W00003

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. W00003

LOCALITY

State ALASKA

General Locality Glacier Bay

Sublocality Muir Inlet to Icy Strait

2007

CHIEF OF PARTY

Thales GeoSolutions (Pacific), Inc.

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DATE

NOAA FORM 77-28
(11-72)

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

REGISTER NO.

W00003

HYDROGRAPHIC TITLE SHEET

INSTRUCTIONS The hydrographic sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the office.

FIELD NO.

State ALASKA

General Locality Glacier Bay

Sublocality Muir Inlet to Icy Strait

Scale N/A

Dates of Survey 05/29/2001 - 06/06/2001

Instructions Dated

Project No.

Vessel R/V/ DAVIDSON

Chief of Party Thales GeoSolutions (Pacific), Inc.

Surveyed by Thales GeoSolutions (Pacific), Inc.

Soundings taken by echo sounders: Reson Seabat 8111 echosounder

Graphic record scaled by

Graphic record checked by

Evaluation by S. Allen

Automated plot by N/A

Verification by S. Allen, K. Reser

Soundings in Fathoms and Feet at MLLW

REMARKS: Time in UTC. UTM Projection Zone 8

Revisions and annotations appearing as endnotes were generated during office processing.

As a result, page numbering may be interrupted or non-sequential

All separates are filed with the hydrographic data.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-6349

July 30, 2008

MEMORANDUM TO: Captain John E. Lowell, NOAA
Chief, Marine Chart Division

THROUGH: Jeffrey Ferguson
Chief, Hydrographic Surveys Division

David Neander
2008.07.30 12:10:43 -07'00'

FROM: Commander David O. Neander, NOAA
Chief, Pacific Hydrographic Branch

SUBJECT: Approval Memorandum for W00003
Muir Inlet to Icy Strait
Glacier Bay, Alaska

The Pacific Hydrographic Branch has completed evaluation and chart application of Outside Source Data from the United States Geological Survey (USGS). The survey was conducted in 2001 by Thales GeoSolutions (Pacific), Inc. for the USGS and National Park Service. The purpose of the survey was to acquire high resolution bathymetry of Glacier Bay along with calibrated backscatter data. I have reviewed the data, reports and compilation to the chart. Data are suitable for nautical charting except where specifically recommended in the Evaluation and Quality Assurance Memorandum and Chart Application Memorandum.

Within the 2007 NOAA Hydrographic Survey Priorities (NHSP), Glacier Bay is listed as "Priority 3" and "Priority 4." Except as noted in the Evaluation and Quality Assurance Memorandum and Chart Application Memorandum, W00003 provided adequate depth information in the areas where it was utilized. However, shoreline features were not addressed by W00003, and all charted shoreline and features should be retained as charted. Additional fieldwork including multibeam and/or side-scan surveys of AWOIS items, inlets, bays and anchorage areas is recommended as resources allow. Due to the potential changes in the Glacier Bay area due to climate change and the large volume of cruise ship traffic, it is recommended that the area encompassing survey W00003 be re-classified as a "Re-Survey Area", surveyed periodically every 7-10 years. The remaining portion of Glacier Bay, outside the limits of survey W00003, should be re-classified as "Emerging Critical Area".

cc: Chief, HSD Operations Branch N/CS31

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF COAST SURVEY
Pacific Hydrographic Branch
Seattle, Washington 98115-6349

28 July 2008

David Neander
2008.07.30 11:43:41
-07'00'

MEMORANDUM TO: Commander David Neander, NOAA
Chief, Pacific Hydrographic Branch

Digitally signed by Katie Reser
DN: cn=Katie Reser, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=katie.reser@noaa.gov
Date: 2008.07.30 11:32:49 -07'00'

FROM: Katie J. Reser
Physical Scientist, Pacific Hydrographic Branch

SUBJECT: Application of Outside Source Data Survey
W00003
U.S. Department of Interior
United States Geologic Survey
(survey conducted by Thales GeoSolutions (Pacific), Inc.)
Reson 8111 Multibeam Sonar Data

I concur with all recommendations by the reviewer Shyla Allen except where noted in this report.

Summary of compilation:

- Soundings have been applied
- No rocks or features were superseded
- Shoals were superseded only if a shoaler depth was found
- Shoreline was retained as charted
- Bottom characteristics were retained as charted
- Recommend aids to navigation be updated with latest ATONIS information
- No additional Dangers to Navigation were found during compilation.

It is recommended that OSD survey W00003 supersedes charted information as depicted in Hcell W00003_hc with associated bluenotes and applied to charts 17318, 17302, 17300, 16760 and ENC US3AK38M.

Hcell Supplemental Report is attached.

