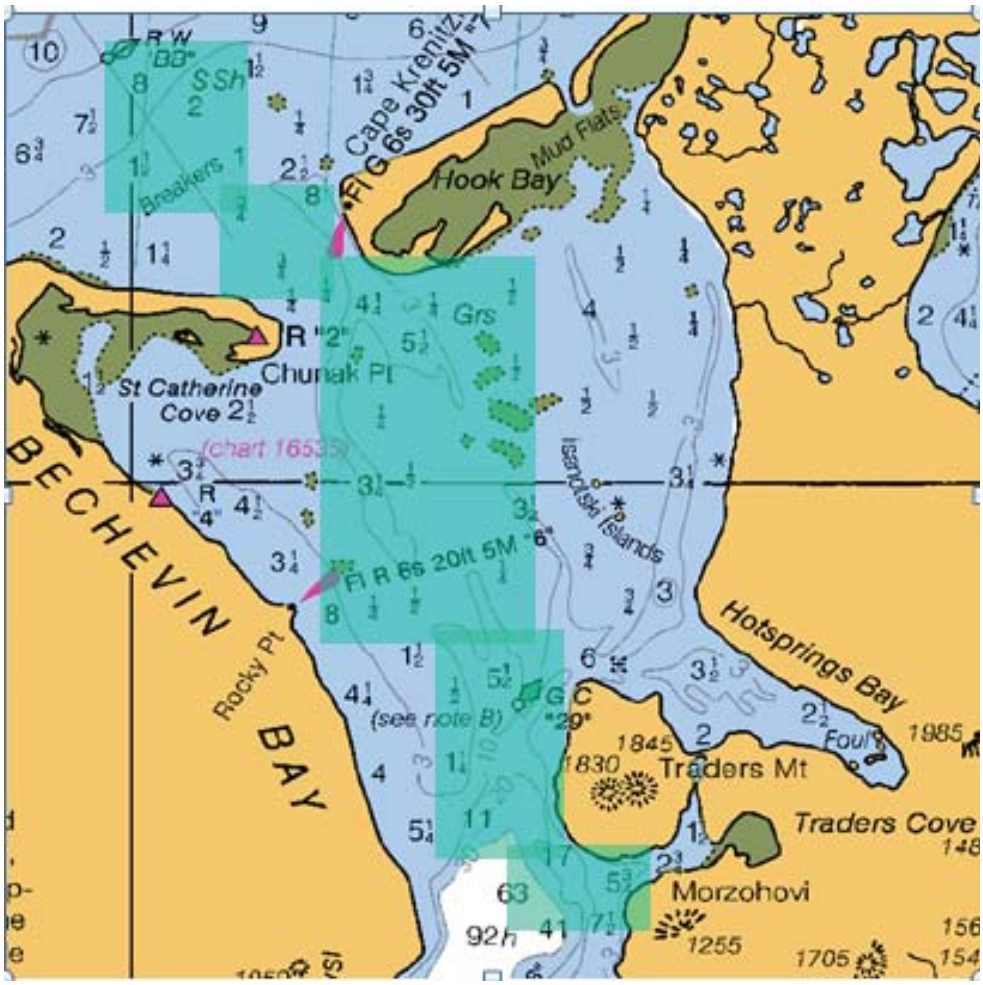

Fig. 1. W00264 Survey Area

Calendar Date	Julian Day
13 May 2013	133
14 May 2013	134
15 May 2013	135
16 May 2013	136
17 May 2013	137
18 May 2013	138
19 May 2013	139

Table 2: VBES Acquisition Dates

B. DATA ACQUISTION AND PROCESSING

Refer to USCGC SPAR 2013 ***Data Acquisition and Processing Report (DAPR)*** **(in Appendix VI*)*** 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 included in this descriptive report.

B 1. EQUIPMENT AND VESSELS

Data was acquired by CGC SPAR's small boats, SPAR 1 and SPAR 2. The small boats collected vertical beam echo sounder (VBES) soundings. Sea bed samples were not collected. Vessel configurations, equipment operation and data acquisition and processing were consistent with specifications described in the *DAPR.*

B 2. QUALITY CONTROL

B 2.1 System Certification and Calibration

Refer to CGC *SPAR DAPR* in Appendix VI for a complete description of system integration and initial calibration results for equipment and sensors used for this survey.

B.2.2 Sounding Coverage

This survey was conducted using VBES bathymetry. It has been observed that Spar 1 survey data was collected with a position accuracy of four decimal places (XXº XX.XXXX'). Spar 2 survey data was collected with a position accuracy of two decimal minutes (XXº XX.XX'). This discrepancy was noticed after all survey data was collected. The resolution of two decimal place position accuracy resulted in different depths being overlaid on top of each other. The accuracy is approximately 60 feet in the latitudinal direction and 35 feet in the longitudinal direction. Viewing raw data acquired by both small boats it becomes readily apparent which vessel collected each line of data. Analysis of this discrepancy provides that, while Spar 2 is not as precise with horizontal positioning, the data collected should be useable for reconnaissance and/or charting. This conclusion is based on the fact that the size of a sounding number height on the Bechevin Bay Chart 16535 as measured using HYPACK is over 500 feet in height and width.

B 2.3 Crosslines

CGC SPAR plans survey work based on areas and not planned track lines. After initial surveys are analyzed, new survey sorties are often planned in the same areas to get better coverage or fill in missed areas as real time data is not observed and analyzed during acquisition. This often leads to lines crossing in the main scheme data. However no crosslines were collected as part of this project.

During data analysis of lines that happened to cross one another that were collected on separate days by two different vessels, a separation in soundings was observed of five to seven feet in the area between buoys 24 and 26. Due to the five to seven foot tide range, it is suspected this is the cause of the discrepancy. Application of final tides should resolve this difference in soundings.

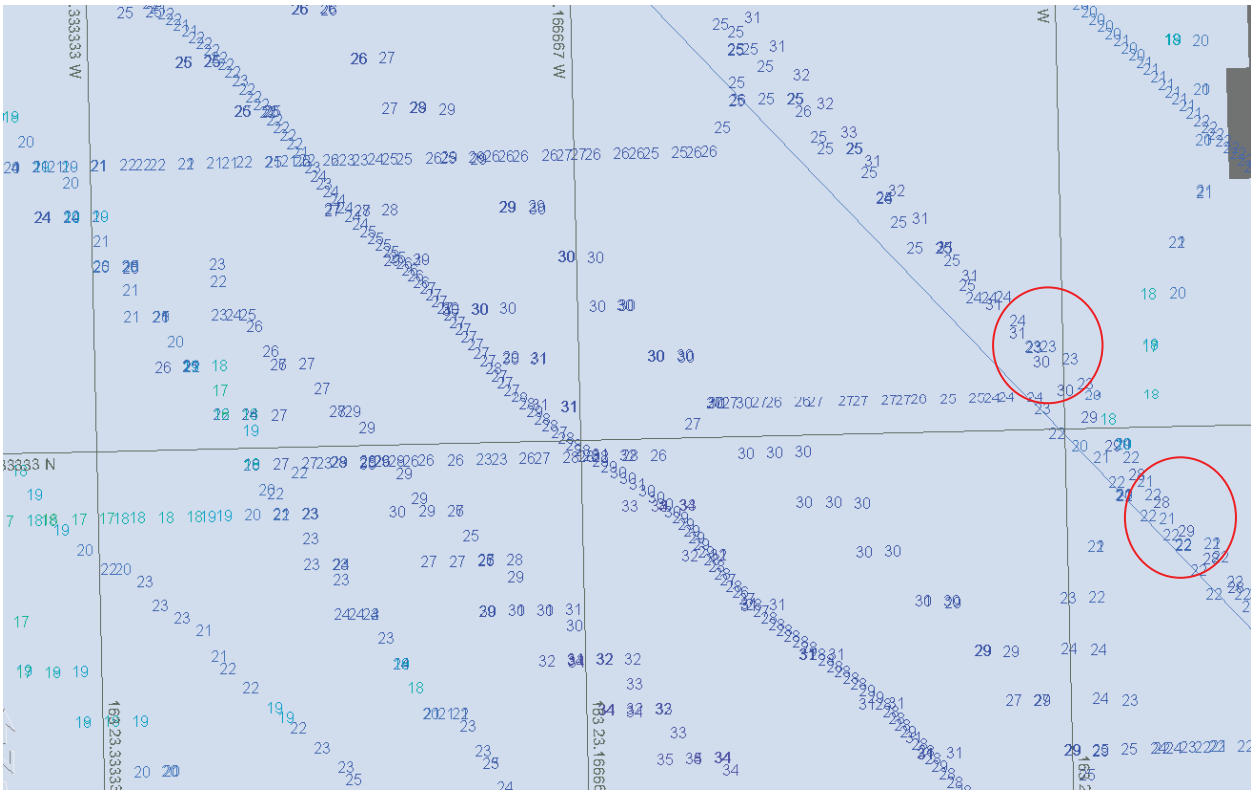

Fig. 2. Sounding differences in the area between buoys 24 and 26. Predicted tides have been applied.

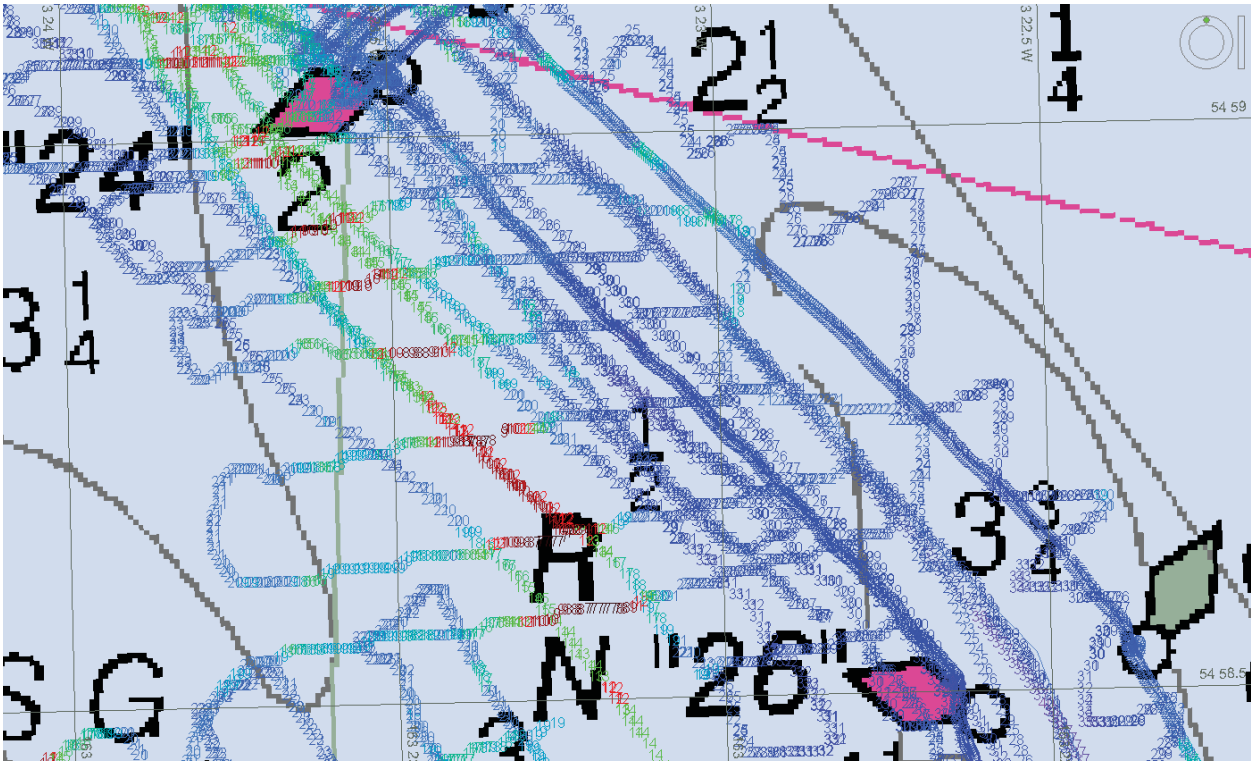

Fig. 3. Overview of sounding difference area.

B 2.4 Systematic Errors

Seas at the north entrance to Bechevin Bay were on average 4-6 feet with calm periods between 2-3 feet. This influence can be viewed in the raw data while processing. These seas also caused position outliers in the data while surveying with SPAR 1 due to either a faulty data connection or signal processing from the antenna (see figure 3 for position outliers.) This problem was not experienced in SPAR 2.

Tides in Bechevin Bay appear to be greatly influenced by meteorological conditions, for example; wind. It was noted that the tides observed by CGC SPAR did not always match up with predicted tides at the St. Catherine Cove tidal station (2287) at all times. Future projects would benefit from setting multiple portable water level buoys or stations to gather accurate data inclusive of meteorological influences.

B 3. CORRECTIONS TO ECHO SOUNDING

SBES sounding data were reduced to mean lower-low water (MLLW) using predicted water levels from St. Catherine Cove tidal station (2287). CGC SPAR observed water depths at anchor and compared the rise and fall of the ship with both Isanotski Strait and St. Catherine Cove. Tides best matched the St. Catherine Cove tide station. Tide Comparisons with observed depths at anchor are included in the supplied data files as “Bech Tides 13May.xlsx.”

