H12520

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12520

LOCALITY

State(s):	Alaska
General Locality:	Bering Sea
Sub-locality:	7 NM NW of Red Dog Mine

2013

CHIEF OF PARTY
Marta Krynytzky

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAPHIC TITLE SHEET	**H12520**

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(s):	**Alaska**
General Locality:	**Bering Sea**
Sub-Locality:	**7 NM NW of Red Dog Mine**
Scale:	**40000**
Dates of Survey:	**07/19/2013 to 08/22/2013**
Instructions Dated:	**04/03/2013**
Project Number:	**OPR-S325-KR-13**
Field Unit:	**TerraSond Limited**
Chief of Party:	**Marta Krynytzky**
Soundings by:	**Multibeam Echosounder Singlebeam Echosounder**
Imagery by:	**Side Scan Sonar**
Verification by:	**Pacific Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

The purpose of this work is to provide NOAA with modern and accurate hydrographic survey data for the Approaches to Red Dog Mine, AK. Work was performed under contract DG133C-08-CQ-0005 by TerraSond Limited., 1617 South Industrial Way, Suite 3, Palmer, AK 99645. Tide support was provided by JOA Surveys, LLC, 2000 E. Dowling Rd., Suite 10, Anchorage, AK 99503.

Horizontal Coordinate System: UTM Zone 3N. The purpose of this survey is to provide contemporary survey to update National Ocean Service (NOS) charts. All separates are filed with the hydrographic data. Revisions and 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/. Compilation units is Meters at MLLW.

Table of Contents

A. Area Surveyed 1
A.1 Survey Limits 1
A.2 Survey Purpose 2
A.3 Survey Quality 3
A.4 Survey Coverage 4
A.5 Survey Statistics 6
B. Data Acquisition and Processing 7
B.1 Equipment and Vessels 7
B.1.1 Vessels 7
B.1.2 Equipment 8
B.2 Quality Control 8
B.2.1 Crosslines 8
B.2.2 Uncertainty 9
B.2.3 Junctions 11
B.2.4 Sonar QC Checks 12
B.2.5 Equipment Effectiveness 12
B.2.6 Factors Affecting Soundings 13
B.2.7 Sound Speed Methods 14
B.2.8 Coverage Equipment and Methods 15
B.3 Echo Sounding Corrections 16
B.3.1 Corrections to Echo Soundings 16
B.3.2 Calibrations 17
B.4 Backscatter 17
B.5 Data Processing 17
B.5.1 Software Updates 17
B.5.2 Surfaces 18
C. Vertical and Horizontal Control 19
C.1 Vertical Control 19
C.2 Horizontal Control 20
C.3 Additional Horizontal or Vertical Control Issues 20
3.3.1 Additional Issues 20
D. Results and Recommendations 21
D.1 Chart Comparison 21
D.1.1 Raster Charts 21
D.1.2 Electronic Navigational Charts 22
D.1.3 AWOIS Items 23
D.1.4 Maritime Boundary Points 23
D.1.5 Charted Features 23
D.1.6 Uncharted Features 23
D.1.7 Dangers to Navigation 23
D.1.8 Shoal and Hazardous Features 23
D.1.9 Channels 23
D.1.10 Bottom Samples 23

D.2 Additional Results..... 24
D.2.1 Shoreline..... 24
D.2.2 Prior Surveys..... 24
D.2.3 Aids to Navigation..... 24
D.2.4 Overhead Features..... 24
D.2.5 Submarine Features..... 24
D.2.6 Ferry Routes and Terminals..... 24
D.2.7 Platforms..... 24
D.2.8 Significant Features..... 24
D.2.9 Construction and Dredging..... 25
D.2.10 New Survey Recommendations..... 25
D.2.11 New Inset Recommendations..... 25
E. Approval Sheet..... 26
F. Table of Acronyms..... 27

List of Tables

Table 1: Survey Limits..... 1
Table 2: Hydrographic Survey Statistics..... 6
Table 3: Dates of Hydrography..... 7
Table 4: Vessels Used..... 7
Table 5: Major Systems Used..... 8
Table 6: Survey Specific Sound Speed TPU Values..... 9
Table 7: Junctioning Surveys..... 11
Table 8: Submitted Surfaces..... 18
Table 9: NWLON Tide Stations..... 19
Table 10: Water Level Files (.tid)..... 19
Table 11: Tide Correctors (.zdf or .tc)..... 19
Table 12: CORS Base Stations..... 20
Table 13: User Installed Base Stations..... 20
Table 14: Largest Scale Raster Charts..... 21
Table 15: Largest Scale ENCs..... 22

List of Figures

Figure 2: Survey extents and overview..... 4
Figure 1: Image showing the conveyor structure at Red Dog dock, and ore barge. A freighter can be seen waiting offshore to receive the load..... 3
Figure 3: Survey Junctions with H12520 (orange)..... 11
Figure 4: Soundings from this survey (blue, fathoms) overlaid on the chart..... 22

Descriptive Report to Accompany Survey H12520

Project: OPR-S325-KR-13

Locality: Bering Sea

Sublocality: 7 NM NW of Red Dog Mine

Scale: 1:40000

July 2013 - August 2013

TerraSond Limited

Chief of Party: Marta Krynytzky

A. Area Surveyed

A navigable area survey (H12520) was conducted in the area 7 NM NW of Red Dog Mine, Alaska, in accordance with the NOAA, National Ocean Service, Statement of Work (SOW), OPR-S325-KR-13, dated April 5th, 2013 and Hydrographic Survey Project Instructions dated April 3rd, 2013. Hydrographic survey data collection began July 19th, 2013 and ended August 22nd, 2013.

Multibeam echosounder (MBES), side scan sonar (SSS), and single beam (SBES) operations were conducted in accordance with the project work instructions, which specified 200 meter (m) set line spacing SBES or MBES (with backscatter) from the inshore limit to 10m water depth, and 200% SSS with concurrent set line spacing SBES or MBES (with backscatter) for depths greater than 10 m.

The inshore limit was the farthest offshore of either the 3 m depth contour, or the line defined by the distance seaward from the MHW line which is equivalent to 0.8 mm at the scale of the largest scale nautical chart. The largest scale nautical chart, 16005, has a scale of 1:700,000, which places the navigational area limit line (NALL) 560 m offshore of the MHW line.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
67° 41" 9.19' N 164° 30" 50.31' W	67° 34" 11.41' N 164° 8" 36.97' W

Table 1: Survey Limits

The survey limit and inshore limits (farthest offshore of either the 3 m depth contour or the NALL) were met. Note that although the NALL was 560 meters offshore, the skiff worked inshore to the 3 m depth

contour since the near-shore area was determined to be navigable by shallow drafted vessels. The 3 m contour (which was found to be within 30-50 m of the MHW line on average) was achieved for the most part, except in rare instances when swell made it unsafe to approach the beach closer.

A.2 Survey Purpose

The purpose of this project is to provide an updated survey for the approaches to Red Dog Mine. It addresses approximately 29 square nautical miles (SQNM) of area identified as “Critical” and “Priority 2” in the 2012 NOAA Hydrographic Survey Priorities (NHSP) document. The best scale chart at the time of this survey (16005) is 1:700,000, with extremely sparse soundings, and is not suitable for navigating the area.

The area is located on the relatively shallow and flat expanse of the Chukchi Sea coastal area. Wind has a greater effect on water levels than tides, which vary daily by less than 1 m. Features were rare, consisting primarily of ice scours and associated sediment piles that seldom produce more than a half meter of elevation above the seafloor. Slope is flat to gentle, increasing as the shore is approached.

This arctic area is ice-bound for the majority of the year, with the ice-free season typically only extending from July through October. The nearby mine, operated by Teck Resources Limited, is one of the world’s largest zinc and lead mines, and accounts for 79% of U.S. zinc mine production, and 33% of U.S. lead mine production. Ore is mined and stored year-round, but can only be transported from the site during the limited ice-free season.

During the ice-free season, the area is frequented by freighters, which are loaded with the ore to be hauled to various ports worldwide. According to FedNav International, the company which currently has the contract to carry ore from Red Dog overseas, typical freighters that transit the area include Panamax (averaging 720 ft length, 106 ft beam, 47 ft draft loaded) and Handymax (averaging 623 ft. length, 106 ft. beam, 43 ft. draft). Rarely post-Panamax vessels have also loaded ore here (up to 753 ft. length, 121 ft. beam, 48 ft. draft).

Freighters currently anchor at least 3 NM offshore (to avoid entering State waters), and maintain at least 10 ft. under keel clearance. The ore is brought to the freighters and loaded by a barge and tug operation (currently operated by Foss Marine Holdings, Inc.). Barges are loaded at the Red Dog port with ore through a conveyor system installed on the dock.

