U.S. Department of Commerce National Oceanic and Atmospheric Administration National Ocean Service			
	DESCRIPTIVE REPORT		
Type of Survey:	Navigable Area		
Registry Number:	H13198		
	LOCALITY		
State(s):	California		
General Locality:	Southern California		
Sub-locality:	Approaches to Long Beach Harbor		
	2018		
CHIEF OF PARTY Benjamin K. Evans, CDR/NOAA			
	LIBRARY & ARCHIVES		
Date:			

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U.S. DEPARTMENT OF COMMERCE REGISTRY NUMBER: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION			
HYDROGRAP	H13198		
INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.			
State(s):	California		
General Locality:	Southern California		
Sub-Locality:	Approaches to Long Beach Harbor		
Scale:	6000		
Dates of Survey:	09/15/2018 to 10/29/2018		
Instructions Dated:	08/20/2018		
Project Number:	S-L318-RA-18		
Field Unit:	NOAA Ship <i>Rainier</i>		
Chief of Party:	arty: Benjamin K. Evans, CDR/NOAA		
Soundings by:	Multibeam Echo Sounder		
Imagery by:	y by: Multibeam Echo Sounder Backscatter		
Verification 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/.

Table of Contents

A. Area Surveyed	<u>1</u>
A.1 Survey Limits	<u>1</u>
A.2 Survey Purpose	<u>2</u>
A.3 Survey Quality	<u>3</u>
A.4 Survey Coverage	<u>4</u>
A.5 Survey Statistics	<u>8</u>
B. Data Acquisition and Processing	<u>10</u>
B.1 Equipment and Vessels	. <u>10</u>
B.1.1 Vessels	<u>10</u>
B.1.2 Equipment	<u>12</u>
B.2 Quality Control	<u>12</u>
B.2.1 Crosslines	<u>12</u>
B.2.2 Uncertainty	<u>15</u>
B.2.3 Junctions	. <u>17</u>
B.2.4 Sonar QC Checks	<u>18</u>
B.2.5 Equipment Effectiveness	<u>19</u>
B.2.6 Factors Affecting Soundings	<u>21</u>
B.2.7 Sound Speed Methods	<u>22</u>
B.2.8 Coverage Equipment and Methods	<u>23</u>
B.3 Echo Sounding Corrections	. <u>23</u>
B.3.1 Corrections to Echo Soundings	. <u>23</u>
B.3.2 Calibrations	. <u>23</u>
B.4 Backscatter	<u>23</u>
B.5 Data Processing	<u>24</u>
B.5.1 Primary Data Processing Software	<u>24</u>
B.5.2 Surfaces	<u>25</u>
C. Vertical and Horizontal Control	<u>25</u>
C.1 Vertical Control	<u>26</u>
C.2 Horizontal Control	<u>26</u>
D. Results and Recommendations	. <u>26</u>
D.1 Chart Comparison	<u>26</u>
D.1.1 Electronic Navigational Charts	<u>26</u>
D.1.2 Maritime Boundary Points	<u>29</u>
D.1.3 Charted Features	<u>29</u>
D.1.4 Uncharted Features	. <u>29</u>
D.1.5 Shoal and Hazardous Features	. <u>30</u>
D.1.6 Channels	. <u>30</u>
D.1.7 Bottom Samples	. <u>30</u>
D.2 Additional Results	<u>30</u>
D.2.1 Shoreline	<u>30</u>
D.2.2 Prior Surveys	<u>30</u>
D.2.3 Aids to Navigation	<u>30</u>
D.2.4 Overhead Features	. <u>31</u>

D.2.5 Submarine Features.	<u>31</u>
D.2.6 Platforms	31
D.2.7 Ferry Routes and Terminals.	31
D.2.8 Abnormal Seafloor and/or Environmental Conditions	31
D.2.9 Construction and Dredging.	31
D.2.10 New Survey Recommendation	31
D.2.11 Inset Recommendation	31
E. Approval Sheet	32
F. Table of Acronyms	33
= <u>····································</u>	

List of Tables

Table 1: Survey Limits.	<u>1</u>
Table 2: Survey Coverage	
Table 3: Hydrographic Survey Statistics	9
Table 4: Dates of Hydrography	
Table 5: Vessels Used	10
Table 6: Major Systems Used	
Table 7: Survey Specific Tide TPU Values.	
Table 8: Survey Specific Sound Speed TPU Values.	
Table 9: Junctioning Surveys	
Table 10: Primary bathymetric data processing software	24
Table 11: Primary imagery data processing software.	25
Table 12: Submitted Surfaces	25
Table 13: Largest Scale ENCs	26
Tuble 15. Durgest Seure Di 105	