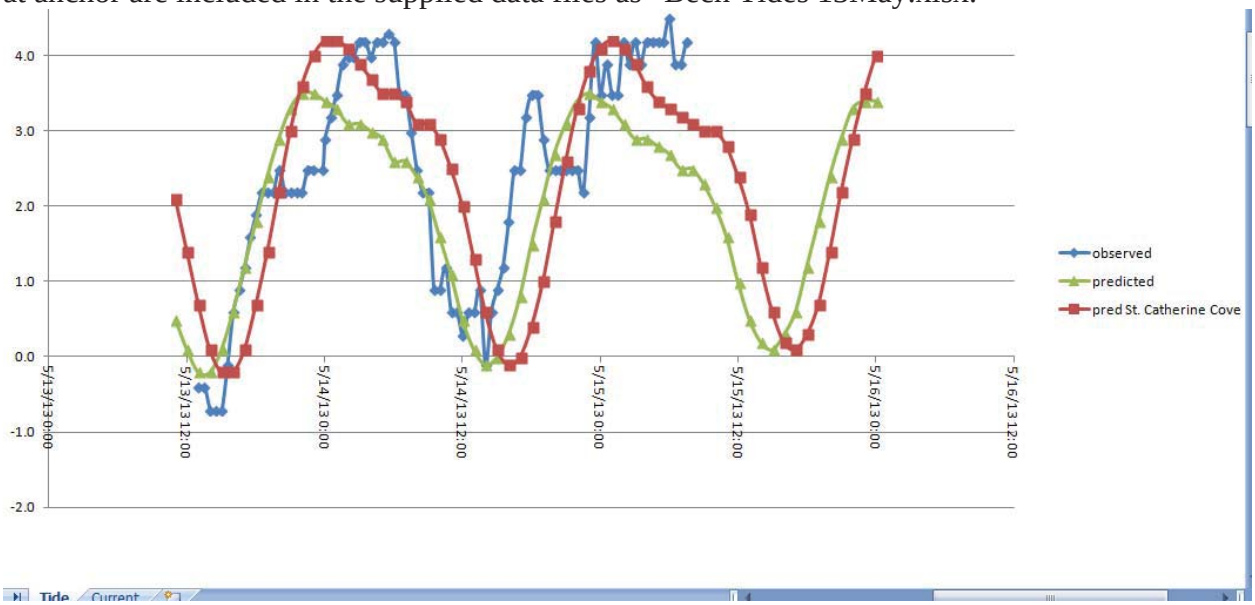

Fig. 4. The tide table compares Isanotski Strait and St. Catherine Cove predicted tides to observed tides at boat anchorage in position 54° 54.357’N 163° 19.829’W. Observed tides were calculated by Fathometer + Ship’s draft – Depth at ships location using surveyed data by small boat. Ship plotted at 37’ depth for the duration of the anchorage. One foot was added for small boat offset and added 1 foot to better line up with the predicted tides for easier comparison. The green line is the Isanotski Strait predicted tides.

Some data files on the 13th of May were saved in local time due to the setting of local time on the computer clock. Once the error was identified, the computer clock was corrected to UTC. Two Tide files were created for both local time and UTC time to process the data. The files to be processed with the Local time tide data are:
Spar1_2013_1331312.raw
Spar1_2013_1331319.raw
Spar1_2013_1331847.raw
Spar1_2013_1331322A.raw
Spar1_2013_1331600A.raw
Spar2_2013_1330848.raw

All other files are to be processed with the UTC tide files based on the file name.

B 4. DATA PROCESSING

B 4.1 Data Cleaning

The survey data were cleaned using the vertical beam editor tools in Hypack. All areas of the track line that indicated a deviation from both charted soundings and adjacent soundings were examined and cleaned. Additional cleaning was performed using depth and speed filters to remove known vessel influences.

Overall data processing was conducted to SPAR Standard Operating Procedures (SOP). Some files were corrupt or only had a few data points and were deleted.

Heading input is not available on the small boats. Due to heading input not being recorded during data acquisition, a known horizontal uncertainty of approximately nine feet is present on SPAR 1 and SPAR 2 due to the offset between the DGPS/GPS antenna to the transducer.

Spar 1 had some connection issues either with the computer or the hardware on the boat. This created lost data and in rougher seas, GPS data fliers that rendered parts of the files unusable. For example, file Spar1_2013__1370224 (Fig. 3.) had half of the file with position data fliers. The seas were approximately 3-5 feet north-west of buoys 5 and 6 and are assumed to be the cause of the position data fliers. The data east and south of buoys 5 and 6 was usable. During processing the portion north-west of buoys 5 and 6 was edited and removed.

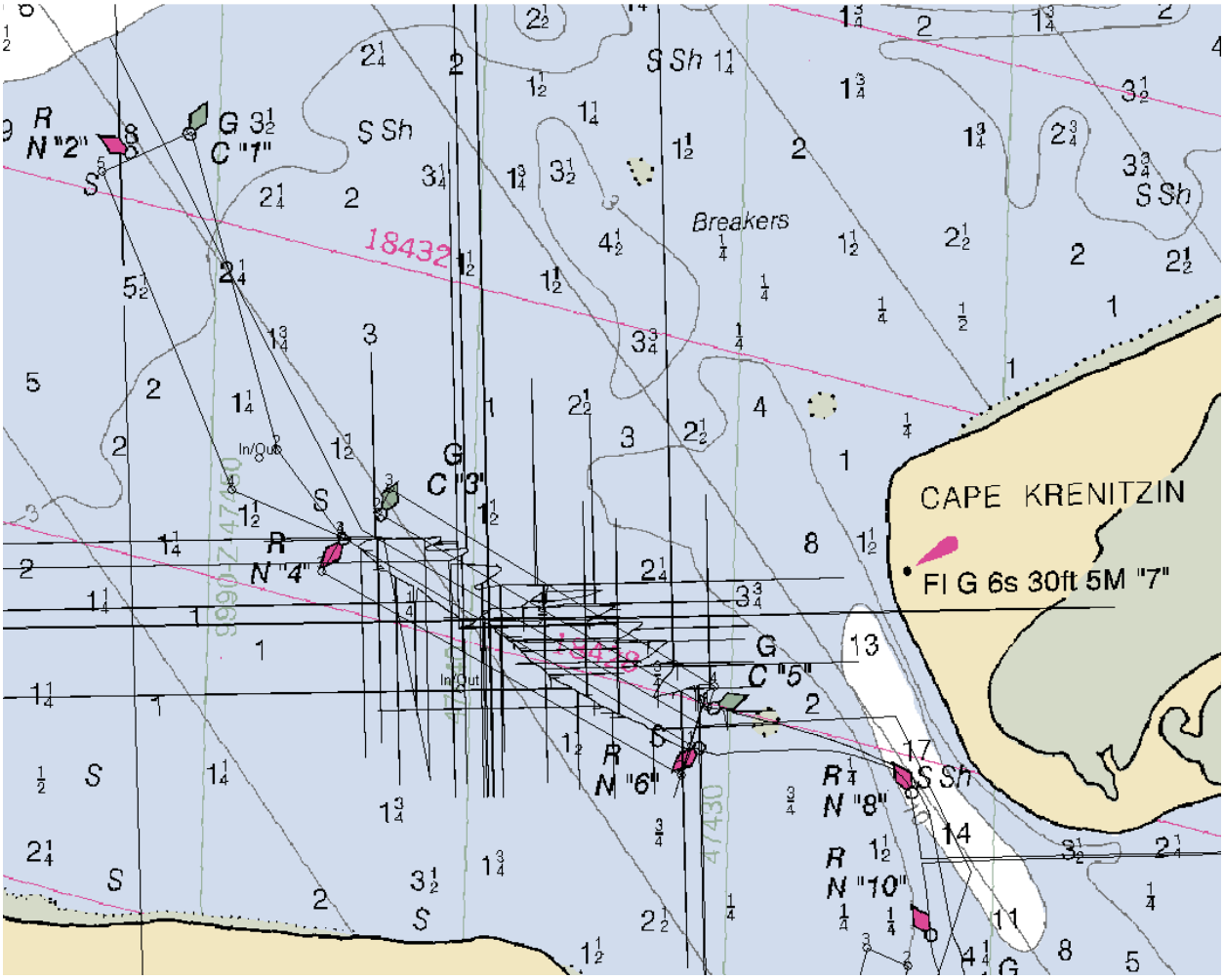

Fig. 5. GPS data fliers.

Multiple days of winds out of the north prevented surveying north of Bechevin Bay buoys 3 and 4. Data was finally collected on 18 May 13 due to operational necessity to determine the depths through to buoys 1 and 2. The conditions were 3 to 4 foot seas and an occasional 6 or 7 foot wave building in the shoaler locations. Figure 4 demonstrates the wave effect on the data collected. During processing the deepest spikes were deleted while the shallower data were kept. The smooth feature was then used to get a better visual picture for analysis of the waterway to determine buoy placement and safety of the SPAR to transit the channel (Figure 5). These same files were processed without the smooth feature and the file names have “nosmooth” added on.

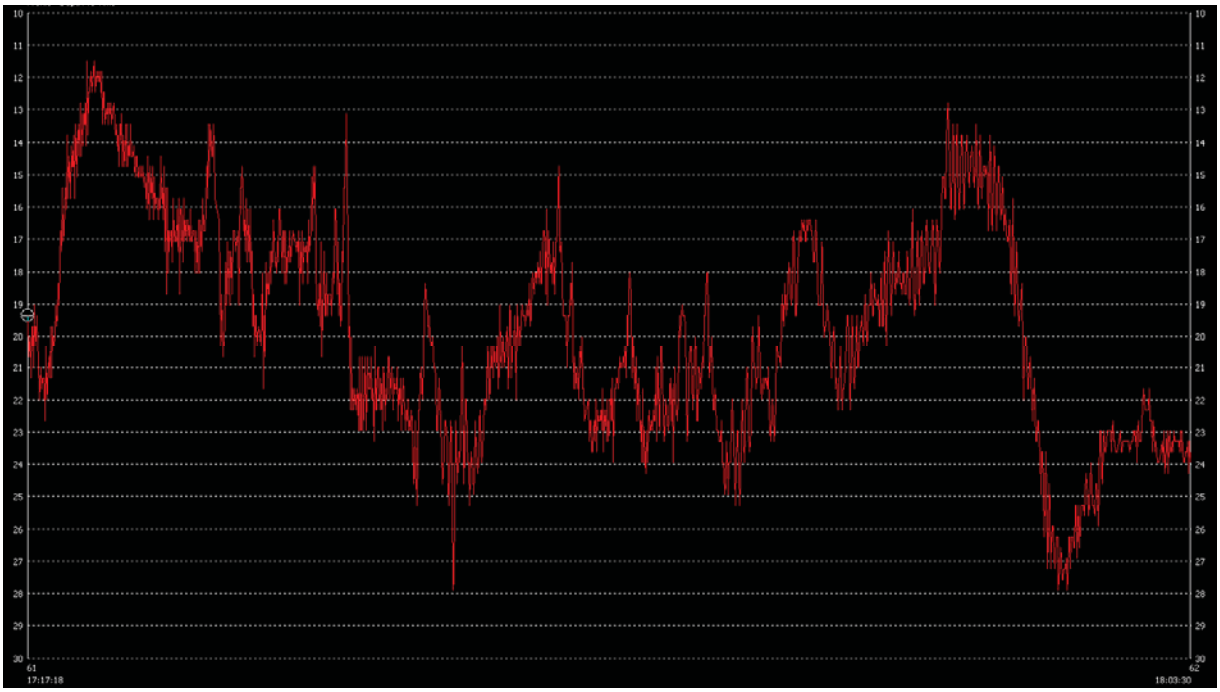

Fig. 6. Data collection in 3-4 foot seas.

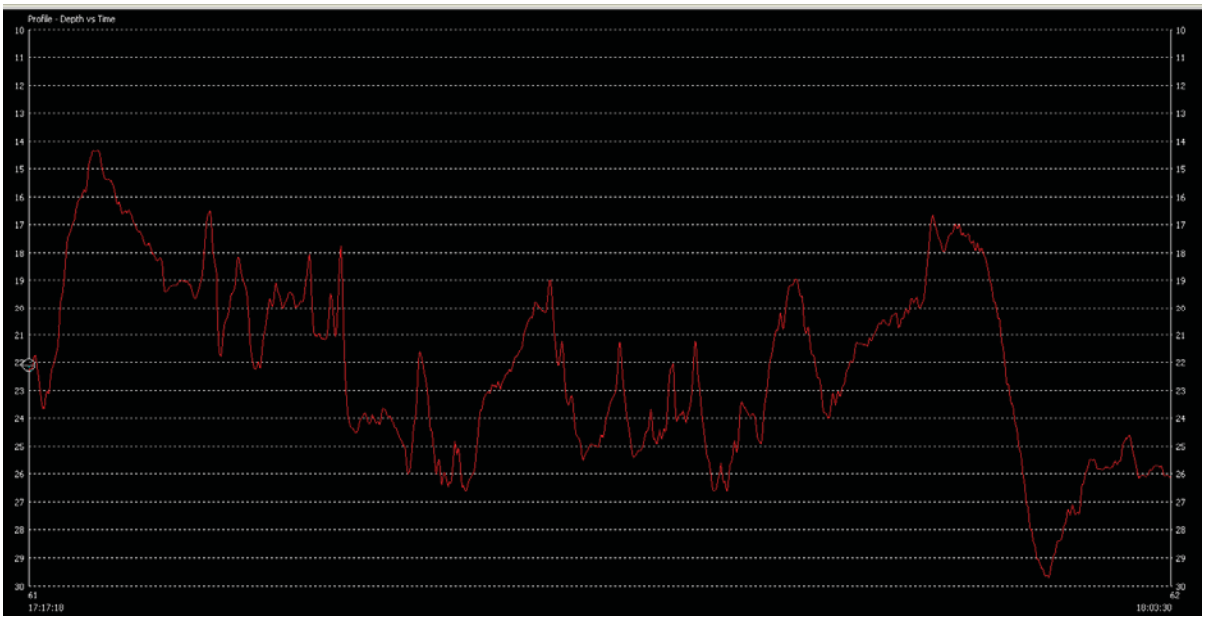

Fig. 7. Smoothed Data from figure 4.

During data acquisition and at the time of this report all data have not been processed with offsets for the small boats. Actual depths are 1.55 feet and 1.33 feet deeper than processed data on SPAR 2 and SPAR 1, respectively.

All DIGIBAR casts collected in Bechevin Bay demonstrated a well-mixed water mass varying from 1458.3m/s to 1460.7m/s due to high winds and currents in the area. Upon submission, no

sound speed casts were applied to the processed vertical beam data of Bechevin Bay, but they have been included with the data package for use in final processing by NOS.

Date	Time (UTC)	Position	Max Depth (meters)
13 May 2013	18:43	54:54:32 -163:19:28	13.9
14 May 2013	02:30	54:54:32 -163:19:28	17.4
14 May 2013	02:31	54:54:32 -163:19:28	13.7
17 May 2013	01:58	54:54:32 -163:19:28	18.4
19 May 2013	02:43	55:02:23 -163:23:28	19.3
19 May 2013	02:44	55:02:23 -163:23:28	18.0

Table 3: Sound Velocity – CTD Casts

C. HORIZONTAL AND VERTICAL CONTROL

As per Field Procedures Manual (2013) section 5.2.2.2.3, a Horizontal and Vertical Control Report was not filed since horizontal and vertical control stations were not established by the field party for this survey. A summary of horizontal and vertical control for this survey follows.

