H12262

NOAA FORM 76-35A

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

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No.

Registry No. H12262

LOCALITY

State Alaska

General Locality Krenitzin Islands

Sublocality Fathometer Reef

2010

CHIEF OF PARTY
David D. Briggs, Fugro Pelagos, Inc.

LIBRARY & ARCHIVES

DATE

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

HYDROGRAPHIC TITLE SHEET

REGISTRY No

H12262

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

FIELD No: N/A

State **Alaska**

General Locality **Krenitzin Islands**

Sub-Locality **Fathometer Reef**

Scale **1:10,000** Date of Survey **06/09/2010 – 07/06/2010**

Instructions dated **April, 2010** Project No. **OPR-Q191-KR-10**

Vessel **F/V PACIFIC STAR (556510), R/V R2 (623241), R/V D2 (647782)**

Chief of party **David D. Briggs, FUGRO PELAGOS, Inc.**

Surveyed by **BRIGGS, REYNOLDS, FARLEY, ROKYTA, LYDON, LOPEZ, TIXIER, GOODALL, CAIN, ESPOSITO, et.al**

Soundings by **RESON SEABAT 7125 (PACIFIC STAR, HULL MOUNT), RESON SEABAT 7101 (R2 HULL MOUNT).**

SAR by **Joe Tegeder** Compilation by **Fernando Ortiz**

Soundings compiled in **Fathoms**

REMARKS: **All times are UTC. UTM Projection 3N**

The purpose of this survey is to provide contemporary surveys to update National Ocean Service (NOS) nautical charts. All separates are filed with the hydrographic data. Revisions and end notes in red were generated during office processing. The processing branch concurs with all information and recomendations 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/.

A. Area Surveyed

H12262 (Sheet C) is located in the area near Fathometer Reef.

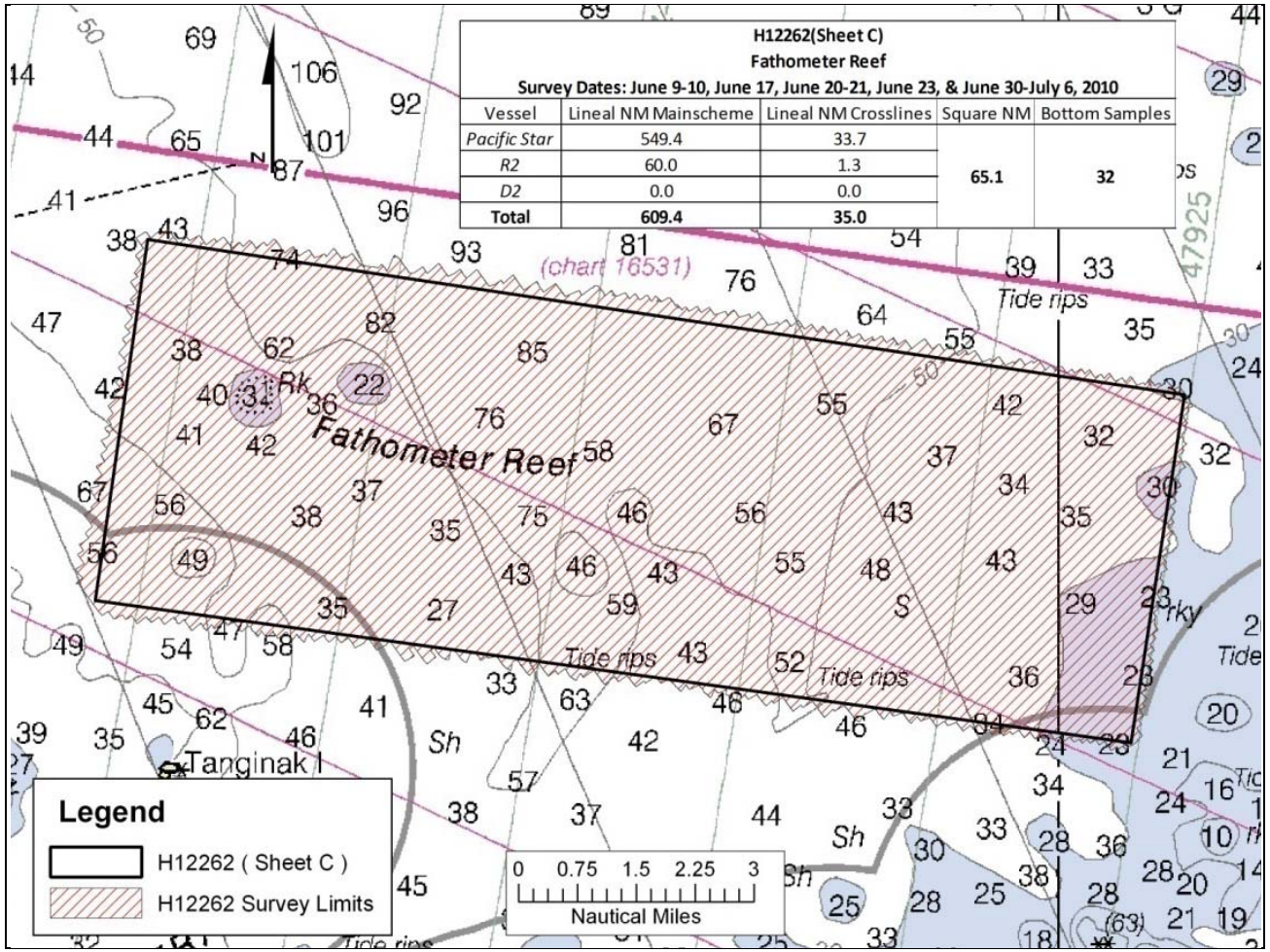

Figure 1 H12262 Area Surveyed

B. Data Acquisition and Processing

Refer to the OPR-Q191-KR-10 Data Acquisition and Processing Report for a detailed description of all equipment, survey vessels, processing procedures, and quality control features. Items specific to this survey and any deviations from the Data Acquisition and Processing Report are discussed in the following sections.

