U.S. Department of Commerce National Oceanic and Atmospheric Administration National Ocean Service		
]	DESCRIPTIVE REPORT	
Type of Survey:	Navigable Area	
Registry Number:	H13002	
	LOCALITY	
State(s):	Alaska	
General Locality:	Kodiak Island, AK	
Sub-locality:	Offshore of Cape Chiniak	
	2017	
CHIEF OF PARTY CDR John Lomnicky		
	LIBRARY & ARCHIVES	
Date:		

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NATIONAL	U.S. DEPARTMENT OF COMMERCE OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NUMBER:
HYDROGRAF	HIC TITLE SHEET	H13002
INSTRUCTIONS: The Hydrog	graphic Sheet should be accompanied by this form, filled in as completely as possib	sle, when the sheet is forwarded to the Office.
State(s):	Alaska	
General Locality:	Kodiak Island, AK	
Sub-Locality:	Offshore of Cape Chiniak	
Scale:	40000	
Dates of Survey:	05/29/2017 to 06/12/2017	
Instructions Dated:	03/20/2017	
Project Number:	OPR-P136-RA-17	
Field Unit:	Jnit: NOAA Ship Rainier	
Chief of Party: CDR John Lomnicky		
Soundings by:	ndings by: Multibeam Echo Sounder	
Imagery by:	ry by: Multibeam Echo Sounder Backscatter	
Verification by:	erification by: Pacific Hydrographic Branch	
Soundings Acquired in:	meters at Mean Lower Low Water	

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/.

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Descriptive Report to Accompany Survey H13002

Project: OPR-P136-RA-17 Locality: Kodiak Island, AK Sublocality: Offshore of Cape Chiniak Scale: 1:40000 May 2017 - June 2017 NOAA Ship *Rainier*

Chief of Party: CDR John Lomnicky

A. Area Surveyed

The project area is referred to as H13002: "Offshore of Cape Chiniak" (sheet 7) within the Project Instructions. This area encompasses approximately 43 square nautical miles north northeast of Cape Chiniak, Alaska (Figure 1).

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
57° 45' 45" N	57° 45' 39.67" N
152° 5' 13.76" W	151° 53' 32.45" W

Table 1: Survey Limits

Data were acquired within survey limits as required in the Project Instructions and HSSD unless otherwise noted in this report.

A.2 Survey Purpose

The area of Chiniak Bay provides access to the second busiest and third richest fisheries port in Alaska. In 2015, the Port of Kodiak was responsible for 514 million pounds of fish and \$138 million dollars of product. Chiniak Bay is the gateway to Kodiak and has a survey vintage of 1933. This survey will serve to update the nautical charts with modern data to provide more accurate navigation information for continued support of this economic hub.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data were acquired within assigned survey limits as required in the Project Instructions and HSSD unless otherwise noted in this report.



Figure 1: H13002 VR density coverage

A.4 Survey Coverage

The following table lists the coverage requirements for this survey as assigned in the project instructions:

Water Depth	Coverage Required
Inshore limit greater than 8 meters water depth	Complete Coverage MBES (HSSD Section 5.2.2.3 Option A)

Survey coverage was in accordance with the requirements listed above and in the HSSD.



Figure 2: Acquired survey coverage with sheet limits overlaid on Charts 16594, 16593, and 16580

A.5 Survey Statistics

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

	HULL ID	2802	S221	Total
	SBES Mainscheme	0	0	0
	MBES Mainscheme	0.12	280.46	280.58
	Lidar Mainscheme	0	0	0
	SSS Mainscheme	0	0	0
	SBES/SSS Mainscheme	0	0	0
	MBES/SSS Mainscheme	0	0	0
	SBES/MBES Crosslines	0	43.7	43.7
	Lidar Crosslines	0	0	0
Numb Botton	er of n Samples			0
Numb Bound Investi	er Maritime lary Points igated			0
Numb	er of DPs			0
Numb Invest Dive C	er of Items igated by Ops			0
Total S	SNM			50.07

Table 2: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
05/29/2017	149
05/30/2017	150

Survey Dates	Day of the Year
06/07/2017	158
06/08/2017	159
06/09/2017	160
06/12/2017	163

Table 3: Dates of Hydrography

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

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	S221	2802
LOA	70.4 meters	8.5 meters
Draft	4.7 meters	1.1 meters

Table 4: Vessels Used

All data for survey H13002 was acquired by NOAA Ship Rainier and her survey launch 2802. The vessels acquired MBES depth soundings and sound velocity profiles.

