D00198

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

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	D00198

LOCALITY

State(s):	Alaska
General Locality:	Corridor between Aleutian Islands and Bering Strait
Sub-locality:	USCG-Proposed PARS Corridor

2015

CHIEF OF PARTY

CDR Edward J. Van Den Ameele, NOAA

LIBRARY & ARCHIVES

Date:

Descriptive Report Summary to Accompany D00198	
Project	OPR-R976-RA-15
Survey	D00198
State	Alaska
Locality	Bering Sea, Bering Strait, Chukchi Sea
Sub Locality	USCG-proposed PARS Corridor
Scale of Survey	1:40000
Sonars Used	Kongsberg EM710 Multibeam Echo Sounder
Horizontal Datum	North American Datum of 1983 (NAD83)
Vertical Datum	Mean Lower Low Water (MLLW)
Vertical Datum Correction	TCARI grid: R976FARA2015
Projection	Latitude-Longitude (NAD83) – UTM 3N
Field Unit	NOAA Ship *Rainier* (S221)
Survey Dates	06/20/2015 – 08/24/2015
Chief of Party	Edward J. Van Den Ameele, CDR/ NOAA
Remarks	***The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Any revisions to the Descriptive Report (DR) generated during office processing are shown in bold, red italic text. The processing branch maintains the DR as a field unit product, therefore, all information and recommendations within the body of the DR are considered preliminary unless otherwise noted. The final disposition of surveyed features is represented in the OCS nautical chart update products. All pertinent records for this survey, including the DR, are archived at the National Centers for Environmental Information (NCEI) and can be retrieved via http://www.ncei.noaa.gov/.***

A. Area Surveyed

This hydrographic survey was acquired in accordance with the requirements as defined in the project instruction OPR-R976-RA-15. The area surveyed was in the vicinity of the Bering Sea, Unimak Pass and Bering Strait. Track line coordinates were provided by HSD OPS and were followed accordingly, except in cases noted in the descriptive report.