B.1 Equipment & Vessels

The F/V Pacific Star, along with survey launch R/V R2 acquired all sounding data for H12262.

F/V Pacific Star, 162 feet in length with a draft of 16 feet, was equipped with a hull mounted Reson SeaBat 7125 dual-frequency multibeam echosounder system for the OPR-Q191-KR-10 project. The Reson 7125 operates at two user-selectable frequencies of 400 and 200 kHz. The 7125 forms 256 or 512 beams over 128° with a beam width of 0.5° (across-track) in the 400 kHz mode, and 256 beams over 128° with a beam width of 1° (across-track) in the 200 kHz mode. It allows the operator to select equi-angle or equi-distant beam spacing. For this project, both the 400 kHz and 200 kHz systems were configured for 256 equi-angle beams. The selection of these frequencies as well as range scale, gain, power levels, ping rates, etc. was a function of water depth and data quality and was noted on the survey line logs (see Separate 1). All 7125 multibeam data files were logged in the S7K format using WinFrog Multibeam v3.09.02. The vessel was equipped with two AML sound velocity and pressure sensors (SV&P), and a Brooks Ocean Moving Vessel Profiler (MVP), for sound velocity profiles. Vessel attitude and position were measured using an Applanix Position and Orientation System for Marine Vessels (POS MV) 320 V4. OTT RLS radar sensors were installed on the port and starboard gunwales of F/V Pacific Star to obtain a more precise static draft measurement. Samples were taken over a 10 minute period and averaged to determine the vessel's draft. Traditional static draft measurement techniques were also employed as a substitute to the OTT RLS measurements when required.

R/V R2, a Pacific Star launch, is 29 feet in length with a draft of 3 feet. For this survey, R2 was initially equipped with a hull mounted Reson SeaBat 7101 multibeam echosounder. The Reson 7101 on R2 was fitted with a stick projector and operated at a frequency of 240 kHz. The system forms either 239 or 511 beams across a 150° swath width. All 7101 multibeam data files were logged in the S7K format using WinFrog Multibeam v3.09.02. On the 26th of June (JD177), the 7101 transducer and receiver were replaced with an extended range 7101 system. The extended range 7101 head did not change any of the original specifications of the RESON beam forming or WinFrog Multibeam logging. R2 was equipped with two AML sound velocity and pressure sensors (SV&P) for sound velocity profiles, and vessel attitude and position were measured using an Applanix Position and Orientation System for Marine Vessels (POS MV) 320 V4.

B.2 Quality Control

Crosslines

Crosslines were planned and well distributed throughout the survey to ensure adequate quality control. Total crossline length surveyed was 35.0 nautical miles or 5.7 percent of the total main scheme line length. Each crossline was compared to the entire main scheme line plan through a 4m CUBE surface, using the CARIS HIPS QC report routine

The majority of QC Reports fall well within the required accuracy specifications. The one exception is the crossline run by R2 over Fathometer Reef. The R2 QC report beams fall below the 95% confidence level due to steep slopes and significant rock ledges. Good conformity was still seen between the main scheme lines and crossline. Main scheme lines are shown in purple and crosslines in beige. Quality Control Results are located in Separate IV.

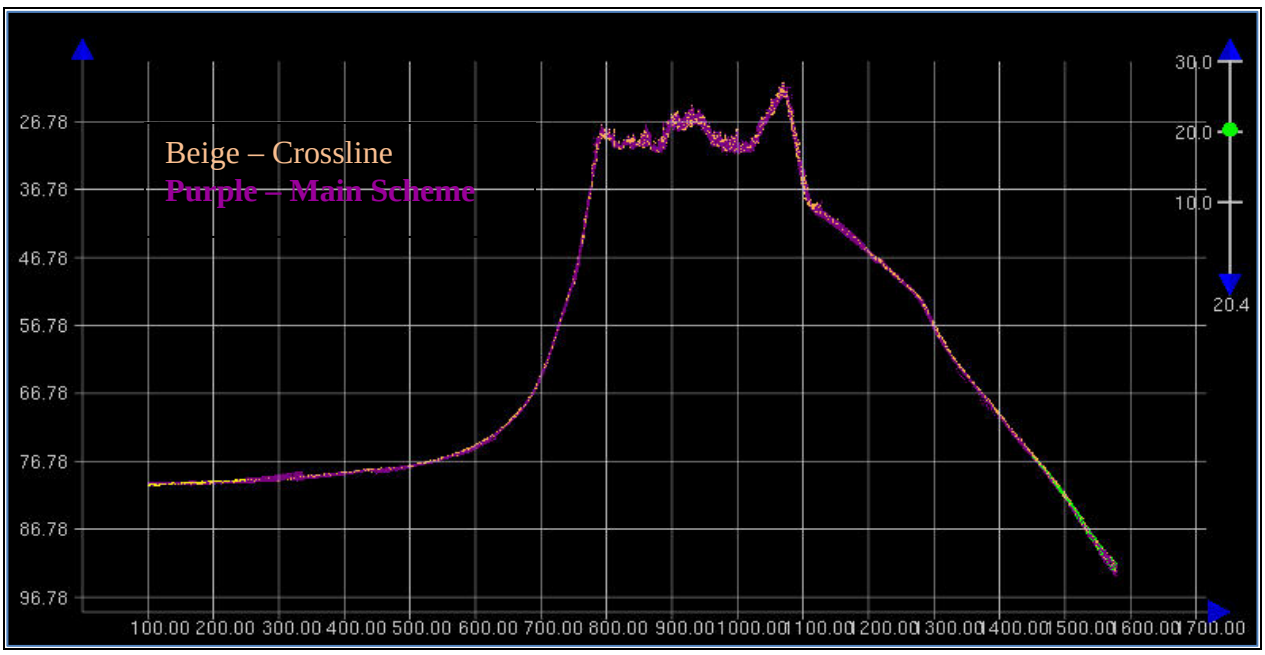

Figure 2 Profile of 2C07-TIE01

Note: The QC reports were generated based on the IHO Order 1a accuracy specification:

$$\pm\sqrt{a^2 + (b * d)^2}$$

Where, a=0.5 and b=0.013, d=depth

Uncertainty Values

The majority of H12262 had uncertainty values of 0.31m to 1.20m, which met project specifications (**Figure 3**).