C 1.1 Horizontal Control

The horizontal datum for this project is Universal Transverse Mercator, North American Datum 1983, Zone 3 (central meridian of 165W). Global Positioning Satellites (GPS) was the sole method of positioning. Differential corrections from the U.S. Coast Guard beacons were not used during this survey due the limited range of the DGPS transmitters in the area.

C 1.2 Vertical Control

The vertical datum for this project is Mean Lower-Low Water (MLLW). The predicted water levels from St. Catherine Cove will serve as datum control for W00264 until final tides are applied by NOS.

D. RESULTS AND RECOMMENDATIONS

D.1 Chart Comparison

D 1.1 Chart 16535 Comparison

Survey W00264 was compared to Chart 16535, (12th Ed., November 2000, 1:80,660), the largest scale chart covering the survey area. Bechevin Bay was officially surveyed last in approximately 1957. The Hydrographer recommends that surveyed depths supersede charted soundings and new depth contours be generated and charted. Shifting shoals and channels have changed the depths through the area in some cases by 23 feet. Other shoals have remained stationary or have moved little and still remain accurately charted. Overall the entire area shows many differences. See figures 6-8 for examples.

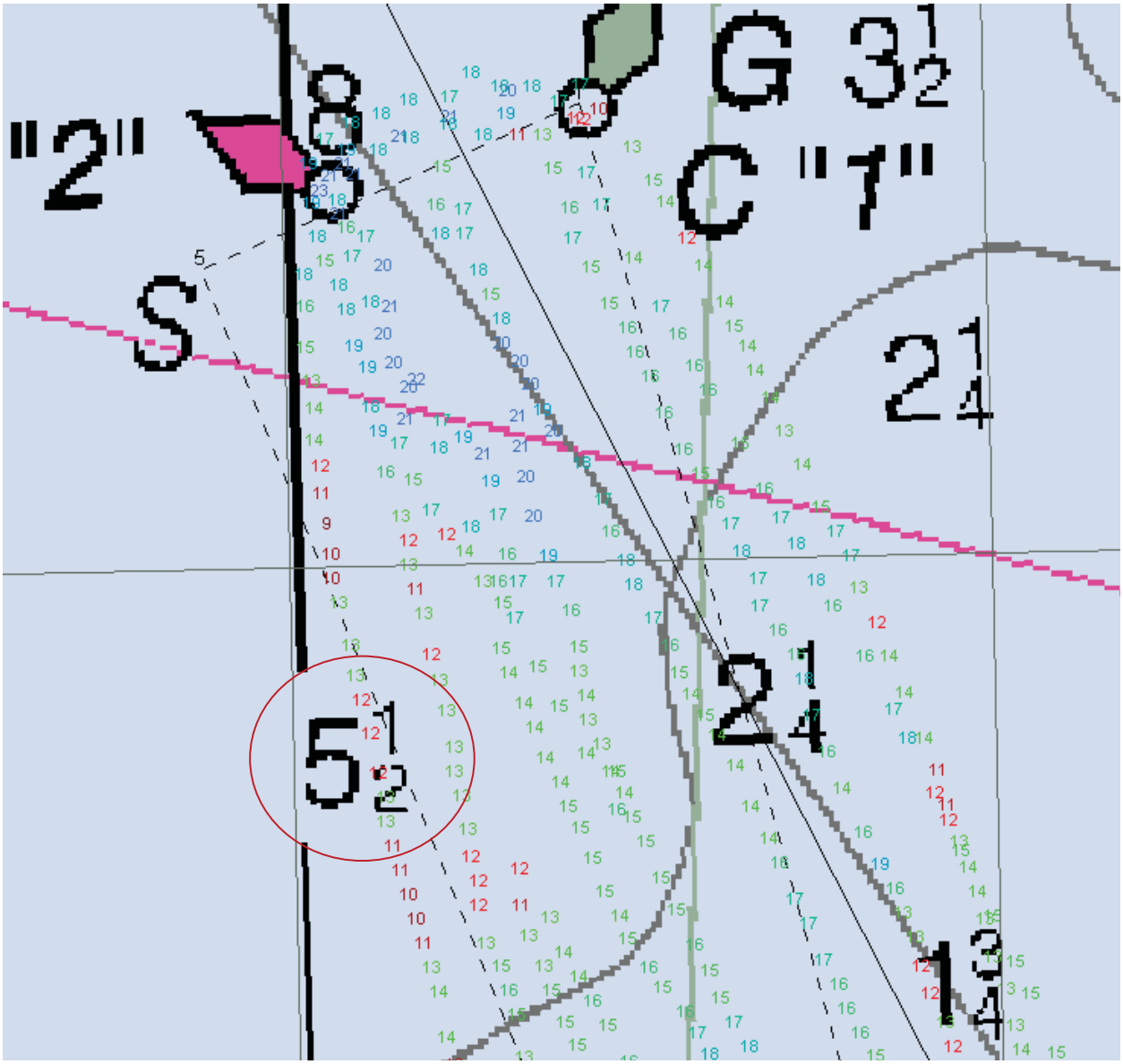

Fig. 8. Shoaling to 12 feet at a charted 5.5 fathom mark in position 55-04.84N 163-29.91W near the north entrance south of buoy 2.

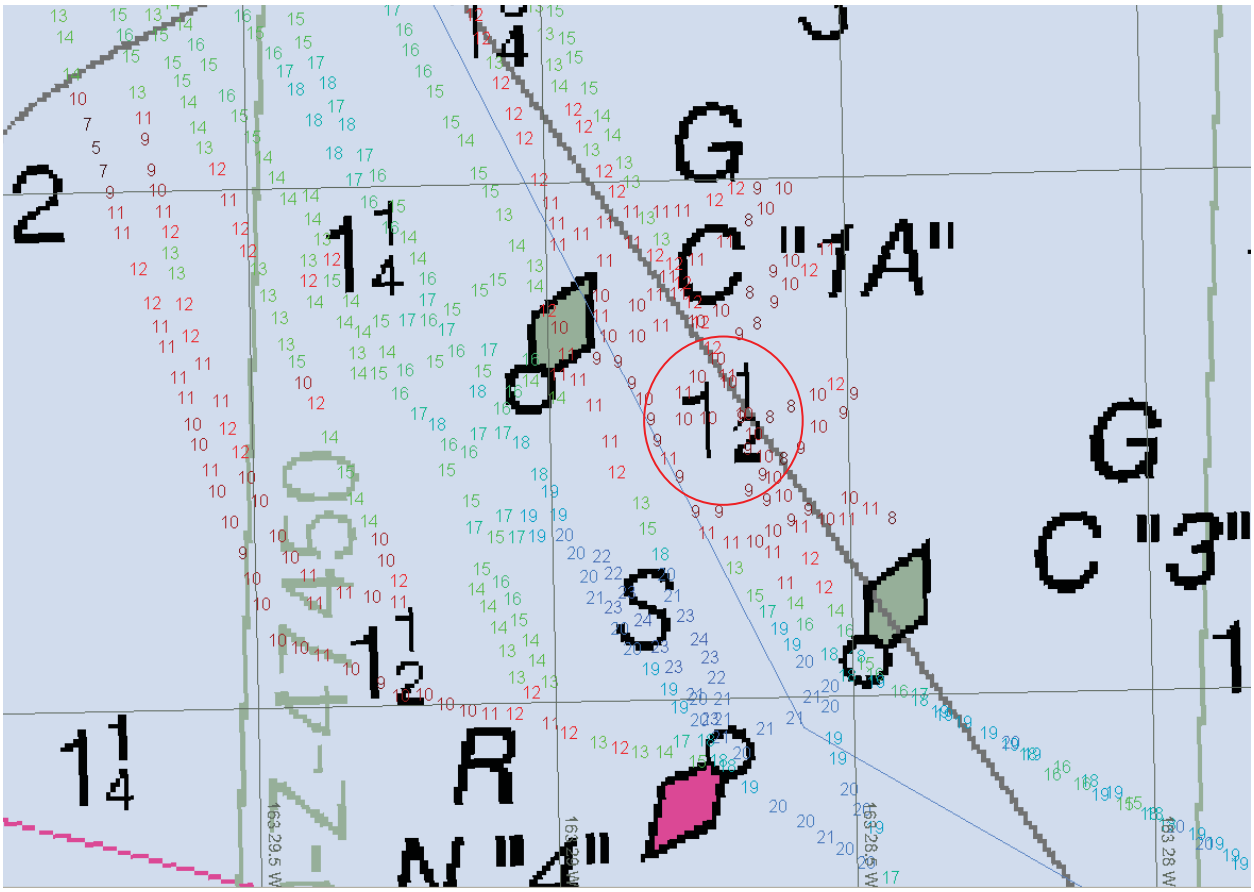

Fig. 9. – Shoal Migration- The shoal north of buoy 3 shifted 200 yards west since 2012. It remains accurately marked due to the fact the entire area is marked at 1.5 fathoms. The Hydrographer recommends shifting the 1.5 fathom sounding to the west.

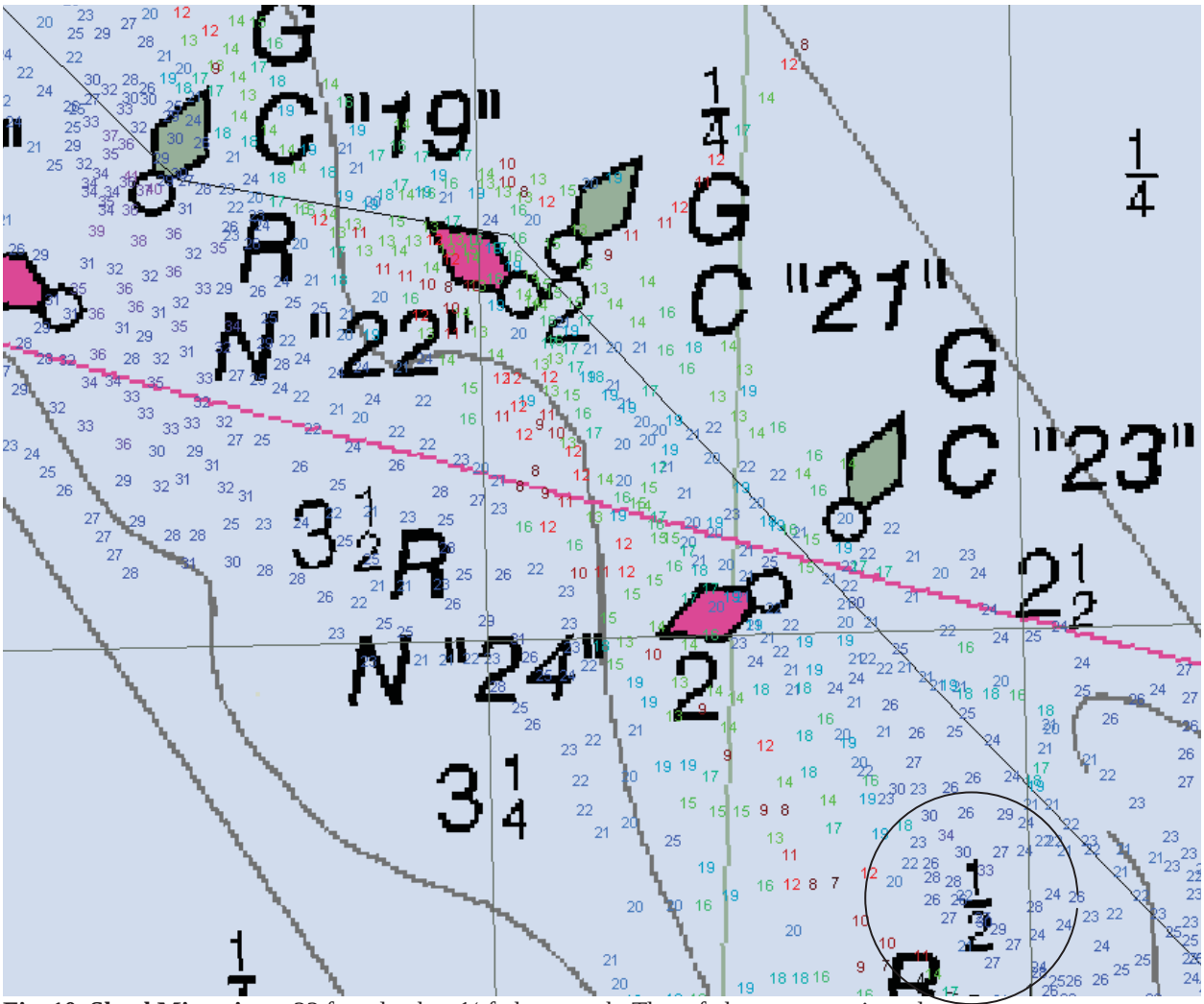

Fig. 10. Shoal Migration – 22 foot depth at ½ fathom mark. Three fathom contour is no longer accurate.

D.2 Additional Results

D.2.1 Automated Wreck and Obstruction Information Service (AWOIS) Items

No AWOIS items were investigated for this survey.

D.2.4 Shoreline

Shoreline verification was not conducted within the scope of this survey.

D.2.5 Charted Features

D.2.6 Charted Pipelines and Cables

No cables or pipelines were observed in this survey.

D.2.7 Bridges, Ferry Routes, and Overhead Cables

There are no ferry routes, bridges, or overhead cable crossings within the limits of the survey.

D.3 Dangers to Navigation and Shoals

D 3.1 Dangers to Navigation

No dangers to navigation were found or reported to the NOAA's Office of Coast Survey.

D 3.2 Shoals

There were no significant uncharted shoals discovered during this survey, however, shoal migration is evident as discussed in the chart comparison section. No rocks or rock outcroppings have been observed by either the small boat crews or the sounding data in or around the marked channel. The sea floor is primarily mud or sand (soft bottom) throughout.

D.4 Aids to Navigation

Bechevin Bay Buoys 19, 20, and 22 were all relocated upon the findings of survey W00264 to better mark the channel and shoals. Bechevin Bay Buoy 1A was added to mark the shifting shoal discussed in Figure 7. USCG District 17 has been notified, Notice to Mariners has been issued and chart products have been updated for all buoy additions and changes.

