8210

Diag. Cht. Nos. 5402-2 and 5530-5.

Form 504

U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

DESCRIPTIVE REPORT

Type of Survey Hydrographic

Field No. WCSP-1256 *Office No.* H-8210

LOCALITY

State California

General locality South San Francisco Bay

Locality Mt. Eden Slough to Ravenswood Point.

1956

CHIEF OF PARTY

H. G. Conerly

LIBRARY & ARCHIVES

DATE October 1956

B-1870-1 (1)

Form 537
(Ed. June 1946)

DEPARTMENT OF COMMERCE

U. S. COAST AND GEODETIC SURVEY

HYDROGRAPHIC TITLE SHEET

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-8210

Field No. WCSP-1256

State CALIFORNIA

General locality SOUTH SAN FRANCISCO BAY

Locality MT. EDEN SLOUGH TO RAVENSWOOD POINT ~~SOUTH OF SAN MATEO - HAYWARD BRIDGE~~

Scale 1:10,000 Date of survey February - March 1956

Instructions dated 25 February 1954 - Supplemental 1 October 1955

Vessel Launch CS-160

Chief of party H. G. CONERLY

Surveyed by H. G. CONERLY

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

Fathograms scaled by A. W. B.

Fathograms checked by K. E. T.

Protracted by C.D.U., R.D.F., M.D.C., L.C.H. & H.A.L. officers

Soundings penciled by C.D.U.

Soundings in ~~fathoms~~ feet at ~~MLLW~~ MLLW AND ARE TRUE DEPTHS

REMARKS:

U. S. GOVERNMENT PRINTING OFFICE 16—66520-1

NOTES FOR DESCRIPTIVE REPORT

TO ACCOMPANY HYDROGRAPHIC SURVEY

REGISTRY NO. H-8210 - FIELD NO. WCSP 1256

SAN FRANCISCO BAY, CALIFORNIA

PROJECT 1256 SCALE: 1:10,000

WEST COAST SHORE PARTY: H. G. CONERLY, CHIEF OF PARTY

SURVEYED BY: H. G. CONERLY, K. E. TAGGART

PROJECT

This survey was executed in accordance with Director's instructions dated 25 February 1954 and supplemental instructions dated 1 October 1955.

SURVEY LIMITS AND DATES

The general locality of this survey is South San Francisco Bay. The survey covers an area which is bordered on the north by the San Mateo-Hayward Bridge, ~~and H-8026~~ (H-8214 (1956)) and extends southward to the Dumbarton Bridge and Sheet WCSP 1356. (H-8211 (1956)) The area enclosed is bordered by the eastern shore and Longitude 122° 10'.0 at the junction of H-8275 (1956)

Field work commenced on 21 February 1956 and continued intermittently until 26 March 1956.

VESSELS AND EQUIPMENT

USC&GS Launch CS-160 was used for all sounding on this survey. Both types 808 J and Edo 255 graphic recording fathometers were used. The 808, no. 152 SPX was calibrated to 800 fm/sec. and used a keel mounted acoustic unit.

The Edo, no. 203, was calibrated to 800 fm/sec. and used an acoustic unit which was fish mounted at one foot below the water surface.

TIDE AND CURRENT STATIONS

Two tide stations were maintained for the purpose of obtaining tide reducers for this survey. They were located on the San Mateo-Hayward and Dumbarton Bridges, California. See TIDE NOTE this report ← Falls off sheet

on fender piles

No current stations were observed.

CROSSLINES

There are adequate crosslines to make comparisons on all 7 days of soundings. The crosslines are satisfactory. See par 2 Review

COMPARISON WITH PRIOR SURVEYS

In comparison to prior surveys the soundings on this sheet indicate that the general contour of the bottom has remained unchanged, however a comparative examination shows the water to be slightly deeper than the latest ~~earlier~~ prior survey. See Review

COMPARISON WITH CHART

The soundings in this survey are found to be from 1/2 foot deeper in the shoaler waters, to 2 feet deeper in the channel, than those shown on the chart. See Review

DANGERS AND SHOALS

A single pile rising to approximately 6.0 feet above Mean High Water was located at Latitude 37° 34'.45, Longitude 122° 09'.12.

There is an old four-stack destroyer located at Latitude 37° 33'.~~38~~ 19-wer, Longitude 122° 09'.40. It was originally anchored at that position and apparently has been used as a machine gun practice target. It now rests on the bottom with the anchor still out and is approximately 20 feet above Mean High Water.