Local vessel traffic is minimal in the area. During survey operations, skiffs were occasionally observed transiting through the survey area, closely following the beach. The nearby village of Kivalina (population 374) is just north of the survey area, and residents conduct subsistence activities along the coast.

The area is very exposed and open in all directions (except the northeast) to the Chukchi and Bering Seas as well as Kotzebue Sound. Storms are frequent and intense in the region, with no protected anchorages nearby suitable for vessels of any significant draft.

Figure 1: Image showing the conveyor structure at Red Dog dock, and ore barge. A freighter can be seen waiting offshore to receive the load.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

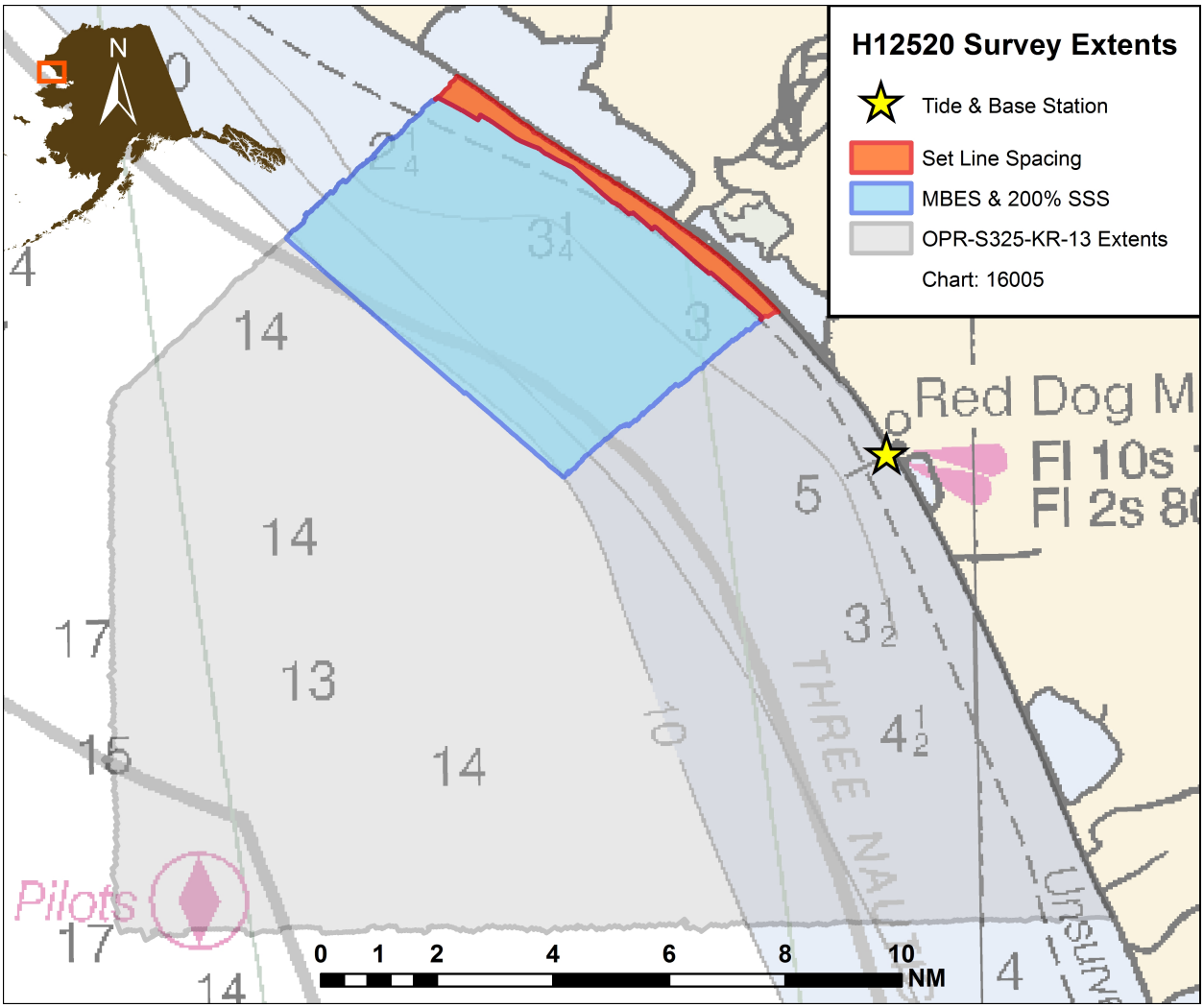


Figure 2: Survey extents and overview.

The 200 m set line spacing requirement for depths less than 10m were generally met. This depth area was primarily surveyed by skiff using SBES, though a small portion was surveyed with MBES. In isolated cases, lines may vary to slightly over 200 m apart in instances of line driving "wobble" when weather made line driving problematic.

The 200 % SSS requirements for depths greater than 10 m were generally met. Gaps in the 200 % coverages are extremely rare and, where they do occur, are small and along-track in nature, indicating possible short dropouts in SSS logging. These gaps received at least 100 % coverage of good quality from an adjacent pass. They also received partial to full coverage from the MBES system, which was run concurrently with SSS collection. Some larger gaps (up to 50 m in width) in the 200% SSS coverage on the north part of the survey that straddle the 10 m contour are attributable to change in depth following final tide corrections, which were

not available until after field operations had concluded. However, these larger gaps also received at least 100% SSS coverage of good quality and partial to full MBES coverage.

The concurrent (with SSS) set line spacing requirement for depths greater than 10 m requirement was met. MBES (with backscatter) data was logged simultaneously with all SSS data. Line spacing for SSS and MBES data was 100 m or 75 m, which coincided with the SSS range scale in use. Significant features evident in the SSS records were developed with the MBES system to “Object Detection” standards.

A.5 Survey Statistics

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

	Vessel	*Qualifier 105*	*Q15 Skiff*	*Total*
LNM	**SBES Mainscheme**	0	20.8	20.8
	MBES Mainscheme	4.1	0	4.1
	Lidar Mainscheme	0	0	0
	SSS Mainscheme	0	0	0
	SBES/MBES Combo Mainscheme	0	0	0
	SBES/SSS Combo Mainscheme	0	0	0
	MBES/SSS Combo Mainscheme	695.0	0	695
	SBES/MBES Combo Crosslines	53.6	5.8	59.4
	Lidar Crosslines	0	0	0
Number of Bottom Samples				5
Number AWOIS Items Investigated				0
Number Maritime Boundary Points Investigated				0
Number of DPs				0
Number of Items Items Investigated by Dive Ops				0
Total Number of SNM				28.6

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Julian Day Number
07/19/2013	200
07/21/2013	202
07/22/2013	203
07/23/2013	204
07/24/2013	205
08/09/2013	221
08/10/2013	222
08/16/2013	228
08/17/2013	229
08/22/2013	234

Table 3: Dates of Hydrography

The area surveyed was calculated to be 25 square nautical miles.

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	*Qualifier 105*	*Q15 Skiff*
LOA	32 meters	4.6 meters
Draft	1.8 meters	0.5 meters

Table 4: Vessels Used

The Qualifier 105 (Q105) is a steel-hulled vessel 32 m in length. It is owned and operated by Support Vessels of Alaska (SVA) of Homer, Alaska. It was chartered by TerraSond to serve as the primary platform for this survey. Among other equipment, it was outfitted with a pole-mounted MBES and towed SSS systems. It also housed staff and on-site processing, and performed bottom sample collection and tide operations.

The Q15 skiff is an aluminum skiff 4.6 m in length. It is also owned by SVA, but was operated by TerraSond. Among other equipment, it was outfitted with a pole-mounted SBES system. It was periodically deployed from the Q105 to collect SBES data in the shallower portions of the survey area.

B.1.2 Equipment

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

Manufacturer	Model	Type
Odom Hydrographic Systems	Echotrac CV100	SBES
Applanix	POSMV 320 V5	Positioning and Attitude System
AML Oceanographic	AML SV+	Sound Speed Profiler
Odom Hydrographic Systems	Digibar Pro	Sound Speed Profiler
Sea-Bird Electronics	SBE 26+	Submerged Tide Gauge
Trimble	5700	Positioning System (Q15 skiff)
Trimble	NETRS	Positioning System (Base Station)
Valeport	Rapid SVT 200Bar	Sound Speed Profiler
Oceanscience	Underway SV400	Sound Speed Deployment System

Table 5: Major Systems Used

Equipment configurations, operations, and data acquisition and processing are described in the DAPR.

A Reson Seabat 7101 (MBES) and an EdgeTech 4200 (SSS) were also used to acquire survey data.

B.2 Quality Control

B.2.1 Crosslines

Crosslines, acquired for this survey, totalled 8.25% of mainscheme acquisition.

Crosslines were collected to meet the 8% requirement for set-line spacing surveys described in the HSSD. Crosslines were evenly distributed across the project area, and effort was made to ensure crosslines from each vessel overlapped mainscheme lines from the other vessel. Note: SSS data was not required nor logged during crossline collection.