D.5 Coast Pilot Information

The Hydrographer does not have recommendations for changes or addenda to the Coast Pilot.

D.6 Bottom Samples

Bottom samples were not conducted within the scope of this survey.

D.7 Environmental Conditions and Notes

No significant environmental conditions occurred during the survey with the exception of wave heights previously mentioned. The cutter weather logs do not accurately depict the wave heights in all areas of the survey due to the protected anchorage location of the cutter. The winds may be a better indication of the actual wave heights at the north entrance of Bechevin Bay. The majority of Bechevin Bay is well protected and not more than one foot was observed in most locations regardless of winds. Significant wave heights were noted in section B. 4. Data Processing.

D.8 Adequacy of Survey

This survey is considered complete and adequate to update the areas near and in the navigable channel through Bechevin Bay. Additional depths and features within the survey may be considered as reconnaissance and validation level data for areas previously charted.

D.9 Summary and Recommendations for Additional Work

Future patrol efforts in this area may benefit from multiple portable water level buoys or stations to increase the accuracy of surveys. Other than the relocation of buoys to better mark the channel, no changes significant to navigation have been noted and it is recommended that this survey receive normal processing priority.

E. APPROVAL

As Commanding Officer, I have ensured that standard field surveying and processing procedures were followed in producing this examination. I understand that these data are considered reconnaissance in nature until further validated by NOAA's Pacific Hydrographic Branch for survey quality in accordance with the Office of Coast Survey Hydrographic Surveys Division's *Field Procedures Manual*, and NOS *Hydrographic Surveys Specifications and Deliverables*. Field operations for this basic hydrographic survey were conducted under my daily supervision with frequent checks of progress and adequacy.

This Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to N/CS34, Pacific Hydrographic Branch.

The Data Acquisition and Processing Report for S-Q922-USCG-13 sheet W00264 is submitted in Appendix VI and contains additional information relevant to this survey.

Approved and Forwarded:

SLOAN.JOHN.RICHARD.1291627419
Digitally signed by SLOAN.JOHN.RICHARD.1291627419
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USCG, cn=SLOAN.JOHN.RICHARD.1291627419
Date: 2013.09.10 07:36:58 -08'00'

LTJG John Sloan, USCG
Operations Officer

SCHALLIP.MICHELE.L.1078920811
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DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USCG, cn=SCHALLIP.MICHELE.L.1078920811
Reason: I am approving this document
Date: 2013.09.10 12:35:08 -08'00'

LCDR Michele Schallip, USCG
Commanding Officer

In addition, the following individual was also responsible for overseeing data acquisition and processing of this survey:

COBB.MICHAEL.B.1236377667
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DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USCG, cn=COBB.MICHAEL.B.1236377667
Date: 2013.09.09 10:08:21 -08'00'

BM1 Michael Cobb, USCG

APPROVAL PAGE

W00264

Data did not meet current specifications as determined by the OCS survey acceptance review process. The survey did not meet specifications mainly due to data gaps, bad navigation data, and bad positioning data . The survey will not be applied to NOAA charting products.

The following products will be sent to NGDC for archive:

- W00264_DR.pdf
- Processed survey data and records

The survey evaluation and verification has been conducted according to current OCS specifications and procedures.

MOEGLING.CRESCENT.H.1243992830
2014.01.10
14:30:35 -08'00'

Approved:_____

Crescent Moegling
Hydrographic Team Lead, Pacific Hydrographic Branch

The survey has not been approved for chart updates. The data will be archived at NGDC so that it can be made available for other uses.

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
Date: 2014.01.10 14:26:51 -08'00'

Approved:_____

Peter Holmberg
Acting Chief, Pacific Hydrographic Branch

Appendix I

Dangers to Navigation

-None reported

Appendix II

Survey Features Report

1. AWOIS Items

-none

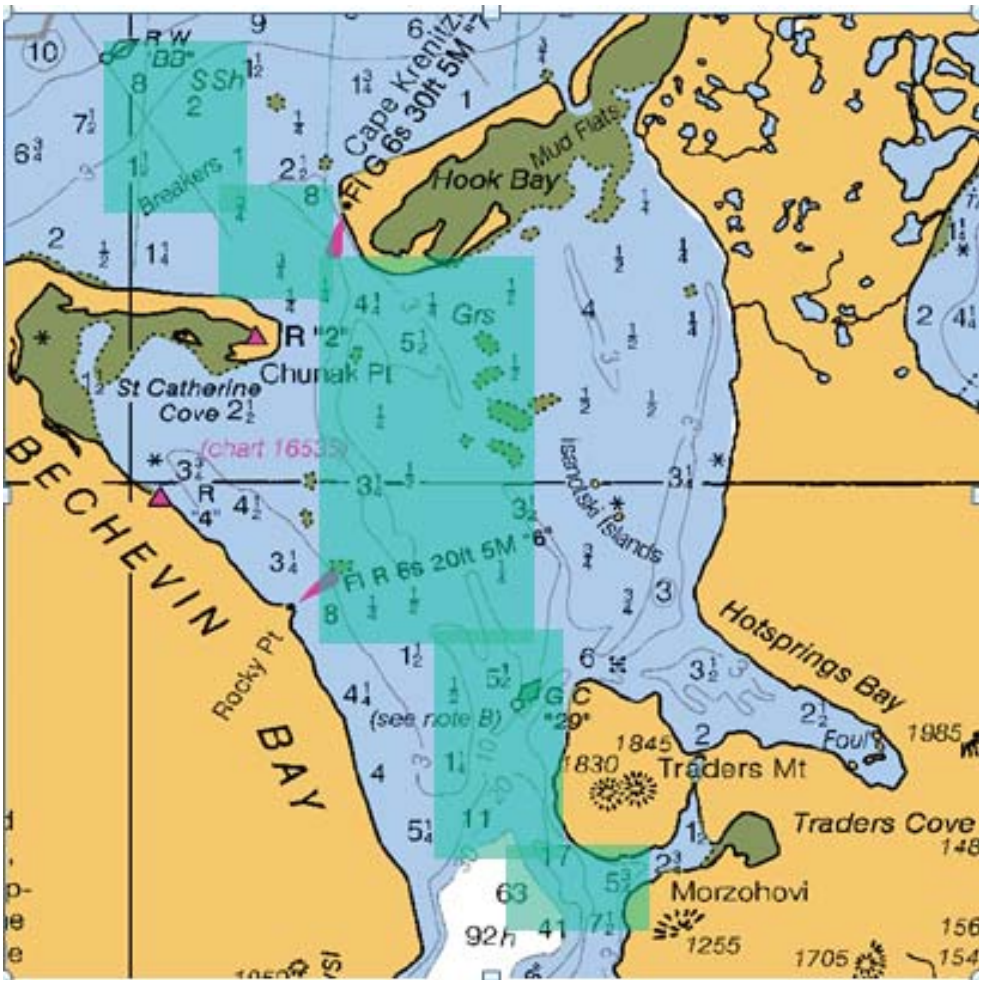
2. Charted Features

-none

3. Uncharted Features

-none

Appendix III



Progress Sketch

Appendix IV

Tides and Water Levels

1. Request for Approved Tides

-none

2. Final Tide Notes

-none

Appendix V

Supplemental Survey Records & Correspondence

-none

Appendix VI

Data Acquisition and Processing Report

DATA ACQUISITION & PROCESSING REPORT

Survey Year: 2013

Field Unit: USCGC SPAR (WLB-206)

Chief of Party: LCDR Michele L. Schallip

Lead Hydrographer: BM1 Michael B. Cobb

Date of most recent DAPR Completion: 26 August 2013

I. Introduction

Figure 1: USCGC SPAR (WLB 206) underway.

The USCGC SPAR is a 225-foot sea going buoy tender with a crew of 42 enlisted and 8 officers. The crew is divided into three departments who work together to form team SPAR (Deck, Operations/Support, and Engineering). The SPAR is a multi-mission cutter whose duties include: maintenance of aids to navigation, search and rescue, maritime law enforcement, marine environmental protection and homeland security. The cutter's primary missions are maintaining aids to navigation along the Aleutian Island Chain and Search and Rescue, but is able to meet any demands from District 17 Command to serve anyplace in Alaskan waters. SPAR uses a commercial single beam survey program to assist in marking best water for navigation. In 2012 SPAR began acquiring and processing bathymetric soundings for hydrography which meet specifications to support NOAA's Office of Coast Survey with Alaskan charting needs.

II. Equipment

A. Vessels

1. USCGC SPAR (WLB-206)

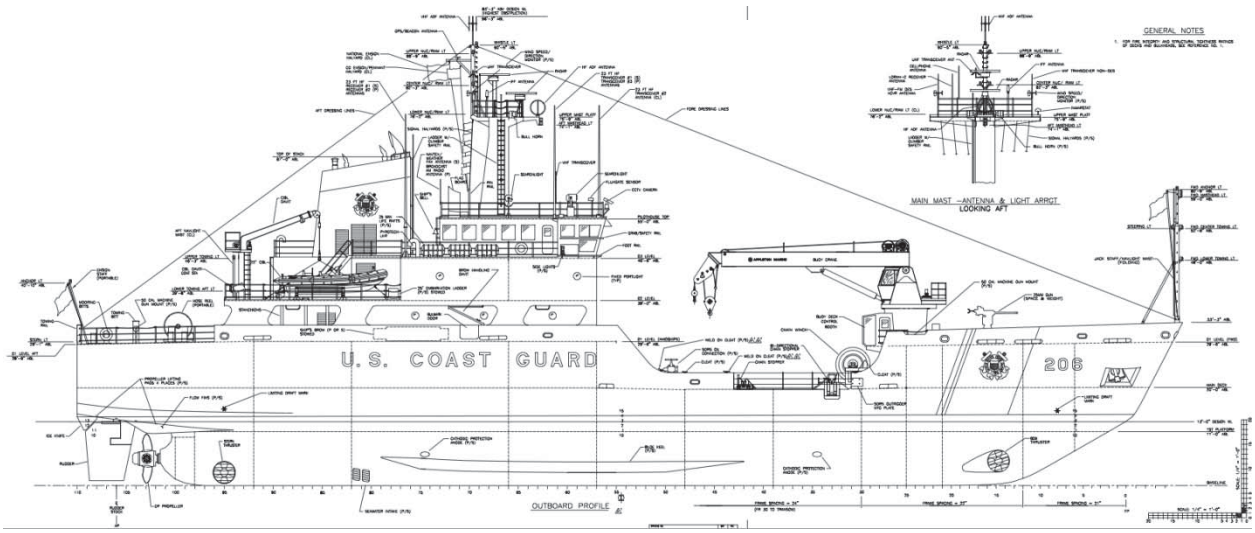


Figure 2: USCGC SPAR (WLB 206)

The CGC SPAR, a *Juniper*-class cutter (WLB), was designed to replace the 180-foot Seagoing Buoy Tender. There are two classes of 225' WLBs and SPAR is a B-Class vessel (hulls 206-216 built and commissioned between 2001 and 2004). The cutter is 225 feet long, 46 foot beam, and commands a 13 foot draft. Vessel endurance is 21 days un-replenished and 45 days replenished. The vessel displaces 2000 long tons at full load, runs two Caterpillar 3608 engines, and is rated to reach 6000 nautical miles at 12 knots.

2. SPAR 1 (24228)

SPAR 1 is a 24-foot Cutter Boat Large (Figure 3) used for survey, patrol, and general vessel operations. The small boat was made in 2010 by Aluminum Chambered Boats and is 24 foot in length, 9 foot beam, and draws a 14-inch draft. For survey operations, this vessel requires a crew of 2-3 personnel including a ship authorized coxswain and engineer at minimum. SPAR 1 carries 25 gallons of fuel and can survey for 4 hours at survey speeds (8-12 knots) un-replenished. The 230 HP Cummins Mercruiser engine powers SPAR 1 up to a maximum transit speed of 30.

Figure 3: SPAR 1, a 24-foot multipurpose small boat carried aboard USCGC SPAR.

3. SPAR 2 (236607)

SPAR 2 is a 23-foot utility boat (Figure 4) utilized for survey and general vessel operations. The small boat was made in 2001 by Metal-shark Incorporated and is 23 feet in length, 9 foot beam, and draws a 20-inch draft. For survey operations, this vessel requires a crew of 2-3 personnel including a ship authorized coxswain and engineer at minimum. SPAR 2 carries 100 gallons of fuel and can survey for 12 hours at survey speeds (8-12 knots). A Volvo Penta engine powers SPAR II to a maximum transit speed of 30.

Figure 4: SPAR 2, a 23-foot utility boat carried aboard USCGC SPAR.

B. Positioning Systems

1. USCGC SPAR (WLB-206)

SPAR uses a MX-Marine MX420 GPS receiver, coupled with a Raven Model # 063-0171-924 GPS antenna and a MX-Marine/Leica MX-525 DGPS beacon receiver to acquire positions with a rated accuracy of 2 meters or better 95% of the time when within range of a DGPS beacon. When not in range of DGPS beacon positions have a rated accuracy of 5 meters 95% of the time. SPAR technicians configure NMEA 0183 output sentences (GGA and VTG) which broadcast from the GPS Positioning System and are logged in the acquisition software HYPACK. Onboard, this equipment is utilized for positioning aids to navigation and the CAPN's Program Navigation Software. The DGPS unit is configured in auto mode to pick up the closest DGPS beacons for correctors. SPAR GPS units undergo quality assurance testing ISO 9001 from the Electronics Repair Facility in Baltimore, MD. Unit technicians verify proper operation by performing a System Operation Verification Test (SOVT) that has been prepared by the Command, Control, and Communication Engineering Center (C3CEN) in Portsmouth, VA.

Figure 5: MX420 GPS receiver left (S/N 00805337) and MX-525 DGPS receiver right (S/N 0340-13002-0114)

2. SPAR 1 (24228)

SPAR 1 uses a Furuno GP-37 GPS/DGPS Chart Plotter (S/N 4429-2485), coupled with a Furuno Model # GPA 019 GPS antenna (S/N 031835), to acquire positions with a rated accuracy of 5 meters or better 95% of the time when within range of a DGPS beacon. When not in range of a DGPS, GPS beacon positions have a rated accuracy of 10 meters 95% of the time. SPAR technicians configure NMEA 0183 output sentences (GGA and VTG) which broadcast from the Furuno RDP-149 chart plotter (S/N 4323-4026) and are logged in the acquisition software HYPACK. The DGPS unit is configured in auto mode to pick up the closest DGPS beacons for correctors. This GPS unit undergoes the same quality assurance testing as described above.