As seen in the uncertainty surface graphic, uncertainty is generally lowest near the sonar nadir beams and increases toward the outside of each swath. This is expected and primarily a result of sound velocity error uncertainty and bottom detection.

Oscillations along-track and port to starboard on the uncertainty surface are due to higher uncertainty computed due to vessel roll, again prevalent mostly in the outer beams.

Higher uncertainties exist in rocky areas as a result of the steep slopes and irregular bottom topography.

In the southwest corner of the sheet, consistently higher uncertainties are seen as compared to the rest of the sheet. This is a result of data being acquired by vessel R2 using a 7101 system. The remainder of the sheet was collected with the Pacific Star using a 7125 system.

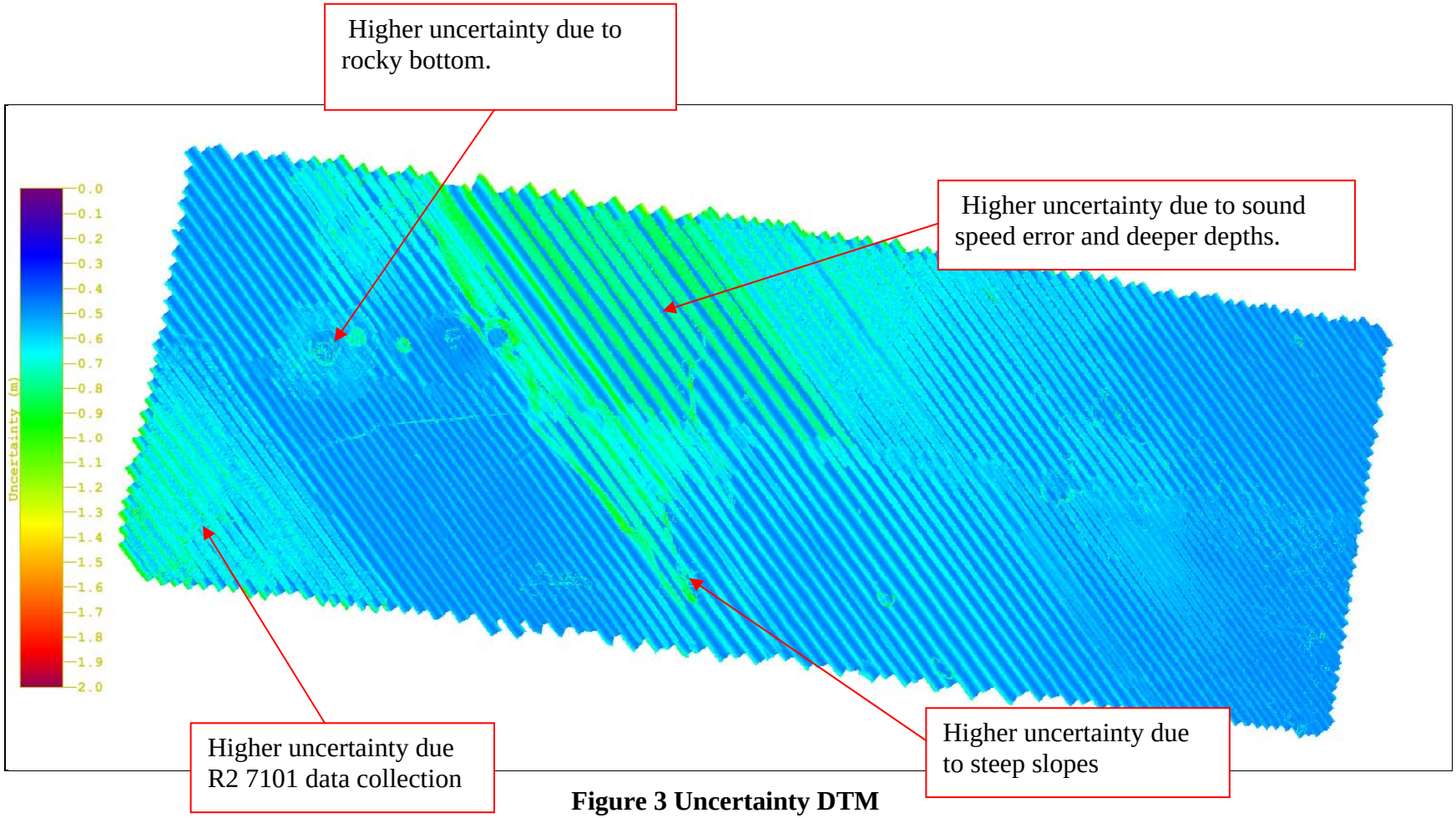

Figure 3 Uncertainty DTM

Data Density

The NOS Hydrographic Surveys Specifications and Deliverables, April 2010, required 95% of all nodes to be populated with at least five soundings. Survey H12262 met these project specifications. The nodes that fell below five pings were mainly a result of inclement weather conditions. (**Figure 4**)