B.1.2 Equipment

Manufacturer	Model	Туре
Kongsberg	EM 710	MBES
Applanix	POS MV v5	Positioning and Attitude System
Reson	SeaBat 7125 SV2	MBES
Odim Brooke Ocean (Rolls Royce Group)	MVP200	Conductivity, Temperature, and Depth Sensor
Reson	SVP71	Sound Speed System
Reson	SVP70	Sound Speed System
Sea-Bird Electronics, Inc.	19plus SEACAT Profiler	Conductivity, Temperature, and Depth Sensor

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

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines acquired for this survey totaled 15.57% of mainscheme acquisition.

Multibeam crosslines were acquired using Rainier S-221 across all depth ranges, water masses and boat days. H13002 crossline data is adequate for verifying and evaluating the internal consistency of survey data. A 8-meter CUBE surface was created using only H13002 mainscheme lines, and a second 8-meter surface was created using only crosslines. A difference surface was then generated in Caris from which statistics were derived. For its respective depths, the difference surface was compared to IHO allowable Total Vertical Uncertainty (TVU) standards. In total, 100% of the depth differences between H13002 mainscheme and crossline data met HSSD TVU standards. The analysis was performed on H13002 MBES data reduced to Mean Lower-Low Water (MLLW) using Ellipsoidally Referenced Zoned Tides (ERZT) methods



Figure 3: H13002 Crosslines overlaid on charts 16593, 16594, and 16580

Depth range	IHO Order	Number of nodes	Nodes satisfying IHO accuracy	Percent nodes satisfying IHO accuracy
Less than 100m	Order 1	446,755	446,622	99.97%
Greater than 100m	Order 2	546,850	546,850	100.00%
	TOTAL:	993,605	993,472	99.99%

Figure 4: Crossline IHO-compliance statistics

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning	Method
0 meters	0.129 meters	ERS via ERZT

Table 6: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
2802	3 meters/second	N/A meters/second	0.15 meters/second
S-221	N/A meters/second	1 meters/second	0.05 meters/second

Table 7: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13002 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field assigned values for sound speed uncertainties. Tidal uncertainty was accounted for by examining the field generated one thousand-meter resolution separation model and statistically determining a measured value. A measured uncertainty of 0.129 meters was entered to account for ERZT processing methods. See the 2017 DAPR for further information.

In addition to the usual a priori estimates of uncertainty, some real-time and post-processed uncertainty sources were also incorporated into the depth estimates of this survey. Real-time uncertainties from Reson MBES sonars were recorded and applied during post-processing. Applanix TrueHeave (POS) files, which record estimates of heave uncertainty, were also applied during post-processing. Finally, the post-processed uncertainties associated with vessel roll, pitch, yaw and position were applied in CARIS HIPS using SBET / RMS files generated using POSPac software.

Uncertainty values of the submitted finalized grid were calculated in CARIS using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Pydro QC tools 2 were used to analyze H13002 TVU compliance; a histogram plot of the results is shown below (Figure 5).



Figure 5: Pydro derived histogram plot showing TVU compliance of H13002 finalized multi-resolution MBES data

B.2.3 Junctions

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13001	1:40000	2017	NOAA Ship RAINIER	W

Table 8: Junctioning Surveys

<u>H13001</u>

One junction comparison exists for H13002 (H13001), which was acquired concurrently with this survey. See Description Report for H13001 for junction analysis.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: Sound Speed Cast Frequency: 38 sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, when significant changes in surface sound speed were observed, or when operating in a new area. Sound speed profiles were acquired using Sea-Bird 19plus SEACAT Profiler and Odim Brooke Ocean MVP200. All casts were concatenated into a master file and applied to MBES data using the "Nearest distance within time" (4 hours) profile selection method."