AIDS TO NAVIGATION

One floating aid was located by the hydrographic party as follows:

Buoy	Date Located	Depth	Latitude	Longitude
12	26 March 1956	33 ft.	37° 30'.86	122° 07'.93

LANDMARKS FOR CHARTS

No additional landmarks for charts are recommended.

VELOCITY CORRECTIONS

Velocity corrections were determined from bar checks and pole comparisons during hydrographic operations. All soundings as plotted on the Boat Sheet have been corrected for echo velocity error. Copies of the abstract of echo corrections are appended to this report.

CONTROL STATIONS

Triangulation control for signals was obtained from publication "Graphic Positions of Triangulation Stations, California Part VII, San Francisco and Vicinity"; from triangulation done by this party in 1955 and from computed theodolite fixes which are part of this report.

Photogrammetric locations of hydrographic signals were taken from manuscripts T-11072 and T-11074.

SHORELINE AND TOPOGRAPHY

The shoreline was transferred to the Boat Sheet from manuscripts T-11070, T-11072, T-11073, T-11074 and T-11075 of 1952-53.

The detail of shoal area and snags which parallels the San Mateo Bridge was plotted from data gathered while driving along the bridge at a low tide. The snags and shoals were carefully located by a combination of angles and estimated distances. The heights of exposed shoals were reduced to MLLW according to our tide station on the San Mateo Bridge. Elevations of shoals are considered accurate and lateral error in estimated distances is within 20 meters. Final detail as plotted on the Boat Sheet is considered adequate for charting.

METHODS

Standard hydrographic methods were used throughout.

SOUNDINGS

Soundings were taken with an 808 J and Edo 255 type fathometers. Soundings were corrected by fathometer comparisons with standard bar checks and pole soundings. An abstract of corrections is part of this report and a separate fathometer report will be forwarded to the Director.

CONTROL OF HYDROGRAPHY

The position of the launch was fixed by sextant angles to previously located objects.

ADEQUACY OF SURVEY

This survey is considered complete and adequate to supersede prior surveys for charting.

MISCELLANEOUS

The two mud groins on the east shore at approximate Latitude 37° 33'.15, as shown on the Boat Sheet, have been repaired but are covered at extreme high tides.

TABULATION OF APPLICABLE DATA

1. Tidal levels, marigrams forwarded to the Director; abstract of reducers appended to this report.

2. Field and office photographs to be forwarded to Director.

3. Photo manuscripts to be forwarded to Seattle Processing Office.

4. TRIANGULATION 1955, forwarded to Director and copy of G.P's. furnished Seattle Processing Office.

5. Fathograms forwarded to Seattle Processing Office.

6. Blueline prints forwarded to Seattle Processing Office.

7. Special fathometer report to be forwarded to Director, with abstract of corrections appended to this report.

8. Boat Sheet to be forwarded to Director for photographing then returned to this party, then to Seattle Processing Office.

Report Submitted

Kelly E. Taggart

Kelly E. Taggart
Ensign, USC&GS

Approved and Forwarded

Horace G. Conerly

Horace G. Conerly
Commander, USC&GS
OinC., West Coast Shore Party

APPROVAL SHEET

HYDROGRAPHIC SURVEY, REGISTRY NO. H 8210, FIELD NO. WCSP 1256

The field work on this sheet was under my close supervision and the records are approved.

Horace G. Conerly
Commander, USC&GS
OinC., West Coast
Shore Party

TIDE NOTE TO ACCOMPANY DESCRIPTIVE REPORT

OF HYDROGRAPHIC SURVEY

FIELD NO. WCSP 1256 - REGISTRY NO. H-8210

WEST COAST SHORE PARTY

PROJECT 1256

Portable automatic tide gages were maintained on the San Mateo-Hayward Bridge, California, Latitude 37° 35'.0 N, Longitude 122° 15'.0 W and on the Dumbarton Bridge, California, Latitude 37° 30'.4 N, Longitude 122° 07'.0 W, to furnish tide reducers in this area. Mean Lower Low corresponds to a staff reading of 2.4 ft. at the San Mateo Bridge and 2.7 ft. at the Dumbarton Bridge.

San Mateo Bridge tide reducers were applied directly to soundings north of a line shown on the Boat Sheet in green, extending from Latitude 37° 33'.0 N, Longitude 122° 13'.56 W to Latitude 37° 35'.71 N, Longitude 122° 08'.77 W. This area is designated zone "A".