Digitally signed by Gary C. Nelson
DN: cn=Gary C. Nelson, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=gary.nelson@noaa.gov
Date: 2008.07.30 12:22:33 -07'00'

Reviewed and approved: _____
Gary Nelson, Cartographic Team Leader
Pacific Hydrographic Branch

Outside Source Data Evaluation
Survey W00003

Data Acquired by:
U.S. Department of Interior
United States Geologic Survey (USGS)
Surveyed by: Thales GeoSolutions (Pacific), Inc.
Glacier Bay, AK
May-June 2001

A. GENERAL INFORMATION[1]

A.1 Background

This survey was conducted by Thales GeoSolutions (Pacific), Inc. for the United States Geological Survey and National Park Service. The purpose of the survey was to collect high resolution multibeam bathymetry of Glacier Bay along with calibrated backscatter data.

A.2 Area Surveyed

The survey area covered the waters south of the fork between Muir Inlet and the west fork of Glacier Bay extending into Icy Straits. See *Figure 1* for graphic of survey limits.

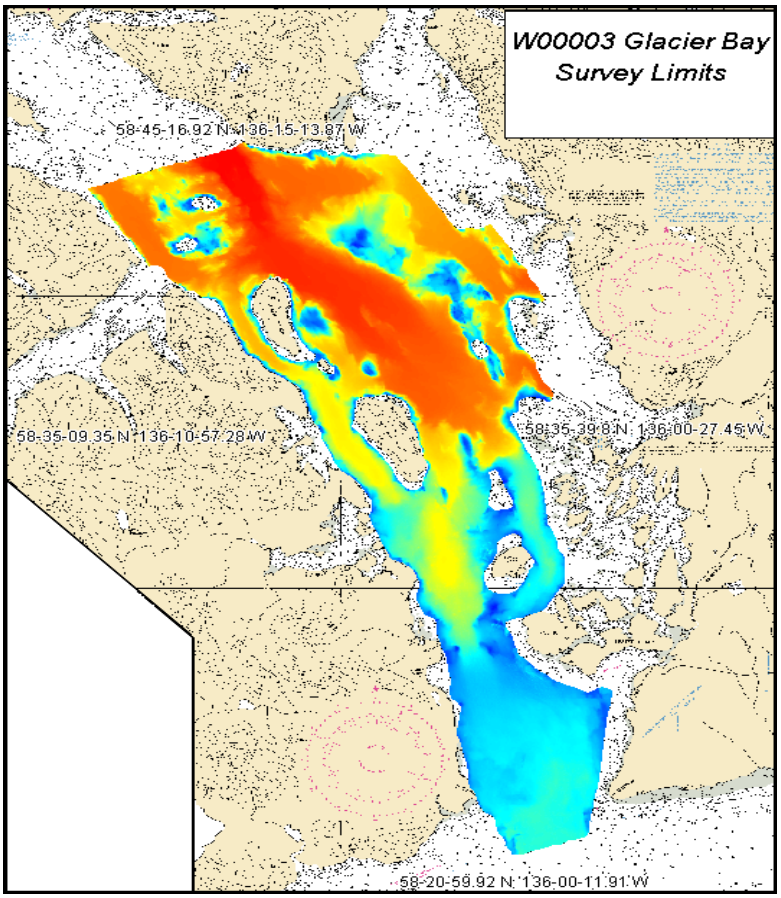

Figure 1: Survey limits of W00003

A.3 Data and Reports

The following data and documentation were received from the United States Geological Survey:

- Raw .XTF multibeam data
- Processed five-meter gridded XYZ data in ASCII format
- A verified CARIS tide file: CapeOmmaney.tid
- A CARIS sound velocity file: GlacierBay.svp
- A Descriptive Report, Thales Document Number: TGP-2251-RPT-01-00
- A Data Acquisition and Processing Report, Thales Document Number: TGP-2251-RPT-01-00[2]

B. DATA ACQUISTION AND PROCESSING

B1. Data Acquisition

As described in the *Data Acquisition and Processing Report*prepared by the hydrographer, the R/V DAVIDSON was the only vessel utilized for the collection of sound velocity profiles and multibeam data in shallow to medium water depths. The R/V DAVIDSON was equipped with a hull mounted Reson SeaBat 8111 and a Sea-Bird CTD for sound velocity profiling. Vessel heading and attitude were measured using a SG Brown Meridian Surveyor Gyrocompass and TSS Dynamic Motion Sensor DMS2-05, respectively. Position data were acquired with NovAtel GPS antennas in conjunction with two MBX-3 differential receivers that utilized USCG beacons. Positioning information was verified in real time using propriety integrated navigation software. Data were logged using Winfrog Multibeam software from Thales GeoSolutions.

B2. Corrections to Echo Soundings

As described in the Hydrographer's *Data Acquisition and Processing Report* sounding data were corrected for sound velocity, dynamic draft, static draft, verified zoned tides, heading, heave, pitch, and roll. A patch test was conducted before acquiring data and is also described in the hydrographer's Data Acquisition and Processing Report. The following sections summarize how the hydrographer measured corrections to echo soundings:

<u>Sound Velocity Correction</u>
A Sea-Bird Model 19-03 Conductivity, Temperature, and Depth profiler was used to determine sound velocities. This is the identical model used by NOAA hydrographic field units. Casts were taken every four to six hours until it was determined that water conditions were isothermal and isohaline. Sound velocity casts were then reduced to intervals of six to ten hours depending on water depth, and the beginning of a new survey area.

