

7717

Diag. Cht. No. 5530-4

Form 504

U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

DESCRIPTIVE REPORT

Type of Survey HYDROGRAPHIC

Field No. Office No. H-7717

LOCALITY

State CALIFORNIA

General locality SAN FRANCISCO BAY

Locality GOLDEN GATE BRIDGE

1948

CHIEF OF PARTY

W.M.Gibson

LIBRARY & ARCHIVES

DATE 6 MAY 1949

217212

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY

HYDROGRAPHIC TITLE SHEET

REG. NO. H-7717

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

REGISTER No. H-7717

Field No. BO 024148

State California

General locality San Francisco Bay

Locality Golden Gate Bridge

Scale 1/2400 ✓ Date of survey 23 August 1948 ✓
16 November 1948

Instructions dated 23, June 1948

Vessel Bowie

Chief of party W.M. Gibson

Surveyed by W.M. GIBSON & P.A. WEBER

Soundings taken by fathometer, ~~graphic recorder, hand lead, wire~~

Fathograms scaled by A.P. Mizisin; R.H. Berg; P.A. Weber

Fathograms checked by A.P. Mizisin; R.H. Berg; H. Knapp; P.A. Weber

Protracted by A. KAUPA ✓ M.M. Rogers

Soundings penciled by A. KAUPA ✓ M.M. Rogers

Soundings in fathoms feet at MLW MLLW ✓

REMARKS: _____

Notes to Accompany
Sheet BO - 024148
H-7717 (1948)

(A) PROJECT:

Hydrography executed under instructions contained in letter from the Director dated 23 June 1948 referenced 22/ M E K S-1- Bowie ✓

(B) SURVEY LIMITS:

The survey extends approximately 500 feet either side of the straight portion of the Golden Gate Bridge and from the north pier to Fort Point. Work began with the establishing of triangulation; ✓
hydrography was started 23 August 1948. ✓

(C) VESSELS AND EQUIPMENT:

Vessels operating were the Ship Bowie and Launch 133. The launch worked close inshore and around the piers. The ship operated in the area between the north and south piers. The launch operated from the ship. Fathometer 808J serial Nos. S-111 and S-112 were used in recording depths. The fathometers operated successfully for all depths. ✓
Some deep soundings were recorded using C & D foot scale but usually the deep soundings were taken using the fathom scale. ✓

(D) TIDE STATION:

For the reduction of soundings the tide staff at Fort Point Coast ✓

Guard Station was read each day during the sounding period. A value of 2.0 feet corresponding to MLLW on the staff was subtracted from staff readings.

(F) CONTROL STATIONS:

All stations with the exception of "MES" and "SOM" were determined by triangulation. ^(List of signals attached) The determination of "MES" and "SOM" is recorded in Vol. 9 page 2.

(H) SOUNDINGS:

Soundings were taken with 808J fathometer S-111 and S-112. The initial was set using a bar. On all days except "g" & "h" for launch 133, echo corrections were determined by temperature and salinity observations. On "g" & "h" days echo corrections were determined directly from bar checks.

An effort was made to get soundings in flat calm. This condition most frequently occurs during foggy periods and accounts for the selection of August, September and October for this survey. However even at this time a moderate swell is experienced due to the racing of the current through the gate and particularly in the vicinity of the south pier. At this point west bound on a flood current the bow of the vessel is struck by a strong current deflected by the pier,

tending to turn the vessel in its course; likewise passing pier eastbound, vessel is deflected as strongly in the opposite direction, with danger of striking the pier itself. In the opinion of the hydrographer, scouring around the south pier is possible. To avoid long costly delays, soundings were taken when considerable swell was running; however it is not believed that any subsequent survey can find ideal conditions and should therefore be comparable.

Many more soundings were scaled and recorded in the sounding records than were put on the ^{or smooth sheet} beat sheet, because of the congestion of sounding lines.

(I) CONTROL OF HYDROGRAPHY:

In order to comply as nearly as possible to paragraph 3 of the instructions i.e. "5 foot depth curves, accurate within 12 inches" the following precautions were taken.

- (1) All control was located by triangulation except as noted above.
- (2) Serial temperatures and salinities were observed at the beginning and end of each days work; or if the duration of hydrography was but a few hours then a single serial near the middle of the period was taken.