Figure 6: Furuno GP-37 GPS/ DGPS Chart Plotter w/ Furuno RD-30 repeater mounted above plotter.

3. SPAR 2 (236607)

SPAR 2 uses a Furuno GP-1850WF GPS Chart Plotter (S/N 3480-4426), coupled with a Furuno Model # GPA-019 GPS/DGPS H-Field antenna (S/N illegible) to acquire positions with a rated accuracy of 10 meters or better 95% of the time. Furuno GP-1850WF GPS Chart Plotter is not DGPS ready. SPAR technicians configure NMEA 0183 output sentences (GGA and VTG) which broadcast from the Furuno chart plotter (S/N 3480-4426) and are logged in the acquisition software HYPACK. This GPS unit undergoes the same quality assurance testing as described above.

Figure 7: Furuno GP-1850WF GPS Chart Plotter

C. Bathymetric Measurement

1. USCGC SPAR (WLB-206)

For bathymetric measurements, the USCGC SPAR uses a hull mounted Furuno 520-5MSD transducer controlled by a Furuno DFF1 Transceiver unit (S/N 8856-4659) which collects raw datagrams and transmits NMEA DBT messages to the bridge Furuno RDP 149/1934C plotter (Figure 7, below) and the HYPACK acquisition machine through a Noland Engineering DX28 NMEA Expander.

Figure 8: Furuno RDP 149/1934C plotter (S/N 4323-3869) left and Furuno 520-5MSD transducer (S/N Unknown) right

The hull mounted vertical beam echo sounder (VBES) transducer operates at two frequencies, LF- 50kHz (46 degree beam angle) and HF-200kHz (10 degree beam angle), and is rated to depths around 1200 feet. The VBES is located near centerline of the vessel one foot aft of frame 57. This unit is a repairable item through Surface Forces Logistics Center's (SFLC) mandatory turn in process. The repairable item is quality assured (QA) to ISO 9001 standards. Upon installation, the system will undergo the SOVT by onboard technicians. SPAR used a lead line to compare with the hull mounted VBES to verify transducer measurements. See Section IV.D for latest comparison results.

2. SPAR 1 (24228)

For bathymetric survey, SPAR1 uses a Airmar Smart Sensor P/N: 44-036-1-02, 235khz single-frequency transducer (14 degree cone at -3dB, 19 degree cone at -6dB, 24 degree cone at -10dB) which supplies the RDP-149 with depth data (see Airmar Technical Data Catalog 17-278-255 rev. 02) The Airmar Smart Sensor is broadcast through the same GPS Furuno chart plotter with the added NMEA 0183 output message DPT. The hull mounted vertical beam (VBES) transducer is rated to depths around 1200 feet. The transducer is located aft of the vessel and starboard of centerline. It is mounted at an approximate 20 degree angle to starboard. A lead line comparison has not yet been conducted. See Section IV.D for latest comparison results.

Figure 9: Airmar Smart Sensor Transducer

3. SPAR 2 (236607)

For bathymetric survey, SPAR2 uses a Furuno (Airmar) plastic mount transducer Model # 525STID-PWD (S/N none), which is broadcast through a Furuno GPS chart plotter with the added NMEA 0183 output message DPT. The hull mounted vertical beam (VBES) transducer operates at two frequencies, LF- 50kHz (45 degree cone at -3dB, 69 degree cone at -6dB, 94 degree cone at -10dB) and HF-200kHz (11 degree cone at -3dB, 16 degree cone at -6dB, 21 degree cone at -10dB) , and is rated to depths around 1200 feet. The transducer is located aft of the vessel and starboard of centerline. A lead line comparison has not yet been conducted. See Section IV.D for latest comparison results.

Figure 10: Airmar plastic mount transducer

D. Sound Speed Measurement

Several sound speed casts were collected during the 2013 season with a Teledyne ODOM DIGIBAR on loan from NOAA Ship *Fairweather* (S/N 98013). The DIGIBAR unit was last calibrated at the manufacturer on 17 April 2009. Sound speed cast comparisons were conducted with a recently calibrated Seabird SBE 19plus on *Fairweather* 9 May 2013, prior to use on SPAR. The cast values agreed within 2 m/s to verify the DIGIBAR's performance.

Figure 11: DIGIBAR setup image from manufacturer materials.

E. Computers and Software

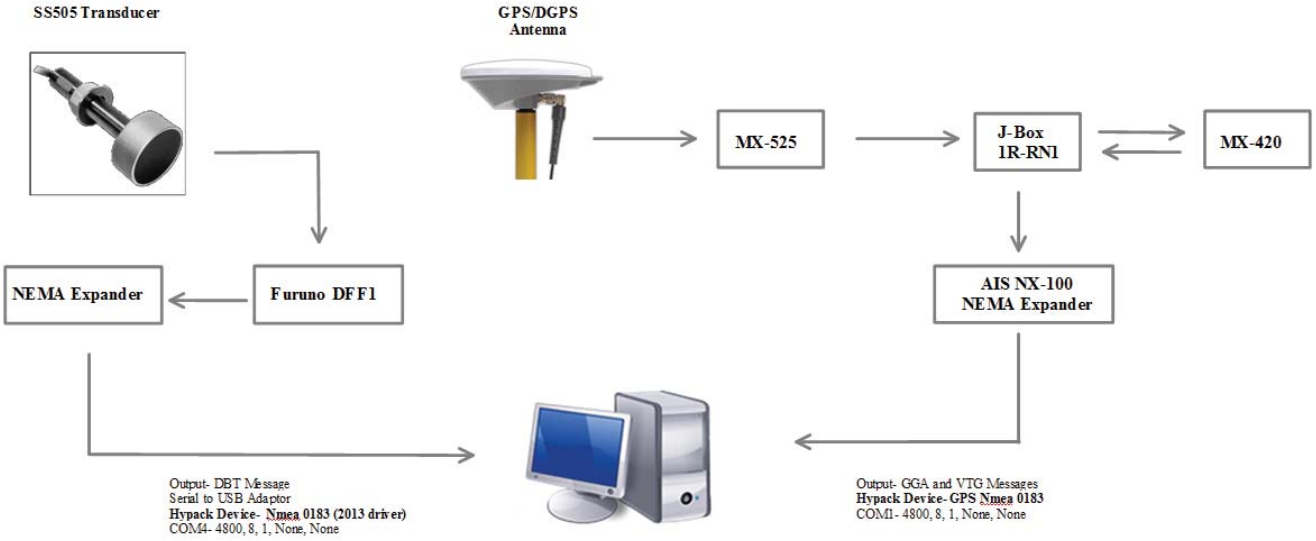
Positioning and bathymetric data logged as NMEA messages on all three vessels are recorded by Windows XP Service Pack 3 machines in HYPACK 2013 (Version 13.0.0.6) as HYPACK raw files. SPAR acquires data on the DellPC which also serves as the processing computer, while SPAR 1 and SPAR 2 acquire data on Panasonic ToughBook ruggedized computers. Due to hardware difficulties, one of SPAR's two ToughBook CF-18s was not in use for the Bechevin Bay project. A NOAA Ship *Fairweather* CF-19 was utilized instead to supplement SPAR's survey capabilities. Details of all seven computers listed below.

1. Computers

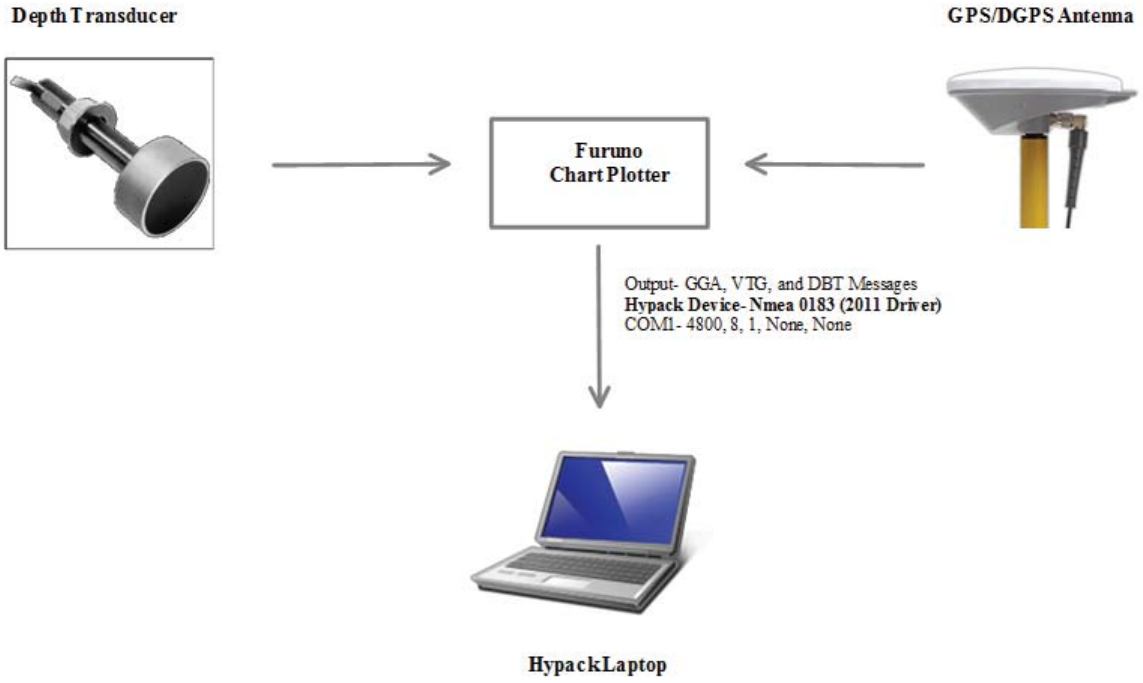
SPAR 1 Panasonic CF-18 ToughBook (S/N: 6BKSB73972)
SPAR 1 Backup (*as of 28JUN13*) Panasonic CF-31 ToughBook (S/N 1DKYB65077)
SPAR 2 *(fixed as of 28JUN13)* Panasonic CF-18 ToughBook (S/N: 6BKSB72785)
SPAR 2*(temp for Bechevin trip)* NOAA Panasonic CF-19 ToughBook (S/N: 9AKSB42381)
SPAR 2 Backup (*as of 28JUN13*) Panasonic CF-31 ToughBook (S/N 1IKYB82660)
SPAR *(acq. and processing)*- Dell Optiplex 960 (S/N: 28049100697)
HYPACK BACKUP (as of 28JUN13) Panasonic CF -19 ToughBook (S/N 3CKSB12594)

2. Wiring Diagrams

USCGC SPAR



SPAR 1 and SPAR 2 Wiring Diagram



III. Quality Control

A. Data Acquisition

For the majority of VBES data collection, manual adjustments of sonar properties are not needed. However, when crossing varying depth areas, changes in range and gain are made to ensure quality bathymetric data. SPAR 1 and SPAR 2 vessel speeds are restricted during data acquisition to 8-12 kts. CGC SPAR is limited in speed by its max speed of 16 KTS. The Lead Hydrographer or electronics division complete pre-survey checks of acquisition computers to verify HYPACK project setup for hardware settings (correct devices and messages logged), geodesy, and survey planning files (charts, line, border, and target files). During survey, either a member of the electronics department, or boat crew, verify that the appropriate NMEA sentences are coming through HYPACK Survey for GGA, VTG, and DBT. The crew member responsible for data acquisition must ensure appropriate logging of sounding data, speed, COG, and position or must otherwise contact the Lead Hydrographer for direction. Note – Data is collected, analyzed and submitted for review in US survey Foot units due to Buoy Tender operational requirement.

B. Data Processing

Data Processing conducted within HYPACK Max aboard CGC SPAR is strictly for use by CGC SPAR for waterway analysis. A systematic approach to tracking data has been developed by Lead Hydrographer BM1 Michael Cobb to maintain data quality and integrity. BM1 Cobb established Standard Operating Procedures (SOPs) and implemented a HYPACK data collection logbook to identify and track the flow of data as it is collected and processed. Before processing, a tide file (*.tdx) is created using the closest tide station available. Tides are applied for buoy tender operations, *.raw files will be sent to NOAA Pacific Hydrographic Branch (PHB) for final processing. After tides and offsets have been applied to the data, soundings are filtered out that have an HDOP higher than 4 or were collected at a speed greater than 12 kts for the small boats. Speed is limited to decrease the effect of cavitation across the transducer and to provide a consistent draft of the small boat to avoid rising up on plane. The sounding data is then cleaned of suspected erroneous depths or bad GPS positions. The final processed data is sorted by a 140 ft radius to create the .xyz overlays in HYPACK for CG navigation purposes.

C. Static Draft

Draft marks for SPAR are read by small boat and entered into the ship's log whenever possible. When collecting VBES data with SPAR, those draft readings are also passed along to the Lead Hydrographer to update the vessel offsets for the project. Draft measurements for SPAR 1 and SPAR 2 are measured when the small boats are alongside in calm seas using either a plumb line or other weighted measuring device. See Section IV.A for latest vessel measurements.

IV. Corrections to Echo Soundings

A. Draft/Waterline Measurements

Waterline measurements were taken for SPAR 1 and SPAR 2 on June 19, 2013 by BM1 Cobb.

B. Offset Measurements

All offset measurements below are relative to HYPACK Coordinate System (Z-Axis positive down, Y- Axis positive forward/bow, and X-Axis positive starboard to the reference point.) As none of the 3 SPAR vessels has a motion-measuring device, the origins (Reference Points) for the vessels listed below are at the static waterline, directly above the transducers per HYPACK direction. All offsets are measured from the sensor device to the origin (reference point).

1. USCGC SPAR (WLB-206)

Offsets for CGC Spar were measured on 25JUN13 by BM1 Cobb. Measurements were conducted utilizing ships drawings and a metal measuring tape with uncertainty estimated at 8-10 inches. The echo sounder transducer is located 10 inches to port of centerline, one foot aft of frame 57 and flush mounted with the hull. The GPS antenna is 4’8” starboard of centerline, 25’ 6” aft of frame 57 and 79’1.5” above the keel as measured to the base of the antenna.