Dumbarton Bridge tide reducers were applied directly to soundings south of a line extending from Latitude 37° 30'.29 N, Longitude 122° 09'.95 W, to Latitude 37° 34'.40 N, Longitude 122° 08'.77 W. This area is designated zone "C".

In zone "B", the area south of the line defined in paragraph two and north of the line described in paragraph three, the tide reducers were obtained from a curve using the means of the highs and lows of the two operating gages and plotting them on the mean time difference. The intermediate heights were interpolated accordingly.

On some days when the San Mateo gage was not operating, reducers were taken from the Dumbarton gage using a range ratio of 0.95 and a minus 7.5 minute time difference for zone "B"; for zone "A" a range ratio of 0.90 and a minus 15 minutes were used.

STATISTICS FOR HYDROGRAPHIC SURVEY

FIELD NO. WCSP-1256 - REGISTRY NO. H-8210

Vol.No.	Day Letter	Date	H.L.Sdgs.	No.Pos.	Stat.Miles Sdg.
1	a	21 February	-	60	6.3
1	b	22 February	-	118	19.3
2 & 3	c	23 February	-	224	37.0
3	d	28 February	-	183	28.6
4	e	7 March	-	126	19.1
4 & 5	f	8 March	-	197	38.5
5 & 6	g	9 March	-	142	22.9
6 & 7	h	12 March	-	227	38.4
7 & 8	j	22 March	-	257	41.6
8	k	26 March	-	62	19.8
				1,596	271.5

Total area, square statute miles 15.5

ABSTRACT OF SMOOTH TIDE REDUCERS

TIDE GAGES AT DUMBARTON AND SAN MATEO BRIDGES

SHEET NO. WCSP 1256 - REGISTRY NO. H-8210

21 February 1956
"a" day Zone "C"
(Dumbarton Direct)

0900 -	0910	- 8.0
	0918	- 7.8
	0926	- 7.6
	0934	- 7.4
	0941	- 7.2
	0948	- 7.0
	0955	- 6.8
	1002	- 6.6
	1009	- 6.4
	1016	- 6.2
	1023	- 6.0
	1029	- 5.8
	1036	- 5.6
	1042	- 5.4

22 February 1956
"b" day Zone "B"
.944 ft range ratio &
minus 7.5^{m} time corr.
to Dumbarton gage.

0850 -	0921	- 8.8
	0938	- 8.6
	0950	- 8.4
	1000	- 8.2
	1010	- 8.0
	1018	- 7.8
	1027	- 7.6
	1034	- 7.4
	1041	- 7.2
	1048	- 7.0
	1057	- 6.8
	1104	- 6.6
	1111	- 6.4
	1117	- 6.2
	1124	- 6.0
	1130	- 5.8
	1137	- 5.6
	1143	- 5.4
	1149	- 5.2
	1156	- 5.0

22 February 1956
"b" day Zone "C"
(Dumbarton Direct)

0807 -	0919	- 9.4
	0936	- 9.2
	0950	- 9.0
	1002	- 8.8
	1012	- 8.6
	1020	- 8.4
	1028	- 8.2
	1036	- 8.0
	1043	- 7.8
	1050	- 7.6
	1057	- 7.4
	1104	- 7.2
	1111	- 7.0
	1117	- 6.8
	1123	- 6.6
	1129	- 6.4
	1136	- 6.2
	1142	- 6.0
	1148	- 5.8
	1154	- 5.6

23 February 1956
"c" day Zone "A"
(San Mateo Direct)

0903 -	1004	- 8.8
	1024	- 8.6
	1038	- 8.4
	1049	- 8.2
	1100	- 8.0

23 February 1956
"c" day Zone "B"
(Dumbarton San Mateo)

0916 -	1000	- 9.2
	1026	- 9.0
	1041	- 8.8
	1053	- 8.6
	1103	- 8.4
	1112	- 8.2
	1121	- 8.0
	1129	- 7.8
	1137	- 7.6
	1144	- 7.4
1326 -	1332	- 3.8
	1339	- 3.6
	1345	- 3.4
	1352	- 3.2
	1400	- 3.0

Continued

"c" day (Continuation)

1400 -	1405	- 2.8
1433 -	1440	- 1.8
	1448	- 1.6
	1455	- 1.4
	1504	- 1.2
	1512	- 1.0
	1520	- 0.8
	1528	- 0.6
	1537	- 0.4
	1548	- 0.2
	1556	0.0
	1615	+0.2