Figure 6: Locations of sound speed casts taken during acquisition on H13002

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Raw backscatter data were logged as .ALL files for delivery to NOAA's Pacific Hydrographic Branch. No post-processing or QC tasks were performed by the field unit.

B.5 Data Processing

B.5.1 Primary Data Processing Software

The following software program was the primary program used for bathymetric data processing:

Manufacturer	Name	Version
CARIS	Hips and Sips	9.1, 10.2, 10.3

Table 9: Primary bathymetric data processing software

The following Feature Object Catalog was used: NOAA Extended Attribute Files V5.5

B.5.2 Surfaces

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

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13002_MB_VR_MLLW	CUBE	999 meters	35.0 meters - 220.7 meters	VR	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H13002_MB_VR_MLLW_Final	CUBE	999 meters	35.0 meters - 220.7 meters	VR	Complete MBES

Table 10: Submitted Surfaces

Submitted surfaces were generated using the recommended parameters for depth-based Caris variable resolution bathymetric grids with Calder-Rice Density as specified in HSTD 2017-2. The resolution values indicated in Table 10 above are not accurate: the XML-DR schema used to generate this report does not accommodate variable resolution grids; the 999 value is obviously spurious and was entered merely as a "place holder." The XML-DR team is aware of this issue and are working to update the schema.

Calder Rice Density was used not Depth Based Variable Resolution.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying HVCR.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

Traditional Methods Used:

TCARI

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

Station Name	Station ID
Womens Bay	9457292

Table 11: NWLON Tide Stations

File Name	Status
9457292.tid	Final Approved

 Table 12: Water Level Files (.tid)

File Name	Status
P136RA2017.tc	Final

Table 13: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 06/23/2017. The final tide note was received on 07/06/2017.

See attached Tide Note dated July 6, 2017.

ERS Methods Used:

ERS via ERZT

Ellipsoid to Chart Datum Separation File:

H13002_NAD83_MLLW_SEP_1000m.csar

Ellipsoidally Referenced Zone Tides (ERZT) methods were used to transform between the ellipsoid and the water level data. A 1000-meter resolution separation model was computed between the ellipsoid and MLLW using real-time position measurements observed during the survey relative to the vessel water line and the TCARI tide file. "GPS tides" were then computed using the above separation model and the corrected GPS-height-to-water-level data (SBET). The 1000-meter resolution model was generated in NAD83 as were the SBETs.

C.2 Horizontal Control

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

The projection used for this project is Universal Transverse Mercator (UTM) Zone 5 North.

The following PPK methods were used for horizontal control:

Single Base

The Wide Area Augmentation System (WAAS) was used as real-time horizontal control for this survey.

The following user installed stations were used for horizontal control:

HVCR Site ID	Base Station ID
9715	Woody

Table 14: User Installed Base Stations

D. Results and Recommendations

D.1 Chart Comparison

Chart comparisons were performed using a Caris sounding layer based on the 8m surface from H13002 and a contour layer also based on the 8m surface. The survey-derived contours and soundings were overlaid on ENC chart US4AK5OM and compared for general agreement and to identify areas of significant change. Aside from slight changes in the 50-fathom contour, no significant changes were noted.

Figure 7: US4AK5OM chart comparison with 50 fathom contour highlighted.

D.1.1 Electronic Navigational Charts

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US4AK5OM	1:80000	22	01/19/2017	02/21/2017	NO

The following are the largest scale ENCs, which cover the survey area:

Table 15: Largest Scale ENCs

US4AK5OM

In the area of survey H13002, Raster chart 16593 coincides with Electronic Navigation Chart (ENC) US4AK5OM, therefore a comparison between H13002 and the Raster chart is equivalent to the following comparison with ENC US4AK5OM.

Several areas in H13002 were found to be different from charted depths, but not drastically so. Close examination of H13002 overlaid on ENC US4AK5OM revealed clusters of uncharted soundings less than 50 fathoms as well as a shift in the 50-fathom contour in the southwest corner of the survey (Figure 7).

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

No charted features exist for this survey.