These serials gave remarkably close values considering the circumstances and were averaged for the entire period for obtaining Velocity corrections.

(3) The sounding vessel was run at as slow speed as currents and wind would permit. In order to use nearest available control sounding lines were run by the ship in one direction to permit theodolites to locate the fish on the Bowie starboard side. Later when this method turned out to be more cumbersome and time consuming than the purpose of the survey seemed to warrant, and difficult to coordinate, sextant angles were taken by two observers standing side by side directly ^{over} ~~above~~ the fish. All soundings after the first day by the ship and launch were located by sextant fixes.

On "A" day ship, theodolites were set at triangulation stations EMIL and BUZZARD; on "a" day launch, theodolites were set at triangulation stations EMIL, BUZZARD and MARIN. *∠s recorded in Vols. 17 & 18*

(J) ADEQUACY OF SURVEY:

The survey is very thorough and lines closely spaced to give coverage desired. Since this was in an area just completed in the 1947 season on BO - 1347 ^{H-7621} no comparison was made with any existing survey.

(K) CROSSLINES:

The area is adequately covered by crosslines. Because of the strong currents many of the lines cross ~~at~~^{as} the ship could not be fully controlled at sounding speed;

(L) COMPARISON WITH PRIOR SURVEYS: See Review, par. 5.

No comparison was made with ^{H-7621 (1947)} BO - 1347.
_{H-7621}

(M) COMPARISON WITH CHART: Review, par. 6.

Since this area had been surveyed during 1947 season no comparison was made with chart.

(Q) LANDMARKS:

For reason contained in (M) no landmarks were submitted.

(R) Methods used on this survey were discussed in advance with both the Supervisor of the Western District and Officials of the Golden Gate Bridge Co. who indicated approval. Remarks: It will be noted on the boat sheet that some soundings in the deep area are in blue ink. In making the corrections for fathom scale initial an error of 8 feet was made, which was later corrected in the sounding records.

A great number of soundings were inked on the boat sheet with this error;

when the mistake was noticed soundings were put on in blue ink. The depth curves are drawn correctly on the sheet using the blue ink figures as guides. Due to congestion no attempt was made to correct soundings already inked on the sheet. The sounding records are all reduced correctly.

P.A. Weber

P.A. WEBER
Lt. Comdr. U.S.C & G.S.

Approved:

W.M. Gibson

W.M. Gibson
Chief of Party

Echo Sounding Corrections

BO - 024148

H-7717 (1948)

Fathometer	808J	Indicator	S-111	used on Bowie
"	808J	"	S-112	" " Launch 133

Index setting was determined by bar check, Variations from the correct setting were entered in the sounding records as an initial correction. Phasing head corrections were derived from taking a mean for each indicator all values determined by bar check on this sheet, except on "g" and "h" days in November where phasing and velocity corrections were derived by bar check only on these days. All bar checks are shown on the accompanying sheets. ✓

Settlement and Squat corrections do not apply as the ship and launch were operated at speeds to eliminate it. ✓

Tides were obtained by direct readings of the Standard Tide Gage at Fort Point. Reducers were based on MLLW at Fort Point = 2.0 ft. on the staff. ✓

Velocity Corrections were derived from mean area serial temperatures and salinities, except "g" and "h" days as noted above. These were obtained from Serials taken before and after work each day or if a short day of work was involved one serial was taken near the middle of the work period. ✓

All serial temperatures and salinities were averaged in 5 ft. layers from the surface to 160 ft. and in 20 ft. layers from 160 ft. to 320 ft. The layer values were used to obtain Velocity corrections graphically from form A 1230-1 for calibration of 820 fathoms per second. Temperatures and Salinities were so near to calibrated values that no corrections were needed.