To evaluate crossline to mainscheme agreement, CARIS HIPS' crossline comparison (QC Report) function was utilized. In CARIS HIPS, a 4 m resolution BASE surface was created from mainscheme-only data for each vessel. Each crossline was then run through the QC Report process, which calculated the difference between accepted crossline soundings and the BASE surface (depth layer). Crosslines with at least 95% of soundings comparing to within IHO Order 1 were considered to "pass", while those with less than 95% of soundings comparing to within IHO Order 1 were considered to "fail".

Three combinations of the crossline comparisons were accomplished: First, the MBES crosslines were compared to the MBES mainscheme surface. Second, SBES crosslines were compared to the SBES mainscheme surface. And finally, as a check of agreement between separate vessels and survey systems, SBES crosslines were compared to the MBES mainscheme surface.

Agreement between mainscheme and crosslines is excellent for both vessels. The vast majority of crossline comparisons pass with 100% of soundings comparing to within IHO Order 1. The lowest percentage was 99.958%.

Refer to the project DAPR for more details concerning analysis methodology. Refer to Separate II: Digital Data for the detailed Crossline QC Reports.

B.2.2 Uncertainty

Hull ID	Measured - CTD	Measured - MVP	Surface
Qualifier 105	0 meters/second	2.426 meters/second	0.025 meters/second
Q15 Skiff	0 meters/second	2.426 meters/second	0 meters/second

Table 6: Survey Specific Sound Speed TPU Values

All soundings were assigned a horizontal and vertical value for estimated total propagated uncertainty (TPU). The parameters and methods used for computation of sounding uncertainty are detailed in the project DAPR, with two exceptions:

1. During TPU computation, an uncertainty of 2.426 m/s was entered for estimated sound speed error, based on an analysis of the variance in sound speed between profiles during this survey.
2. Line 0070_-_B02610 (Q105, JD202) had TPU computed using "Vessel Settings" instead of "Error Data". The SMRMSG file loaded into the line (Error Data) was causing unreasonable error estimates given the line's normal standard deviation and good matchup with adjacent lines.

The BASE surfaces were finalized in CARIS HIPS so that the final uncertainty value for the each grid cell is the greater of either standard deviation or uncertainty. The uncertainty layer of the final surface was then examined for areas of uncertainty that exceeded IHO Order 1.

Uncertainty for the SBES surface ranged from 0.22 to 0.33 m, with the majority between 0.20 and 0.25. Uncertainty for the MBES surface ranged from 0.09 to 0.56 m, with the majority between 0.15 and 0.20m. Few exceeded IHO Order 1. Highest uncertainties were found in the rare areas of changing bottom topography and on features where high standard deviations are common across the relatively large grid size (4m), and on the outer edges of swathes without adjacent overlap.

Given the amount of sound speed variance described in the DAPR (section A.3 states 12 m/s), the sound speed TPU value applied to the data (both the DAPR section B.3.5 & DR section B.2.2 states 2.426 m/s) is suspect and should be closer to the maximum variance stated in section A.3 of 12m/s.

B.2.3 Junctions

This survey junctions with two contemporary surveys, both of which were collected concurrent with this sheet.

The junctions were compared by creating a difference surface in CARIS HIPS using the 4 m resolution finalized BASE surfaces, extracting the difference for each grid cell, and computing statistics.

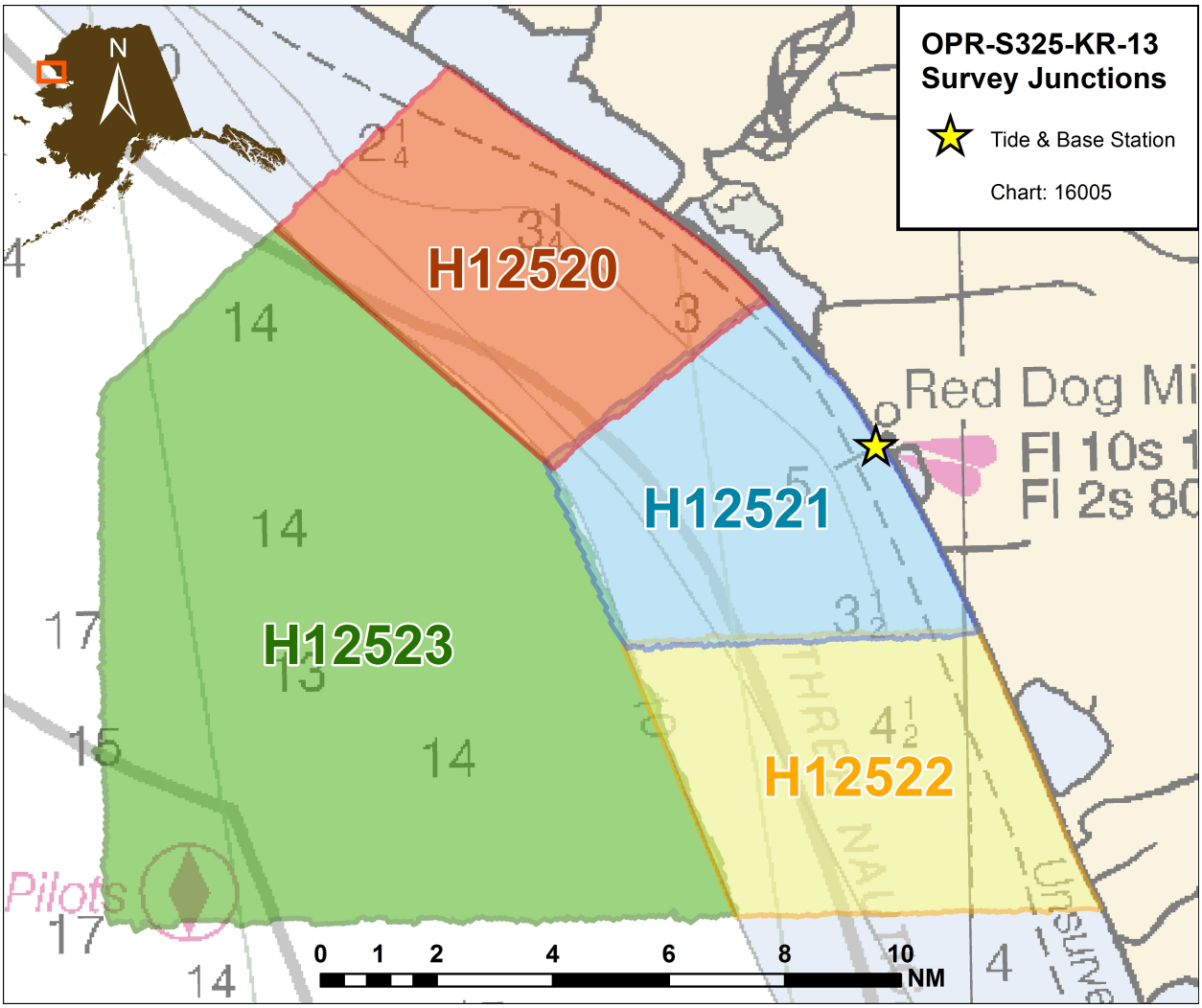


Figure 3: Survey Junctions with H12520 (orange).

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12521	1:40000	2013	Terrasond, Ltd.	SE
H12523	1:40000	2013	Terrasond, Ltd.	SW

Table 7: Junctioning Surveys

H12521

This survey and H12521 are in excellent agreement, with an average difference of 0.06 m (with a standard deviation of 0.10 m), and extremes of -0.461 m and 0.538m. Borderline IHO Order 1 differences were examined closer. The cause was found to be a gridding-related issue common on slopes with SBES, whereby grid cells can be assigned differing depth values due to where the soundings track across the cell (high end of the slope or low end of the slope). Despite the differences in the grid cells, the data is within specifications.

H12523

This survey and H12523 are in excellent agreement, with an average difference of 0.03 m (with a standard deviation of 0.07 m), and extremes of -0.45 m and 0.386 m. No differences exceeded IHO Order 1, and the data is within specifications.

B.2.4 Sonar QC Checks

Echosounder confidence checks consisting of bar checks, lead-lines, and acoustic comparisons were undertaken on this project. Checks occurred normally on a weekly basis.

Five bar checks were completed for the MBES system on the Q105, and one was completed for the SBES system on the Q15 skiff. Bar checks served as a check on both real-time as well as processed depth accuracy, and were also used to refine the sonar acoustic center offset. Results were very good, comparing on average to 0.05 m or better of the actual bar depth.

Six lead line comparisons were completed for the MBES system on the Q105, and one was completed for the SBES system on the Q15 skiff. Others were attempted but were unsuccessful due to current. Agreement varied from 0.01 m to 0.62 m, results which were deemed acceptable given the conditions and variables surrounding the lead line collection.