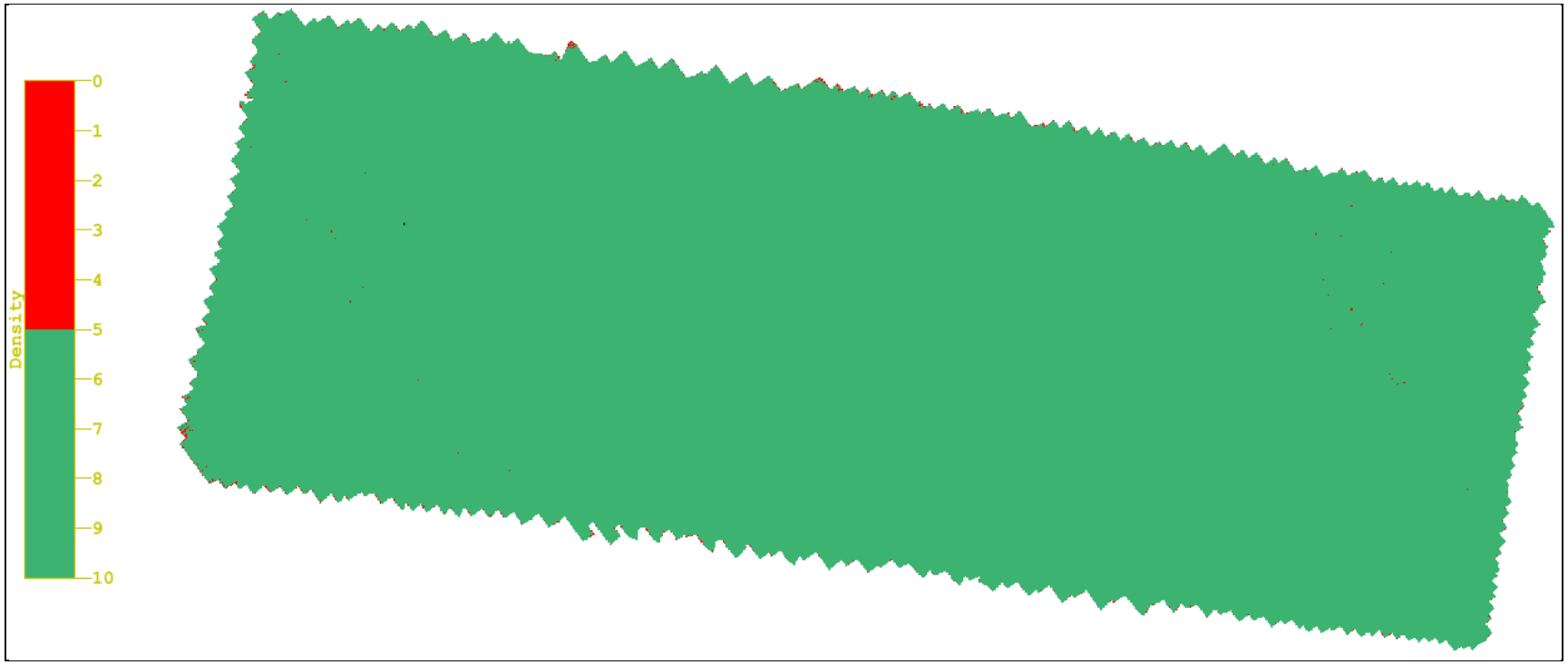

Figure 4 Density DTM

Detection requirements were met by minimizing vessel speed when necessary, using sonar range scales appropriate to the water depth to maximize ping rates, and maximizing swath overlap. These variables were adjusted in real-time by the online acquisition crew based on the WinFrog QC and coverage displays. The shipboard processing crew provided feedback after preliminary processing and coverage creation in CARIS HIPS, and reported re-runs or in-fills as necessary to the acquisition crew.

Survey Junctions

H12262 (Sheet C) junctions with: [1]

Registry #	Date	Junction Side
H12260	2010	East
H12261	2010	South
H12263	2010	South
H12264	2010	West