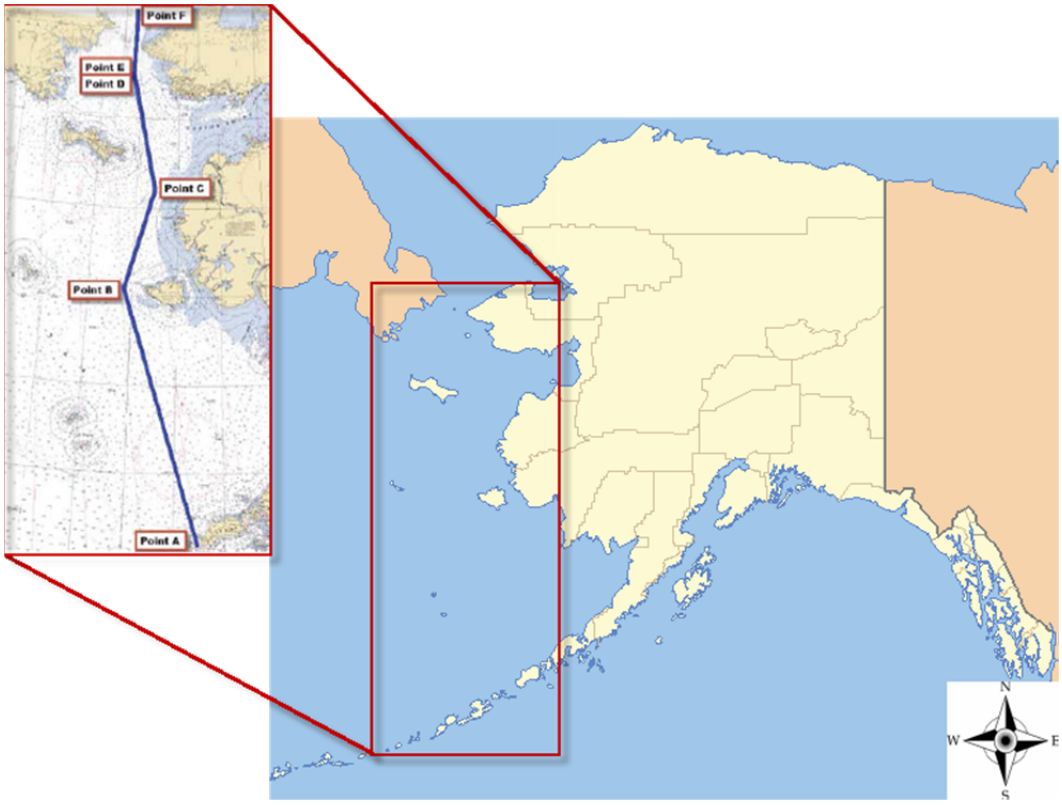


Figure 1: Waypoint reference provided by Hydrographic Survey Division Operations Branch (HSD OPS) (left) and geographical reference (right).

The exceptions are as follows:

- There exist several blowouts due to rough seas along track-line RA4 between waypoints RA4A and RA4B on DN203. Ship southbound acquisition was terminated before reaching waypoint RA4A at Unimak Pass to divert on account of weather.
- Acquisition of southbound track-line RA1 began midway between waypoints RA1D and RA1C. Data north of waypoint RA1D was not collected as result of the ships sudden diversion to Kodiak Coast Guard Base.

Northeast Limit	Southwest Limit
64° 25.51 N	45° 32”.15 N
129° 16”.28 W	172°01”.17 W

B. Survey Purpose

This survey was conducted to update existing data along the United States Coast Guard (USCG) proposed Arctic Port Access Route Study (PARS) corridor. Data was collected in the most efficient manner in conjunction with NOAA Ship *Fairweather*, NOAA Ship *Ronald H Brown* and the USCG Cutter HEALY.

The survey from NOAA Ship Fairweather is archived as D00197.

C. Intended Use of Survey

The survey has been conducted in support of NOAA's Office of Coast Survey to provide contemporary hydrographic data in order to update the nautical charting products and reduce survey backlog in the area. Application to the chart is subject to coverage achieved by survey D00198 paired with adjacent contemporary surveys from vessels listed in section B. The survey data will also be used to support the USCG in developing proposed vessel traffic routing measures in Arctic waters.

D. Data Acquisition and Processing

Please reference 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.

There exist several lines for which Delayed Heave was not applied. The files (.all) are as follows: 0097_20150721_120729, 0000_20150728_044834, 0001_20150728_050849, 0121_20150722_120056, 0002_20150728_053758, 0122_20150722_130056, 0123_20150722_140056, 0012_20150730_110516, 0024_20150730_225955, 0004_20150822_110513, 0027_20150823_105853, 0040_20150823_235904, 0028_20150823_115905, 0039_20150823_225904.

The data is adequate for charting despite Delayed Heave not being applied to the lines listed above.

E. Uncertainty

Sound Speed

Sound speed was applied utilizing two different methods. For lines RA2, RA3 and RA4, sound speed was applied *Nearest in Time*. The dynamic nature of the sound speed profile of the Bering Sea required frequent casts to be taken (more than 1/hr). To ensure strong data quality, casts were taken when 2.0 m/s differences in sound speed were observed. Transmission from the Moving Vessel Profiler (MVP) was lost at the conclusion of DN 234; line RA1. Continued sound speed data acquisition was abandoned, no real-time sound speed data was applied to data acquired on DN 235 and DN 236. Areas of line RA1 lacking real time data utilized CTD casts from previously surveyed lines by applying *Nearest in Distance*.

The data from DN 235 and 236 is adequate for charting despite having older sound speed casts applied.

F. Results and Recommendations

The following surfaces were submitted to NOAA Pacific Hydrographic Branch.