<u>Dynamic Draft (Settlement Curve)</u>

The settlement curve was established by using Trimble RTK GPS derived altitude data. The dynamic draft correctors were applied in CARIS HIPS.

Static Draft
Draft measurements were taken on both sides of the vessel over of a period of several days. The average of these measurements was used to establish the static draft, which was entered into the CARIS Vessel Configuration File (VCF) and applied in CARIS HIPS.

Tides
All soundings for W00003 were reduced to Mean Lower-Low Water (MLLW) using verified tide data from one NOAA tide station located at Juneau, AK (945-2210). These data were used in creating tide tables that were applied to the data in CARIS. LCMF Inc was contracted by Thales Geosolutions (Pacific) to provide final verified tidal zoning for the Glacier Bay survey area. Tide reports were not included with deliverables to the Pacific Hydrographic Branch.

Vessel Attitude
Vessel heading and dynamic motion was measure with a SG Brown Gyrocompass and TSS DMS2-05, respectively.

B3. Data Processing and Quality Control

Hydrographer

The hydrographer processed and analyzed survey data CARIS Hydrographic Information and Processing System (HIPS) and Hydrographic Data Cleaning System (HDCS) on Unix and NT workstations.

As described in detail in the hydrographer's *Data Acquisition and Processing Report*, following acquisition, shallow-water multibeam data were converted from Winfrog Multibeam to XTF, then to HDCS using the CARIS xtfToHDCS program. Sound velocity profiles and static draft were loaded into each line and then corrected in the HDCS program SwathEdit. All soundings beyond a maximum angle of 65° off-nadir were flagged as rejected. Attitude, navigation, and bathymetry data for individual lines were examined for noise, as well as to ensure the completeness and correctness of the data set. After individual lines were examined and cleaned, the tide file was loaded and the lines were merged.

All soundings were then again reviewed, spatially referenced, in CARIS HDCS Subset Edit Mode. Data were compared with adjacent lines and crosslines, for systematic errors such as tide or sound velocity and to clean any remaining noise.

Sun-illuminated Digital Terrain Model images (DTMs) were created in CARIS HIPS to demonstrate coverage and to further check for systematic errors such as tide, sound velocity,

or attitude and/or timing errors. The DTM's were created at a specified 5 meter and 10 meter grid intervals.

Evaluator

The evaluator imported the five-meter gridded XYZ data into CARIS GIS for analysis and suppresson. The evaluator created DTM's in CARIS Editor to inspect for systematic errors, such as tide busts or sound velocity errors, and for blunders such as fliers remaining in the dataset. None were found. The DTM was also used to identify shoal areas and hydrographic features for further inspection. The dataset was suppressed with a shoal-biasing criteria using CARIS' "suppsoun" utility, and the suppressed dataset was then exported to MapInfo for further analysis.

As a quality control measure and to ensure that least depths over navigationally significant hydrographic features had properly been identified in the gridded dataset, the evaluator selected areas of 12 fathoms and shoaler and processed and cleaned the corresponding data from raw XTF format to CARIS HDCS format. This provided a dataset in which the results of the processing techniques of the evaluator could be compared to that of the hydrographer for a confidence check on the hydrographer's processing and quality control. DTMs were created of the evaluator-processed area, providing a quick reference to high points of a shoal region. The evaluator-processed and -cleaned soundings and the DTMs were then exported to MapInfo for further comparison with the chart and the processed five meter gridded XYZ dataset. The evaluator then compared the depths from the gridded dataset supplied by the hydrographer and suppressed by the evaluator, with the least depths from the data cleaned by the evaluator.

Discrepancies between office-processed sounding and field-processed soundings were generally within half a meter, with a few exceptions, and are likely explained by minor differences between the rounding routines used in the field and that of the office and the gridding technique used by the contractor, which the evaluator believes to be a bin-averaging method. In addition slight discrepancies may also be associated with the differences between NOAA's excessing routine and CARIS's sounding suppression algorithm. Where significant discrepancies existed and it was determined that the appropriate least depth was not reflected in the hydrographer's dataset, the evaluator inserted the appropriate least depths into the gridded dataset.

Discrepancies on shoals may be accounted for by the gridding process that may have averaged data for each grid cell and therefore suppressed shoal soundings on peaks of features based on the grid size. In instances where the least depths were found to be suppressed, the evaluator manually inserted the least depth into a shoal biased XYZ ASCII dataset exported from CARIS GIS.

Internal Data Consistency

A total of 57 cross lines were examined by the hydrographer using CARIS HIPS Q/C report. The quality control cross lines totaling 4.7 percent of the total main scheme miles were

acquired in the field.[3] A majority of the QC cross lines passed vertical accuracy standards of IHO Order 1 for hydrographic surveys, at a 95 percent confidence level, yet some did not.