Effort was made in the field to ensure significant overlap was achieved between the independent echosounder systems on the two survey vessels (Q105 MBES and Q15 skiff SBES) for comparison purposes. The overlap area was examined in CARIS HIPS Subset mode to check matchup. Overall the two vessels show very good agreement with each other, usually comparing to 0.05 m or better.

Refer to the bar check and lead line logs available in Separate I: Acquisition and Processing Logs for specific results. Refer to the project DAPR for more information regarding the QC checks.

B.2.5 Equipment Effectiveness

Mount-related variable roll error

A small variable roll offset was discovered during field operations, affecting the MBES data on the Q105. The issue was apparent as an across-track misalignment when adjacent multibeam lines were viewed in

CARIS Subset Mode, indicating a change in the previously determined patch-test correction value for roll. The offset was found to be stable over short periods of time, indicating periodic movement in the multibeam mounting pole as the suspect, possibly as a result of fluctuations in hydraulic pressure or vessel hull flex. Because the error would shift to a new value and tend to stay at that value for hours or days, it was possible to largely correct for the issue in processing by making small adjustments to the roll calibration. The adjustments were determined by systematic review of overlapping swaths, using both mainscheme data as well as "roll-check" lines that were run in the field following discovery of the issue. These adjustments, which ranged from 0 to 0.11 degrees, were applied as error values to the "Roll" sensor in the CARIS HVF. Though the issue was largely resolved in processing, some artifact remains in the data negatively affecting the final surface by up to 0.20 m in places. Despite the issue, the data is within specifications. More information is available in Section C of the DAPR.

The data is adequate for charting despite the remaining roll artifact.

MBES beam pattern

A distinct beam pattern was obvious in the data set, with a fuzziness or "horn" like features on both sides of nadir on multibeam swaths, coinciding with the bottom detection shift from phase to amplitude detection. The pattern is common with Reson 8101/7101 multibeam sounders in certain bottom types. Power and range settings were adjusted in acquisition to minimize the issue, with little effect. However, the "horns", which can be as great as 0.20 m in height, appear to be largely ignored by the CUBE algorithm during surface creation, with minimal effect on the final surfaces.

The data is adequate for charting despite the remaining beam pattern artifact.

B.2.6 Factors Affecting Soundings

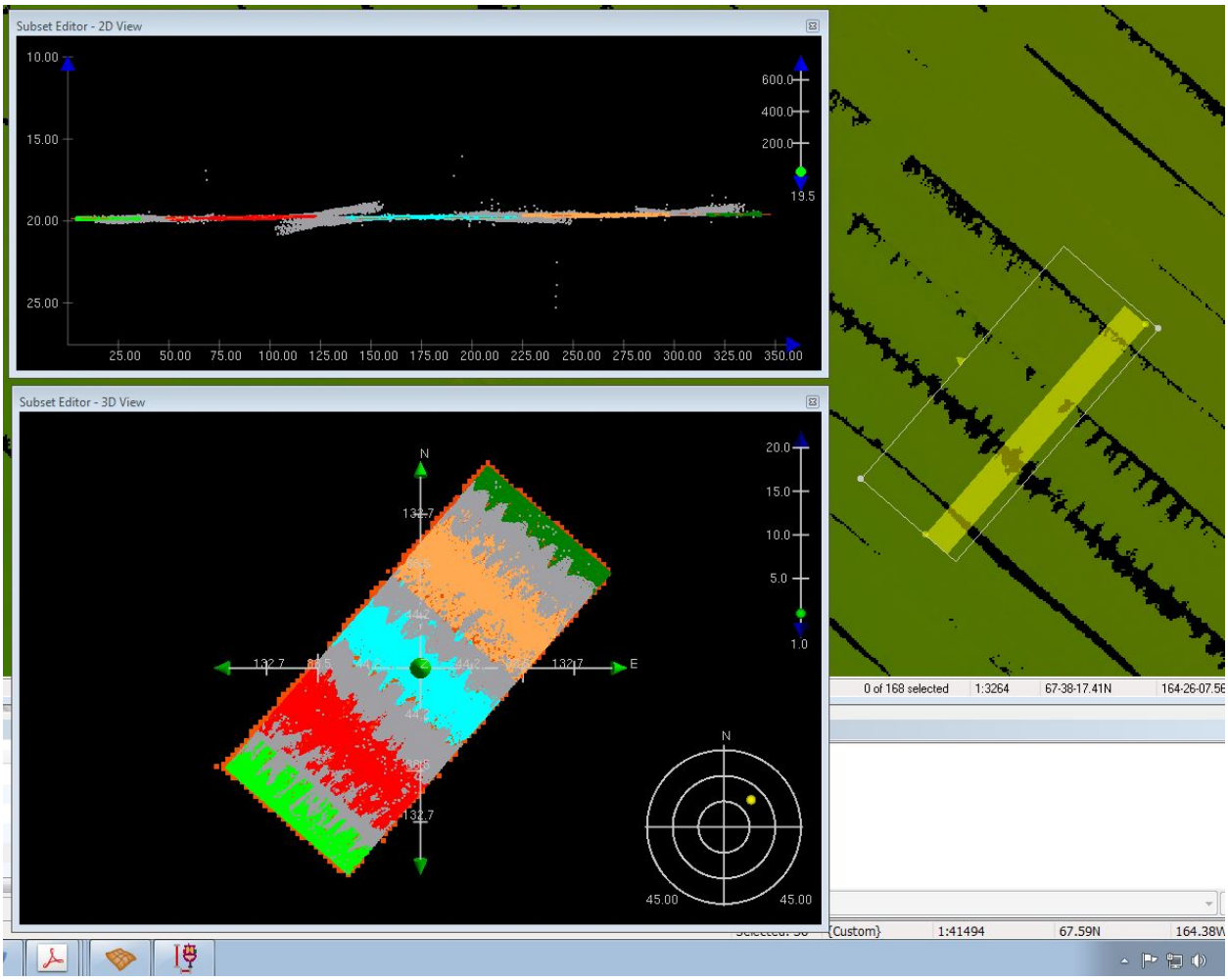
Sound speed error

High amounts of sound-speed stratification was apparent in the survey area, which had a negative effect on multibeam data quality. Layering with abrupt changes in sound speed over short depth intervals are evident in most of the profiles. This led to general downward or upward across-track cupping in multibeam data, indicative of sound speed error.

To limit the error, profile collection frequency was increased from 4 hours to 2 hours early in the project. As a set-line spacing survey without a complete coverage requirement, it was possible to filter lines to remove outer beams most affected by error, and then manually edit to further reject erroneous or borderline data that negatively affected the final surfaces. Lines in the western part of the survey area, which were most affected, also received reruns and infills at the end of the project over the most affected areas.

Following the methods described previously, the final surfaces are negatively affected by sound speed artifact on the order of 0.20 m in places. Despite the error, data is within specifications.

Filtering these outer beams resulted in good data (within spec) being rejected. Since this survey was a set-line spacing survey without a complete coverage requirement, and the artifact did not put the final surfaces out of spec (on the order of 0.20m in places) this was deemed acceptable.



H12520 rejected outer beams by filtering.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: 2 hours

Casts were taken with an Ocean Science Underway SV system, which utilized a Valeport sound speed profiler. Casts were initially taken at a 4-hour interval, but the frequency was increased to a 2-hour interval for the majority of the project when sound-speed error became apparent.

The profiler was deployed while underway during survey operations. The profiler was lowered to as close to the seafloor as possible, and then retracted to the vessel and downloaded. Up and down portions of the cast were averaged and a combined cast output to CARIS SVP format with time and position.

Sound speed profiles were applied with the “nearest in distance within time” method in CARIS HIPS, with time set to 2 hours, with few exceptions (noted in Section B.3.)

B.2.8 Coverage Equipment and Methods

As coverage requirements differed for depths greater or lesser then 10 m, the 10 m curve was first established by running multibeam crosslines towards shore to establish the contour. Note that the location of the 10 m contour was dependent on preliminary tides and experienced slight shifts following application of final tide corrections.

To achieve 200 m spacing in the area shoaler than 10 m, a line plan of 190 m (to allow for line driving variance) parallel to the coast was developed. The lines were plotted in QPS QINSy or HYPACK acquisition software (depending on the survey vessel) and tracked during survey. The sub-10 m area was surveyed primarily with SBES by the Q15 skiff, while the outside portion was surveyed with MBES by the Q105 where it was safe for the larger vessel to operate.

To achieve the inshore limit (NALL or 3 m contour), the Q15 skiff collected SBES data while running parallel to the beach, as close as safely possible. The 3 m depth limit was achieved in general; however, in some instances the ever-present ocean swell prevented closer approach to the beach.