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
D00198_MLLW_2m	CUBE	2 METERS	18-40 m	NOAA_2m	MBES Trackline
D00198_MLLW_4m	CUBE	4 METERS	0-40 m	NOAA_4m	MBES Trackline
D00198_MLLW_16m	CUBE	16 METERS	>40 m	NOAA_16m	MBES Trackline

The surfaces listed above are the finalized surfaces originally submitted to the Processing Branch. The parent BASE surfaces were submitted at a later date during office processing.

- **Ping Rate**

Subset analysis reveals along-track resolution meets and exceeds 3.2 pings/3 meters in depths less than or equal to 40 meters as per requirement outlined in section 5.2.2.4.2 of the HSD Technical Directive.

No density analysis was required as per project instructions but was recommended (in lieu of ping rate analysis). Density analysis results support strong soundings confidence for each surface submitted.

Resolution	Depth range	Number of nodes	Fewer than five soundings per node	Percent of nodes with greater than five soundings per node
4m	< 40 m	18,747,621	88,431	99.53%
16m	> 40 m	3,263,495	16,701	99.49%
	TOTAL:	22,011,116	105,132	**99.52%**

A density analysis was not conducted on each of the submitted surfaces, only the two required (4m & 16m) surfaces.

- **Chart Comparison**

There exist numerous areas within the PARS corridor where charted depths do not agree with observed data. The most prominent Raster chart differences are included as examples in this section. Large sounding discrepancies were also observed in corresponding ENCs. Shoaler charted depths should be retained since full bottom coverage was not conducted.

The following are all Raster Navigational Charts (RNC) and Electronic Navigation Charts (ENC) which are in the affected survey area and were examined:

Affected Raster Charts					
Chart Number	**Scale**	**Edition Number**	**Edition Date**	**LNM Date**	**NM Date**
16005	700000	10	10/2007	4/25/2015	4/21/2015
16006	1534076	36	07/2015	8/22/215	8/18/2015

16011	1023188	38	08/2012	5/23/2015	5/12/2015
16200	400000	15	10/2014	4/25/2015	4/21/2015
16220	315350	6	05/2013	5/23/2015	5/12/2015
16190	100000	1	05/2013	5/23/2015	5/12/2015
16520	300000	24	06/2015	8/22/2015	8/18/2015
16531	80000	8	06/2015	8/22/2015	8/18/2015

Affected ENCs					
ENC Name	**Scale**	**Edition**	**Update Application Date**	**Issue Date**	**Preliminary**
US2AK5FM	1023188	10	11/30/2012	08/06/2014	NO
US2AK92M	700000	7	05/02/2015	11/13/2014	NO
US3AK80M	400000	6	10/11/2013	08/01/2014	NO
US3AK89M	315350	3	04/10/2014	08/04/2014	NO
US4AK8DM	100000	3	04/22/2015	04/22/2015	NO
US3AK61M	300000	17	11/20/2014	11/20/2014	NO
US4AK6FM	80000	8	04/28/2015	06/13/2014	NO

ENC US2AK95M (Scale 1,534,076, Ed. 3, App date 4/15/2016, Issue date 4/15/2016) is also affected by this survey.

ENC US3AK80M has a scale of 1:350,000 even though corresponding RNC 16200 has a scale of 1:400,000