The motor speed of each fathometer was tested as follows;

Indicator S-111

7/10/48	2"/min	(foot scale)
	10/ 30 min	(fathom scale)
8/23/48	speed 0.34% fast	(fathom scale)
9/15/48	" 0.27% fast	(foot scale)
	" 0.25% fast	(fathom scale)

Indicator S-112

6/22/48	speed 0.6% slow	(foot scale)
	" 0.6% "	(fathom scale)
8/26/48	speed 0.53% slow	(foot scale)
9/15/48	" 0.10% "	(foot scale)
	0.25% fast	(fathom scale)
11/16/48	speed 0.20% slow	(foot scale)
	30 min. = 25.4 cm speed correct	(fathom scale)

The final corrections as derived from the velocity curves were less than 0.1 foot at all depths. Simultaneous bar checks taken on the Bowie to depths of 300 ft. verified the values as obtained above. The mean area temperature and salinities representing a mean of daily Serials taken during this work in the Golden Gate showed only small variations. The possible error in the Velocity of sound so determined from the mean value rather from the daily values is indicated in the following analysis;

Temperature

Maximum temperature observed = 16.8 Degs. C (Surface)
Minimum " " = 13.1 " C (320 ft.)
Average temperature (Means area values top to bottom)
= 14.89 Degs. C

Temperature Variation for Depth

Maximum = 1.9 Degs. C (corresponds to 6.0 m/sec.)
Allowable Variations = 7.5 m/sec.
Average Variations from mean to depth = +1.28 C
= -1.00 C
" " corresponds to 4.1 m/sec.

Layer temperature Variation

Maximum from layer mean = +1.7 Degs. C (240ft.)
-1.1 " C (0-35ft.)
Minimum Variation from layer mean +1.1 Degs. C (95-115ft.)

Minimum Variation from layer mean = 0.9 Degs. C (240-320ft.)

Salinity

Maximum salinity observed = 33.4 o/oo (bottom 320ft.)

Minimum " " = 30.6 o/oo (surface)

Average top to bottom from Mean Area Values= 32.07 o/oo

Maximum variation from average of Mean Values= + 1.3 o/oo
- 1.5 o/oo

Maximum variation corresponds to error of 1.9 m/sec.

Adequacy

It is believed that the Velocity of sound as determined from the Serials taken is correct within the allowable limits as prescribed in Hydrographic manual, the maximum occasional error that might be expected being about 6.0 meters per second. ✓

W.M. Gibson
Comdr. U.S.C. & G.S.

Approved:

W.M. Gibson
Chief of Party

APPROVAL SHEET

H-7717 (1948)
BO -024148

14 December 1948

Approved and forwarded. The echo sounding corrections were derived personally. Through general assistance with the hydrography, occasional assistance on the office work and an examination afterward, I believe it to be complete and adequate for the purpose intended. No further work is considered necessary.

W M Gibson
W. M. Gibson,
Chief of Party.

Summary of Serials

No.	Date	Location
44	8/23/48	Golden Gate
45	8/23/48	"
47	8/24/48	"
48A	8/26/48 A.M.	"
48B	8/26/48 P.M.	"
49	8/30/48	"
50	8/30/48	"
51	8/31/48	"
52	8/31/48	"
59	9/9 /48	"
61	9/14/48	"
62	9/15/48	"
64	9/16/48	"
65	9/20/48	"

Dates of Hydrography: Same as the dates of Serials.

COPY

22/MEK
S-1-BOWIE

23 June 1948

To: Commanding Officer
USC&GS Ship BOWIE
Box 328
Oakland, California

Subject: Special survey, vicinity of Golden Gate Bridge
piers

A special survey in the vicinity of the Golden Gate Bridge has been approved by this office. The purpose of this survey is to determine the bottom contour and various depth curves in the vicinity of the bridge piers and in a water area approximately 1,000 feet wide, centered on the centerline of the straight portion of the bridge.

The determination of contours above the water surface will not be included in the survey by this Bureau since this requires no special equipment unaccessible to my engineer engaged in general surveying work. Your part of the project therefore will deal only with the hydrographic phase of this survey.

The request for the survey expressed a desire for 5-foot depth curves, accurate within 12 inches, and based upon points at a spacing not to exceed 20 feet along or between sounding lines. It was stated that this accuracy and frequency of soundings are particularly desirable for an area 600 feet square at each of the piers under the two main towers and desirable, but not strictly necessary, for the remainder of the area. Considering conditions in this locality, particularly current conditions, these specifications will be very difficult to attain. The methods to be employed to obtain the most accurate results practicable should, therefore, be given very careful study.

No detailed instructions or specifications for this work will be prepared by this office. It is desired that these be decided upon by mutual agreement in conference between yourself, the Supervisor, Western District, and authorities interested in this particular survey.