To achieve 200 % SSS coverage (with concurrent bathymetry) for depths greater than 10m, a line plan was developed and ran based on 90 m and 60 m intervals. The 90 m line plan was run whenever the SSS was operated at 100 m range scale, which allowed for 200% coverage given line driving variance. Similarly, the 60 m line plan was run whenever the SSS was operated at 75 m range scale. The transition from 100 m to 75 m range scale (and subsequent change in line plans) was determined by data-quality and found to generally occur in 13 m to 15 m water depth.

MBES (with backscatter) was logged at all times during SSS operations. The Reson Seabat 7101 in use on this project was operated in 239 beam mode, which provided good across-track resolution and data density meeting HSSD requirements, without the extreme data volume generated from higher beam modes.

SSS/MBES lines were run in a “race-track” pattern to assist with line turns while towing equipment. At completion of a survey line, instead of running the adjacent line that was only 60-90 m distant, 10-12 lines would be skipped, allowing a long gentle turn that minimized the necessity to frequently adjust SSS cable out. Skipped lines were therefore surveyed 10-12 lines later when the pattern returned to them.

During operations, the survey limits were displayed in QPS QINSy (or HYPACK). Logging was stopped at the survey limits, although excess was normally collected on run-ins and run-outs to ensure coverage met the boundary, especially for the SSS sonar which could have as much as 200 m of cable out.

During SSS/MBES collection on the Q105, survey speed was minimized, averaging about 8 knots, to maximize along-track ping density. The SSS in use, an Edgetech 4200, was operated in “High-Speed” mode, thereby enabling its multi-pulse feature to allow for NOAA object detection requirements to be met at this speed. Towfish altitude above the seafloor was continuously monitored and adjusted when necessary to ensure an altitude of 8% to 20% of the range scale in use was maintained.

Significant SSS contacts were further developed by MBES to “Object Detection” requirements.

Survey speed was also limited during SBES collection on the Q15 skiff, averaging 6 knots or less.

To confirm MBES and SBES coverage requirements following processing and rejection of erroneous soundings, 4 m resolution BASE surfaces were created and examined in context of the sheet limits and preliminary 10 m contour in CARIS HIPS. To confirm SSS coverage requirements, SonarWiz's coverage check utility was utilized, which provided a color-coded report on areas with 200% or better coverage.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

Corrections applied to echo soundings are detailed in the project DAPR. No deviations occurred, with the following exceptions:

1. SVP exceptions

The following lines were sound-speed corrected with nearest-in-distance 4 hours instead of the standard 2 hours:

Q105\2013-205\0143_-_A1_C06720
Q105\2013-205\0138_-_A1_C05760
Q105\2013-205\0142_-_A1_C05880
Q105\2013-205\0134_-_A1_C05640
Q105\2013-205\0126_-_A1_C05400
Q105\2013-204\0118_-_A1_B05130
Q105\2013-204\0119_-_A1_C06000
Q105\2013-204\0106_-_A1_B04590
Q105\2013-203\0094_-_A1_B03690
Q105\2013-203\0093_-_A1_B04500
Q105\2013-203\0089_-_A1_B04320
Q105\2013-202\0068_-_A1_B00810
Q105\2013-202\0069_-_A1_B01710
Q105\2013-200\0006_-_A1_E04500
Q105\2013-200\0007_-_A1_E05400

2. TrueHeave exception

The following line did not have TrueHeave fully available, and instead used real-time heave:

Q105\2013-202\0070_-_A1_B02610

3. SMRMSG exception

The following line produced unreasonable TPU results when using the SMRMSG error, and required TPU computation using "Vessel Settings" instead of "Error Data". The line was well within specifications as determined by matchup with adjacent lines and crossline comparisons.

Q105\2013-202\0070_-_A1_B02610

4. Cable-Out % Exception

SSS processing used a cable out percentage for layback computation of 90% (instead of the standard 85%) for line Q105\2013-222\0579-A1_C07620

The data is adequate for charting despite the exceptions listed above.

B.3.2 Calibrations

Calibrations were undertaken as described in the DAPR, no deviations occurred.

B.4 Backscatter

Multibeam backscatter was logged during this survey, but not processed. The MBES DB files as well as the MBES XTF files contain the backscatter records.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: V5.3.2

Data processing methods and software are described in the DAPR.

Note that SSS was processed in Chesapeake SonarWiz, not CARIS SIPS (bathymetric data was processed in CARIS HIPS). However, SSS data in SIPS format is provided with the survey deliverables under the "Q105_SSS" HIPS vessel file. The SIPS-format SSS data was supplied in order to provide SSS data in a format readable by CARIS SIPS, per the HSSD. The SIPS data set was created by exporting fully processed SSS data from SonarWiz in XTF format, and importing into CARIS. The SIPS data ("Q105_SSS") received spot checks only, to confirm positioning was comparable to SonarWiz, but the data set has not been fully reviewed and should be used for reference only. No data products were generated from the SIPS data set; contacts and coverage TIFs were produced from the fully reviewed SonarWiz data set.

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12520_MB_4m_MLLW	MBES Tracline	4 meters	0 meters - 40 meters	NOAA_4m	MBES Set Line Spacing
H12520_SB_4m_MLLW	SBES	4 meters	0 meters - 40 meters	NOAA_4m	SBES Set Line Spacing

Table 8: Submitted Surfaces

The final depth information for this survey was submitted as a set of CARIS BASE surfaces which best represented the sea floor at the time of the 2013 survey. The surfaces were created from fully processed soundings with all final corrections applied. Surfaces were finalized and designated soundings were applied.

The surfaces were created using CUBE parameters that ensured a maximum propagation distance of the grid resolution divided by #2. 4 m was selected as the resolution for both surfaces per the requirements for “Set Line Spacing” (with concurrent 200% SSS coverage) described in the HSSD. Horizontal projection was selected as UTM Zone 3 North, NAD 1983.

A CARIS HOB file was submitted (H12520_FFF.HOB) with the survey deliverables as well. The final feature file (FFF) contains meta-data and other data not readily represented by the depth grids, such as bottom samples.

A SSS Contact Feature File (H12520_SSS_Contacts.HOB) is also included with the survey deliverables. SSS contacts (including significant, insignificant, and disproven) were attributed as “CSYMB” objects and are available for review in the SSS contact feature file, with contact images in the accompanying Multimedia folder. "SOUNDG" objects in the side scan contact feature file represent the least depth and position on significant contacts determined from MBES development and correspond to designated soundings. Note: "SOUNDG" objects are included in the SSS contact feature file for reference only; least depth on objects are represented in the final surfaces.

Each object is encoded with mandatory S-57 attributes, additional attributes and NOAA Extended Attributes (V#5.3.2).

Refer to the DAPR for more detailed discussion of the steps followed when acquiring and processing the 2013 survey data, including the surface creation and finalizing processes.

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 Columbia River.

Standard Vertical Control Methods Used:

Discrete Zoning

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

Station Name	Station ID
Red Dog Dock, AK	9491094

Table 9: NWLON Tide Stations

File Name	Status
9491094.tid	Final Approved

Table 10: Water Level Files (.tid)

File Name	Status
S325KR2013CORP_20131125.zdf	Final

Table 11: Tide Correctors (.zdf or .tc)

The NWLON station on Red Dog Dock (949-1094), was utilized on this project for tide corrections.

BMPG (bottom mounted pressure gauges) were deployed at the project extents to capture zoning characteristics across the area. Preliminary zones provided by CO-OPS were refined using the BMPG data.

Refer to the HVCR for more information regarding tides and tide zones.

C.2 Horizontal Control

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

The projection used for this project is UTM Zone 3 N.

The following PPK methods were used for horizontal control:

Single Base

The CORS site in Kotzebue (OTZ1, operated by the FAA) was used extensively for comparison and QC purposes. It was also used for PPK processing for rare instances when REDD was not operational, as described in the HVCR and DAPR.

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
OTZ1	OTZ1

Table 12: CORS Base Stations

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
REDD	REDD

Table 13: User Installed Base Stations

The project base station (REDD) broadcasted RTK positions for real time and preliminary positioning for the majority of the project. REDD also continuously logged data, enabling PPK processing. All real-time positions were replaced in processing with PPK positions.

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 Additional Issues

None to note.

D. Results and Recommendations

D.1 Chart Comparison

The chart comparison for H12520 was performed by examining all Raster Navigational Charts (RNCs) and Electronic Navigation Charts (ENCs) that intersect the survey area.

The chart comparison was accomplished by overlaying the finalized BASE surface with shoal-biased soundings, and final feature file on the charts in CARIS HIPS. The general agreement between charted soundings and H12520 soundings was then examined and a more detailed comparison was undertaken for any shoals or other dangerous features. Results are shown in the following sections.

It is recommended that this survey supersede charted data where they overlap.

USCG Notice to Mariners (NM) and USCG Local Notice to Mariners were checked for updates affecting the area. None were found that were issued subsequent to issuance date of the project instructions.