As described in detail in the hydrographer's *Descriptive Report*, cross line discrepancies can likely be attributed to steeply sloped topography that would mask the GPS constellation near shore and cause position jumps as the visible GPS constellation rapidly changes with respect to the survey vessel, and to steep sloped bathymetry which provides large changes in depth over small horizontal distances. In addition, the evaluator manually compared cross lines to mainscheme lines where crossings existed in the areas selected for further analysis. The selected cross lines which were examined by the evaluator agreed within vertical accuracy standards of the NOS Hydrographic Surveys Specifications and Deliverables Manual (HSSDM). The areas selected by the evaluator for analysis were both consistent internally and consistent with the hydrographer's findings.

The evaluator believes that crossline comparison is acceptable and that the data is internally consistent within specifications required by the Specifications and Deliverables Manual.

Data Quality Factors

No factors were noted by the hydrographer or noticed by the evaluator which would affect the quality of the data.

B4. Data Decimation

The processed five meter gridded XYZ dataset with the added least depths (see section B.3) was further decimated by the evaluator in CARIS GIS using the sounding suppression algorithm "suppsound." The evaluator chose the "straight" method for over plot removal which creates the same size buffer zone around each sounding.[4] The entire file was processed using the shoal biased option. The data were then plotted in MapInfo using a font size of 6. The suppressed dataset was also exported to a "sounding.txt" file which can be used by the cartographer in MicroStation to create a sounding (smooth) sheet to aid in chart compilation.

C. VERTICAL AND HORIZONTAL CONTROL

Vertical and horizontal control is adequately addressed in the hydrographer's *Descriptive Report*. A summary of horizontal and vertical control for this survey follows.

C.1 Horizontal Control

The horizontal control datum for survey W00003 was the World Geodetic System of 1984 (WGS84). Differential GPS was the sole method of positioning. Differential corrections from US Coast Guard beacons at Gustavus (288 kHz) and Biorka Island (305 kHz) were utilized independently by two MBX-3 differential receivers.

As a quality control measure of positioning the hydrographer logged three separate position files. The first file contained only the raw antenna position. The second file contained the pseudorange-corrected position calculated from a single differential beacon, with antenna offsets applied and Kalman filtering used to reject outliers. The third file contained a position generated from a weighted mean of pseudorange correctors logged simultaneously from both differential beacons. This file was also corrected for antenna offsets and Kalman filtering.

At the end of every line the hydrographer reviewed the weighted mean position with the single source position. This provided near real time verification of the RTCM sources.

In addition positioning system confidence checks were conducted daily however, were not included with the *Descriptive Report* or the digital data.

Based on the information provided and a review of the data, horizontal accuracy standards of the HSSDM appear to have been met.

C.2 Vertical Control

The vertical datum for survey W00003 was Mean Lower Low Water (MLLW). The operating National Water Level Observation Network primary tide station at Juneau, AK (945-2210) served as control for datum determination and as the primary source for water level reducers. The hydrographer installed no additional tide stations.

The "ZoneHIPS" function in HPTools V 8.9.5, supplied to Thales Geosolutions (Pacific) by NOAA, was used to calculate zoned tidal correctors using CARIS navigation files that were exported from CARIS NT. LCMF Inc. was subcontracted by Thales Geosolutions (Pacific) to provide final tidal zoning for the Glacier Bay. Tide reports were not included with deliverables to PHB; however the tide zones and co-tidal correctors used are summarized in section 3.4 of the hydrographer's *Data Acquisition and Processing Report*. An evaluation of selected areas did not reveal tidal offsets in the data. The evaluator believes that tides used by the hydrographer meet standards set forth in the NOS Hydrographic Surveys Specifications and Deliverables Manual (HSSDM).

D. ANALYSIS AND RECOMMENDATIONS

D.1 Error Analysis

A posteriori approach to error analysis and estimation was used to determine what accuracy standards were actually achieved by this survey. The data were assessed for repeatability and consistency, system capabilities, object detection capabilities, and survey procedures.

To determine the repeatability of selected soundings the raw XTF multibeam data were converted and shoals of twelve fathoms or less were manually processed by the evaluator.[5] The resulting comparison of the hydrographer's and evaluator's processed data set demonstrated consistency in both depth and position measurements, confirming that the data processing methods used by the hydrographer were sound.

The 5-meter gridded XYZ dataset was also compared to the largest scale chart which provided rudimentary 'ground truthing' as well as a check for anomalous depths. The processed soundings were in general consistent with the charted soundings and contours (see *D.4 Chart Comparisons).*

The survey equipment, as described in the hydrographer's *Data Acquisition and Processing Report*, are capable of meeting depth accuracy standards for an IHO order 1 survey.

Although, not apparent from manual examination of selected bathymetry, the evaluator noted two possible sources of error that may affect data accuracy. Sound velocity profiling may not have been frequent enough to accurately correct for fluctuations in conductivity and temperature. Another source of possible error stems from the tidal zoning. The primary tide gauge is not in the survey area and no tertiary gauges were established. However, from the areas inspected by the evaluator in CARIS subset mode, no SV or tide errors were noticed and the data were internally consistent. The evaluator believes that, while methods for acquiring sound velocity profiles and water level data were not consistent with standard NOAA field procedures, that the data still meet accuracy requirements set forth by the HSSDM.