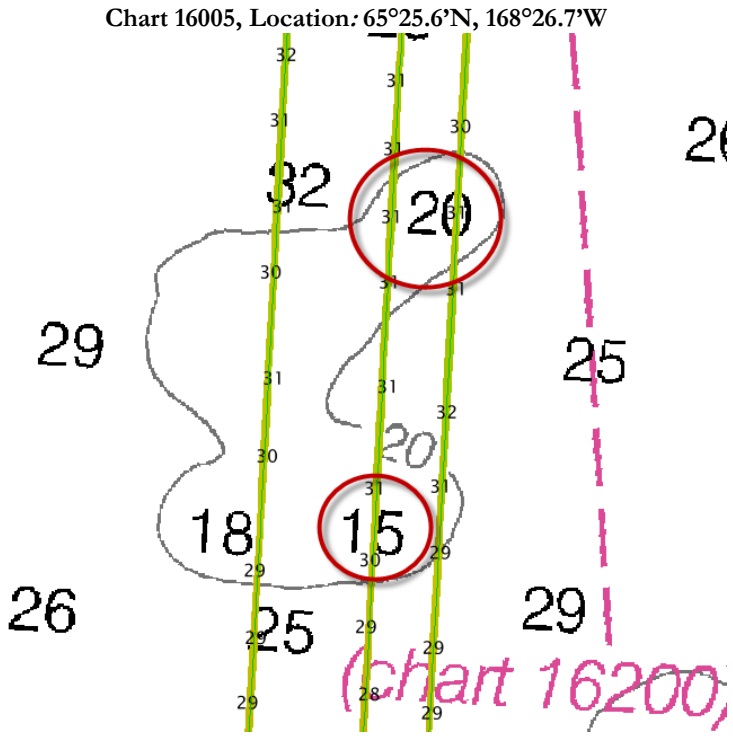


Figure 2: Soundings do not directly support charted shoal area.

Chart 16006, Location 65° 40.6' N, 168° 25.0' W

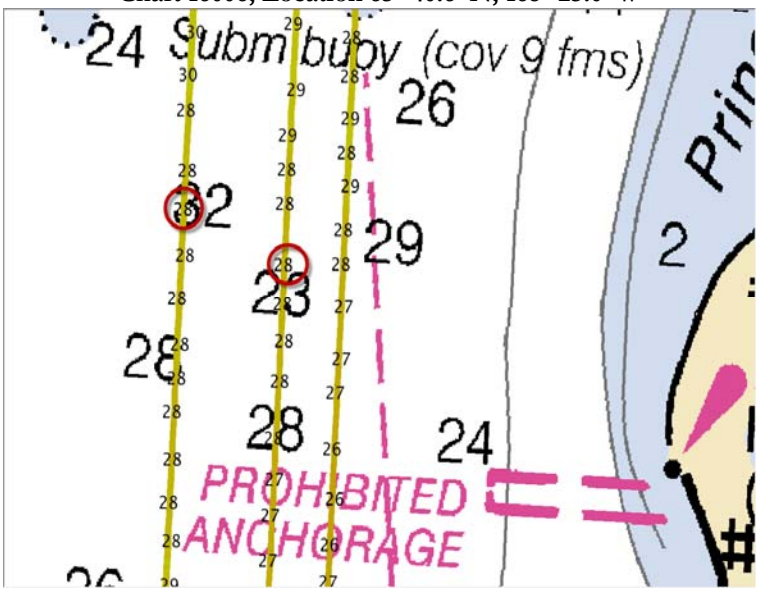


Figure 3: Shoal 23 fathom sounding not reflected in PARS line.

G. Vertical and Horizontal Control

The vertical datum for this project is Mean Lower Low Water. A TCARI grid (R976FARA2015_Final.tc), provided by Center for Operational Oceanographic Products and Services (CO-OPS) acted as the vertical control method used. The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Red Dog Mine	9491094
Nome	9468756
Village Cove	9464212
Unalaska	9462620
Port Moller	9463502

See attached Tide Note dated September 2, 2015.

The horizontal datum for this project is North American Datum of 1983 (NAD83). Differential GPS (DGPS): line RA3; Wide Area Ambiguity System (WAAS): lines RA2, RA4; and MarineStar Precise Point Positioning (PPP): line RA1; were utilized for positioning. The following DGPS Station was used for horizontal control:

DGPS Station
Cold Bay 289 kHz

DGPS maintained a fixed lock on Cold Bay beacon (289 kHz) until DN173 just south of waypoint RA3C in the region of Norton Sound. Stand-alone GPS was used for the remainder of line RA3. WAAS was incorporated and configured into the ships positioning system for lines RA2 and RA4 and performed well within specification and uneventfully. The PPP license was acquired in time for testing and utilization for a south-bound transit along track line RA1. The PPP system maintained an intermittent lock in the northern latitudes of what was acquired for RA1. Irregular positioning dropouts occurred throughout DN234, switching between Course Acquisition Mode (Stand-alone GPS) and remained so until part way through DN235 where PPP was able to maintain a sufficient positioning solution uneventfully until the conclusion of acquisition on DN236.