List of Figures

Figure 1: H13198 assigned survey area (black dashed line) and area of actual coverage (light blue), on Chart
<u>18749.</u> <u>2</u>
Figure 8: H13198 MBES coverage and assigned survey limits (Chart 18749)
Figure 2: Pydro-derived plot showing HSSD density compliance of H13198 finalized variable-resolution
MBES data
Figure 3: Pydro-derived plot showing HSSD object detection compliance of H13198 finalized variable-
resolution MBES data
Figure 4: Approaches to Los Angeles and Long Beach, California (S-L318-RA-18) priority areas
Figure 5: Existing features within multibeam echosounder coverage along Long Beach Breakwater
Figure 6: Examples of the 15 holidays (indicated in image as blue "1") located in crosslines and outside of
the sheet limits
Figure 7: Overview of H13198 showing final Holiday Finder results (numbers in purple) for the VR surface.
The majority of holidays are located in the 16 to 21 meter range
Figure 9: RAINIER Launch 2801 and 2803 near Santa Barbara Island, CA
Figure 10: H13198 crossline surface overlaid on mainscheme tracklines

Figure 11: Pydro-derived plot showing percentage-pass value of H13198 mainscheme to crossline
<u>data.</u>
Figure 12: Pydro-derived plot showing absolute difference statistics of H13198 mainscheme to crossline
<u>data.</u>
Figure 13: Pydro-derived plot showing TVU compliance of H13198 finalized variable-resolution MBES
<u>data.</u>
Figure 14: H13198 junction with survey H13197
Figure 15: Pydro-derived surface uncertainty for H13198 MBES data, as processed with the original .hvf
file (left) and after the addition of a -0.190 degree roll offset (right). Data comparison shows a small but
quantifiable improvement in the overall uncertainty as a fraction of allowable TVU
Figure 16: Pydro-derived plot showing percentage-pass value of H13198 mainscheme to crossline data,
using the original .hvf file (left) and using the updated -0.190 degree roll offset (right). Data comparison
shows a small but quantifiable improvement in comparison values
Figure 17: Pydro-derived plot showing absolute difference statistics of H13198 mainscheme to crossline
data, before (left) and after (right) application of adjusted roll offset value
Figure 18: Visual comparison of H13198 surface as originally computed (top) and after application of
adjusted roll offset (bottom). Vertical exaggeration at 10 for display purposes
Figure 19: H13198 sound speed cast locations
Figure 20: Overview of H13198 backscatter mosaics (Chart 18749)
Figure 21: H13198-derived contours compared with ENC US5CA61M (covering the majority of the survey
area) and ENC US5CA62M (covering the northwest corner of the survey area) depth curves
Figure 22: H13198-derived 10-fathom contour compared with ENC US5CA62M 10-fathom depth curve in
area to the east of the entrance to Long Beach Channel

Descriptive Report to Accompany Survey H13198

Project: S-L318-RA-18 Locality: Southern California Sublocality: Approaches to Long Beach Harbor Scale: 1:6000 September 2018 - October 2018

NOAA Ship Rainier

Chief of Party: Benjamin K. Evans, CDR/NOAA

A. Area Surveyed

This survey is referred to as H13198, "Approaches to Long Beach Harbor" (Sheet 2), within the Project Instructions. The sheet as assigned covered an estimated 18 SNM east of the Long Beach pilot boarding area and offshore of the Long Beach Breakwater.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
33° 43' 39.55" N	33° 39' 3.88" N
118° 11' 55.01" W	118° 5' 33.95" W

Table 1: Survey Limits



Figure 1: H13198 assigned survey area (black dashed line) and area of actual coverage (light blue), on Chart 18749.

Data were acquired within the assigned survey limits as required in the Project Instructions and HSSD excepted as noted below.

A.2 Survey Purpose

The ports of Los Angeles and Long Beach are critical economic drivers for the California economy, handling more shipping containers than any other U.S. port. The port complex is also a leading terminal for liquid fuel, chemicals, auto carriers, dry bulk, and cruise ships, moving over \$460 billion in cargo annually. The harbor has been surveyed as recently as 2013; however, in 2014, Hurricane Marie caused offshore waves to propagate shorewards, breaching a breakwater and causing nearly \$16 million in damage to the Port of Long Beach. Related concerns include hurricane-induced shoaling in or near the channels and port approaches.