The evaluator believes that object detection criteria for IHO Order 1 were met by limiting survey speeds to an average of 7.5 knots, ensuring that the maximum line spacing did not to exceed three times the water depth and reviewing snippet backscatter data in conjunction with bathymetry line data.[6]

The following table is the evaluator's assessment of whether or not the systems utilized are capable of meeting IHO accuracy and object detection requirements:

Measurement Source	IHO Special Order	IHO Order 1	IHO Order 2
Echosounder	Unknown	Yes	Yes
Vertical GPS	No	Not used	Not used
Horizontal GPS	No	Yes	Yes
Vessel heading	Yes	Yes	Yes
Sound Velocity / Refraction	Yes	Yes	Yes
Heave	Yes	Yes	Yes
Vessel Attitude source	Yes	Yes	Yes
Water Level	No	Yes	Yes
Object detection	No	Yes	Yes
Standard Met?	No	Yes	Yes

D.2 Discussion of Data Quality and Suitability for Charting

An evaluation of the data has determined that this survey meets accuracy requirements as set forth in the HSSDM. This determination is based on the following factors:

- The systems used by the hydrographer are capable of meeting NOS accuracy and object detection requirements.[7]

- The field procedures used by the hydrographer in acquiring the data meet bottom coverage, data accuracy, and object detection criteria required by NOS.[8]
- The data are internally consistent; no tide errors, sound velocity, or positioning errors are evident in the data.[9]
- All necessary corrections to echo soundings were measured within NOS accuracy requirements and have been applied to the data.[10]
- The data processing and quality assurance methods used by the hydrographer appear sound.[11]
- Apart from areas of obvious bottom change, the data compare well with the largest scale chart of the area.[12]
- No systematic errors are apparent in the data.[13]
- No gross blunders are evident in the data.[14]

The data have also been evaluated to determine suitability for use in revising the specified nautical chart. With the following exceptions these data are considered to be acceptable to supersede the charted information within the common area[15]:

- In the vicinity of 58-39-34.6 N, 136-03-30.35 W there is a holiday in coverage which corresponds with a charted 0-fathom, 4-foot shoal that is reported to bare. As hydrography from this survey does not appear to have detected the least depth over this shoal, the shoal should be retained as charted.[16]
- In the vicinity of 58-28-11.6 N, 136-03-21.39 W there is a holiday in coverage which corresponds with a charted shoal of 3.3 fathoms. Hydrography from this survey does not appear to have detected a least depth; therefore the charted data should not be superseded in this area.[17]
- In the vicinity of Beardslee Entrance at 58-29-43.7 N, 136-01-24.93 W and 58-29-02.18 N, 136-01-02.5 W there are holidays in coverage over the charted 9-fathom 3-foot sounding and 5-fathom 5-foot sounding. The chart should not be superceded in this area.[18]
- In the vicinity of a charted foul area at 58-33-30.56 N, 136-01-08.4 W there is a holiday in coverage that corresponds to the area inside charted ten fathom contour. The chart should not be superceded in this area.[19]
- There is a holiday in coverage south of South Marble Island, centered at 58-38-08.78 N, 136-02-12.13 W, and extending approximately 4500 meters to the south. There is a charted 7-fathom 1-foot sounding inside this region, and charted 5-fathom 4-foot and 13-fathom soundings at the edge of coverage in this region. These soundings should be retained as charted.[20]

D.3 Automated Wreck and Obstruction Information System (AWOIS) Items

Although not specifically addressed by this survey there are three AWOIS items located within the survey limits.[21] The evaluator charting recommendations have been entered into the Microsoft Access AWOIS database and are submitted with the digital data. Printouts of the AWOIS listings and evaluator's recommendations are attached as an appendix to this report.

No new AWOIS items should be created as a result of this survey.[22]

D.4 Chart Comparison

Survey W00003 was compared with chart 17318 (5^{h} Ed.; Jan. 13, 2001, 1:80,000).

Depths from survey W00003 compare well with chart 17318, with differences ranging from one to four fathoms.[23] Greater differences between adjacent charted and survey soundings can be attributed to the steep and rugged character of the bathymetry, and to increased bottom coverage using SWMB methods.

D.5 Shoreline

No outside source shoreline was provided with this survey. No shoreline was investigated during this survey. The evaluator recommends retaining the shoreline as charted.[24]

D.6 Dangers to Navigation

Four dangers to navigation (DtoN's) were found during the hydrographic evaluation of this survey. These were submitted to Marine Chart Division (MCD) on July 16, 2003. A copy of the DtoN Letter is attached to this report.[25]

D.7 Aids to Navigation

No aids to navigation were investigated by this survey, and none exist within the survey area.[26]

E. APPROVAL

All records, reports, and data obtained by the Pacific Hydrographic Branch from this outside data source have been evaluated with regard to survey coverage, data accuracy, and suitability for use in nautical charting. Charting recommendations contained in this report are based on an assessment of the systems, field procedures, and quality assurance methods used by the hydrographer in comparison with the NOS Hydrographic Surveys Specifications and Deliverables Manual, and Special Publication 44 of the International Hydrographic Organization.