23 February 1956
"c" day Zone "C"
(Dumbarton Direct)

0850 -	0904	- 9.2
	1029	- 9.4
1132 -	1139	- 8.0
	1146	- 7.8
	1153	- 7.6
	1158	- 7.4
	1204	- 7.2
	1211	- 7.0
	1217	- 6.8
	1223	- 6.6
	1228	- 6.4
	1234	- 6.2
	1240	- 6.0
	1246	- 5.8
	1251	- 5.6
	1257	- 5.4
	1302	- 5.2
	1308	- 5.0
	1316	- 4.8
	1321	- 4.6
	1328	- 4.4
	1334	- 4.2
1400 -	1407	- 3.2
	1413	- 3.0
	1419	- 2.8
	1426	- 2.6
	1432	- 2.4
	1438	- 2.2
	1444	- 2.0
1516 -	1522	- 0.8
	1528	- 0.6
	1536	- 0.4
	1545	- 0.2
	1556	0.0

ABSTRACT OF SMOOTH TIDE REDUCERS

SHEET NO. WCSP 1256 - REGISTRY NO. H-8210

28 February 1956
"d" day Zone "A"
Curve for San Mateo Bridge drawn by useing .9 ft range ratio and -15m time Correction from Dumbarton

1048	- 1055	- 3.8
	1102	- 4.0
	1109	- 4.2
	1117	- 4.4
	1125	- 4.6
	1132	- 4.8
	1140	- 5.0
	1146	- 5.2
	1153	- 5.4
	1200	- 5.6
	1208	- 5.8
	1217	- 6.0
	1225	- 6.2
	1235	- 6.4
	1245	- 6.6
	1259	- 6.8
	1315	- 7.0
	1444	- 7.2
1513	- 1525	- 6.6
	1536	- 6.4

28 February 1956
"d" day "B" Zone
Curve drawn between San Mateo & Dumbarton.

1332	- 1448	- 7.6
	1506	- 7.4
	1520	- 7.2
	1531	- 7.0
	1543	- 6.8
	1553	- 6.6
	1603	- 6.4

28 February 1956
"d" day Zone "C"
(Dumbarton Direct)

1436	- 1500	- 8.0

7 March 1956
"e" day Zone "B"
Curve drawn by applying .95 ft range ratio & minus 7.5m time corr. to Dumbarton.

0800	- 0929	- 6.4
	0948	- 6.2
	1004	- 6.0
	1016	- 5.8
	1027	- 5.6
	1036	- 5.4
	1045	- 5.2
	1055	- 5.0
	1103	- 4.8
	1112	- 4.6
	1121	- 4.4
	1130	- 4.2
	1139	- 4.0
	1148	- 3.8
	1157	- 3.6
	1205	- 3.4

7 March 1956
"e" day Zone "C"
(Dumbarton Direct)

0800	- 0930	- 6.8
	0952	- 6.6
	1007	- 6.4
	1018	- 6.2
	1029	- 6.0
	1038	- 5.8
	1047	- 5.6
	1055	- 5.4
	1105	- 5.2
	1114	- 5.0
	1122	- 4.8
	1131	- 4.6
	1139	- 4.4
	1148	- 4.2
	1156	- 4.0
	1205	- 3.8

8 March 1956
"f" day Zone "B"
Curve drawn by applying .95 ft range ratio and minus 7.5m time corr. to Dumbarton.

0832	- 0903	- 6.8
	0953	- 6.0
	1025	- 6.8
	1042	- 6.6

Continued

"f" day Continuation

1042	- 1057	- 6.4
1318	- 1326	- 2.8
	1334	- 2.6
	1341	- 2.4
	1348	- 2.2
	1356	- 2.0
	1404	- 1.8
	1413	- 1.6
	1422	- 1.4
	1432	- 1.2
	1443	- 1.0

8 March 1956
"f" day Zone "C"
(Dumbarton Direct)

0850	- 0922	- 7.2
	1005	- 7.4
	1030	- 7.2
	1046	- 7.0
	1100	- 6.8
	1110	- 6.6
	1120	- 6.4
	1128	- 6.2
	1136	- 6.0
	1144	- 5.8
	1152	- 5.6
	1200	- 5.4
	1208	- 5.2
	1216	- 5.0
	1224	- 4.8
	1232	- 4.6
	1240	- 4.4
	1247	- 4.2
	1255	- 4.0
	1303	- 3.8
	1311	- 3.6
	1318	- 3.4
	1325	- 3.2
	1332	- 3.0
1400	- 1407	- 2.0
	1416	- 1.8
	1425	- 1.6