You will please accomplish this survey when you consider conditions will be most favorable for its execution. You are authorized to furnish preliminary data from the survey. It should be clearly indicated that such data are subject to verification by this office. Field records shall be submitted to this office rather than to a processing office. Such processing as is usually accomplished by ship personnel will, of course, be completed before the records are transmitted. If you so desire, this office will construct the projections for you upon

Page Two
23 June 1948

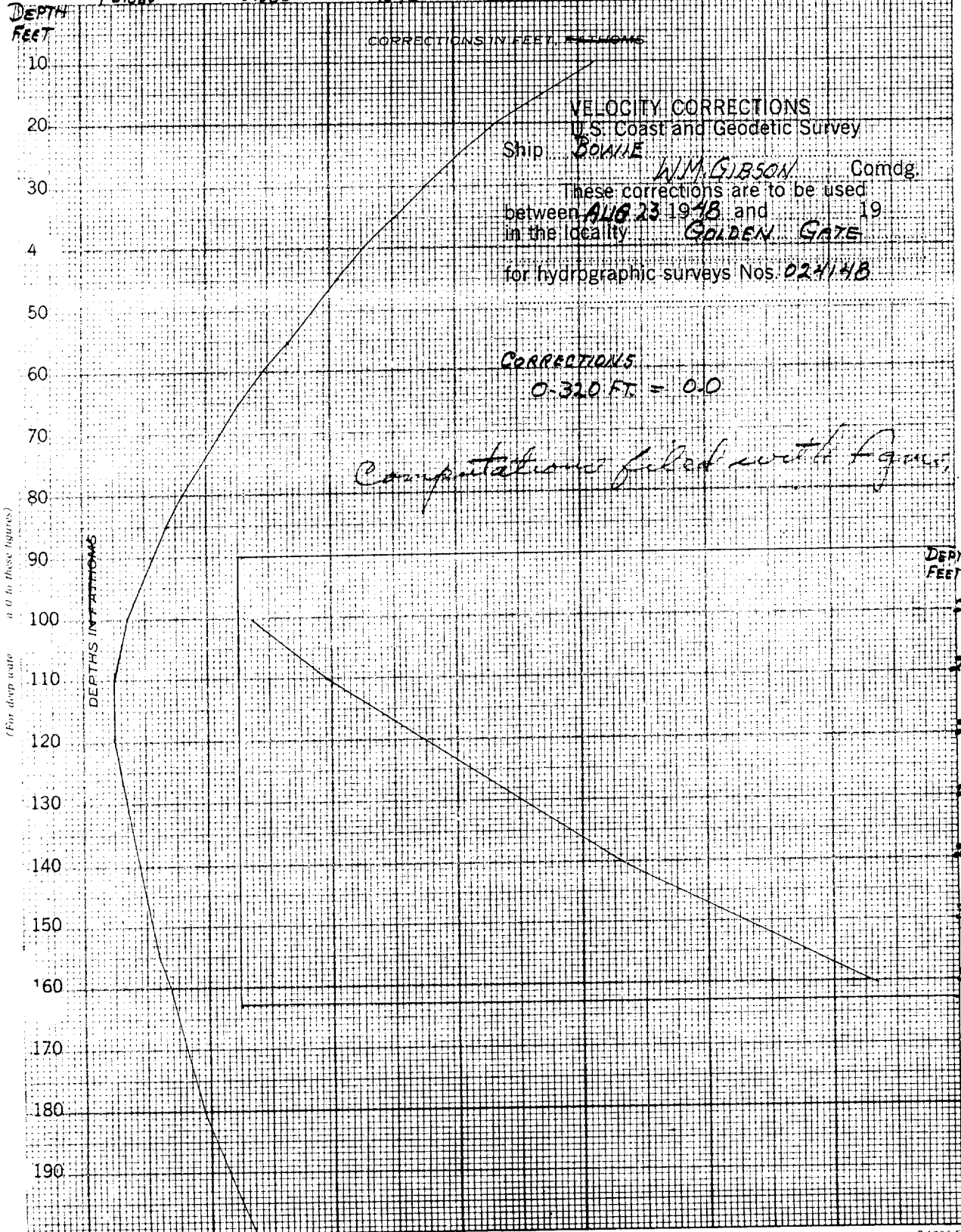
receipt of the necessary data.

You will please acknowledge the receipt of this letter.