NAD 83 is the horizontal datum used for DGPS. However, WAAS uses WGS84 and MarineStar uses ITRF2008. No post-processing was conducted to transform these positions to NAD83. The data is adequate for charting despite the horizontal datum discrepancy.

Designated Soundings:

Designated soundings were selected based on a dynamic criterion established by HSD OPS. In the area between waypoints C and D along the PARS route there initially existed >40 designated soundings that met or exceeded IHO Order 2 TVU values when gridded to a 4 meter resolution surface. This number decreased when, at the direction of HSD OPS, gridded at a more depth appropriate 2 meter resolution surface. The remaining soundings were deemed to be of further importance if they were more shoal than the nearest charted depth and met or exceeded IHO Order 2 TVU limits. Extrapolation was avoided where few charted depths existed.

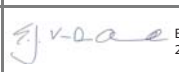
As a clarification: The correspondence with HSD OPS (appended to this report) did not officially authorize the field unit to create a 2 meter surface. It was suggested that a finer resolution grid be created if designated soundings numbered in the dozens. However, the guidance was intended to decrease designated soundings, which the field accomplished.

H. Approval

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

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

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

Approver Name	Approver Title	Approval Date	Signature
Edward J. Van Den Ameele, CDR/NOAA	Chief of Party	2/9/2016	 Edward J. Van Den Ameele 2016.02.09 11:06:25 -08'00'
Adam Pfundt, LT/NOAA	Field Operations Officer	2/9/2016	 Adam Pfundt I have reviewed this document 2016.02.09 10:51:33 -08'00'
James B. Jacobson, CST	Chief Survey Technician	2/9/2016	 Adam Pfundt I am signing this for CST Jacobson 2016.02.09 10:52:34 -08'00'
Kevin P. Parine, HAST	Hydrographic Assistant Survey Technician, Sheet Manager	1/23/2016	

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

PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : September 02, 2015

HYDROGRAPHIC BRANCH: Pacific
HYDROGRAPHIC PROJECT: OPR-R976-RA-2015
HYDROGRAPHIC SHEET: D00198

LOCALITY: USCG-proposed PARS Corridor, AK
TIME PERIOD: June 21 - August 24, 2015

TIDE STATION USED: Unalaska, AK 9462620
Lat.53° 52.8′ N Long. 166° 32.4' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 1.011 meters

TIDE STATION USED: Port Moller, AK 9463502
Lat. 55° 59.1' N Long. 160° 34.4' W
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.921 meters

TIDE STATION USED: Village Cove, AK 9464212
Lat. 57° 07.5' Long. 170° 17.1'
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.938 meters

TIDE STATION USED: Nome, AK 9468756
Lat. 64° 29.7' Long. 165° 26.4'
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.406 meters

TIDE STATION USED: Red Dog Dock, AK 9491094
Lat. 67° 34.5' Long. 164° 03.9'
PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters
HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 0.240 meters

REMARKS: RECOMMENDED Grid

Please use the TCARI grid "R976FARA2015_Final.tc" as the final grid for project OPR-R976-RA-2015, D00198, during the time period between June 21 - August 24, 2015.

Refer to attachments for grid information.

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

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National Ocean Service
Silver Spring, Maryland 20910

Note 2: Annual leveling for Nome, AK (9468756) and Red Dog Dock, AK (9491094) was not completed in FY15. A review of the water level data collected during the survey period for this sheet indicates good data quality, however the sensor stability cannot be verified until the most recent set of levels are reviewed. This provisional tide note should be used as the final tide for this sheet and after the leveling information has been received and reviewed, a follow-up memo to OCS will validate the stability of the data. Should the most recent set of levels indicate that the sensor was not stable during the period of survey operations, CO-OPS will immediately provide a revised Tide Note with updated water level reference information.