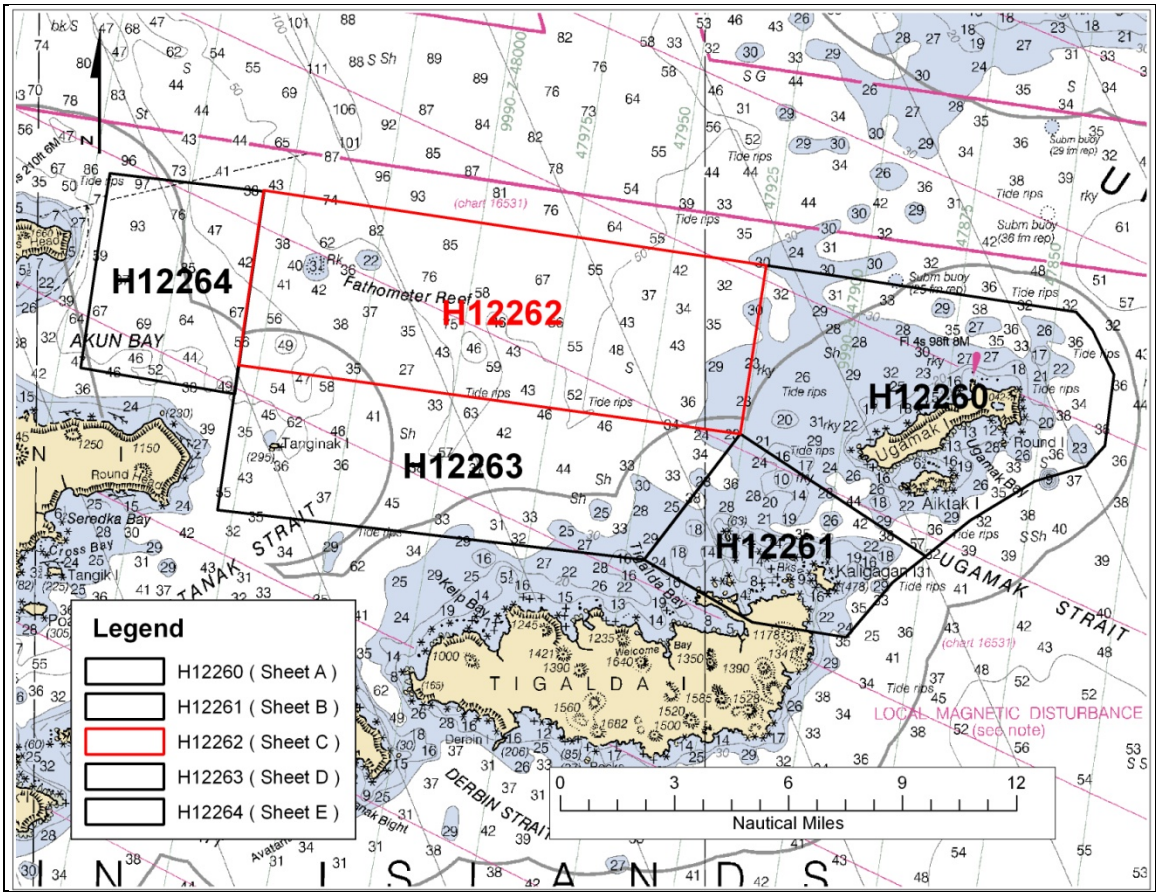

Figure 5 H12262 Survey Junctions

The surveys are in agreement along their common borders. The agreement was noted in the field using the CUBE surfaces during subset cleaning. The conformity is also apparent in the Finalized BASE Surfaces.

Quality Control Checks

Positioning system confidence checks were conducted on a daily basis using the (POS MV) controller software. The controller software had numerous real-time displays that were monitored throughout the survey to ensure the positional accuracies specified in the NOS Hydrographic Surveys Specifications and Deliverables were achieved. These include, but are not limited to the following: GPS Status, Position Accuracy, Receiver Status (which included HDOP), and Satellite Status. During periods of high HDOP and/or low number of available satellites, survey operations were suspended.

Sonar system confidence checks were performed weekly by comparing post processed depth information collected by multiple vessels surveying over a common area. In addition, bar checks were performed to maintain a high confidence level. Sound Velocity Probe confidence checks were conducted weekly by producing comparable sound velocity data between all vessels. This was conducted by having all sound velocity profiling equipment (MVP and SVPs) perform a cast in close proximity to each other in a near simultaneous time period.

Data Quality

In general, the multibeam data quality for H12262 was good. One notable problem follows:

1. A general downward and/or upward cupping is noticeable in the across-track sounding profiles for certain areas. This is possibly due to a high volume of thermal layering and strong undercurrents in the water column. This problem was addressed by conducting SVP casts more frequently and reducing the line spacing interval. Even though this SVP error is noticeable in the data, it is within required specifications.

The Pacific Star and R2 collected sound velocity profiles every two hours (or less) to compensate for velocity changes over time. Profiles were collected on alternate ends of lines, or often in the middle of lines, to minimize the spatial aspect of sound velocity changes.

Refer to the OPR-Q191-KR-10 Data Acquisition and Processing Report for a detailed description of the survey equipment and methodology used over the course of this survey.

B.3 Corrections to Echo Soundings

Refer to the OPR-Q191-KR-10 Data Acquisition and Processing Report for a detailed description of all corrections to echo soundings. No deviations from the report occurred.

B.4 Data Processing

Refer to the OPR-Q191-KR-10 Data Acquisition and Processing Report for a detailed description of the processing flow.

In order to provide more accurate project wide TPU values, all full water column sound speed cast measurements were statistically analyzed in MBTools, via the SVP Statistics utility. This utility calculated a mean, variance, and standard deviation at a user specified depth interval. The standard deviation was then used to produce a TPU value of higher accuracy that was vessel and sheet specific.

TPU models for the 7101 and 7125 system were found to be incorrectly applied in CARIS v7.0. The DeviceModel.xml file was edited to correct the sonar TPU values. See the Data Acquisition and Processing Report Section B for a more specific description of the issue and corrective action.

Launch R2 performed survey operations in H12262 from JD160 to JD161 and JD184 to JD185. Due to the long off period between acquisition sessions, the two sessions were considered to be stastistically incompatible, requiring that they be split into separate populations. A Sound Velocity TPU value was calculated for each R2 time group and applied appropriately. TPU values specific to H12262 are shown in **Table 1**.

Table 1 H12262 TPU Values

Vessel	Measured	Surface
1-Pacific Star	0.742	0.250
2-R2(JD160-JD161)	0.512	0.250
2-R2(JD184-JD185)	0.504	0.250

The final fieldsheet for H12262 is called “H12262_(Sheet_C)”, and it contains four BASE surfaces. The following parameters were used:[2]

0-22 meters: 1 m resolution, name “H12262_1m_Final”
20-44 meters: 2 m resolution, name “H12262_2m_Final”
40-80 meters: 4 m resolution, name “H12262_4m_Final”
80-176 meters: 8 m resolution, name “H12262_8m_Final”

Notes:

- Maximum depth was approximately 170m; therefore, resolutions coarser than 8m were not computed.

- Final CUBE BASE surfaces were created with CARIS v 7.0 in the CARIS Spatial Archive (CSAR) format. These surfaces are located under the "H12262(Sheet_C)\CARIS\Fieldsheets" directory.