D.1.4 Uncharted Features

No new navigationally significant features were detected during this survey.

D.1.5 Dangers to Navigation

No Danger to Navigation Reports were submitted for this survey.

D.1.6 Shoal and Hazardous Features

No shoals or potentially hazardous features exist for this survey.

D.1.7 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.1.8 Bottom Samples

Field survey teams were unsuccessful in acquiring a bottom sample using the approved sampling methods after multiple attempts.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was not assigned in the Hydrographic Survey Project Instructions or Statement of Work.

D.2.2 Prior Surveys

No prior survey comparisons were provided for this survey.

D.2.3 Aids to Navigation

No ATONs were specifically assigned for this survey and none exist within the assigned sheet limits.

D.2.4 Overhead Features

No overhead features were observed within the H13002 survey area.

D.2.5 Submarine Features

A charted (16593) cable area extends through the H13002 survey area; no evidence of cables was identified in H13002 MBES data.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

There are no platforms within the H13002 survey area.

D.2.8 Significant Features

Unexploded ordnance (reported 2013) is charted (16593) within the survey area. No evidence of these features was discovered, nor was this survey designed to observe such evidence.

D.2.9 Construction and Dredging

No present or planned construction or dredging are known to exist within the survey limits.

D.2.10 New Survey Recommendation

No new surveys or further investigations are recommended for this area.

D.2.11 Inset Recommendation

No new insets are recommended for this area.

E. Approval Sheet

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, 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, 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
John J. Lomnicky, CDR/NOAA	Commanding Officer, NOAA Ship Rainier	10/11/2017	Man K Tan Digitally signed by EVANS BENJAMIN.K.1237217094 Date: 2017.10.12 20.43:24-07/00
Scott Broo, LT/NOAA	Field Operations Officer, NOAA Ship Rainier	10/11/2017	BROO.SCOTT.EDW Digitally signed by BROO.SCOTT.EDWARD.1396599976 Dtk c:u5_c:u5_covernment, ou=DoD, ou=PKI, ou=NOAA, c==BRO.SCOTT.EDWARD.1396599976 Date: 2017.10.11 16:02:47-0700
James B. Jacobson	Chief Survey Technician, NOAA Ship Rainier	10/11/2017	JACOBSONJAMES.BRYAN.1 269664017 June B June I have reviewed this document 2017.10.11 09:32:02 -07'00'
Bethany McAcy, ENS/NOAA	Sheet Manager, NOAA Ship Rainier	10/11/2017	MCACY.BETHANY, Digitally signed by MCACYBETHAWY.NCLE1516645900 NICOLE.151664590 00 DMc-clS_culS_Government, ou=DoD, ou=PK, ou=NOAA, CI-SCRETHAWY.NCLE1516645900 Date: 2017.10.11 13:15:27-0700'

F. Table of Acronyms

Acronym	Definition	
AHB	Atlantic Hydrographic Branch	
AST	T Assistant Survey Technician	
ATON	Aid to Navigation	
AWOIS	Automated Wreck and Obstruction Information System	
BAG	Bathymetric Attributed Grid	
BASE	Bathymetry Associated with Statistical Error	
СО	Commanding Officer	
CO-OPS	Center for Operational Products and Services	
CORS	Continually Operating Reference Staiton	
CTD	Conductivity Temperature Depth	
CEF	Chart Evaluation File	
CSF	Composite Source File	
CST	Chief Survey Technician	
CUBE	Combined Uncertainty and Bathymetry Estimator	
DAPR	Data Acquisition and Processing Report	
DGPS	Differential Global Positioning System	
DP	Detached Position	
DR	Descriptive Report	
DTON	Danger to Navigation	
ENC	Electronic Navigational Chart	
ERS	Ellipsoidal Referenced Survey	
ERZT	Ellipsoidally Referenced Zoned Tides	
FFF	Final Feature File	
FOO	Field Operations Officer	
FPM	Field Procedures Manual	
GAMS	GPS Azimuth Measurement Subsystem	
GC	Geographic Cell	
GPS	Global Positioning System	
HIPS	Hydrographic Information Processing System	
HSD	Hydrographic Surveys Division	
HSSD	Hydrographic Survey Specifications and Deliverables	