The ports of Los Angeles and Long Beach participate in the NOAA Physical Oceanographic Real-Time (PORTS®) system and NOAA's Precise Navigation Initiative, which utilize a battery of local weather, swell, wave, water column, tidal, and bridge air gap sensors to provide in-situ, real-time data to the maritime public. Up-to-date water depths provided by this survey will enhance the utility of these systems, improving harbor safety, and increasing efficiency by decreasing the need for tanker lightering offshore. These bathymetric data will provide updated, high-resolution depths, as well as information on seabed

characteristics, which will support maritime commerce, update National Ocean Service (NOS) nautical charts and products, and contribute to the understanding of long-range re-survey intervals for the area.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Pydro QC Tools 2 Grid QA was used to analyze H13198 multibeam echosounder (MBES) data density. The submitted H13198 finalized variable-resolution (VR) surface met HSSD and object detection requirements as shown in the histograms below.



Figure 2: Pydro-derived plot showing HSSD density compliance of H13198 finalized variable-resolution MBES data.



Figure 3: Pydro-derived plot showing HSSD object detection compliance of H13198 finalized variable-resolution MBES data.

A.4 Survey Coverage

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

Water Depth	Coverage Required		
All waters in survey area	Object Detection Coverage (Refer to HSSD Section 5.2.2.2)		

Table 2: Survey Coverage

A section in the northeast corner of the assigned survey area, as well as the northernmost extent of the sheet south of the breakwater, was not fully addressed due to time constraints. However, multibeam echosounder data for object detection were acquired in most of the designated priority areas from the pre-project brief - the "Sierra-Foxtrot" and "Foxtrot" Anchorages and the region designated as "the approaches to the Port of Long Beach" - as required in the Project Instructions and the HSSD (see Figure 4). "Briefing Slides" documenting these priorities is included in Appendix II.

Within the surveyed areas, while object detection coverage did not reach fully to the Long Beach Breakwater, effort was made to verify existing features within time limitations (see Figure 5).

Seventy-two "certain" gaps in coverage ("holidays") were identified in the data using Pydro's Holiday Finder. Of these, 15 were outside of the sheet limits or within crosslines which did not wind up intersecting with the the final mainscheme data (see Figure 6 below). All holidays were examined in CARIS Subset Editor and no shoaling trend of the seafloor was noticed. Holidays were discovered primarily in depths of 16 meters to 21 meters and were between approximately 2 and 15 square meters in size (see Figure 7, below). While the "Holiday Finder" tool was used during field operations, for unknown reasons (possibly incorrect settings) all holidays were not flagged initially. While the final run of Holiday Finder did identify the holidays correctly, the field unit had already left the area and re-acquisition was not possible. Additionally, delayed SBET application to acquired data accompanied by time constraints in the field resulted in a failure to comprehensively resurvey all gaps in coverage. The results of Holiday Finder are included in Appendix II.



Figure 4: Approaches to Los Angeles and Long Beach, California (S-L318-RA-18) priority areas.



Figure 5: Existing features within multibeam echosounder coverage along Long Beach Breakwater.



Figure 6: Examples of the 15 holidays (indicated in image as blue "1") located in crosslines and outside of the sheet limits.



Figure 7: Overview of H13198 showing final Holiday Finder results (numbers in purple) for the VR surface. The majority of holidays are located in the 16 to 21 meter range.



Figure 8: H13198 MBES coverage and assigned survey limits (Chart 18749).

A.5 Survey Statistics

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

	HULL ID	2801	2802	2803	Total
	SBES Mainscheme	0	0	0	0
	MBES Mainscheme	282.06	85.93	2.70	370.69
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/SSS Mainscheme	0	0	0	0
	MBES/SSS Mainscheme	0	0	0	0
	SBES/MBES Crosslines	0	21.66	0	21.66
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					0
Number Maritime Boundary Points Investigated					0
Number of DPs					2
Number of Items Investigated by Dive Ops					0
Total SNM					15.24

 Table 3: Hydrographic Survey Statistics

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

Survey Dates	Day of the Year
09/15/2018	258
09/16/2018	259

Survey Dates	Day of the Year
09/17/2018	260
09/18/2018	261
09/19/2018	262
09/20/2018	263
09/21/2018	264
09/25/2018	268
10/29/2018	302

Table 4: Dates of Hydrography

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	2801	2802	2803
LOA	8.8 meters	8.8 meters	8.8 meters
Draft	1.1 meters	1.1 meters	1.1 meters

Table 5: Vessels Used



Figure 9: RAINIER Launch 2801 and 2803 near Santa Barbara Island, CA.