The final S57 file for this project is called "H12262_S57_Features.000".[3] This file contains the object and metadata S57 objects as required in the Specifications and Deliverables.

C. Vertical and Horizontal Control

Refer to the OPR-Q191-KR-10 Horizontal and Vertical Control Report for a detailed description of the horizontal and vertical control used on this survey. No deviations from the report occurred. A summary of the project's horizontal and vertical control follows.

Horizontal Control

The horizontal control datum for this survey was the North American Datum of 1983 (NAD83).

For real-time DGPS corrections, a CSI MBX-3 unit was tuned to the Cold Bay, Alaska USCG DGPS site. The unit output differentially corrected positions at 1 Hz to the (POS MV) 320 V4 where it was integrated with inertial data and a position for the top-center of the IMU was generated. This position was logged concurrently with the bathymetry from WinFrog and the POS file with Fugro Pelagos PosMvLogger. It was later corrected for offsets to the multibeam echosounder (MBES) by CARIS HIPS in post processing.

Final positioning was done using post-processed kinematic (PPK) methods. Applanix POSPac v5.3 software was used in conjunction with the POS files and local 1Hz base station data to generate a higher accuracy position which was applied in processing, replacing the real-time position records.

See OPR-Q191-KR-10 Horizontal and Vertical Control Report for a more detailed description of PPK positioning methods used.

Vertical Control

All sounding data were reduced to MLLW initially using observed tidal data from two John Oswald and Associates (JOA) tide stations located in Akun Bay and Tigalda Bay, AK and one NOAA COOPS tide station located in King Cove, AK. Tidal data for a twenty-four hour period UTC, (Alaska Daylight Time to UTC was +8 hours) was assembled by JOA and e-mailed to the F/V Pacific Star at the end of every Julian Day. A cumulative file for the gauges was updated each day by appending the new data. It should be noted that these unverified tides were used in the field for preliminary processing only. The NOAA supplied tidal zoning was modified by

JOA, providing a more elaborate zoning scheme than those zones issued in the Statement of Work.

On March 29, 2011, JOA issued verified tidal data and final zoning for H12260, H12261, H12262, H12263, & H12264 of OPR-Q191-KR-10. All sounding data was then re-merged using CARIS HIPS and SIPS tide routine. Verified tidal data were used for all final Navigation BASE surfaces and S57 Feature files.

For additional information, refer OPR-Q191-KR-10 Horizontal and Vertical Control Report.

Table 2 Tide Gauge

Gauge	Location	Latitude	Longitude
946-2719	Akun Island, AK	54° 14' 20” N	165° 32' 28” W
946-2782	Tigalda Bay, AK	54° 07' 05” N	164° 58' 35” W
945-9881	King Cove, AK	55° 03' 42” N	162° 19' 36” W

D. Results and Recommendations

D.1 Chart Comparison

H12262 survey was compared with charts shown in **Table 3**.

Table 3 Chart Comparisons

Chart Number	Type	Scale	Edition	Edition Date
16520	Raster	1:300,000	23	August-2008
16531	Raster	1:80,000	7	February-2002
US3AK61M	ENC	n/a	16	January-2011
US4AK6FM	ENC	n/a	7	October-2010

Comparison of Soundings

A comparison of soundings was accomplished by overlaying the latest edition of NOAA charts and ENCs onto the final BASE surfaces in CARIS HIPS & SIPS. The general agreement between the charted soundings and H12262 soundings is noted. A more detailed comparison was undertaken for any charted shoals or other dangerous features.

Agreement between the H12262 BASE surface depths and the charted soundings for all applicable ENC and Raster charts was within +/- 1 to 2 fathoms. Since the survey area was ensonified with 100% multibeam coverage, shoaler depths were discovered between the charted soundings. Additionally, contours in the area were adequate, but require revision from the high

resolution data. In these areas, when necessary, the sounding was designated to ensure its inclusion in the finalized BASE surface. Exceptions follow:

1. Charted contours were in general found to be adequate, but the 100% multibeam coverage discovered discrepancies between charted and observed contours. Hydrographer recommends contours and soundings should be modified to agree with the H12262 survey.[4]

2. The charted 22 fathom shoal 2.5km east of Fathometer Reef was found to be shoaler than charted on both RNCs and ENCs. The surveyed least depth of the shoal is 17.28 fathoms. [5]

3. The Fathometer Reef charted 3.25 fathom underwater rock was found to be deeper than charted on both RNCs and ENCs. The surveyed least depth of the rock is 5.26 fathoms and is located 100m north of its current charted position.[6]

The Hydrographer recommends that soundings within the survey limits of H12262 supersede all prior survey and charted depths.