The average waterline was 12’6” above the keel as calculated from draft readings from the first half of the arctic patrol including prior to and after fueling. Max average draft observed was 12’10.5” and minimum average draft observed was 12’1.5”. Average readings were calculated by averaging the fore and aft drafts observed which reasonably approximates the draft at the transducer. The transducer lies about amidships longitudinally on the vessel.

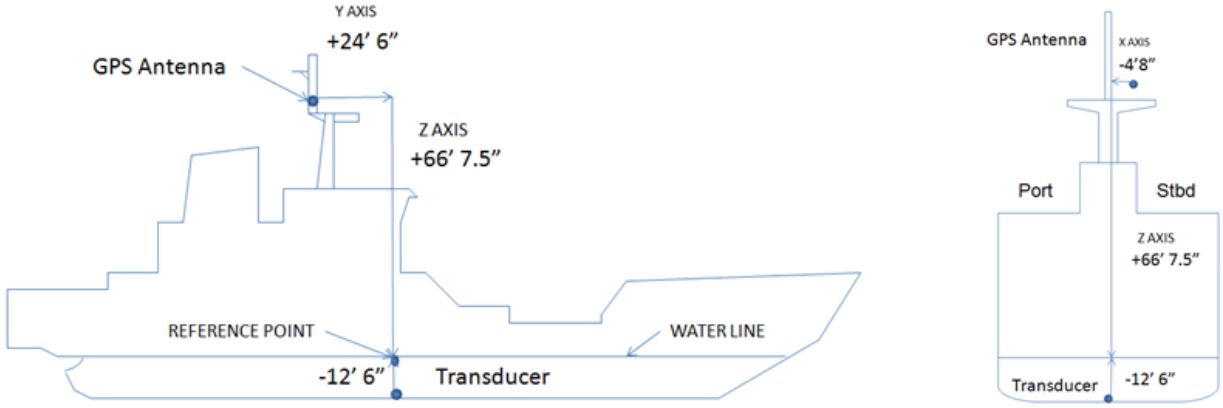


Figure 12: Vessel offsets to the reference point (RP) Z-Axis positive down, Y- Axis positive forward/bow, and X-Axis positive starboard.

GPS Antenna to RP	Offsets (feet)
X-Axis	-4.66’
Y-Axis	24.5’
Z-Axis	66.625’

Transducer to RP	Offsets (feet)
X-Axis	0’
Y-Axis	0’
Z-Axis	-12.5’

2. SPAR 1 (24228)

Offsets for SPAR 1 were measured on 17 May 2013 by ET1 Berno Atalig and CST Tami Beduhn, NOAA. Measurements were conducted utilizing a plumb-line and fiberglass tape measure with uncertainty of measurements estimated at 2-4 inches.

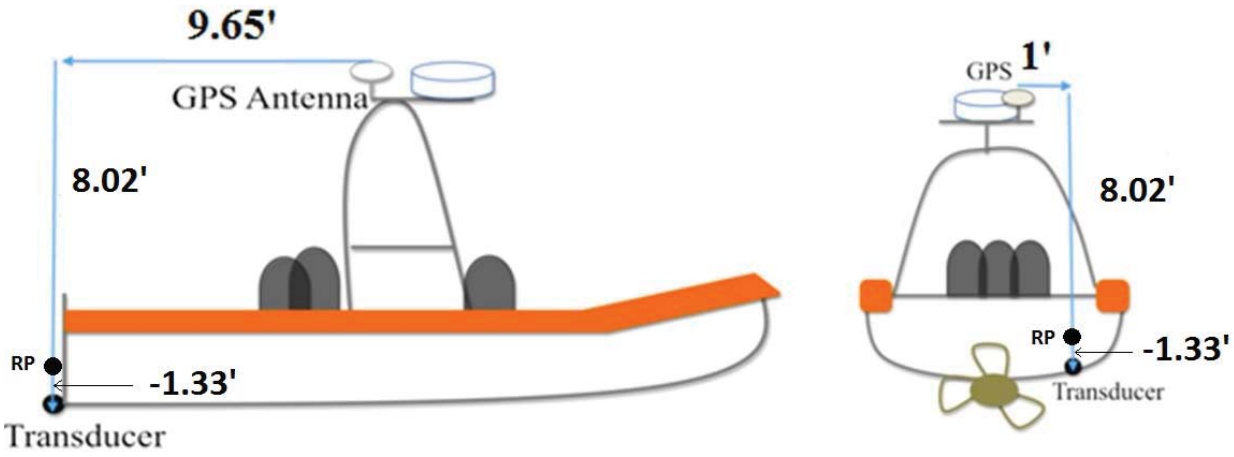


Figure 13: SPAR1 measurements between the GPS antenna and depth sounder in feet.

Waterline measurements were combined with the offset measurements above to create the offsets for use in HYPACK below. At the time of this report the measurement from the waterline to the transducer is an estimate, measured in the cradle aboard CGC SPAR with an uncertainty of 2 inches.

GPS Antenna to RP	Offsets (feet)
X-Axis	1’
Y-Axis	-9.65’
Z-Axis	8.02’

Transducer to RP	Offsets (feet)
X-Axis	0’
Y-Axis	0’
Z-Axis	-1.33’

3. SPAR 2 (236607)

Offsets for SPAR 2 were measured on 17 May 2013 by ET1 Berno Atalig, USCG and CST Tami Beduhn, NOAA. Measurements were conducted utilizing a plumb-line and fiberglass tape measure with uncertainty of measurements estimated at 2-4 inches.

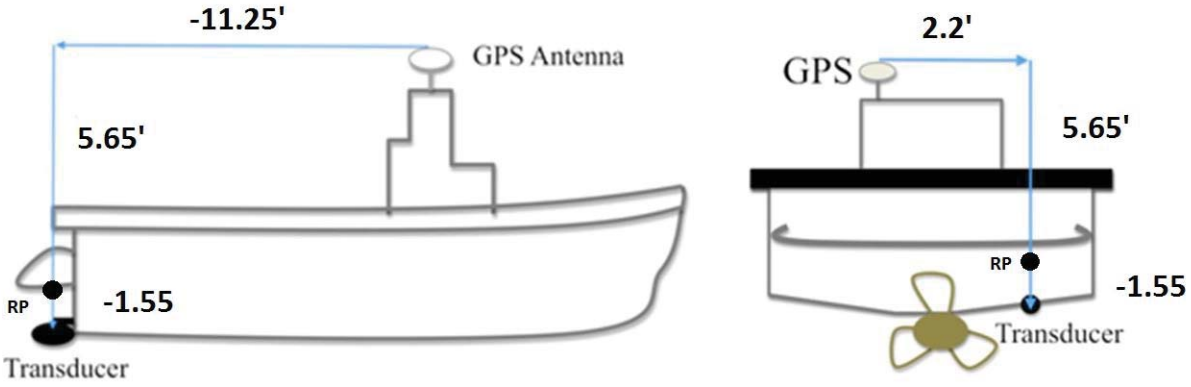


Figure 14: SPAR1 measurements between the GPS antenna and depth sounder in feet.

Waterline measurements were combined with the offset measurements above to create the offsets for use in HYPACK below.

GPS Antenna to RP	Offsets (feet)
X-Axis	2.2’
Y-Axis	-11.25’
Z-Axis	5.65’

Transducer to RP	Offsets (feet)
X-Axis	0’
Y-Axis	0’
Z-Axis	-1.55’

C. Timing Results

Latency tests were conducted on CGC SPAR on 24 July 2013. Latency test was conducted in Unalaska Bay north of Hog Island at 6 kts and 12 kts. The time difference between the two data acquisition lines was 13 minutes for the 6 knot latency test and 34 minutes for the 12 knot latency test. Due to the difficulty of running exact tracklines over one another and the uneven/rocky bottom, the latency timing was evaluated where the two data acquisition lines crossed one another. The lines used to evaluate the latency are SPAR_2013SP2050638.raw and SPAR_2013SP2050712.raw at 12 knots and SPAR_2013SP2050648.raw and SPAR_2013SP2050701.raw at 6 knots. The latency was found to be -1.4 seconds at both speeds.

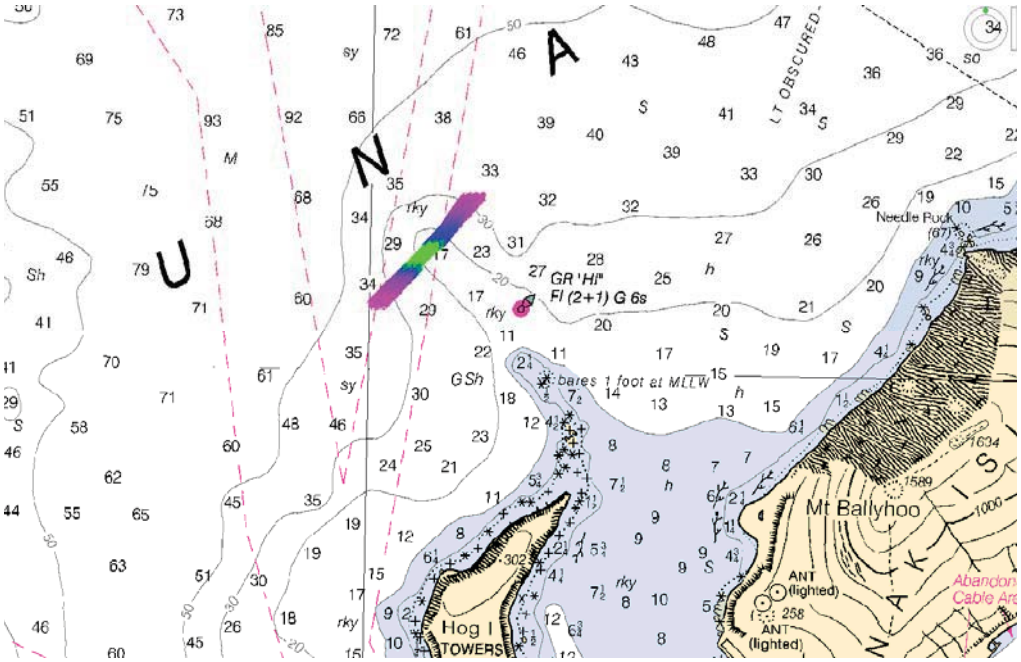


Figure 12: CGC SPAR latency data acquisition lines.

Latency tests were conducted on SPAR 2 on 25 July 2013. Latency test was conducted in Iliuliuk Harbor at 6 kts. The time difference between the two data acquisition lines was one minute. Due to the difficulty of running exact tracklines over one another and the uneven/rocky bottom, the latency timing was evaluated where the two data acquisition lines converged within 6 feet of one another. The lines used to evaluate the latency are SPAR2_2013__2061740.raw and SPAR2_2013__2061740.raw. The latency was found to be 0.8 seconds.

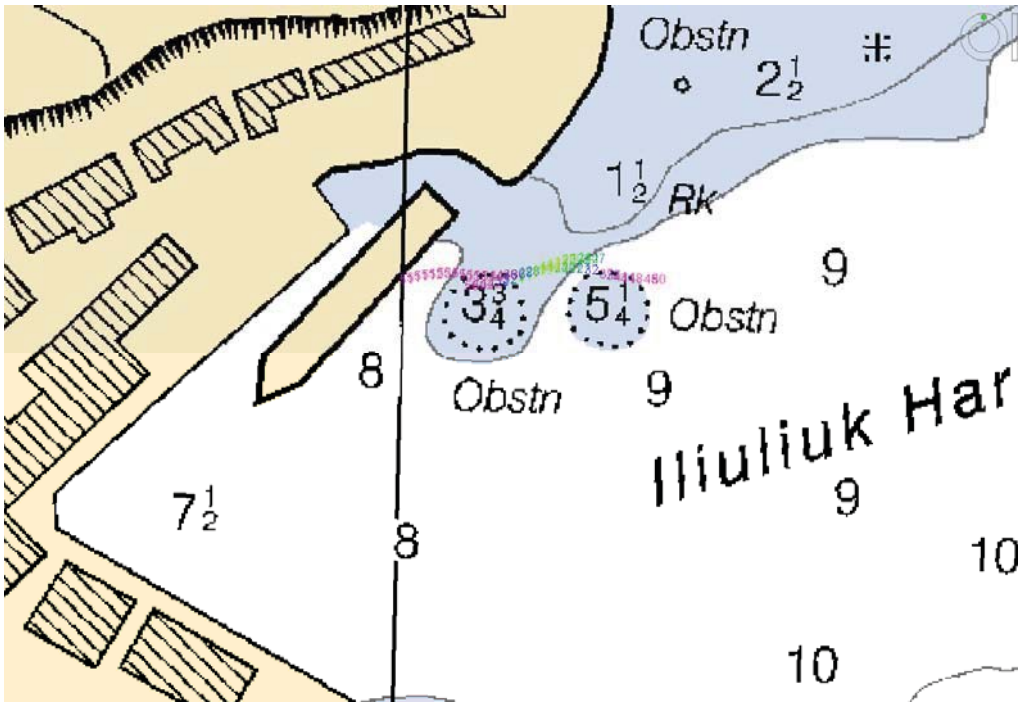


Figure 12: SPAR 2 latency data acquisition lines.

Latency testing was not conducted on SPAR 1.

Vessel Latency Results	Time (seconds)
CGC SPAR	-1.4
SPAR 2	0.8

D. Physical Depth Comparison

1. USCGC SPAR (WLB-206)

A lead line comparison was done in Traders Cove of Bechevin Bay 14 May 2013 by ENS Paul Milliken, Cadet Anthony Monteforte, and CST Tami Beduhn, NOAA. The lead line measured depth from the waterline to the seafloor was 41.375 feet. The echo sounder reading (28.2 feet) plus ship's designed draft (13.0 feet) provided a measured depth of 41.2 feet. Therefore the difference between the echo sounded depth and lead line value was within 2.1 inches.