Evaluated by:

Digitally signed by Gary C. Nelson
DN: cn=Gary C. Nelson, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=gary.nelson@noaa.gov
Reason: For Shyla Allen
Date: 2008.07.30 12:23:40 -07'00'

Shyla Allen
Physical Scientist - Hydrographer
Pacific Hydrographic Branch

Reviewed by:

David Neander
2008.07.30
11:42:36 -07'00'

Lieutenant Edward J. Van Den Ameele, NOAA
Hydrographic Team Leader
Pacific Hydrographic Branch

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DN: cn=Gary C. Nelson, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=gary.nelson@noaa.gov
Reason: For Bruce Olmstead
Date: 2008.07.30 12:25:42 -07'00'

Bruce Olmstead
Acting Cartographic Team Leader
Pacific Hydrographic Branch

Approval

I have reviewed the accompanying outside source data and accompanying reports. Data are suitable for use in nautical charting as noted in this report. [27]

Approved by:

David Neander
2008.07.30
11:42:53 -07'00'

Commander John E. Lowell, Jr., NOAA
Chief
Pacific Hydrographic Branch

[1] For the purpose of this report, the term "hydrographer" refers to Thales GeoSolutions (Pacific), Inc., the term "evaluator" refers to the physical scientist who reviewed the survey, and the term "compiler" refers to the physical scientist who compiled the Hcell.
[2] Digital copy only. The report was not recoverable on tape media. The descriptive report was sufficient to enable compilation of the data.
[3] Crossline mileage totaling 5% of the mainscheme mileage was not required for this survey.
[4] For the purpose of compilation, a different suppression routine was used. Sounding suppression was run on the full 5 meter resolution XYZ dataset using the shoal bias option and the following radius table:

Depth Range (meters)	**Radius (mm at map scale)**
0 – 10	3
10 – 20	4
20 – 40	4.5
40 – 500	5

[5] The reported DTONs for this survey were apparently derived from the processing conducted by the evaluator and the exact details of how the processing was conducted was not documented. Since the office processing yielded shoaler depths for the reported DTONs than what was identified in the XYZ dataset submitted by the hydrographer, all reported DTONs should be retained as charted.
[6] Concur with clarification. Object detection was met except in places specifically noted by the evaluator. See exceptions noted in section D.2.
[7] Concur.
[8] Concur with clarification. See exceptions noted in section D.2 and endnote 3.
[9] Concur.
[10] Concur.
[11] Concur.
[12] Concur.
[13] Concur.
[14] Do not concur. Fliers were found in the full 5 meter resolution XYZ data. After shoal-biased sounding suppression, one remained in the survey scale sounding set just east of the north end of Drake Island (58-40-41.603N, 136-11-53.322W). The flier has a depth of 214 meters with surrounding depths between 329 meters and 337 meters.
[15] Concur with clarification. There are also fliers noted in the 5 meter resolution XYZ data. See endnote 14.
[16] Concur with clarification. Charted sounding is AWOIS record 50999 and should be retained as charted.
[17] Concur.
[18] Concur with clarification. The 5 fathom 5 foot sounding was superseded by a 5 fathom 3 foot sounding.
[19] Concur.
[20] Concur.
[21] Concur with clarification. Coverage was not obtained over AWOIS items 50999 and 50616 which are reported 0.7 fathom sounding at 58-39-27.07N, 136-03-32.77W and 3 fathom sounding at 58-39-22.67N, 136-03-30.67W respectively. Given that the two items are reported within 140 meters of each other, the 0.7 fathom sounding should be retained as charted. AWOIS item 50998 (a reported 12.1 fathom sounding) was surveyed to 11.24 fathoms at 58-37-30.41N, 136-08-30.56W. AWOIS 50998 should be superseded by the surveyed position and depth.
[22] Concur.
[23] Concur.
[24] Concur with clarification. Retain all charted bottom type classifications. Use the latest RSD shoreline available.

[25] Concur.
[26] Do not concur. There are three ATONs within the limits or on the edge of survey W00003. There is Rush Point Shoal Buoy 1(Light List 24220), which is a green can buoy at 58-28-05N, 136-03-20W that is maintained from May 1 to Oct 1. There is Ancon Rock Buoy 2 (Light List 24190), which is a red nun buoy at 58-22-24N, 135-55-56W. There is also a white and orange pillar buoy that is a private aid at 58-25-49N, 135-55-14W. None of the ATONs were investigated during this survey. Use the latest ATONIS information for charting.
[27] Concur.

Danger to Navigation Report

Hydrographic Survey Registry Number: W00003

Survey Title: **State:** Alaska **Locality:** Glacier Bay **Sub-locality:** Southern Glacier Bay

Survey Dates: May 29th-June 6th, 2001

Depths are reduced to Mean Lower Low Water using verified tides. Positions are based on the NAD83 horizontal datum.