All MBES data for H13198 were acquired by NOAA Ship RAINIER survey launches 2801, 2802, and 2803. These vessels acquired depth soundings, backscatter, and sound speed profiles.

B.1.2 Equipment

Manufacturer	Model	Туре
Applanix	POS MV 320 v5	Positioning and Attitude System
Kongsberg Maritime	EM 2040	MBES
Sea-Bird Scientific	SBE 19plus	Conductivity, Temperature, and Depth Sensor
Reson	SVP 70	Sound Speed System

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

Table 6: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Multibeam/single beam echo sounder/side scan sonar crosslines acquired for this survey totaled 5.84% of mainscheme acquisition.

Rainier launch 2802 acquired 22.7 nautical miles of multibeam crosslines across the entire assigned survey area. The intended nautical miles of crosslines was calculated in relation to full MBES detection of the assigned survey area. However, 18.7 nautical miles of crosslines acquired covered the final mainscheme area, resulting in a final crossline to mainscheme linear nautical mile ratio of 5.0%.

The Compare Grids function in Pydro Explorer analyzed finalized VR surfaces of H13198 crossline-only and mainscheme-only data. The difference surface showed that 99.5% of nodes met HSSD allowable Total Vertical Uncertainty (TVU) standards. See figures below for crossline coverage and Pydro-generated histograms.



Figure 10: H13198 crossline surface overlaid on mainscheme tracklines.



Figure 11: Pydro-derived plot showing percentage-pass value of H13198 mainscheme to crossline data.

14



Figure 12: Pydro-derived plot showing absolute difference statistics of H13198 mainscheme to crossline data.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Method	Measured	Zoning
ERS via VDATUM	0 meters	0.082867 meters

Table 7: Survey Specific Tide TPU Values.

Hull ID	Measured - CTD	Measured - MVP	Surface
2801, 2802, 2803	3 meters/second	N/A meters/second	0.05 meters/second

Table 8: Survey Specific Sound Speed TPU Values.

Total Propagated Uncertainty (TPU) values for survey H13198 were derived from a combination of fixed values for equipment and vessel characteristics, as well as from field-assigned values for sound speed uncertainties. The uncertainty value of NOAA's Vertical Datum (VDatum) transformation model was documented in metadata that accompanied the VDatum model.

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 Kongsberg MBES sonars were recorded and applied in 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 position and attitude were applied in Caris HIPS using SBET and RMS files generated using POSPac MMS software.

Uncertainty values of the submitted finalized grid was calculated in Caris using "Greater of the Two" of uncertainty and standard deviation (scaled to 95%). Grid QA within Pydro QC Tools 2 was used to analyze H13198 Total Vertical Uncertainty (TVU) compliance. A histogram plot of the results is shown below.



of H13198 finalized variable-resolution MBES data.

B.2.3 Junctions

Survey H13198 junctions with one contemporary survey, H13197, conducted by NOAA Ship Rainier in 2018 as part of S-L318-RA-18. No prior junctioning surveys were provided. Comparison between H13197 and H13198 will be described in the Descriptive Report accompanying data from survey H13197.



Figure 14: H13198 junction with survey H13197.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H13197	1:6000	2018	NOAA Ship RAINIER	W

Table 9: Junctioning Surveys

<u>H13197</u>

The junction with contemporary survey H13198 encompassed approximately 2.2 square nautical miles along the western boundary of H13198. A full surface comparison has not been carried out at the time of this report, as a finalized surface for H13197 was not available; it will be included with the submission of survey H13197.

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

RA-4 (2801) Roll Bias Adjustment

After data acquisition, artifacts were noted in the data from survey launch RA-4 (hull number 2801), throughout much of the largely flat survey area of H13198. Numerous possible equipment and software related issues were investigated; however, at the time of this report, a conclusive cause of the offset has yet to be determined. A value of -0.190 degrees roll was added to the 2801_EM2040.hvf in an attempt to address this slight bias; however, the Hydrographer recommends continued investigation into the source of this issue.

All submitted H13198 MBES meet HSSD specifications. TPU and Crossline Comparison analyses indicate an improvement in data correlation following the introduction of the new roll offset value (see figures below).



Figure 15: Pydro-derived surface uncertainty for H13198 MBES data, as processed with the original .hvf file (left) and after the addition of a -0.190 degree roll offset (right). Data comparison shows a small but quantifiable improvement in the overall uncertainty as a fraction of allowable TVU.