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 14: Largest Scale Raster Charts

16005

Only three soundings on chart 16005 intersect the survey area. None compare well to this survey.

This survey found a depth of 8 ½ fathoms at the charted 2 ¼ fathom sounding, a depth of 8 ½ fathoms at the charted 3 ¼ fathom sounding, and a depth of 7 ½ fathoms at the charted 3 fathom sounding. The discrepancy is likely due to shifting of soundings offshore due to the relatively small scale of chart 16005 (1:700000).

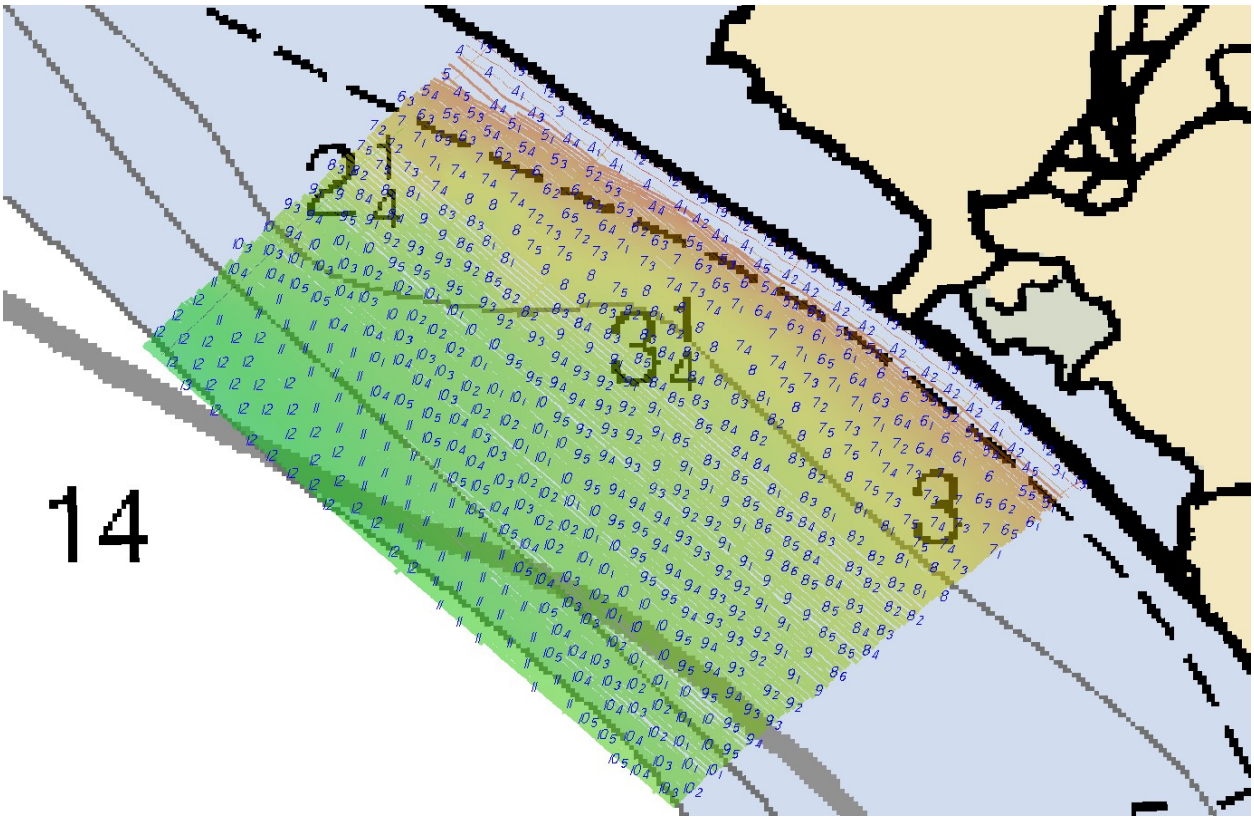


Figure 4: Soundings from this survey (blue, fathoms) overlaid on the chart.

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	7	05/02/2011	11/19/2012	NO

Table 15: Largest Scale ENCs

US2AK92M

The same differences observed for the RNC apply to this ENC.

D.1.3 AWOIS Items

No AWOIS items intersected the survey area. No items were found for inclusion into the database.

D.1.4 Maritime Boundary Points

No maritime boundary points were assigned for this survey.

D.1.5 Charted Features

There are no charted features labeled PA, ED, PD, or Rep. within the survey extents.

D.1.6 Uncharted Features

No uncharted features were found during this survey.

D.1.7 Dangers to Navigation

No dangers to navigation were found during this project.

D.1.8 Shoal and Hazardous Features

No shoal or hazardous features were found during this project.

D.1.9 Channels

No maintained channels exist in the survey area.

D.1.10 Bottom Samples

Bottom samples were collected for this survey. Bottom characteristics are encoded as SBDARE objects in the FFF included with the survey deliverables.

A total of 5 bottom samples were collected and are recommended for charting.

D.2 Additional Results

D.2.1 Shoreline

Shoreline verification was required for cultural or assigned features only. None intersected the survey area.

D.2.2 Prior Surveys

Comparison with prior surveys was not required. See Section D.1 for comparison to the existing nautical charts.

D.2.3 Aids to Navigation

ATONs did not exist in the survey area.

D.2.4 Overhead Features

No overhead features existed within the survey area.

D.2.5 Submarine Features

Features were rare, consisting primarily of ice scours and associated sediment piles that seldom produce more than a half meter of elevation above the seafloor.

D.2.6 Ferry Routes and Terminals

Ferry routes and terminals do not exist within the survey area.

D.2.7 Platforms

Platforms do not exist within the survey area.

D.2.8 Significant Features

All significant features and conditions encountered have been described previously. Refer to the FFF file submitted with the survey deliverables for any new feature charting recommendations.

D.2.9 Construction and Dredging

No construction or dredging was occurring within the survey extents, nor are there any known future plans for construction or dredging in the survey area.

D.2.10 New Survey Recommendations

None to note.

D.2.11 New Inset Recommendations

It is recommended that a larger scale chart and/or inset centered on the Red Dog Dock be issued using this survey data.

A new 1:40,000 scale chart is currently planned for this area.

E. Approval Sheet

Field operations contributing to the completion of survey H12520 were conducted under my direct supervision with frequent personal checks of progress, integrity, and adequacy.

This report, digital data, and all other accompanying records are approved. All records are respectfully submitted and forwarded for final review.

The survey data was collected in accordance with the Statement of Work and meets or exceeds the requirements set in the 2013 NOS Hydrographic Surveys and Specifications Deliverables document. This data is adequate to supersede charted data in common areas. This survey is complete and no additional work is required with the exception of any deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
Andrew Orthmann, C.H.	TerraSond Charting Program Manager	01/06/2014	Validity unknown Andrew Orthmann 2014.01.06 16:41:41 -09'00'
Marta Krynytzky, C.H.	TerraSond Lead Hydrographer	01/06/2014	Marta Krynytzky 2014.01.06 16:21:22 -09'00'

F. Table of Acronyms

Acronym	Definition
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	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
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
HSSD	Hydrographic Survey Specifications and Deliverables

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	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

APPENDIX I

Tides and Water Levels

Contents:

1. Abstract of Times of Hydrography
2. Transmittal Letters for Tide Stations
3. Tides Correspondence

Abstract of Times of Hydrography

Project: OPR-S325-KR-13

Registry No.: H12520

Contractor: TerraSond Limited

Date: January 6th, 2014

Inclusive Dates: July 19, 2013 – August 22, 2013

Field work is complete.

All times UTC.

Times of Hydrography		
Day	Start	Stop
200	03:04:15	11:04:05
202	04:28:28	23:59:59
203	00:00:00	23:30:12
204	02:47:15	23:59:59
205	00:00:00	18:02:18
221	19:07:29	23:59:17
222	00:01:29	20:44:01
228	17:15:07	23:53:35
229	00:01:06	14:22:17
234	04:55:58	04:55:58

Transmittal Letters for Tide Stations

The NWLON tide gauge Red Dog Dock (949-1094) was utilized for tide corrections on this project. Tide zones were refined using temporary BMPG zoning guage deployments. Refer to the HVCR for more information.

All tide zoning data has been submitted to CO-OPS. Transmittal letter and tides correspondence follows.