ABSTRACT OF SMOOTH TIDE REDUCERS

SHEET NO. WCSP 1256 - REGISTRY NO. H-8210

Continuation

9 March 1956
"g" day Zone "B"
Curve drawn by applying .95 ft. range ratio and minus 7.5m time corr. from Dumbarton.

0848 -	0904	- 6.8
	0922	- 7.0
	0948	- 7.2
	1040	- 7.4
	1100	- 7.2
	1114	- 7.0
	1125	- 6.8
	1136	- 6.6
	1146	- 6.4
	1157	- 6.2
1204 -	1213	- 5.8
	1220	- 5.6
	1228	- 5.4
	1235	- 5.2
	1242	- 5.0

9 March 1956
"g" day Zone "C"
(Dumbarton Direct)-

0846 -	0900	- 7.0
	0915	- 7.2
1000 -	1045	- 7.8
1142 -	1152	- 6.8
	1200	- 6.6
	1207	- 6.4

12 March 1956
"h" day Zone "B"
Curve drawn by applying .95 ft ft range ratio & minus 7.5m time corr. to Dumbarton Bridge.

0920 -	0927	- 4.4
	0934	- 4.6
	0942	- 4.8
	0949	- 5.0
	0953	- 5.2
	1002	- 5.4
	1010	- 5.6
	1018	- 5.8
	1027	- 6.0
	1035	- 6.2
	1045	- 6.4
	1055	- 6.6
1108 -	1122	- 7.0
	1139	- 7.2

Continued

"h " day(Continuation)

1139 -	1304	- 7.4
	1318	- 7.2
	1331	- 7.0
	1341	- 6.8
	1351	- 6.6
	1400	- 6.4
	1408	- 6.2
	1417	- 6.0
	1425	- 5.8
	1432	- 5.6
	1439	- 5.4
	1446	- 5.2
	1454	- 5.0
	1500	- 4.8
	1507	- 4.6
	1515	- 4.4
	1522	- 4.2
	1529	- 4.0
	1536	- 3.8
	1543	- 3.6

12 March 1956
"h" day Zone "C"
(Dumbarton Direct)

0910 -	0916	- 4.2
	0923	- 4.4
	0930	- 4.6
1046 -	1055	- 6.8
	1105	- 7.0
	1117	- 7.2
1147 -	1310	- 7.8
	1325	- 7.6
	1336	- 7.4
1442 -	1449	- 5.6
	1457	- 5.4
	1504	- 5.2

22 March 1956
"j" day Zone "B"
Curve drawn by applying .95 ft range ratio and minus 7.5m time corr. to Dumbarton Bridge.

0800 -	0912	- 8.0
	0930	- 7.8
	0945	- 7.6
	0956	- 7.4
	1005	- 7.2
	1013	- 7.0
	1022	- 6.8
	1029	- 6.6
	1036	- 6.4
	1043	- 6.2
	1050	- 6.0
	1057	- 5.8
	1103	- 5.6
	1111	- 5.4
	1118	- 5.2
	1125	- 5.0
	1132	- 4.8
	1139	- 4.6
	1146	- 4.4
	1153	- 4.2
	1159	- 4.0
	1206	- 3.8
	1213	- 3.6
	1220	- 3.4
	1226	- 3.2
	1233	- 3.0
	1240	- 2.8
	1247	- 2.6
	1253	- 2.4
	1300	- 2.2
	1307	- 2.0
	1315	- 1.8
	1322	- 1.6
	1330	- 1.4
	1337	- 1.2
	1345	- 1.0
	1353	- 0.8
	1402	- 0.6
	1410	- 0.4
	1419	- 0.2
	1430	0.0
	1442	+ 0.2
	1500	+ 0.4
	1539	+ 0.6
	1600	+ 0.4
	1611	+ 0.2

ABSTRACT OF SMOOTH TIDE REDUCERS

SHEET NO. WCSP 1256 - REGISTRY NO. H-8210

Continuation

22 March 1956
"j" day Zone "C"
(Dumbarton Direct)

0919 - 0939	- 8.2
0953	- 8.0
1035 - 1042	- 6.8
1048	- 6.6
1500 - 1544	+ 0.6

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26 March 1956
"k" day Zone "B"
Curve drawn by applying .95 ft range ratio and minus 7.5^{m} time corr. to Dumbarton Bridge.