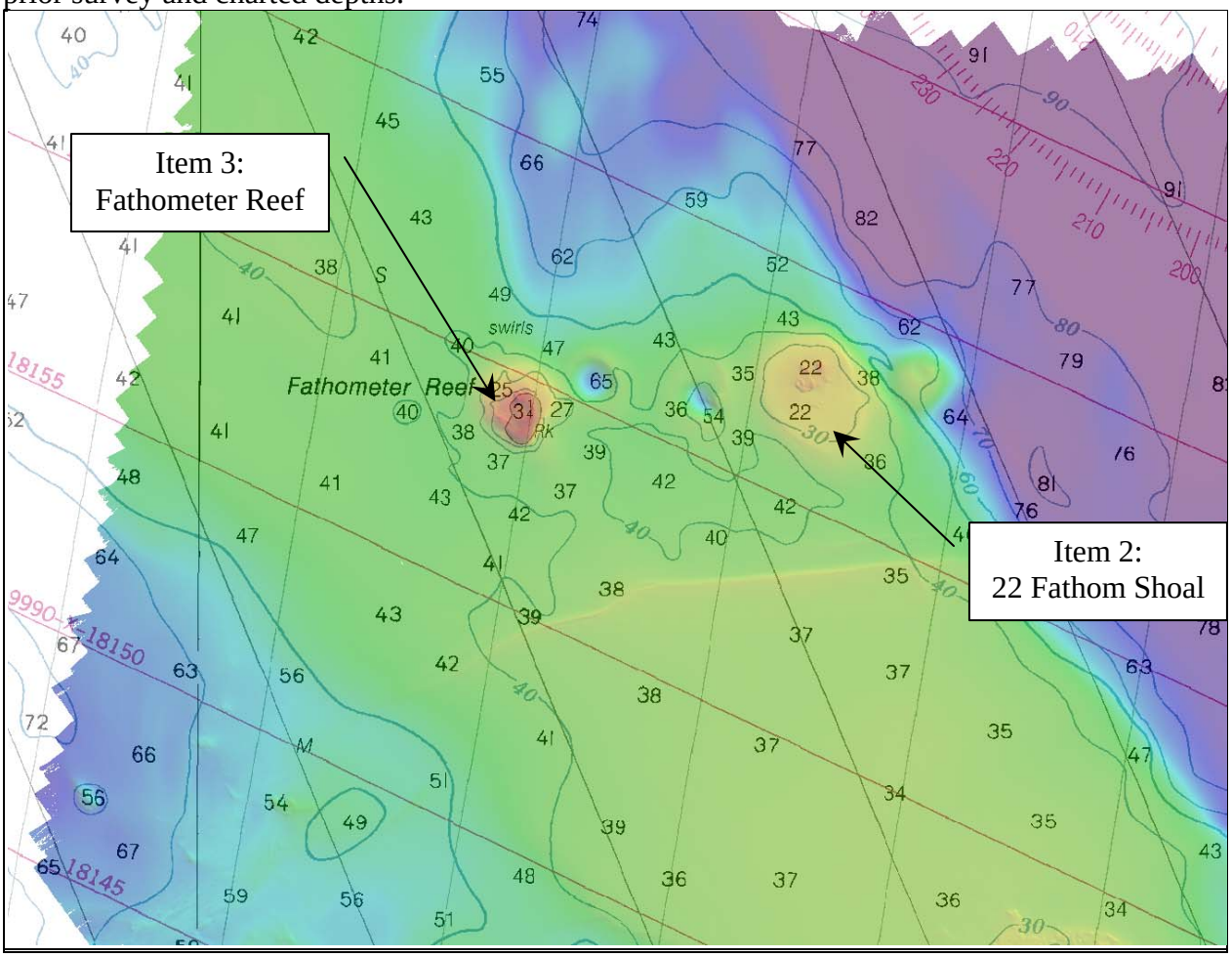

Figure 6 Bathymetry overlayed on Chart 16531

Automated Wreck and Observation Information System (AWOIS)

There were no AWOIS items assigned for investigation.

Charted Features

There were no charted features labeled ED, PD, or PA within the limits of H12262.

Dangers to Navigation

No dangers to navigation were found or reported for this survey.

D.2 Additional Results

None to note.

Bottom Samples

The F/V Pacific Star and launches (R2 and D2) were fitted to obtain bottom samples as specified in the Statement of Work. Thirty-two samples were obtained in survey H12262.

Samples were taken with a Van Veen grab sampler and positions were recorded with WinFrog Multibeam v 3.09.02. Samples retrieved were analyzed and then encoded with the appropriate S57 attributes. Positions and descriptions of samples are found in the H12262_S57_Features.000 file.[7]

Aids to Navigation

There were no charted aids to navigation in the survey area. No uncharted aids to navigation were found in the survey area.

Revisions and corrections performed during office processing and certification.

---

[1] H12262 junctions with H12264 to the West and H12263 to the South. A common junction was made with an adjoining portion of these surveys. In addition, a common junction will be made with with H12261 to the Southeast and H12260 to the East during compilation process.
[2] A 8 meter combined surface was created during the Survey Acceptance Review and was used for the cartographic compilation of this survey.
[3] Concur with clarification, the features submitted in "H12262_S57_Features.000 file, delivered from the field were used in the compilation of H12262, however modifications were made at the Pacific Hydrographic Branch to accommodate chart scale. Chart features as depicted in the HCell.
[4] Chart contours as shown in the SS file. Chart depths as shown in the HCell.
[5] The sounding is 17.28 fm after final tide correction. Chart as depited in the HCell.
[6] A rock symbol was added to the HCell. Chart features as depicted in the HCell.
[7] Thirty two bottom samples are included in the HCell to be charted. Two bottom samples from the ENC were imported to be retained.

H12262 HCell Compilation Report

Fernando Ortiz, Physical Scientist
Pacific Hydrographic Branch

1. Specifications, Standards and Guidance Used in HCell Compilation

HCell compilation of survey H12262 used:

Office of Coast Survey HCell Specifications: Version: 6.1, 2 July, 2011.
HCell Reference Guide: Version 2.0, 2 June, 2010.

2. Compilation Scale

Depths and features for HCell H12262 were compiled to the largest scale raster charts shown below:

Chart	Scale	Edition	Edition Date	NTM Date
16531	1:80,000	7th	02/16/2002	07/02/2011

The following ENCs were also used during compilation:

Chart	Scale
US4AK6FM	1:80,000

3. Soundings

A survey-scale sounding (SOUNDG) feature object layer was built from the 8-meter Combined Surface in CARIS BASE Editor. A shoal-biased selection was made at 1:10,000 at survey scale using a Radius Table file with values shown in the table, below.

Shoal Limit (m)	Deep Limit (m)	Radius (mm)
-5	10	2
10	20	3
20	50	3.5
50	500	4

In CARIS BASE Editor soundings were manually selected from the high density sounding layers (SS) and imported into a new layer (CS) created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that closely represents the seafloor morphology.