JOA Surveys, LLC
SURVEYING GPS TIDES HYDROGRAPHY

2000 E. Dowling Road, Suite 10
Anchorage, AK 99507
(907) 561-0136 Phone
(907) 561-0143 Fax
www.joasurveys.com

December 16, 2013

Artara Johnson
OET/CO-OPS
1305 East-West Highway
Silver Spring, MD 20910-3281

Cc Andrew Orthmann, TerraSond Ltd., aorthmann@terrasond.com
Mark Lathrop, NOS/OCS mark.t.lathrop@noaa.gov

Re: Transmittal of Tidal Zoning Report for project OPR-S325-KR-2013

Artara:

The tidal zoning report for hydrographic survey OPR-S325-KR-2013 has been posted to the JOA FTP site. This report includes shape files of the contours used to generate the final zoning scheme, a text file of six minute readings for each zoning station, a report on the development of the final zoning scheme and the final zoning scheme in shapefile format. Each text file of six minute readings has two columns and is comma delimited. Column 1 is time referenced to UTC. Column 2 is water level in meters above STND. Below is the information needed to retrieve the report from the JOA FTP site:

Host: **ftp.joasurveys.com**
Username: **oet**
Password: **1305east-west**
Filename: **OPR-S325-KR-2013 Red Dog Zoning Report 20131216.zip**

Sincerely,

Nathan Wardwell
nathan@joasurveys.com

Andrew Orthmann

From: Artara Johnson - NOAA Federal <artara.johnson@noaa.gov>
Sent: Thursday, December 19, 2013 12:51
To: nathan
Cc: OET Team; Andrew Orthmann; Mark Lathrop - NOAA Federal; HPT
Subject: Re: Tidal Zoning Report for OPR-S325-KR-2013 Red Dog

Good afternoon Nathan....

CO-OPS has successfully downloaded the tidal zoning report for OPR-S325-KR-2013 Red Dog Mine Approaches.

Have a great day!

Tara

On Mon, Dec 16, 2013 at 3:12 PM, nathan <nathan@joasurveys.com> wrote:
The tidal zoning report for OPR-S325-KR-2013 Red Dog Mine Approaches has been completed and posted to the JOA FTP site. Download instructions are included in the attached transmittal letter. Please notify me when you have retrieved the report and if you have any questions.

Thanks,
Nathan

--
Nathan Wardwell
JOA Surveys, LLC
www.joasurveys.com
2000 E. Dowling Rd, #10
Anchorage, AK 99507
(907) 227-6635 cell
(907) 561-0136 office

APPENDIX II

Supplemental Survey Records and Correspondence

Contents:

1. DTON Recommendations
2. Bottom Sample Table
3. Other Correspondence

DTON Recommendations

No DTONs were found during this survey.

Bottom Sample Table

The following bottom samples were taken during this survey.

Sheet	Sample Number	Julian Day	Time (UTC)	Latitude	Longitude	Surface Description	Color	Nature of Surface
H12520	01	2013-229	14:52	67-39-28.35N	164-24-44.32W	calcareous	black	cobbles
H12520	02	2013-229	15:24	67-38-51.25N	164-19-23.34W	medium	black	pebbles
H12520	03	2013-229	15:53	67-36-51.19N	164-24-51.23W	fine	grey	silt
H12520	04	2013-229	16:27	67-36-49.04N	164-18-09.89W	fine	grey	silt
H12520	05	2013-229	17:00	67-36-48.76N	164-11-20.37W	coarse	grey	gravel

Other Correspondence

Andrew Orthmann

From: Mark Lathrop - NOAA Federal <mark.t.lathrop@noaa.gov>
Sent: Friday, August 02, 2013 04:33
To: Andrew Orthmann
Subject: Re: combined progress spreadsheets?

Andy,

Nope. Keep them separate.

Mark

On Fri, Aug 2, 2013 at 1:24 AM, Andrew Orthmann <aorthmann@terrasond.com> wrote:
Hi Mark, it occurred to me as I was putting together the progress spreadsheet for Red Dog for July that the spreadsheet seems to be set up to support multiple projects. Since we normally have one project only this hasn't occurred before - I already sent a Cook Inlet progress sheet, but do you think I should combine Cook Inlet and Red Dog in the spreadsheet for July, or go ahead and send a separate Red-Dog only one?

Andy

Andrew Orthmann

From: Mark Lathrop - NOAA Federal <mark.t.lathrop@noaa.gov>
Sent: Friday, July 26, 2013 07:33
To: Andrew Orthmann
Subject: Re: complete mbes coverage

Andy,

Yes, if needed, you may run complete MBES coverage in lieu of 200% SSS w/MBES for this survey. What are your issues with the side scan?

Mark

On Thu, Jul 25, 2013 at 7:59 PM, Andrew Orthmann <aorthmann@terrasond.com> wrote:
If necessary, can we substitute complete MBES coverage for the 200% SSS w/ MBES requirement on this survey?

This would probably only happen if for some reason we can't run the sidescan for some reason; we would need to tighten up the line spacing to get good MBES overlap but it would keep us working until the sidescan was up again.

Andy

Andrew Orthmann

From: Mark Lathrop - NOAA Federal <mark.t.lathrop@noaa.gov>
Sent: Wednesday, July 31, 2013 07:01
To: Andrew Orthmann
Subject: Re: grid resolutions for red dog multibeam

Andy,

Yes. Use the Specification's requirements for "set line spacing surveys". Objects found in the sidescan should still be developed to "object detection standards".

Mark

On Wed, Jul 31, 2013 at 1:40 AM, Andrew Orthmann <aorthmann@terrasond.com> wrote:
Hi Mark,

I just wanted to confirm that we are expected to use the Specification's requirements for "set line spacing surveys" (section 5.2.2.3), which among other things calls for a 4m grid resolution for collected sounding data, (when collected concurrent with 200% side scan coverage). It is clear in that section that objects found in the sidescan should still be developed to "object detection standards".

I expect the answer is yes, but the work instructions say coverage type "complete coverage" and then go on to say "200% SSS with concurrent Set Line Spacing".

Thanks,

Andy

From: Fed Nav Portsite Rep RDOG [mailto:Fed.Nav@teck.com]
Sent: Thursday, October 10, 2013 10:34
To: Andrew Orthmann
Subject: FW: question about possible lost mooring anchor

Andy/Robert

Don't know if Jay Justus sent to you as well, see below.

Robert

Robert Kuikhoven
Marine Superintendent
Fednav Intl - Red Dog Port
Phone: +1.907.754.8084
eMail: fed.nav@teck.com

From: James Justus [jjustus@foss.com]
Sent: Thursday, October 10, 2013 10:26 AM
To: Fed Nav Portsite Rep RDOG
Subject: RE: question about possible lost mooring anchor

Good morning,

In answer to your questions:

1. The white mooring buoys are installed by Foss each season, usually around the first or second week of July, and removed the second or third week of October. They are used for the tugs to moor during wait times.

2. The feature at 7 miles that appears to be a lost anchor/mooring system is not recalled by any of our employees that have been here long term.

3. The possible abandoned chain and anchor at 67-32-53 N, 164-11-01 W is the same as above, no one recalls an anchor lost or abandoned.

Regards,

Jay Justus

From: Fed Nav Portsite Rep RDOG [mailto:Fed.Nav@teck.com]
Sent: Thursday, October 10, 2013 08:38
To: Andrew Orthmann
Cc: Jeffrey Morris
Subject: RE: Red Dog Port

Morning Andy,

No problem passing the chartlet on to NOAA. The chartlet has been used since shipping started here, only other option is 16005 and scale not suitable. Over the years it worked for us and found it to be accurate enough for our purpose. We anchor the ships basis maximum draft when loaded plus 10ft UKC and make sure we are at least 3nm offshore.
When you pass along your report to NOAA, would appreciate if you can request a copy of the new chartlet for me, so we can print copies and put on our vessels for next season. Electronic copy as well please.

Robert

Robert Kuikhoven
Marine Superintendent
Fednav Intl - Red Dog Port
Phone: +1.907.754.8084
eMail: fed.nav@teck.com

www.Fednav.com

Andrew Orthmann

From: Fed Nav Portsite Rep RDOG <Fed.Nav@teck.com>
Sent: Thursday, October 10, 2013 04:41
To: Andrew Orthmann
Cc: Jeffrey Morris
Subject: Red Dog Port
Attachments: R Dog chart 2003.tif

Morning again Andy,

Attached a tif copy of the Red Dog Port Site chartlet that we use for anchoring vessels, this is from a original survey done for "COMINCO ALASKA" in 1989 and updated in 1991,
The ships receive a full scale copy of this chart before heading to Red Dog. If you would like a copy of this chart, let me know. I have extra copies here in my office.
Re the lost mooring at 3nm offshore, in the early lighterage years, Foss would pack around anchor/chain on one of their tugs and set it close to to where the ships would anchor and tie the stern of the vessels to that buoy, in order to create a lee. It is possible that they were unable to retrieve it after the season one year.
The system at 7nm offshore could indeed be a lost ship's tackle. During the years that I have been here, no ships have lost their tackle but could have happened before I started here.
University of Fairbanks a couple of years ago was doing research on currents here in Chuckchi Sea and Foss helped them put some submersible systems in the water to do measurements and retrieve the next summer, remember the first name of one of the folks, "Oceana"
I have forwarded your original email to the Foss folks here at the Port as well as to Alaska Marine Pilots in Dutch.
Have copied Jeff Morris, Fednav Montreal, the Fleet Operator I work with for the Red Dog season on this message.
Feel free to contact me at any time. We have 2 more ships heading this way and will be here till around Oct.25, then I will be back in Ketchikan.
Home: 907-225-2707, Mobile: 907-617-0492.