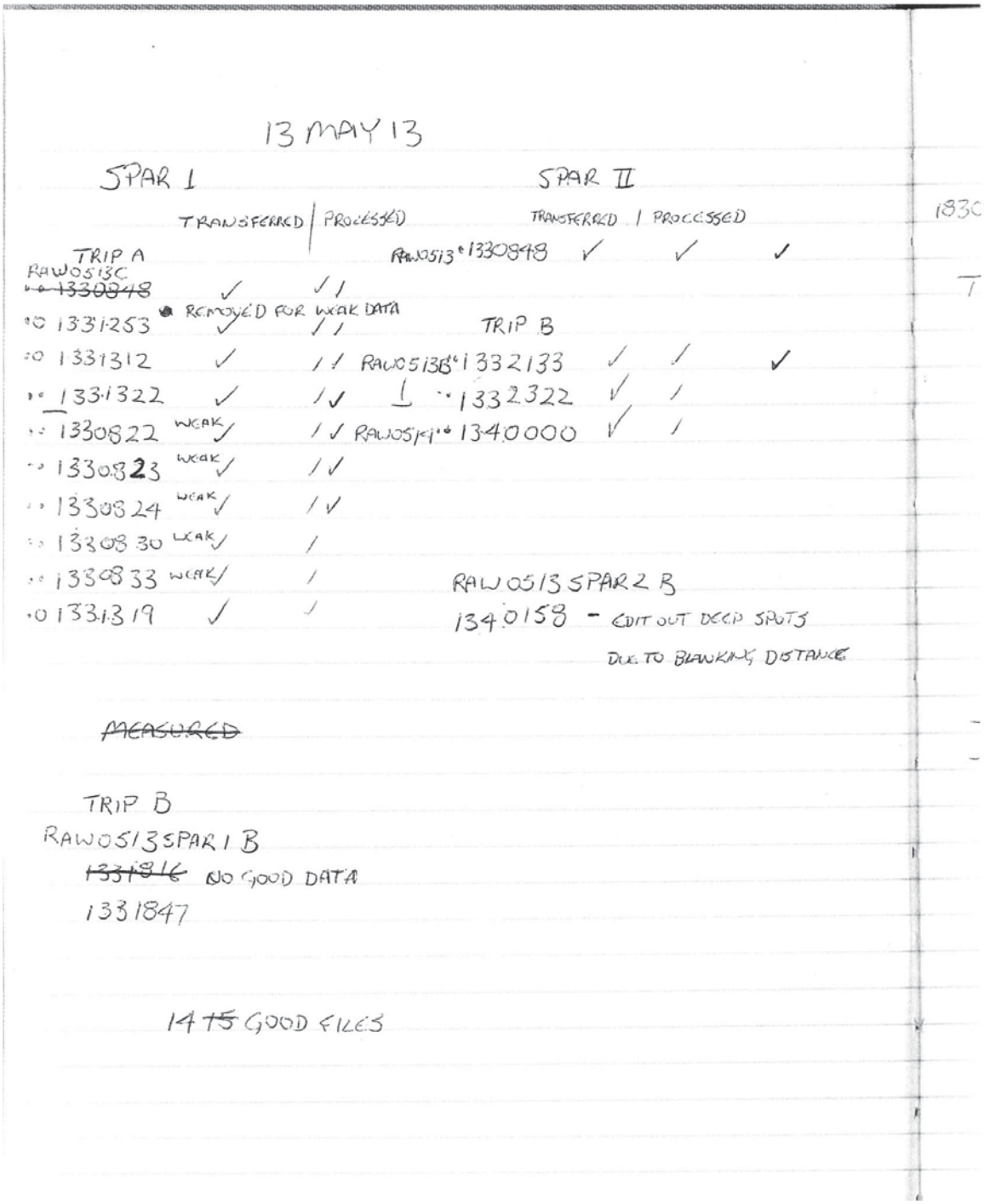
2. SPAR 1 (24228) and SPAR 2 (236607)

Lead line comparisons not currently available.

Appendix VII

Survey Logs

Below are data acquisition and processing logs. Notes include all files collected, corrupted files and tide processing data.



13 MAY 13

SPAR I

	TRANSFERRED	PROCESSED
TRIP A		
RAW0513C ~~1330848~~	✓	✓
1331253	✓	✓
1331312	✓	✓
1331322	✓	✓
1330822 WEAK	✓	✓
1330823 WEAK	✓	✓
1330824 WEAK	✓	✓
1330830 WEAK	✓	✓
1330833 WEAK	✓	✓
1331319	✓	✓

REMOVED FOR WEAK DATA

SPAR II

	TRANSFERRED	PROCESSED	
RAW0513 1330848	✓	✓	✓
TRIP B			
RAW0513B 1332133	✓	✓	✓
1332322	✓	✓	
RAW0514 1340000	✓	✓	

RAW0513 SPAR 2 B
1340158 - EDIT OUT DEEP SPOTS DUE TO BLANKING DISTANCE

~~MEASURED~~

TRIP B
RAW0513SPAR 1 B
~~1331816~~ NO GOOD DATA
1331847

14 ~~15~~ GOOD FILES

13MAY13

1830 LEAD LINE MEASURED 41'4.5" / SOUNDER ~~28.2~~ ~~28.2~~ FT

TIDE TABLE - USCD BECH TIDES 13MAY.XLSX

TABLE COMPARES ISANOTSKI STRAIT AND ST. CATHERINE COVE PREDICTED TIDES TO OBSERVED TIDES AT BOAT ANCHORAGE IN POSITION 54.357 N 163 19.329 W. ~~[illegible]~~ OBSERVED TIDES WERE CALCULATED BY FATHOMETER + SHIPS DRAFT - DEPTH FOUND BY HYPACK SOUNDINGS FOUND. SHIP PLOTTED AT 37' DEPTH FOR FIRST DAY'S DEPTHS. ADDED 1 FOOT FOR SMALL BOAT OFFSET. ADDED 1 FOOT TO BETTER LINE UP WITH PREDICTED TIDES FOR COMPARISON.

WISHLIST
- TIDE BUOYS
- HEAVE SENSOR

15 MAY

TRIP A
SPAR 1
1351644
1351849

TRIP A
SPAR 2
1351633 - DELETE 1K FILE
1351635 - DELETE 1K FILE
1351636
1351847

PROCESS W/ 15MAY UTC TIDES

TRIP B
SPAR1
✓1352049
~~1352057~~ - BAD FILE & DATA POOR
~~1352141~~ - WILL NOT LOAD
✓1352306

TRIP B
SPAR 11
1352051
1352215
1352307

PROCESS W/ 16 MAY UTC TIDES
1360000
1360002

16MAY
SPAR 1
~~1370143~~ - TROUBLESHOOTING
1370229 - ROUGH SEAS, PARTIALLY GOOD, DELETED HALF OF FILE OUT OF PROCESS DATA, PROCESS W/ 17MAY UTC TIDES

15 MAY

TRIP A
SPAR 1
1351644
1351819

TRIP A
SPAR 2
1351633 - DELETE 1K FILE
1351635 - DELETE 1K FILE
1351636
1351847

PROCESS W/ 15MAY UTC TIDES

TRIP B
SPAR1
✓1352049
~~1352057~~ - BAD FILE & DATA PAGE
~~1352141~~ - WILL NOT LOAD
✓1352306

TRIP B
SPAR 11
1352051
1352215
1352307

PROCESS W/ 16 MAY UTC TIDES
1360000
1360002

16MAY
SPAR 1
~~1370143~~ - TROUBLESHOOTING
1370229 - ROUGH SEAS. PART FULL GOOD. DELETED HALF OF FILE OUT OF PROCESS DATA. PROCESS W/ 17MAY UTC TIDES

17 MAY

SPAR I
NO DATA

SPAR II
1371794
1371850
1371905

PROCESS W/ 17MAY UTC TIDES

18 MAY

SPAR I
NONE

SPAR II
1381703
1381717 - (3 TO 4 FT SEAS OCC. 6-7 SCREEN GRAB
1381803 - "

PROCESS W/ 18 MAY UTC TIDES

SPAR II B RUN
1390231
1390247
1390347
1390435

Appendix VIII

Anchor Logs

Date	Geographic Location	Position	Depth (beneath keel)	Bottom Type
13 May 2013	Traders Cove	54-54.499N 163-19.938N	25 FT	N/A
17 May 2013	S. of Hook Bay	55-02.314N 163-24.280W	44FT	N/A

Appendix IX

Weather Logs

VESSEL: USCGC SPAR (WLB-206) | DAY: MONDAY | DATE(DDMMMYY): 13MAY13 | ZONE DESCRIPTION: +8 UNIFORM

1. WEATHER OBSERVATIONS

TIME	DISTANCE TRAVELED MILES	DISTANCE TRAVELED TENTHS	WINDS IF ESTIMATED DIRECTION (TRUE)	WINDS IF ESTIMATED FORCE (KNOTS)	VISIBILITY (MILES)	WEATHER (SYMBOLS)	BAROMETER (INCHES) SEA LEVEL	TEMPERATURE DRY BULB	TEMPERATURE WET BULB	CLOUDS AMOUNT (Tenths)	CLOUDS TYPE	SEA WATER TEMP (Degrees)	ICECONDITION AMOUNT (Tenths)	ICECONDITION TYPE	ICECONDITION ICE THICKNESS (Feet)	SEA WAVES DIRECTION (True)	SEA WAVES HEIGHT (Feet)	SWELL WAVES DIRECTION (True)	SWELL WAVES HEIGHT (Feet)
01	5	5	359	8	10	CLR	29.71	35	78	0	NA	38				0	0	0	0
02	4	1	330	23	10	CLR	29.70	32	86	0	NA	38				0	0	0	0
03	5	3	342	25	10	CLR	29.69	32	92	0	NA	38				310	1	310	2
04	5	7	008	28	10	CLR	29.68	33	95	0	NA	38				310	1	310	2
05	5	7	320	22	10	CLR	29.69	32	96	0	NA	38				310	1	310	2
06	6	1	327	16	10	SCT	29.71	33	97	3	SC	37				0	0	325	1
07	5	5	340	20	10	SCT	29.72	32	97	3	SC	37				0	0	325	1
08	5	3	018	9	10	SCT	29.72	34	97	2	SC	37				0	0	345	1
09	5	6	357	30	2	SCT	29.70	32	94	1	SC	37				010	1	0	0
10	2	6	348	26	5	BKN	29.73	31	92	9	CU	37				010	1	0	0
11	0	1	347	25	5	OVC	29.74	31	93	10	CU	37				320	1	0	0
12	0	1	354	21	5	OVC	29.74	32	93	10	CU	37				320	1	0	0
13	0	0	350	22	10	SCT	29.75	32	93	5	CU	37				320	1	0	0
14	0	0	351	24	10	SCT	29.75	33	93	5	CU	37				320	1	0	0
15	0	0	348	20	8	BKN	29.77	33	93	9	CU	37				320	1	0	0
16	0	0	347	19	8	OVC	29.77	33	93	10	CU	37				320	1	0	0
17	0	0	349	20	10	BKN	29.76	33	92	7	CU	37				320	1	0	0
18	0	0	352	18	10	BKN	29.77	33	92	9	CU	37				320	1	0	0
19	0	0	343	18	10	BKN	29.77	33	91	9	CU	37				323	1	0	0
20	0	0	007	4	10	SCT	29.77	34	91	5	CU	37				320	1	0	0
21	0	0	015	12	10	SCT	29.77	34	91	5	CU	37				330	1	0	0
22	0	0	338	16	10	SCT	29.77	34	91	5	CU	37				330	1	0	0
23	0	0	008	12	10	OVC	29.78	33	91	10	CU	38				310	1	0	0
24	0	0	354	15	10	OVC	29.79	32	92	10	CU	38				310	1	0	0
TOTAL	51	6																	

VESSEL: USCGC SPAR (WLB-206) | DAY: TUESDAY | DATE(DDMMMYY): 14MAY13 | ZONE DESCRIPTION: +8 UNIFORM

1. WEATHER OBSERVATIONS

TIME	DISTANCE TRAVELED MILES	DISTANCE TRAVELED TENTHS	WINDS IF ESTIMATED DIRECTION (TRUE)	WINDS IF ESTIMATED FORCE (KNOTS)	VISIBILITY (MILES)	WEATHER (SYMBOLS)	BAROMETER (INCHES) SEA LEVEL	TEMPERATURE DRY BULB	TEMPERATURE WET BULB	CLOUDS AMOUNT (Tenths)	CLOUDS TYPE	SEA WATER TEMP (Degrees)	ICECONDITION AMOUNT (Tenths)	ICECONDITION TYPE	ICECONDITION ICE THICKNESS (Feet)	SEA WAVES DIRECTION (True)	SEA WAVES HEIGHT (Feet)	SWELL WAVES DIRECTION (True)	SWELL WAVES HEIGHT (Feet)
01	0	0	336	17	10	BKN	29.79	32	92	7	NS	37				330	1	0	0
02	0	0	335	12	10	BKN	29.80	33	92	7	NS	38				330	1	0	0
03	0	0	Direction True		10	BKN	29.79	32	92	7	NS	37				330	1	0	0
04	0	0	359	9	10	BKN	29.80	32	91	6	ST	37				0	0	0	0
05	0	0	333	12	10	BKN	29.79	32	90	9	ST	37				0	0	0	0
06	0	0	345	12	10	BKN	29.80	31	89	9	ST	37				0	0	0	0
07	0	0	343	10	10	OVC	29.79	31	89	10	ST	37				0	0	0	0
08	0	0	344	12	10	OVC	29.78	32	88	10	NS	37				0	0	0	0
09	0	0	322	9	10	OVC	29.80	32	88	10	NS	37				0	0	0	0
10	0	0	333	13	10	OVC	29.80	31	88	10	NS	37				0	0	0	0
11	0	0	330	11	10	OVC	29.78	32	88	10	ST	38				0	0	0	0
12	0	0	340	14	10	OVC	29.78	32	88	10	ST	37				0	0	0	0
13	0	0	326	11	10	OVC	29.78	33	88	10	ST	38				0	0	0	0
14	0	0	322	14	10	OVC	29.76	33	87	10	ST	37				0	0	0	0
15	0	0	332	11	10	BKN	29.76	33	87	8	CU	38				0	0	0	0
16	0	0	331	17	10	BKN	29.74	33	86	8	CU	38				0	0	0	0
17	0	0	325	18	10	BKN	29.71	34	86	7	CU	38				0	0	0	0
18	0	0	315	15	10	BKN	29.71	35	86	7	CU	38				0	0	0	0
19	0	0	332	15	10	BKN	29.68	36	86	7	CU	38				0	0	0	0
20	0	0	335	16	10	BKN	29.68	34	85	7	CU	38				0	0	0	0
21	0	0	345	13	10	BKN	29.68	34	85	7	CU	38				0	0	0	0
22	0	0	353	10	10	BKN	29.67	34	86	8	CU	38				0	0	0	0
23	0	0	337	8	10	OVC	29.68	33	86	10	CU	38				0	0	0	0
24	0	0	340	10	10	OVC	29.67	33	87	10	CU	38				0	0	0	0