4. Depth Contours

Depth contours at the intervals on the largest scale chart are included in the *_SS HCell for MCD raster charting division to use for guidance in creating chart contours. The metric and fathom equivalent contour values are shown in the table below.

Chart Contour Intervals in Fathoms from Chart 16531	Metric Equivalent to Chart Fathoms, Arithmetically Rounded	Metric Equivalent of Chart Fathoms, with NOAA Rounding Applied	Fathoms with NOAA Rounding Applied	Fathoms with NOAA Rounding Removed for Display on H12262_SS.000
3	5.4864	5.715	3.125	3
5	9.144	9.3726	5.125	5
10	18.288	18.5166	10.250	10
20	36.576	37.9476	20.750	20
30	54.864	56.2356	30.750	30
40	73.152	74.5236	40.750	40
50	91.44	92.8116	50.750	50
60	109.728	111.0996	60.750	60
70	128.016	129.3876	70.750	70
80	146.304	147.6756	80.750	80
90	164.592	165.9636	90.750	90

5. Meta Areas

The following Meta objects area is included in HCell H12262:

M_QUAL

The Meta area objects were constructed on the basis of the limits of the hydrography.

6. Features

Features addressed by the field units are delivered to PHB where they are deconflicted against the hydrography and the largest scale chart. These features, as well as features to be retained from the chart and features digitized from the Base Surface, are included in the HCell. The geometry of these features may be modified to emulate chart scale per the HCell Reference Guide on compiling features to the chart scale HCell.

7. Spatial Framework

7.1 Coordinate System

All spatial map and base cell file deliverables are in an LLDG geographic coordinate system, with WGS84 horizontal, MHW vertical, and MLLW (1983-2001 NTDE) sounding datums.

7.2 Horizontal and Vertical Units

DUNI, HUNI and PUNI are used to define units for depth, height and horizontal position in the chart units HCell, as shown below.

Chart Unit Base Cell Units:

Depth Units (DUNI):	Fathoms and feet
Height Units (HUNI):	Feet
Positional Units (PUNI):	Meters

During creation of the HCell in CARIS BASE Editor and CARIS S-57 Composer, all soundings and features are maintained in metric units with as high precision as possible. Depth units for soundings measured with sonar maintain millimeter precision. Depths on rocks above MLLW and heights on islets above MHW are typically measured with range finder, so precision is less. Units and precision are shown below.

BASE Editor and S-57 Composer Units:

Sounding Units:	Meters rounded to the nearest millimeter
Spot Height Units:	Meters rounded to the nearest decimeter

See the HCell Reference Guide for details of conversion from metric to charting units, and application of NOAA rounding.

7. 3 S-57 Object Classes

The CS HCell contains the following Object Classes:

$CSYMB	Blue Notes (points) —Notes to the MCD chart Compiler
M_QUAL	Data quality Meta object
SBDARE	Bottom samples
SOUNDG	Soundings at chart scale density
UWTROC	Rocks

The M_QUAL is adequate for NDB product searches.

The SS HCell contains the following Object Classes:

DEPCNT	Generalized contours at chart scale intervals (See table under section 4.)
SOUNDG	Soundings at the survey scale density (See table under section 3.)

8. Data Processing Notes

There were no significant deviations from the standards and protocols given in the HCell Specification and HCell Reference Guide.

9. QA/QC and ENC Validation Checks

H12262 was subjected to QA checks in S-57 Composer prior to exporting to the metric HCell base cell (000) file. The millimeter precision metric S-57 HCell was converted to chart units and NOAA rounding applied. dKart Inspector was then used to further check the data set for conformity with the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and warnings and errors investigated and corrected unless they are MCD approved as inherent to and acceptable for HCells.

10. Products

10.1 HSD, MCD and CGTP Deliverables

H12262_CS.000	Base Cell File, Chart Units, Soundings and features compiled to 1:80,000
H12262 _SS.000	Base Cell File, Chart Units, Soundings and Contours compiled to 1:10,000
H12262 _DR.pdf	Descriptive Report including end notes compiled during office processing and certification, the HCell Report, and supplemental items
H12262 _outline.gml	Survey outline
H12262 _outline.xsd	Survey outline

10.2 Software

CARIS HIPS Ver. 7.0	Inspection of Combined BASE Surfaces
CARIS BASE Editor Ver. 3.2	Creation of soundings and bathy-derived features, creation of the meta area objects, and Blue Notes; Survey evaluation and verification; Initial HCell assembly.
CARIS S-57 Composer Ver. 2.2	Final compilation of the HCell, correct geometry and build topology, apply final attributes, export the HCell, and QA.
CARIS GIS 4.4a	Setting the sounding rounding variable for conversion of the metric HCell to NOAA charting units with NOAA rounding.
CARIS HOM Ver. 3.3	Perform conversion of the metric HCell to NOAA charting units with NOAA rounding.
HydroService AS, dKart Inspector Ver. 5.1, SP 1	Validation of the base cell file.
Northport Systems, Inc., Fugawi View ENC Ver.1.0.0.3	Independent inspection of final HCells using a COTS viewer.

11. Contacts

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

Fernando Ortiz
Physical Scientist
Pacific Hydrographic Branch
Seattle, WA
206-526-6859
Fernando.ortiz@noaa.gov.

APPROVAL SHEET
H12262

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

Fernando Ortiz
2011.08.24
14:02:43 -07'00'

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

Kurt Brown
2011.08.24
14:07:55 -07'00'

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

Digitally signed by NELSON.GARY.C.1365885318
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=OTHER, cn=NELSON.GARY.C.1365885318
Date: 2011.08.24 14:18:23 -07'00'