0900 - 0907	- 3.2
0914	- 3.4
0921	- 3.6
0928	- 3.8
0935	- 4.0

---

26 March 1956
"k" day Zone "C"
(Dumbarton Direct)

0928 - 0935	- 4.0
0942	- 4.2
0949	- 4.4
0956	- 4.6
1003	- 4.8
1010	- 5.0
1016	- 5.2
1022	- 5.4
1029	- 5.6
1035	- 5.8
1042	- 6.0
1048	- 6.2
1056	- 6.4

COMBINED CORRECTIONS FOR

FATHOMETER 152 SPX

AS USED IN LAUNCH CS 160

SEASON 1956

"A" Scale Fathometer Reading	Corr'n.	"B" Scale Fathometer Reading	Corr'n.
3.5 - 6.6	- 0.6		
19.0	- 0.5		
30.9	- 0.4	30.0	+ 0.5
42.9	- 0.3	42.0	+ 0.6
61.0	- 0.2	60.1	+ 0.7

COMBINED CORRECTIONS FOR EDO FATHOMETER #203

AS USED IN LAUNCH CS 160 - SEASON 1956

Reading In Feet	Frequency in cycles per second 61.00	60.75	60.50	60.25	60.00	59.75	59.50	59.25	59.00	58.75	58.50	58.25	58.00
A Scale													
8.0	−0.6	- 0.6	- 0.5	- 0.5	- 0.5	- 0.5	- 0.5	- 0.4	- 0.4	- 0.4	- 0.4	- 0.3	- 0.3
12.2	- 0.6	- 0.5	- 0.5	- 0.4	- 0.4	- 0.4	- 0.3	- 0.3	- 0.2	- 0.2	- 0.1	- 0.1	- 0.1
16.5	−0.5	- 0.5	- 0.4	- 0.4	- 0.3	- 0.2	- 0.2	- 0.1	- 0.1	0.0	+0.1	+0.1	+0.2
20.6	- 0.5	- 0.4	- 0.4	- 0.3	- 0.2	- 0.1	0.0	0.0	+0.1	+0.2	+0.3	+0.3	+0.4
24.7	- 0.5	- 0.4	- 0.3	- 0.2	- 0.1	0.0	+0.1	+0.2	+0.3	+0.4	+0.5	+0.6	+0.7
29.0	- 0.4	- 0.3	- 0.2	- 0.1	0.0	+0.1	+0.2	+0.3	+0.4	+0.6	+0.7	+0.8	+0.9
33.0	- 0.4	- 0.3	- 0.2	0.0	+0.1	+0.2	+0.4	+0.5	+0.6	+0.7	+0.9	+1.0	+1.1
37.2	- 0.4	- 0.2	- 0.1	+0.1	+0.2	+0.3	+0.5	+0.6	+0.8	+0.9	+1.1	+1.2	+1.4
41.5	- 0.4	- 0.2	0.0	+0.1	+0.3	+0.5	+0.6	+0.8	+1.0	+1.1	+1.3	+1.4	+1.6
45.6	- 0.3	- 0.1	0.0	+0.2	+0.4	+0.6	+0.8	+0.9	+1.1	+1.3	+1.5	+1.7	+1.9
49.8	- 0.3	- 0.1	+ 0.1	+0.3	+0.5	+0.7	+0.9	+1.1	+1.3	+1.5	+1.7	+1.9	+2.1
54.0	−0.3	0.0	+ 0.2	+0.4	+0.6	+0.8	+1.0	+1.2	+1.5	+1.7	+1.9	+2.1	+2.3
58.0	−0.2	0.0	+ 0.2	+ 0.5	+0.7	+0.9	+1.2	+1.4	+1.6	+1.9	+2.1	+2.3	+2.6

LIST OF SIGNALS USED

ON SHEET WCSP 1256 - REGISTRY NO. H-8210

Name Used on Sheet	Origin of Signal
ATE	TRANSMISSION TOWER NO. 8, 1955.
BAT	T-11074.
BEND	SOUTH OF RAVENSWOOD SLOUGH BEND, TRANSMISSION TOWER, 1931.
BIG	T-11072.
CENTER	T-11073.
CREEK	SOUTH SIDE OF REDWOOD CREEK, TRANSMISSION TOWER, 1931.
DAD	T-11072.
DIK	Computed three point fix. See this sheet report.
DON	T-11074.
DOS	TRANSMISSION TOWER NO. 2, 1955.
DRY	T-11074.
EAST	DUMBARTON HIGHWAY BRIDGE, EAST TOWER, 1931.
EVA	T-11072.
FOR	TRANSMISSION TOWER NO. 4, 1955.
GAB	SMALL HOUSE, END OF PIPE LINE, WEST GABLE, 1931. on T-11075
HOE	T-11072.
ION	BEND OF RAVENSWOOD SLOUGH, TALLER TRANSMISSION TOWER, 1931.
IRB	TRANSMISSION TOWER NO. 3, 1955.
IVE	TRANSMISSION TOWER NO. 5, 1955.
KEL	Computed three point fix. See this sheet report.
LIGHT	DUMBARTON DRAW BRIDGE LIGHT, 1925. on T-11075
MUD	Computed three point fix. See this sheet report.
NOR	T-11073.
OUT	T-11072.