HOVIS.GERALD.THOMAS.JR.1365860250

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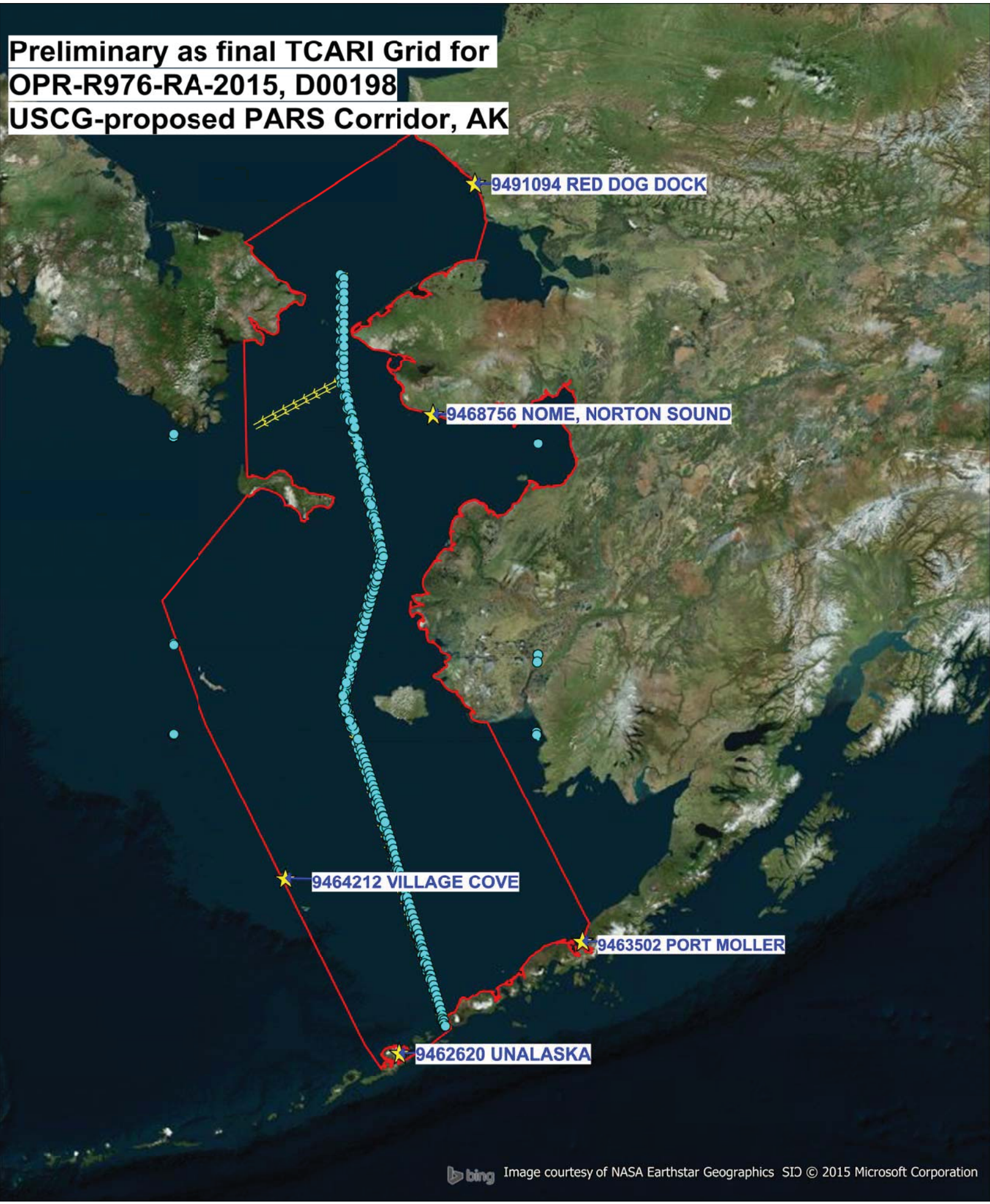
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOVIS.GERALD.THOMAS.JR.1365860250
Date: 2015.09.11 15:23:56 -04'00'