/ s/ J. H. HAWLEY

Acting Director

c.c. Supervisor, Western District
Chief, Hydrography Section



STATISTICS

Bo-02448

H-7717 (1948)

<u>Date</u>	<u>Vol. No.</u>	<u>Day Letter</u>	<u>No. of Pos.</u>	<u>Stat. Mi.</u>	<u>LL sdgs.</u>
Aug. 26, 1948	1, 2	a (red)	238	12.0	
Aug. 30, 1948	2	b (red)	5	0.3	
Sept. 22, 1948	3	a (blue)	3	0.1	56
Sept. 9, 1948	4, 5	c (red)	183	8.3	
Sept. 14, 1948	5, 6	d (red)	227	8.9	
Sept. 15, 1948	7	e (red)	104	7.1	
Sept. 20, 1948	7	f (red)	21	3.1	Bottom samples only
Nov. 15, 1948	8	g (red)	81	1.1	
Nov. 16, 1948	8, 9	h (red)	77	1.4	
Aug. 23, 1948	10, 11	A (red)	142	7.0	
Aug. 30, 1948	11	B (red)	64	4.1	
Aug. 31, 1948	11, 12, 13	C (red)	214	13.0	
Sept. 14, 1948	13	G (red)	21		Bottom samples only
Sept. 15, 1948	13, 14	D (red)	176	13.5	
Sept. 17, 1948	14, 15	E (red)	147	6.4	
Sept. 20, 1948	16	F (red)	<u>31</u>	<u>3.1</u>	
		Total	1734	89.4	

Statute square miles of sounding: .4 squ. mi.

LIST OF SIGNALS IN VOL. NO. 9

LIST OF STATIONS ON
H-7717 (1948)
BO-24148

TRIANGULATION STATIONS

Name used in Hydrographic Survey	Origin of Station
DIABLO	PT. DIABLO L. H. 1928
CROSS	CROSS 1948
BUZZARD	BUZZARD 1948
OKE	OKE 1948
RANGE	RANGE 1931
CHIM	CHIM 1948
EMIL	EMIL 1948
MARIN	MARIN 1948
CLARK	CLARK 1948
GATE	GATE 1948
RAM	LIGHT N SIDE OF SO. PIER 1948 (Pacific Coast LL #273)
GOLD	GOLD 1948
TOW	TOW 1948
ROUND	ROUND 1948

TOPOGRAPHIC STATIONS

MES	VOL 9, Page 2 ✓
SOM	VOL 9, Page 2 ✓

ADDENDUM

To Accompany

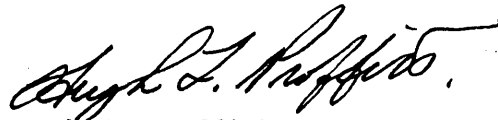
H-7717 (1948)
HYDROGRAPHIC SURVEY BO-024148

Due to the congestion of sounding lines in the vicinity of the North pier, Lat. $37^{\circ}-49'-28''$, Long. $122^{\circ}-28'-43''$, it was necessary to plot positions 140 a thru 238 a (Launch) on a template. Positions & sdgs. verified & transferred to smooth sheet

DISCREPANCIES

Lat. $37^{\circ}-49'-23''$, Long. $122^{\circ}-28'-35''$ Shoal soundings between positions 13F and 14F (BOWIE) are in disagreement with other hydrography in this area. Positions revised during verification, good agreement obtained.