Acronym	Definition	
HSTP	Hydrographic Systems Technology Programs	
HSX	Hypack Hysweep File Format	
HTD	Hydrographic Surveys Technical Directive	
HVCR	Horizontal and Vertical Control Report	
HVF	HIPS Vessel File	
ІНО	O International Hydrographic Organization	
IMU	Inertial Motion Unit	
ITRF	RF International Terrestrial Reference Frame	
LNM	M Local Notice to Mariners	
LNM	NM Linear Nautical Miles	
MCD	Marine Chart Division	
MHW	Mean High Water	
MLLW	Mean Lower Low Water	
NAD 83	North American Datum of 1983	
NAIP	National Agriculture and Imagery Program	
NALL	Navigable Area Limit Line	
NM	Notice to Mariners	
NMEA	National Marine Electronics Association	
NOAA	National Oceanic and Atmospheric Administration	
NOS	National Ocean Service	
NRT	Navigation Response Team	
NSD	Navigation Services Division	
OCS	Office of Coast Survey	
OMAO	Office of Marine and Aviation Operations (NOAA)	
OPS	Operations Branch	
MBES	Multibeam Echosounder	
NWLON	National Water Level Observation Network	
PDBS	Phase Differencing Bathymetric Sonar	
РНВ	Pacific Hydrographic Branch	
POS/MV	Position and Orientation System for Marine Vessels	
РРК	Post Processed Kinematic	
PPP	Precise Point Positioning	
PPS	Pulse per second	

Acronym	Definition	
PRF	Project Reference File	
PS	Physical Scientist	
PST	Physical Science Technician	
RNC	Raster Navigational Chart	
RTK	Real Time Kinematic	
SBES	Singlebeam Echosounder	
SBET	Smooth Best Estimate and Trajectory	
SNM	Square Nautical Miles	
SSS	Side Scan Sonar	
ST	Survey Technician	
SVP	Sound Velocity Profiler	
TCARI	Tidal Constituent And Residual Interpolation	
ТРЕ	Total Propagated Error	
TPU	Topside Processing Unit	
USACE	United States Army Corps of Engineers	
USCG	United Stated Coast Guard	
UTM	Universal Transverse Mercator	
XO	Executive Officer	
ZDA	Global Positiong System timing message	
ZDF	Zone Definition File	

PROVISIONAL TIDE NOTE FOR HYDROGRAPHIC SURVEY

DATE : July 6th, 2017 HYDROGRAPHIC BRANCH: Pacific HYDROGRAPHIC PROJECT: OPR-P136-RA-2017 HYDROGRAPHIC SHEET: H13002 LOCALITY: Offshore of Cape Chinak, Kodiak Island, AK TIME PERIOD: May 29 - June 12, 2017

TIDE STATION USED: 945-7292 Kodiak Island, AK

Lat. 57° 43.8'N Long. 152° 30.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE: 2.400 meters

REMARKS: RECOMMENDED GRID Please use the TCARI grid " P136RA2017.tc" as the final grid for project OPR-P136-RA-2017, H13002, during the period between May 29th and June 12th, 2017.

Refer to attachments for zoning 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).

Note 2: Annual leveling for Kodiak Island, AK (945-7292) was not completed in FY17. A review of the verified leveling records from May 2006 - May 2016 shows the tide station benchmark network to be stable within an allowable 0.009 m tolerance. This Tide Note may be used as final stability verification for survey OPR-P136-RA-2017, H13002. CO-OPS will immediately provide a revised Tide Note should subsequent leveling records indicate any benchmark network stability movement beyond the allowable 0.009 m tolerance.

CHIEF, PRODUCTS AND SERVICES BRANCH

APPROVAL PAGE

H13002

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

- H13002_DR.pdf
- Collection of depth varied resolution BAGS
- Processed survey data and records
- H13002_GeoImage.pdf

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

Approved:

Peter Holmberg

Cartographic Team Lead, Pacific Hydrographic Branch

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

Approved:

Lieutenant Commander Olivia Hauser, NOAA Chief, Pacific Hydrographic Branch