CHIEF, PRODUCTS AND SERVICES BRANCH


Preliminary as final TCARI Grid for
OPR-R976-RA-2015, D00198
USCG-proposed PARS Corridor, AK
9491094 RED DOG DOCK
9468756 NOME, NORTON SOUND
9464212 VILLAGE COVE
9463502 PORT MOLLER
9462620 UNALASKA
bing
Image courtesy of NASA Earthstar Geographics SIO © 2015 Microsoft Corporation

Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>

PARS Designated Soundings

10 messages

Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov> Mon, Dec 14, 2015 at 12:45 PM
To: "katrina.wyllie" <katrina.wyllie@noaa.gov>

HI Katrina,

Hoping you can offer some guidance on designated soundings for PARS. On the 4 meter surface we found some soundings that the surface isn't honoring that fall outside of IHO compliance. They are in the same area, between way points B and C, and are probably not navigationally significant (< 2.0 m in ~20 m water depth). Should I be designating soundings or is this outside the scope of a reconnaissance survey?

Regards,
HAST Kevin P

Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov> Thu, Dec 17, 2015 at 9:20 AM
To: Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>

Hi Kevin,

How many designated soundings do you anticipate having to create? Hundreds? Dozens?

Katrina
[Quoted text hidden]

Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov> Thu, Dec 17, 2015 at 11:11 AM
To: Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov>

Dozens

-Kevin P
[Quoted text hidden]

Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov> Thu, Dec 17, 2015 at 11:35 AM
To: Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>

Hi Kevin,

My first response is to make sure the surface represents the features. That can be achieved by gridding at 2m for that section of PARS or by designating soundings. Before I finalize that guidance, I am waiting on some feedback from PHB. I will respond as soon as I hear back.

Thank you,
Katrina
[Quoted text hidden]

Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov> Fri, Dec 18, 2015 at 7:17 AM
To: Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>

Hi Kevin,

I heard back from Ben at PHB and we are in discussion. Question for you; for this section of the PARS line, how is the general chart comparison? From the DR Summary draft I have seen, there seem to be areas where the RA data is much shoaler and areas where the RA data is much deeper than charted.

Thank you,
Katrina
[Quoted text hidden]

Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov> Fri, Dec 18, 2015 at 10:37 AM
To: Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov>
Cc: Shelley Devereaux - NOAA Federal <shelley.devereaux@noaa.gov>

Hi Katrina,

I'd have to take a look at the data again, however, I'm on leave till the 4th of January. I'll touch base with my sheet assistant and refer your question to her.

Thanks,
Kevin
[Quoted text hidden]

Shelley Devereaux - NOAA Federal <shelley.devereaux@noaa.gov> Mon, Dec 21, 2015 at 3:25 PM
To: Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>
Cc: Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov>

Hi Katrina,

Yes, there was some noticeable discrepancies between what was charted and what the PARS route indicated, but most of these were between points D/E and point F on Chart 16220 (much shoaler).

The Chart Comparison between waypoints B and C, specifically where there a higher concentration of designated soundings, show that the soundings are slightly deeper than what is represented on the chart 16006. The soundings are approximately 1 fathom deeper than the chart indicates, or within 1 fathom of the charted depth.