VESSEL: USCGC SPAR (WLB-206) | DAY: WEDNESDAY | DATE(DDMMMYY): 15MAY13 | ZONE DESCRIPTION: +8 UNIFORM

1. WEATHER OBSERVATIONS

TIME	DISTANCE TRAVELED MILES	DISTANCE TRAVELED TENTHS	WINDS IF ESTIMATED DIRECTION (TRUE)	WINDS IF ESTIMATED FORCE (KNOTS)	VISIBILITY (MILES)	WEATHER (SYMBOLS)	BAROMETER (INCHES) SEA LEVEL	TEMPERATURE DRY BULB	TEMPERATURE WET BULB	CLOUDS AMOUNT (Tenths)	CLOUDS TYPE	SEA WATER TEMP (Degrees)	ICE/CONDITION AMOUNT (Tenths)	ICE/CONDITION TYPE	ICE/CONDITION ICE THICKNESS (Feet)	SEA WAVES DIRECTION (True)	SEA WAVES HEIGHT (Feet)	SWELL WAVES DIRECTION (True)	SWELL WAVES HEIGHT (Feet)
01	0.0		322	10	10	OVC	29.66	32	87	10	NS	38				0	0	0	0
02	0.0		340	9	10	OVC	29.64	32	88	10	NS	38				0	0	0	0
03	0.0		330	8	10	OVC	29.63	32	88	10	NS	38				0	0	0	0
04	0.0		356	7	10	OVC	29.62	32	89	10	ST	38				0	0	0	0
05	0.0		346	13	10	OVC	29.61	32	89	10	ST	38				0	0	0	0
06	0.0		336	14	10	OVC	29.60	32	89	10	ST	38				0	0	0	0
07	0.0		350	10	5	OVC	29.60	32	89	10	ST	38				0	0	0	0
08	0.0		034	2	5	OVC	29.60	33	90	10	ST	38				0	0	0	0
09	0.5		332	11	5	OVC/S	29.59	32	90	10	NS	38				0	0	0	0
10	3.9		288	11	5	OVC/F	29.59	32	91	10	NS	37				0	0	0	0
11	1.2		339	9	5	OVC/F/S	29.62	33	92	10	NS	38				0	0	0	0
12	0.1		349	11	5	OVC/F/S	29.60	33	93	10	NS	38				0	0	0	0
13	0.1		351	9	4	OVC/F/S	29.60	35	93	10	NS	38				0	0	0	0
14	0.1		046	04	6	OVC	29.60	35	93	10	NS	38				0	0	0	0
15	0.2		021	15	6	OVC	29.60	35	93	10	NS	38				0	0	0	0
16	0.1		011	17	6	OVC	29.62	35	93	10	NS	39				0	0	0	0
17	0.1		349	15	6	OVC	29.61	35	93	10	NS	39				0	0	0	0
18	0.1		360	14	6	OVC	29.62	37	93	10	NS	39				0	0	0	0
19	0.4		005	12	6	OVC	29.62	34	92	10	NS	38				0	0	0	0
20	0.4		357	11	6	OVC	29.62	35	90	10	NS	38				0	0	0	0
21	0.2		354	9	6	OVC	29.65	35	89	10	NS	38				0	0	0	0
22	0.9		002	14	6	OVC	29.65	38	85	10	NS	38				0	0	0	0
23	0.2		342	17	6	OVC	29.65	35	85	10	NS	38				0	0	0	0
24	3.04		345	15	6	OVC	29.65	33	84	10	NS	38				0	0	0	0

VESSEL: USCGC SPAR (WLB-206) | DAY: THURSDAY | DATE(DDMMMYY): 16MAY13 | ZONE DESCRIPTION: +8 UNIFORM

1. WEATHER OBSERVATIONS

TIME	DISTANCE TRAVELED MILES	DISTANCE TRAVELED TENTHS	WINDS IF ESTIMATED DIRECTION (TRUE)	WINDS IF ESTIMATED FORCE (KNOTS)	VISIBILITY (MILES)	WEATHER (SYMBOLS)	BAROMETER (INCHES) SEA LEVEL	TEMPERATURE DRY BULB	TEMPERATURE WET BULB	CLOUDS AMOUNT (Tenths)	CLOUDS TYPE	SEA WATER TEMP (Degrees)	ICE/CONDITION AMOUNT (Tenths)	ICE/CONDITION TYPE	ICE/CONDITION ICE THICKNESS (Feet)	SEA WAVES DIRECTION (True)	SEA WAVES HEIGHT (Feet)	SWELL WAVES DIRECTION (True)	SWELL WAVES HEIGHT (Feet)
01	0.0		347	19	10	OVC	29.68	32	86	10	NS	38				0	0	0	0
02	0.0		345	18	10	OVC	29.69	32	87	10	NS	38				0	0	0	0
03	0.0		350	18	10	OVC	29.69	32	88	10	NS	38				0	0	0	0
04	0.0		357	19	10	OVC	29.70	31	88	10	ST	38				0	0	0	0
05	0.0		334	20	10	OVC	29.70	30	88	10	ST	38				0	0	0	0
06	0.0		343	22	10	OVC	29.71	30	87	10	ST	38				333	1	0	0
07	0.0		333	19	10	BKN	29.73	30	85	9	ST	38				333	1	0	0
08	0.0		347	25	10	BKN	29.74	30	84	9	ST	38				333	1	0	0
09	0.0		330	20	10	BKN	29.74	30	84	9	ST	38				333	1	0	0
10	0.0		344	17	10	BKN	29.77	31	84	9	ST	37				0	0	0	0
11	0.0		337	17	10	BKN	29.77	30	83	9	ST	37				0	0	0	0
12	0.0		324	18	10	OVC	29.78	30	83	10	ST	37				0	0	0	0
13	0.0		335	21	10	OVC	29.79	30	83	10	ST	37				0	0	0	0
14	0.0		331	20	10	OVC	29.80	31	83	10	ST	37				0	0	0	0
15	0.0		351	14	10	OVC	29.80	33	79	10	ST	38				335	3	0	0
16	0.0		333	17	10	OVC	29.80	34	79	10	ST	38				335	3	0	0
17	0.0		313	22	10	OVC	29.80	34	80	10	ST	38				335	3	0	0
18	0.0		300	19	10	OVC	29.79	35	80	8	ST	38				335	3	0	0
19	0.0		305	21	10	BKN	29.80	36	80	8	ST	38				289	3	0	0
20	0.0		303	23	10	BKN	29.80	36	80	8	ST	38				290	1	0	0
21	0.0		309	14	10	BKN	29.81	36	80	8	ST	38				290	1	0	0
22	0.0		301	21	10	BKN	29.82	36	79	7	ST	38				290	1	0	0
23	0.0		297	13	10	BKN	29.82	36	76	6	ST	38				290	1	0	0
24	0.0		294	18	10	BKN	29.82	36	79	8	ST	38				290	1	0	0

VESSEL: USCGC SPAR (WLB-206) | DAY: FRIDAY | DATE(DDMMMYY): 17MAY13 | ZONE DESCRIPTION: +8 UNIFORM

1. WEATHER OBSERVATIONS

TIME	DISTANCE TRAVELED MILES	DISTANCE TRAVELED TENTHS	WINDS IF ESTIMATED DIRECTION (TRUE)	WINDS IF ESTIMATED FORCE (KNOTS)	VISIBILITY (MILES)	WEATHER (SYMBOLS)	BAROMETER (INCHES) SEA LEVEL	TEMPERATURE DRY BULB	TEMPERATURE WET BULB	CLOUDS AMOUNT (Tenths)	CLOUDS TYPE	SEA WATER TEMP (Degrees)	ICE/CONDITION AMOUNT (Tenths)	ICE/CONDITION TYPE	ICE/CONDITION ICE THICKNESS (Feet)	SEA WAVES DIRECTION (True)	SEA WAVES HEIGHT (Feet)	SWELL WAVES DIRECTION (True)	SWELL WAVES HEIGHT (Feet)
01	0.0		280	23	10	OVC	29.83	37	79	10	ST	38				290	1	0	0
02	0.0		269	15	10	OVC	29.83	37	78	10	ST	38				265	1	0	0
03	0.0		239	14	10	OVC	29.82	38	76	10	ST	38				245	1	0	0
04	0.0		269	17	10	OVC	29.82	38	78	10	ST	38				250	1	0	0
05	0.0		280	17	10	OVC/R	29.82	37	80	10	ST	38				250	1	0	0
06	0.0		314	11	10	OVC/R	29.83	35	85	10	NS	38				270	1	0	0
07	0.0		062	12	04	OVC/S/F	29.86	33	88	10	NS	38				310	1	0	0
08	0.0		035	11	02	OVC/S/F	29.89	33	88	10	NS	38				0	0	0	0
09	0.0		355	9	03	OVS/S/F	29.91	33	91	10	NS	38				0	0	0	0
10	1.3		012	17	06	OVC/R	29.93	32	88	10	NS	37				355	01	0	0
11	4.7		026	14	10	OVC	29.94	33	86	10	NS	38				030	1	0	0
12	0.0		007	16	10	OVC	29.97	32	83	10	NS	38				030	1	0	0
13	0.3		346	14	10	OVC	30.00	31	81	10	NS	38				030	1	0	0
14	0.0		353	16	10	OVC	30.00	31	80	10	NS	38				030	1	0	0
15	0.0		347	18	10	OVC	30.03	30	78	10	NS	38				030	1	0	0
16	0.1		351	16	10	BKN	30.06	30	76	9	NS	38				010	1	0	0
17	0.0		008	16	10	BKN	30.06	30	78	9	NS	38				010	1	0	0
18	0.8		006	18	10	BKN	30.10	29	77	9	NS	37				010	1	0	0
19	0.2		005	19	10	BKN	30.11	29	76	9	NS	37				010	1	0	0
20	0.8		351	19	10	BKN	30.13	33	74	9	ST	37				0	0	0	0
21	0.8		348	10	10	BKN	30.16	29	71	9	ST	38				0	0	0	0
22	0.0		347	8	10	BKN	30.18	28	71	9	ST	38				0	0	0	0
23	0.0		009	8	10	BKN	30.19	28	70	8	ST	38				0	0	310	1
24	0.0		009	9	10	BKN	30.21	29	69	8	ST	38				0	0	0	0

VESSEL: USCGC SPAR (WLB-206) | DAY: SATURDAY | DATE(DDMMMYY): 18MAY13 | ZONE DESCRIPTION: +8 UNIFORM

1. WEATHER OBSERVATIONS

TIME	DISTANCE TRAVELED MILES	DISTANCE TRAVELED TENTHS	WINDS IF ESTIMATED DIRECTION (TRUE)	WINDS IF ESTIMATED FORCE (KNOTS)	VISIBILITY (MILES)	WEATHER (SYMBOLS)	BAROMETER (INCHES) SEA LEVEL	TEMPERATURE DRY BULB	TEMPERATURE WET BULB	CLOUDS AMOUNT (Tenths)	CLOUDS TYPE	SEA WATER TEMP (Degrees)	ICE/CONDITION AMOUNT (Tenths)	ICE/CONDITION TYPE	ICE/CONDITION ICE THICKNESS (Feet)	SEA WAVES DIRECTION (True)	SEA WAVES HEIGHT (Feet)	SWELL WAVES DIRECTION (True)	SWELL WAVES HEIGHT (Feet)
01	0.0		358	12	10	BKN	30.22	29	69	9	ST	38				0	0	0	0
02	0.0		353	11	10	BKN	30.24	29	69	9	ST	38				0	0	0	0
03	0.0		358	8	10	BKN	30.25	30	68	9	ST	38				0	0	0	0
04	0.0		350	6	10	BKN	30.26	30	68	8	ST	38				0	0	0	0
05	0.0		328	11	10	BKN	30.26	30	69	7	ST	38				0	0	0	0
06	0.0		289	10	10	SCT	30.28	30	69	6	ST	38				0	0	0	0
07	0.0		292	9	10	SCT	30.29	30	69	5	ST	38				0	0	0	0
08	0.0		285	3	10	SCT	30.30	31	70	4	ST	37				0	0	0	0
09	0.5		258	10	10	SCT	30.30	30	69	4	ST	37				0	0	0	0
10	0.6		235	4	10	SCT	30.33	33	68	4	ST	37				0	0	0	0
11	0.7		303	2	10	SCT	30.33	38	66	4	ST	38				0	0	0	0
12	0.5		200	2	10	SCT	30.33	35	65	4	ST	38				0	0	0	0
13	0.5		10	1	10	SCT	30.34	35	65	4	ST	38				0	0	0	0
14	0.7		100	5	10	SCT	30.34	36	64	3	ST	38				0	0	355	1
15	0.5		106	6	10	SCT	30.34	43	65	3	AS	38				0	0	0	0
16	0.0		164	10	10	SCT	30.34	37	65	4	ST	38				0	0	0	0
17	0.6		160	16	10	SCT	30.35	36	67	4	ST	38				0	0	0	0
18	0.0		165	12	10	SCT	30.34	37	69	4	SC	38				0	0	0	0
19	0.0		173	18	10	SCT	30.35	37	69	3	SC	38				0	0	0	0
20	0.0		172	15	10	SCT	30.37	38	71	3	SC	38				0	0	0	0
21	0.0		175	12	10	SCT	30.38	38	72	3	SC	38				0	0	0	0
22	0.0		175	18	10	SCT	30.41	39	75	3	SC	39				0	0	0	0
23	0.0		177	14	10	SCT	30.41	36	77	3	SC	39				0	0	0	0
24	0.0		173	17	10	SCT	30.41	36	77	3	SC	39				0	0	0	0

Appendix X

DRAFT READINGS

Draft readings were not taken on acquisition vessels. See the DAPR for vessel offset information. Surveying was not conducted with CGC SPAR for this project.

Appendix XI

Coast Pilot Recommendations

None.