Best rgds,

Robert Kuikhoven
Marine Superintendent
Fednav Intl - Red Dog Port
Phone: +1.907.754.8084
eMail: fed.nav@teck.com

www.Fednav.com

From: Fed Nav Portsite Rep RDOG [mailto:Fed.Nav@teck.com]
Sent: Tuesday, August 20, 2013 07:06
To: Andrew Orthmann
Subject: RE: Red Dog Port

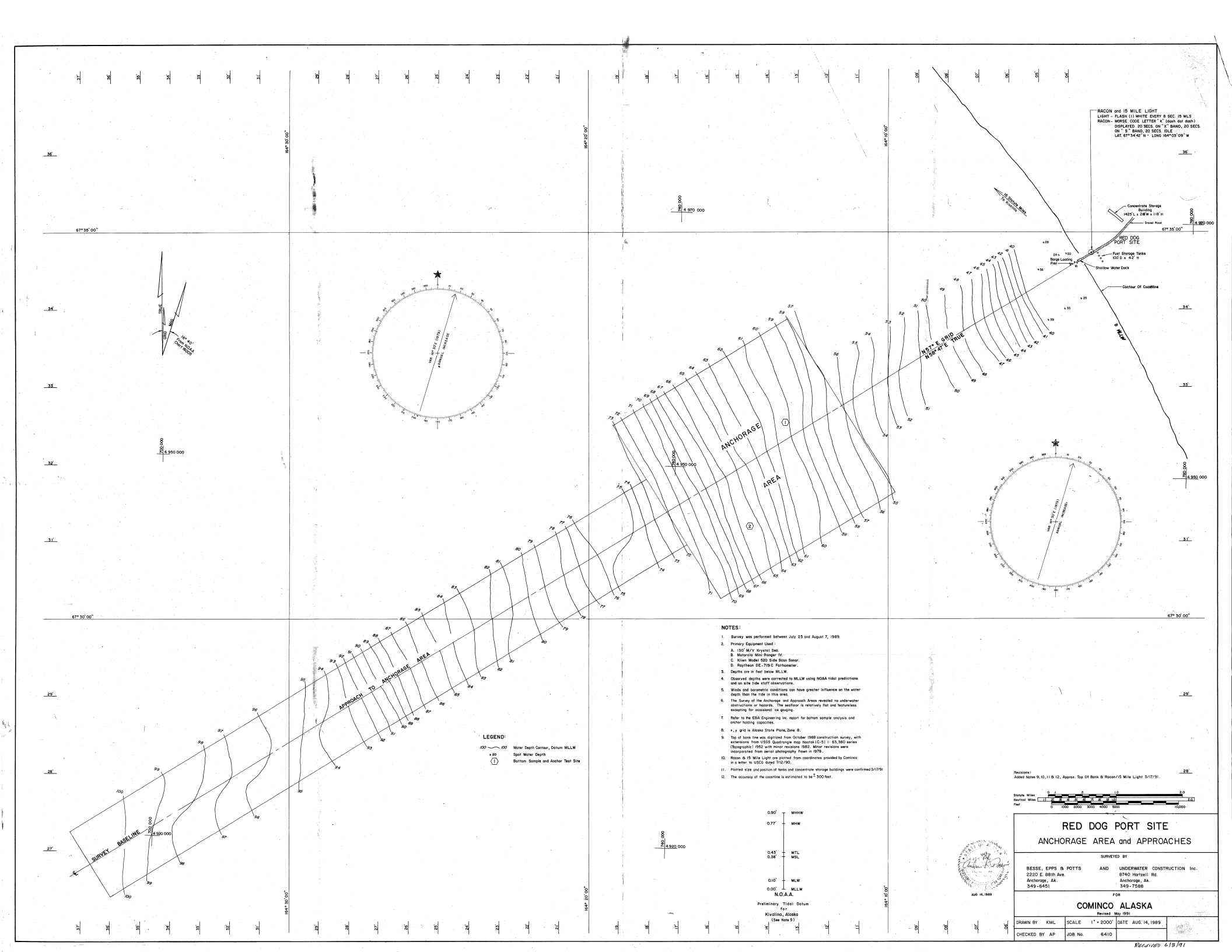
good morning,

playing catch up here. Just got back to the beach, vessel departed yesterday, now have a break.
We load mostly panamaxes and handy maxes here at RD.
Typical Panamax is abt 720 ft long, beam of 106 ft, max summer load DWT of 73000WMT, deepest draft then abt 14.3M.
Typical Handymax is abt 623ft long, beam 106ft, DWT: 55921, draft abt 13.0M
we have loaded larger vessels, but those are not frequent, for example post panamax vessel, 753ft long, 121ft beam, draft 14.6M, DWT 92000WMT.
Same for Laker type vessels, 37000DWT, 627ft loa, beam 93.3, draft abt 11.0M
We always keep 10ft UKC, also ships anchor at least 3nm from shore, in order to be outside state waters.

Best rgds,

Robert Kuikhoven
Marine Superintendent
Fednav Intl - Red Dog Port
Phone: +1.907.426.9421
eMail: fed.nav@teck.com

www.Fednav.com



LEGEND:

- 100 ~ 100 — Water Depth Contour, Datum MLLW
- x 20 — Spot Water Depth
- (1) — Bottom Sample and Anchor Test Site

NOTES:

1. Survey was performed between July 25 and August 7, 1989.
2. Primary Equipment Used :
   A. 130' M/V Krystal Sea.
   B. Motorola Mini-Ranger IV.
   C. Klein Model 520 Side Scan Sonar.
   D. Raytheon DE-719C Fathometer.
3. Depths are in feet below MLLW.
4. Observed depths were corrected to MLLW using NOAA tidal predictions and on site tide staff observations.
5. Winds and barometric conditions can have greater influence on the water depth than the tide in this area.
6. The Survey of the Anchorage and Approach Areas revealed no underwater obstructions or hazards. The seafloor is relatively flat and featureless excepting for occasional ice gouging.
7. Refer to the EBA Engineering Inc. report for bottom sample analysis and anchor holding capacities.
8. x , y grid is Alaska State Plane, Zone 8.
9. Top of bank line was digitized from October 1988 construction survey, with extensions from USGS Quadrangle map Nootak (C-5) I: 63,360 series (Topographic) 1952 with minor revisions 1982. Minor revisions were incorporated from aerial photography Flown in 1978.
10. Racon & 15 Mile Light are plotted from coordinates provided by Cominco in a letter to USCG dated 7/12/90.
11. Plotted size and position of tanks and concentrate storage buildings were confirmed 5/17/91
12. The accuracy of the coastline is estimated to be ± 300 feet.

Revisions:
Added Notes 9, 10, 11 & 12, Approx. Top Of Bank & Racon/15 Mile Light 5/17/91.

Statute Miles 0 1 2 5 10 20
Nautical Miles 1 0 1 2 3 4 5 10 20
Feet 0 5000 10000 20000 30000 40000 50000 100000

0.90' MHHW
0.77' MHW
0.43' MTL
0.38' MSL
0.10' MLW
0.00' MLLW
N.O.A.A.
Preliminary Tidal Datum for Kivalina, Alaska
(See Note 5)

AUG 14, 1989

RED DOG PORT SITE
ANCHORAGE AREA and APPROACHES

SURVEYED BY

BESSE, EPPS & POTTS
2220 E. 88th Ave.
Anchorage, Ak.
349-6451

AND

UNDERWATER CONSTRUCTION Inc.
8740 Hartzell Rd.
Anchorage, Ak.
349-7586

FOR

COMINCO ALASKA

Revised May 1991

DRAWN BY KML	SCALE 1" = 2000'	DATE AUG. 14, 1989	
CHECKED BY AP	JOB No. 6410		

Received 6/3/91

APPROVAL PAGE

H12520

Data meet or exceed current specifications as certified by the OCS survey acceptance review process. Descriptive Report and survey data except where noted are adequate to supersede prior surveys and nautical charts in the common area.

The following products will be sent to NGDC for archive

- H12520_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H12520_GeoImage.pdf

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

Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101
Date: 2014.05.13 14:09:43 -07'00'

Approved:_____

Peter Holmberg
Cartographic Team Lead, Pacific Hydrographic Branch

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

Benjamin K. Evans
2014.05.13 15:08:43
-07'00'

Approved:_____

LCDR Benjamin K. Evans, NOAA
Chief, Pacific Hydrographic Branch