Figure 16: Pydro-derived plot showing percentage-pass value of H13198 mainscheme to crossline data, using the original .hvf file (left) and using the updated -0.190 degree roll offset (right). Data comparison shows a small but quantifiable improvement in comparison values.



Figure 17: Pydro-derived plot showing absolute difference statistics of H13198 mainscheme to crossline data, before (left) and after (right) application of adjusted roll offset value.



Figure 18: Visual comparison of H13198 surface as originally computed (top) and after application of adjusted roll offset (bottom). Vertical exaggeration at 10 for display purposes.

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: Thirty-four sound speed profiles were acquired for this survey at discrete locations within the survey area at least once every four hours, when significant changes to surface sound speed were observed, or when operating in a new area.

Sound speed profiles were acquired using Sea-Bird Scientific SBE 19plus profilers. All casts were concatenated into a master file and applied using the "Nearest in distance within Time" (4 hours) profile selection method.



Figure 19: H13198 sound speed cast locations.

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 was acquired as .all files logged during MBES operations and subsequently processed by personnel aboard RAINIER. The .GSF files created during processing and one backscatter mosaic per vessel per frequency has been delivered with this report. Backscatter processing procedures are described in the DAPR.



Figure 20: Overview of H13198 backscatter mosaics (Chart 18749)

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	10.3.3

Table 10: Primary bathymetric data processing software

Manufacturer	Name	Version
QPS	Fledermaus Geocoder Tool Box (FMGT)	7.8.1

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

Table 11: Primary imagery data processing software

The following Feature Object Catalog was used: NOAA Extended Attribute file Version 5.7.

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
H13198_MB_VR_MLLW	CARIS VR Surface (CUBE)	Variable Resolution	4.4 meters - 30.7 meters	NOAA_VR	Object Detection
H13198_MB_VR_MLLW_Final	CARIS VR Surface (CUBE)	Variable Resolution	4.4 meters - 30.7 meters	NOAA_VR	Object Detection

Table 12: Submitted Surfaces

Submitted surfaces were generated using the NOAA recommended parameters for depth-based (Ranges) CARIS variable-resolution bathymetric grids as specified in 2018 HSSD.

Pydro QC Tools 2 "Detect Fliers" program with default settings was used to identify fliers in the data; obvious noise was rejected. Results from Pydro QC tools are included in the Separates section of this report.

Ten critical sounding were designated for this survey. One was identified as a Danger to Navigation and processed appropriately. The others were designated to honor the least depth over assigned and previously charted feature. See sections D.1.3 and D.1.5, below, for further detail.

C. Vertical and Horizontal Control

Additional information discussing the vertical or horizontal control for this survey can be found in the accompanying 2018 DAPR.

C.1 Vertical Control

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

ERS Methods Used:

ERS via VDATUM

Ellipsoid to Chart Datum Separation File:

VDatum_Outline_Shape_xyNAD83-MLLW_geoid12b.csar

C.2 Horizontal Control

The horizontal datum for this project is North American Datum 1983.

The projection used for this project is Universal Transverse Mercator (UTM) Zone 11 North.

D. Results and Recommendations

D.1 Chart Comparison

A comparison was made between H13198 survey data and the largest scale Electronic Navigational Charts (ENC) for the area (US5CA61M and US5CA62M) using CUBE surfaces, selected soundings, and contours created in Caris.

D.1.1 Electronic Navigational Charts

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

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5CA61M	1:20000	42	10/23/2018	10/23/2018	NO
US5CA62M	1:12000	59	06/18/2018	10/18/2018	NO

Table 13: Largest Scale ENCs

US5CA61M

ENC US5CA61M encompasses the majority of the survey area of H13198.

H13198 depth contours were generally determined to be shoreward of ENC depth curves. The surveyderived 10-fathom depth contour is located inshore of the ENC 10-fathom depth curve by between approximately 100 and 300 meters. Limited multibeam data were acquired at shoaler depths and data affecting shoaler contours were obtained from a single crossline. However, in these regions, the surveyderived 5-fathom depth contour is roughly 130 meters inshore of the 5-fathom ENC depth curve, and the survey-derived 3-fathom depth contour is approximately 45 meters inshore of the 3-fathom ENC depth curve. See Figure 20, below.



Figure 21: H13198-derived contours compared with ENC US5CA61M (covering the majority of the survey area) and ENC US5CA62M (covering the northwest corner of the survey area) depth curves.