CHARTS AFFECTED:

Chart	Scale	Edition	Date
17318	1:80,000	5th	1/13/01
17300	1:209,978	30th	10/30/02

DANGERS:

Feature	Depth	Latitude	Longitude
Shoal	8 fathoms 1 foot	58-41-33.11N	136-17-27.14W
Shoal	8 fathoms 1 foot	58-28-05.70N	136-01-31.51W
Shoal	6 fathoms 4 feet	58-41-51.62N	136-09-22.60W
Shoal	5 fathoms 3 feet	58-33-52.05N	136-00-55.87W

COMMENTS: These soundings are derived from outside source data hydrographic survey W00003, which was a full bottom coverage multibeam survey conducted under contract for the US Geologic Survey in May-June, 2001. Data from this survey have been evaluated by the Pacific Hydrographic Branch and have been deemed to meet standards suitable for nautical charting.
Questions concerning this report should be directed to the Chief, Pacific Hydrographic Branch (N/CS34), at (206) 526-6836.

W00003 HCell Report

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Introduction

The primary purpose of the HCell is to directly update NOAA ENCs with new survey information in International Hydrographic Organization (IHO) format S-57. HCell compilation of survey W00003 utilized Office of Coast Survey HCell Specifications Version 3.0, May 2008 and Hcell User Guide Version 1.1, June 2008. The survey was compiled as HCell W00003 and will be used to update charts 17318, 1:80,000 (6th Ed.; January 08, NM 3/1/2008), 17302, 1:80,000 (18th Ed.; March 02, NM 6/7/2008), 17300, 1:209,978(31st Ed.; September 05, NM 6/7/2008), 16760, 1:300,000 (10th Ed.; November 02, NM 6/7/2008) and US3AK38M.

1. Compilation Scale

The density of soundings in the HCell are compiled as appropriate to emulate those soundings of chart 17318, 1:80,000.

2. Soundings

2.1 Source Data

A 5 meter resolution XYZ sounding set, **glacier_bay_01_02** was used as the basis for HCell production following Branch certification.

A survey-scale sounding (SOUNDG) feature object source layer was extracted from the **glacier_bay_01_02** sounding set in CARIS GIS. A shoal-biased sounding suppression was made at 1:40,000 scale using a radius table with values shown in **Table 1**.

Upper limit (m)	Lower limit (m)	Radius (mm)
0	10	3
10	20	4
20	40	4.5
40	500	5

Table 1

2.2 Sounding Feature Objects

In CARIS BASE Editor soundings were manually selected from the high density sounding layer extracted from the **glacier_bay_01_02** XYZ sounding set, and imported into a new layer created to accommodate chart density depths. Manual selection was used to accomplish a density and distribution that more closely represents the seafloor morphology and that emulates density and distribution of soundings on chart 17318 than is possible using automated methods. See section 10.1, Data Processing Notes, for details about the use of manual sounding selection for W00003. The sounding feature object source layer was exported as **W00003_CS**, and imported into HOM.

3. Depth Areas

3.1 Source Data

Using a 5 meter TIN surface created from the full 5 meter resolution **glacier_bay_01_02** XYZ sounding set, a single depth area was generated. No depth contours were delivered per OCS HCell Specifications ver.3.0 and Hcell User Guide ver. 1.1.

3.2 Depth Area Feature Objects

One all-encompassing depth range, 9 meters to 412 meters, was used for all depth area objects below MLLW.

4. Meta Areas

The following Meta object areas are included in HCell W00003:

M_QUAL
M_COVR

Meta area objects were constructed on the basis of a perimeter line delineating the surveyed limits. This perimeter was first used to create the Skin of The Earth (SOTE) layer, then was duplicated to the Meta object layers and attributed per the HCell Specifications, ver. 3.0 and Hcell User Guide ver. 1.1.

5. Survey Features

Survey W00003 contains two charted (17318) rocks that fall within the limits of the survey that could not be confirmed or disproved. The rocks should be retained as charted and are located at 58-34-56.839N, 136-05-26.103W and 58-35-07.843N, 136-05-36.999W

There were three AWOIS items located within the limits of surveys W00003 with the following positions and recommendations:

> AWOIS item 50999 is a reported 0.7 fathom sounding at 58-39-27.07N, 136-03-32.77W. Coverage was not obtained over the position and the sounding should be retained as charted.
>
> AWOIS item 50616 is a reported 3 fathom sounding at 58-39-22.67N, 136-03-30.67W. Coverage was not obtained over the position and since only 140 meters away from item 50999, the 0.7 meter sounding mentioned above should be retained as charted.
>
> AWOIS item 50998 is a reported 12.1 fathom sounding that was surveyed to 11.24 fathoms at 58-37-30.41N, 136-08-30.56W. AWOIS 50998 should be superseded by the surveyed position and depth.

No bottom samples were collected during survey W00003. All charted (17318) bottom samples within the surveyed area were digitized and imported into the W00003 HCell.

6. Shoreline / Tide Delineation

One depth area (DEPARE) was created for the SOTE.

7. Attribution

All S-57 Feature Objects have been attributed as fully as possible based on information provided by the Hydrographer and in accordance with OCS HCell Specifications, ver. 3.0 and Hcell User Guide ver. 1.1.