Respectfully submitted,

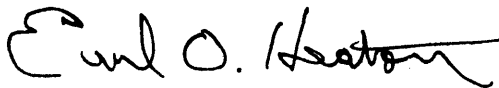


Hugh L. Proffitt
Cartographer

Norfolk, Virginia

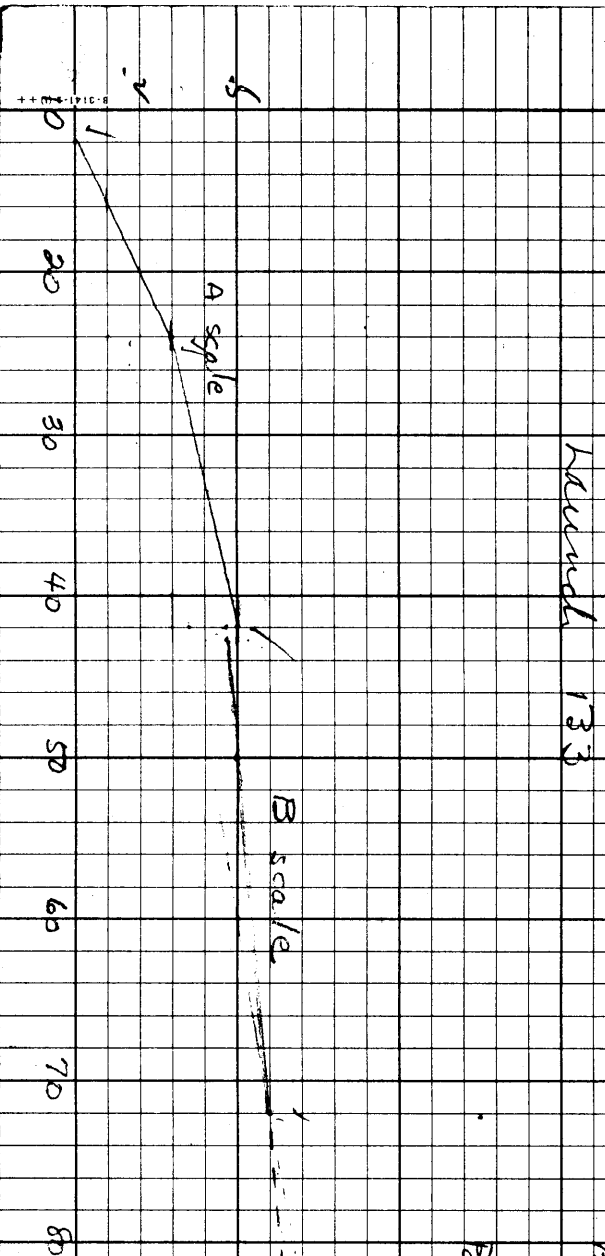
2 May 1949

Approved and forwarded.



Earl O. Heaton
Supervisor, SE Dist.

Math Cornus Sheet 02448
 H day 11/16/48
 Manned 133



Cornus total including
 phase error + ~~red~~

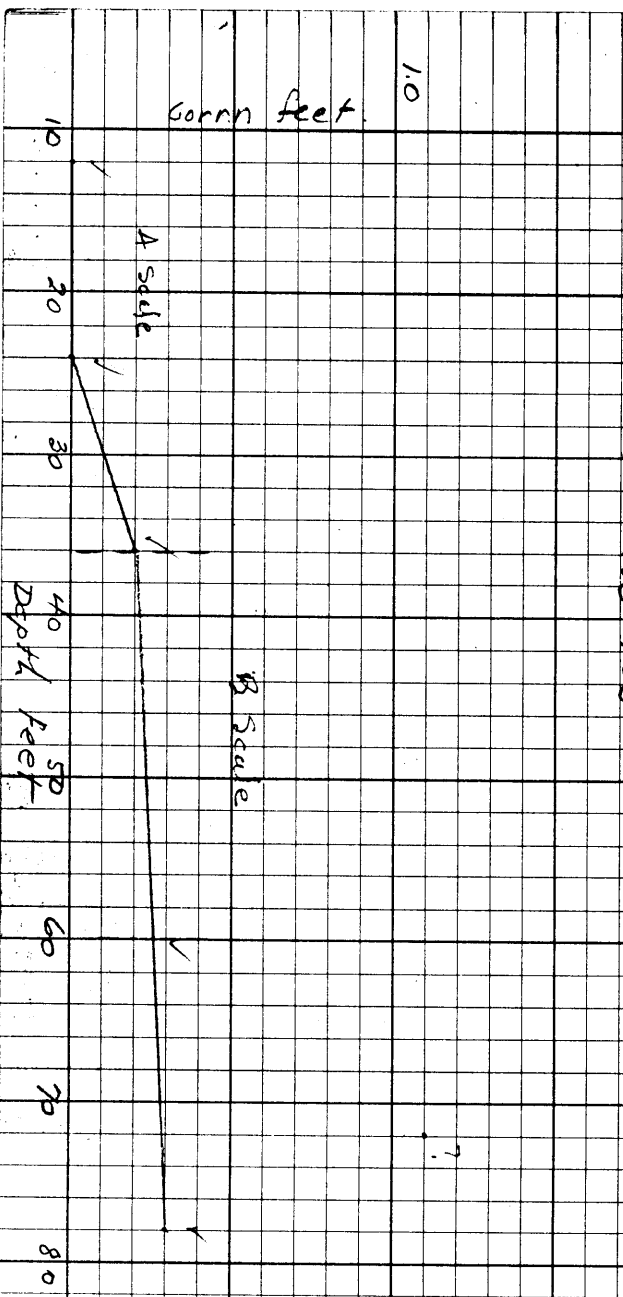
A scale	0-15.5	0	✓
	15.6-24.0	-0.2	✓
	24.1-42.0	-0.4	✓
	42.1-55.0	-0.6	✓
B scale	42-50.0	-0.4	✓
	50.1-70.0	-0.6	✓
C scale	-1.0	✓	✓