US5CA62M

Trends between H13198 depth contours and ENC US5CA62M follow those noted in the comparison above with ENC US5CA61M. The survey-derived 10-fathom depth contour is located some 150 to 300 meters inshore of the ENC depth curve (see Figure 21 below). Shoreward regions showing multiple 10-fathom depth contours east of the entrance to Long Beach Channel indicate the possibility of increasing depths in this region.



Figure 22: H13198-derived 10-fathom contour compared with ENC US5CA62M 10-fathom depth curve in area to the east of the entrance to Long Beach Channel.

D.1.2 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.3 Charted Features

There are no charted features with the label PA, ED, PD or Rep within the H13198 survey area.

D.1.4 Uncharted Features

There are no new features that are not addressed in the H13198 Final Feature File or elsewhere in this report.

D.1.5 Shoal and Hazardous Features

One Danger to Navigation (DTON) was identified within the H13198 survey area and submitted to the Office of Coast Survey Nautical Data Branch. See Supplemental Correspondence folder for further information.

D.1.6 Channels

No channels were assigned for this survey. While there are designated anchorages, regulated navigation areas, and precautionary areas within this survey, they were not assigned for investigation in the Project Instructions. No safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines were assigned within the limits of Survey H13198, although they affect immediately adjacent areas.

D.1.7 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results

D.2.1 Shoreline

Limited shoreline verification was conducted in accordance with applicable sections of NOAA HSSD and FPM using the Project Reference File (PRF) and Composite Source File (CSF) provided with the Project Instructions. In the field, all assigned features that were safe to approach, were addressed as required with S-57 attribution and recorded in the H13198_FFF (Final Feature File) to best represent the features at chart scale.

As previously discussed in section A.4, multibeam coverage was not obtained in the entirety of the assigned limits of H13198 due to time constraints. Only features located within the surveyed multibeam coverage were investigated, all others were flagged as "Not Addressed" in the FFF. The H13198 FFF also includes new features found in the field as well as recommendations to update, retain or delete assigned features.

D.2.2 Prior Surveys

No prior survey comparisons were assigned for this survey.

D.2.3 Aids to Navigation

Aids to navigation (ATONs) assigned in the northeast section of the assigned survey limits were not investigated due to time constraints.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

One submarine pipeline that was assigned was determined to be seen in areas within the multibeam. Other sections of submarine pipeline that were assigned were not investigated due to time constraints.

D.2.6 Platforms

No platforms exist for this survey.

D.2.7 Ferry Routes and Terminals

No ferry routes or terminals were assigned for this survey.

D.2.8 Abnormal Seafloor and/or Environmental Conditions

The Hydrographer observed no abnormal seafloor and/or environmental conditions for this survey.

D.2.9 Construction and Dredging

The Hydrographer is not aware of any present or planned construction or dredging within the limits of Survey H13198.

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 Specifications and Deliverables, 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
Benjamin K. Evans, CDR/NOAA	Commanding Officer	05/28/2019	Un K In EVANS.BENJAMIN.K.1237217094 Date: 2019.06.02 18:11:15-08'00'
Hadley A. Owen, LT/NOAA	Field Operations Officer	05/28/2019	Digitally signed by OWEN HADLEY ANNE 1410967070 DN: c=US, c=US. Government, o==DoD, o==PKI, ou=NOAA, c==OWEN HADLEY ANNE 1410967070 Date: 2019.05.28 16:15:38-0800'
James B. Jacobson	Chief Survey Technician	05/28/2019	Jacobson JAKOSSON JAMES. BRYAN. 1269664017 Ihave reviewed this document 2019.05.30 08:52:09-08'00'
Hadley A. Owen, LT/NOAA	Sheet Manager	05/28/2019	Digitally signed by OWEN.HAD.ET.Y.NNE.1410967070 DN: c-US, Go-US. Government, ou-D-D0, ou=FRI, ou=bRNA, DEV.HANE.1410657070 Date: 2019.05.28 16:16:08-08'00

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
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	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Linear Nautical Miles
MBAB	Multibeam Echosounder Acoustic Backscatter
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
SSSAB	Side Scan Sonar Acoustic Backscatter
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

APPROVAL PAGE

H13198

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

- Descriptive Report
- Collection of Bathymetric Attributed Grids (BAGs)
- Collection of backscatter mosaics
- Processed survey data and records
- GeoPDF of survey products

The survey evaluation and verification has been conducted according current OCS Specifications, and the survey has been approved for dissemination and usage of updating NOAA's suite of nautical charts.

Approved:

Commander Olivia Hauser, NOAA Chief, Pacific Hydrographic Branch