Regards,

ENS Shelley Devereaux
[Quoted text hidden]
--
ENS Devereaux
Junior Officer
NOAA Ship Rainier
2002 SE Marine Science Drive
Newport, OR 97365-5229

Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov> Tue, Dec 22, 2015 at 1:56 PM
To: Shelley Devereaux - NOAA Federal <shelley.devereaux@noaa.gov>
Cc: Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Eric Berkowitz - NOAA Federal <eric.w.berkowitz@noaa.gov>, Benjamin K Evans - NOAA Federal <benjamin.k.evans@noaa.gov>, Adam Pfundt - NOAA Federal <adam.pfundt@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

ENS Devereaux,

Thank you for providing that feedback. This is a great question that you and Kevin brought up and it was discussed with CDR Evans at PHB as well as LCDR Gonsalves at Ops. Typically a reconnaissance survey simply suggests where additional surveys are needed. In the case of these PARS lines, that purpose is being met but there are also significant chart updates that can be made with the data collected by FA/RA.

The guidance from LCDR Gonsalves, Acting Chief HSD, is to designate any features where the designated depth is then shoaler than the existing charted soundings. The designation threshold should follow the HSSD guidance. If you find yourself designating more than a dozen soundings, touch base with me and we can discuss gridding at a finer resolution. Please include this guidance email in the survey supplemental correspondence folder and discuss briefly in the DR Summary. Let me know if you have any questions.

Thank you,
Katrina
[Quoted text hidden]

CDR Ben Evans <benjamin.k.evans@noaa.gov> Tue, Dec 22, 2015 at 8:13 PM
To: Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov>, Shelley Devereaux - NOAA Federal <shelley.devereaux@noaa.gov>
Cc: Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Eric Berkowitz - NOAA Federal <eric.w.berkowitz@noaa.gov>, Adam Pfundt - NOAA Federal <adam.pfundt@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

Katrina,

Just to be clear: you would like RA to designate soundings only on "features" (i.e., non skin-of-the-earth items on the seafloor) which fail the HSSD thresholds? Or, does Ops intend that RA should designate _all_ "reliable" soundings which fail the HSSD threshholds?

Also: I recommend we share this guidance with FA, as they have a similar survey.

Thanks,

Ben
[Quoted text hidden]

--
CDR Ben Evans, NOAA
Chief, Pacific Hydrographic Branch (N/CS34)
NOAA Office of Coast Survey
7600 Sand Point Way NE
Seattle, WA 98115
(206) 526-6835

Katrina Wyllie - NOAA Federal <katrina.wyllie@noaa.gov> Mon, Jan 4, 2016 at 8:35 AM
To: CDR Ben Evans <benjamin.k.evans@noaa.gov>
Cc: Shelley Devereaux - NOAA Federal <shelley.devereaux@noaa.gov>, Kevin Parine - NOAA Federal <kevin.p.parine@noaa.gov>, Michael Gonsalves - NOAA Federal <michael.gonsalves@noaa.gov>, Eric Berkowitz - NOAA Federal <eric.w.berkowitz@noaa.gov>, Adam Pfundt - NOAA Federal <adam.pfundt@noaa.gov>, Corey Allen - NOAA Federal <corey.allen@noaa.gov>

CDR Evans,

Sorry for the delay in response. HSSD defines features to be any anthropogenic or natural object. The natural objects (e.g. rocks) should be appropriately represented in the grid but should not be turned into S-57 features. For this reconnaissance survey, we would like RA to designate soundings on any features that fail the HSSD threshold *only* when that designated sounding will be shoaler than what is currently on the chart. If this guidance is still unclear, please respond.

FA has submitted their PARS survey. They had about 40 designated soundings, mostly in this same section of the corridor. They designed all features that broke HSSD using Order 2 TPU values.

Thank you,
Katrina
[Quoted text hidden]

APPROVAL PAGE

D00198

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 NCEI for archive

- D00198_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- D00198_GeoImage.pdf

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

Approved: Digitally signed by HOLMBERG.PETER.SCOTT.1365886101
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=HOLMBERG.PETER.SCOTT.1365886101
Date: 2016.09.01 08:48:45 -07'00'

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.

Approved: FROELICH.GRANT.DANIEL.1272192509
2016.09.01 08:52:02 -07'00'

Grant Froelich
Acting Chief, Pacific Hydrographic Branch