11717

Earth Corrus Sheet 024148

8 day N/15/48

Corrus 133



Corrections for	
including phase error + velocity	
A scale	Corrus ✓
10-30	0 ✓
30-end of A	-0.2 ✓
B scale	
30-78	-0.2 ✓
78-end of B	-0.4 ✓
C scale	-1.0 ✓

GEOGRAPHIC NAMES

Survey No. H-7717

Name on Survey	On Chart No.		On previous survey No.		On U. S. quadrangle Maps		From local information		On local Maps		P. O. Guide or Map		Rand McNally Atlas		U. S. Light List		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
California																	V.S. & B. 1
San Francisco Bay																	" 2
Golden Gate																	3
Golden Gate Bridge																	4
Fort Point																	5
Lime Point																	(See chart 5532 for application of names) 6
																	7
																	8
																	9
																	10
																	11
																	12
																	13
																	14
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																	26
																	27

(See chart 5532 for application of names)

Names underlined in red are approved

5-12-49
L. Heck

Hydrographic Surveys (Chart Division)

HYDROGRAPHIC SURVEY NO. H-7717.....

Records accompanying survey:

Boat sheets ...².; sounding vols. ...¹⁸.; wire drag vols.;
 bomb vols.; graphic recorder rolls ...⁵envel.
 special reports, etc. 1. Tracing paper overlay, 1 Sheet, Fathometer corr.

The following statistics will be submitted with the cartographer's report on the sheet:

Number of positions on sheet		.1734.
Number of positions checked		..275.
Number of positions revised		..100.
Number of soundings revised (refers to depth only)		..350.
Number of soundings erroneously spaced		..230.
Number of signals erroneously plotted or transferred		..0..
Topographic details	Time	..16..
Junctions	Time	..0..
Verification of soundings from graphic record	Time	..175..

Verification by *M. M. Rogers*..... Total time ⁴⁰53.4 Date 10/26/49

Reviewed by *J. A. Dimmore*..... Time 30 hrs Date 9 June 1950

RHC

TIDE NOTE FOR HYDROGRAPHIC SHEET

May 12, 1949

~~Division of Hydrography and Topography.~~

Division of Charts: R. H. Carstens

Plane of reference approved in
18 volumes of sounding records for

HYDROGRAPHIC SHEET 7717

Locality Golden Gate Bridge, San Francisco Bay

Chief of Party: W. M. Gibson in 1948

Plane of reference is mean lower low water, reading
5.6 ft. on tide staff at San Francisco (Presidio)
13.4 ft. below B. M. 180 (1936)

Height of mean high water above plane of reference is 6.2 feet.

Condition of records satisfactory except as noted below:

E. C. McKay

Section

Chief, ~~Division of Tides and Currents.~~

DIVISION OF CHARTS

REVIEW SECTION - NAUTICAL CHART BRANCH

REVIEW OF HYDROGRAPHIC SURVEY

REGISTRY NO. H-7717

FIELD NO. BO-024148

California, San Francisco Bay, Golden Gate Bridge
Surveyed in Aug. - Nov, 1948 Scale 1:2,400
Instructions dated 23 June 1948

Soundings:

808 Fathometer

Control:

Sextant fixes on shore signals
Theodolite cuts on sounding
boats from shore stations

Chief of Party - W. M. Gibson
Surveyed by - W. M. Gibson and P. A. Weber
Protracted by - A. Kaupa
Soundings plotted by - A. Kaupa
Verified and inked by - M. M. Rogers
Reviewed by - T. A. Dinsmore, 9 June 1950
Inspected by - R. H. Carstens

1. Shoreline and Signals

The shoreline originates with T-5922 and T-5926 (1941-45).