8. Layout

8.1 CARIS HOM Layering Scheme

100	Chart scale soundings
101	Survey scale soundings
200	Group 1 object (Skin of the Earth)
300	Point objects

600-601	Meta layers
800	Items used for creation of Blue Notes

8.2 Blue Notes

Notes regarding data sources are in CARIS HOM as layer 800 as a Shapefile set, **W00003_bluenotes_p and W00003_bluenotes_l**.

9. Spatial Framework

9.1 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.

9.2 Horizontal and Vertical Units

During creation of sounding sets in CARIS BASE Editor, and creation of the HCell in CARIS HOM, units are maintained as metric with millimeter resolution. NOAA rounding is applied at the same time that conversion to chart units is made to the metric HCell base cell file, at the end of the HCell compilation process.

A CARIS environment variable, uslXsounding_round, controls the depth at which rounding occurs. Setting this variable to NOAA fathoms and feet displays all soundings from 0 to equal to or greater than 11 fathoms as whole units.

In an ENC viewer fathoms and feet display in the format X**.**YZZZ, where X is fathoms, Y is feet, and ZZZ is decimals of the foot. For fathoms and feet between 0 and 10 fathoms 4.5 feet (10.75 fms), soundings round to the deeper foot if the decimals of the foot are X**.**Y75000 or greater. For fathoms and feet deeper or equal to 11 fathoms, soundings round to the deeper fathom if feet and decimals of the foot are X**.**45000 (X**.**Y75000) or greater. Drying heights are in feet and are rounded using arithmetic methods. In an ENC viewer, heights greater than 6 feet will register in fathoms and feet using the above stated rules.

<u>HOM Units</u>

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

<u>Chart Unit Base Cell Units</u>

Depth Units (DUNI):	Fathoms and feet
Height Units (HUNI):	Feet (or fathoms and feet above 6 feet)
Positional Units (PUNI):	Meters

10. QA/QC

10.1 Data Processing Notes

Manual chart scale sounding selections were made for this survey. Experience has shown that in areas where bathymetry varied, automated sounding selection is impractical. None of the default sounding suppression options offered in CARIS BASE Editor or HOM yields an acceptable density and distribution of depths, generally bunching soundings nearshore with too sparse coverage seaward. While the customized options are more practical for this type of terrain, an inordinate amount of time must be spent in experimentation with variations on the algebraic terms in order to devise the most suitable formula, and manual adjustments are still required to the resulting sounding set.

10.2 ENC Validation Checks

W00003 was subjected to QA and Validation checks in HOM prior to exporting to the HCell base cell (000) file. Full millimeter precision was retained in the export of the metric S-57 base cell data set. This data set was converted to a chart unit 000 file. dKart Inspector 5.0 (Service Pack 1) was then used to further check the data set for conformity using the S-58 ver. 2 standard (formerly Appendix B.1 Annex C of the S-57 standard). All tests were run and errors investigated and corrected where necessary.

11. Products

11.1 HSD, MCD and CGTP Deliverables

- W00003 Base Cell File, Chart Units, Soundings compiled to 1:80,000
- W00003 Base Cell File, Chart Units, Soundings compiled to 1:40,000
- W00003 Descriptive Report including end notes compiled during office processing and certification
- W00003 HCell Report
- Blue Notes shape files

11.2 File Naming Conventions

<u>HOM file set prefix</u>: *W00003_hc*

<u>MCD Chart units base cell file</u>: *US300003_CS.000*

<u>MCD Chart units base cell file, survey scale soundings</u>: *US300003_SS.000*

11.3 Software

BASE Editor 2.1:	Combination of Product Surfaces and initial creation of the S-57 bathymetry-derived features
HOM 3.3:	Assembly of the HCell, S-57 products, QA
GIS 4.4a:	Setting the sounding rounding variable
dKart Inspector 5.0:	Validation of the base cell file

12. Contacts

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

Katie Reser, Physical Scientist, PHB, Seattle, WA; 206-526-6864;
Katie.Reser@noaa.gov.

APPROVAL SHEET
W00003

Cartography

The evaluated survey has been inspected with regard to delineation of the depth curves, development of critical depths, cartographic symbolization, and verification or disproval of charted data

Compiled by:

Digitally signed by Katie Reser
DN: cn=Katie Reser, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=katie.reser@noaa.gov
Date: 2008.07.30 11:33:03 -07'00'

Katie Reser
Physical Scientist
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Reviewed by:

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DN: cn=Gary C. Nelson, c=US, o=NOAA, ou=Pacific Hydrographic Branch, email=gary.nelson@noaa.gov
Date: 2008.07.30 12:26:05 -07'00'

Gary Nelson
Cartographer
Pacific Hydrographic Branch

Approval

I have reviewed the data, and reports. Data are suitable for nautical charting except where specifically recommended in this report.

David Neander
2008.07.30 11:43:22
-07'00'

David Neander
CDR, NOAA
Chief, Pacific Hydrographic Branch

David Scharff
AWOIS and Surf Check
2008.08.21 17:58:48 -04'00'