The origin of the signals is given in the Descriptive Report.

2. Sounding Line Crossings

Depths at crossings are in good agreement.

3. Depth Curves and Bottom Configuration

The present survey provides a large-scale development of that portion of the Golden Gate which lies between Fort Point and Lime Point and under the Golden Gate Bridge. The usual depth curves are adequately delineated except in foul inshore areas. Several supplemental depth curves have been added to aid in defining more clearly the configuration of the bottom.

Except for irregularities inshore, the bottom is fairly smooth and drops rather abruptly to depths of 350 feet in the vicinity of lat. 37° 49.0', long. 122° 28.5'.

4. Junctions with Contemporary Surveys

The present survey falls within the area covered at a scale of 1:10,000 by H-7621 (1947). Junctions with H-7621 will be considered in the review of that survey.

5. Comparison with Prior Surveys

- | | | | | |
|----|-------------------|----------|------------------|----------|
| a. | H-462 (1855) | 1:10,000 | H-2283 (1894-97) | 1:10,000 |
| | H-1214a (1871-73) | 1:20,000 | H-2285 (1895-97) | 1:5,000 |
| | H-2254 (1895-96) | 1:10,000 | | |

These surveys comprise previous coverage over the area of the present survey during the periods indicated. The construction of the south pier of the Golden Gate Bridge subsequent to the prior surveys has created marked bottom changes in that vicinity. These changes are of a sporadic nature and could have resulted from the scouring action of the strong tidal currents which are deflected by the pier. Except in the vicinity of the pier, no appreciable changes in bottom are noted elsewhere in the area.

The 60-ft. sounding charted in lat. 37° 48.88', long. 122° 28.65', from H-2285 should be disregarded. Falling in present depths of 75 ft., this prior sounding is considered to be displaced and should actually fall about 45 meters southward where comparable depths were obtained on the present survey.

- b. H-4105 (1920) 1:4,000

Sparse development on this large-scale survey covers only the inshore areas at Lime Point and Fort Point. Except for the existence of the south pier of the Golden Gate Bridge, no important differences are noted between depths on the prior and present surveys.

Several inshore rocks and soundings have been carried forward, from the prior surveys, to supplement the present hydrography. With these additions, the present survey is adequate to supersede the prior surveys within the common area.

- c. H-3968 (1917) W.D. 1:20,000 H-4105a (1921)W.D. 1:4,000

These wire-drag surveys cover the area of the present survey except close inshore. No conflicts are noted between depths on the present survey and the effective drag depths.

6. Comparison with Chart 5535 (Latest print date 3/27/50)

A. Hydrography

Charted hydrography originates with the prior surveys which need no further consideration.

B. Aids to Navigation

No floating aids to navigation are charted within the limits of the present survey.

No fixed aids to navigation were located within the limits of the present survey except the light on the north side of Golden Gate Bridge south pier (station RAM) which agrees with the charted position.

7. Condition of Survey

- a. The sounding records and Descriptive Report are complete.
- b. The smooth plotting was satisfactory.

8. Compliance with Project Instructions

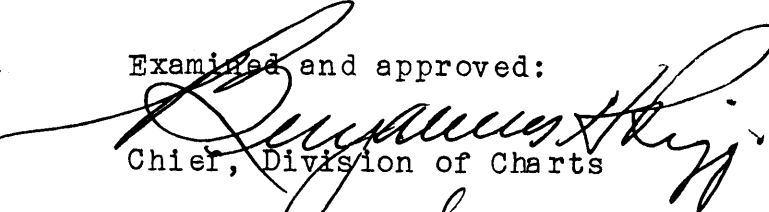
The survey is considered to have complied as nearly as practicable with the written instructions.


9. Additional Field Work


This is an excellent basic survey of the area covered and no additional work is recommended.


H. R. Edmonston
Chief, Nautical Chart Branch

Examined and approved:


Chief, Division of Charts


K. G. Crosby
Chief, Section of Hydrography


W. M. Scaife
Chief, Division of Coastal Surveys