CONTINUATION

LIST OF SIGNALS USED

Name Used on Sheet	Origin of Signal
RAG	T-11072.
RAV	SOUTH OF RAVENSWOOD SLOUGH, TALL TRANSMISSION TOWER, 1931.
SAL	T-11072.
SET	TRANSMISSION TOWER NO. 6, 1955.
SIDE	RAVENSWOOD SLOUGH, NORTH SIDE, TALL TRANSMISSION TOWER, 1931.
SOUTH	T-11073.
TAP	T-11072.
UNO	TRANSMISSION TOWER NO. 1, 1955.
VEN	TRANSMISSION TOWER NO. 7, 1955.
WAY	T-11072.
WEST	DUMBARTON HIGHWAY BRIDGE, WEST TOWER, 1931.
ZOO	T-11074.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 562
Rev. Sept. 1942

INVERSE POSITION COMPUTATION

Comp KET

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

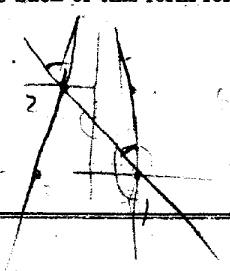
$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which $\log \Delta\lambda_1=\log(\lambda'-\lambda)-$correction for arc to sin*; $\log \Delta\phi_1=\log(\phi'-\phi)-$correction for arc to sin*; and $\log s=\log s_1+$ correction for arc to sin*.

	NAME OF STATION					
1. ϕ	37°	33′	14.065	Red Hill Top	λ	122° 05′ 36.907
2. ϕ'	37	36	51.733	TRB Tower No. 3	λ'	122 09 40.996
$\Delta\phi\ (=\phi'-\phi)$		+03	37.668		$\Delta\lambda\ (=\lambda'-\lambda)$	+04 04.089
$\frac{\Delta\phi}{2}$		01	48.834		$\frac{\Delta\lambda}{2}$	02 02.044
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	35	02.899			
$\Delta\phi$ (secs.)	+217.668				$\Delta\lambda$ (secs.)	+244.089

$\log \Delta\phi$	2.3377946		$\log \Delta\lambda$	2.3875482
cor. arc—sin	—		cor. arc—sin	—
$\log \Delta\phi_1$	2.3377946		$\log \Delta\lambda_1$	2.3875482
$\log \cos\frac{\Delta\lambda}{2}$			$\log \cos\phi_m$	9.8989765
$\operatorname{colog} B_m$	1.4889662		$\operatorname{colog} A_m$	1.4908209
$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.8267608	(opposite in sign to $\Delta\phi$)	$\log\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.7773457
			$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.8267608
			$\log \tan\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.9505849
$\log \Delta\lambda$	2.3875482	3 log $\Delta\lambda$	$\alpha+\frac{\Delta\alpha}{2}$	138° 15′ 09.45
$\log \sin\phi_m$	9.7852771	log F	$\log \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.8233748
$\log \sec\frac{\Delta\phi}{2}$		log b	$\log \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.8727899
$\log a$	2.1728253		$\log s_1$	3.9539709
a	148.88		cor. arc—sin	3.9539709 +
b			log s	3.9539709
$-\Delta\alpha$ (secs.)	148.88			8994.87
$-\frac{\Delta\alpha}{2}$	74.44			
	+01	14.44		
$\alpha+\frac{\Delta\alpha}{2}$	138 15	09.45		
α (1 to 2)	138 16	23.89		
$\Delta\alpha$	−02	28.88		
	180			
α' (2 to 1)	318 13	55.01		

* Use the table on the back of this form for correction of arc to sin.



NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—31070-1

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

U. S. GOVERNMENT PRINTING OFFICE 16—81070-1

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 562
Rev. Sept. 1942

INVERSE POSITION COMPUTATION

comp KET

KE1

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

KE1

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

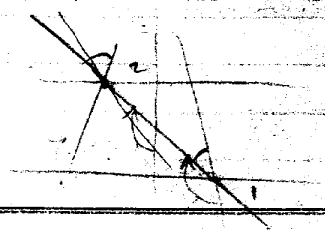
in which $\log \Delta\lambda_1 = \log(\lambda'-\lambda)$ − correction for arc to sin*; $\log \Delta\phi_1 = \log(\phi'-\phi)$ − correction for arc to sin*; and $\log s = \log s_1$ + correction for arc to sin*.

NAME OF STATION

1. ϕ	37°	30′	20.072	Dumbarton West	λ	122°	07′	03.080
2. ϕ'	37	36	51.733	IRB	λ'	122	09	40.996
$\Delta\phi\ (=\phi'-\phi)$		+ 06	31.661		$\Delta\lambda\ (=\lambda'-\lambda)$		+ 02	37.916
$\frac{\Delta\phi}{2}$		03	15.830		$\frac{\Delta\lambda}{2}$		01	18.958
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	33	35.902					
$\Delta\phi$ (secs.)	+391.661				$\Delta\lambda$ (secs.)	+157.916		

log $\Delta\phi$	2.5929103		**log** $\Delta\lambda$	2.1984261
cor. arc−sin	−		cor. arc−sin	−
log $\Delta\phi_1$	2.5929103		log $\Delta\lambda_1$	2.1984261
log cos $\frac{\Delta\lambda}{2}$			**log cos** ϕ_m	9.8991174
colog B_m	1.4889643		**colog** A_m	1.4908203
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.0818746	(opposite in sign to $\Delta\phi$)	**log** $\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.5883638
			log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.0818746
			log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.5064892
log $\Delta\lambda$	2.1984261	3 log $\Delta\lambda$	$\alpha+\frac{\Delta\alpha}{2}$	162° 12′ 14.34
log sin ϕ_m	9.7850389	log F	**log sin** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.4851949
log sec $\frac{\Delta\phi}{2}$		log b	**log cos** $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.9787056
log a	1.9834650		**log** s_1	4.1031689
a	96.26		cor. arc−sin	4.1031690 +
b			log s	4.1031689
$-\Delta\alpha$ (secs.)	− 96.26		S =	1268145
$-\frac{\Delta\alpha}{2}$	− 48.13			
$\alpha+\frac{\Delta\alpha}{2}$	+ 48.13			
	162° 12′ 14.30			
α (1 to 2)	162 13 02.43			
$\Delta\alpha$	+ 01 36.26			
	180			
α' (2 to 1)	342 11 26.17			

* Use the table on the back of this form for correction of arc to sin.



Note.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—81070-1

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

U. S. GOVERNMENT PRINTING OFFICE 16—31070-1

Comp K&L

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 568
Rev. Sept. 1942

INVERSE POSITION COMPUTATION

DIK.

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

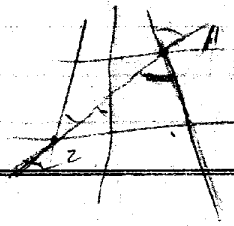
in which log $\Delta\lambda_1$=log $(\lambda'-\lambda)$−correction for arc to sin*; log $\Delta\phi_1$=log $(\phi'-\phi)$−correction for arc to sin*; and log s=log s_1+correction for arc to sin*.

NAME OF STATION

1. ϕ	37°	33′	14.065	Red Hill Top	λ	122°	05′	36.907
2. ϕ'	37	30	20.072	Dumbarton West	λ'	122	07	03.080
$\Delta\phi$ (=$\phi'-\phi$)	−	02	53.993		$\Delta\lambda$ (=$\lambda'-\lambda$)	+	01	26.173
$\frac{\Delta\phi}{2}$	−	01	26.996		$\frac{\Delta\lambda}{2}$		00	43.086
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	31	47.068					
$\Delta\phi$ (secs.)	−	173.993			$\Delta\lambda$ (secs.)	+	86.173	

log $\Delta\phi$	2.2405318n	log $\Delta\lambda$	1.9353712
cor. arc−sin	−	cor. arc−sin	−
log $\Delta\phi_1$	2.2405318n	log $\Delta\lambda_1$	1.9353712
log cos $\frac{\Delta\lambda}{2}$		log cos ϕ_m	9.8992936
colog B_m	1.4889622	colog A_m	1.4908195
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.7294940 (opposite in sign to $\Delta\phi$)	log $\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.3254842
		log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.7294940
		log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.5959902
log $\Delta\lambda$	1.9353712 (3 log $\Delta\lambda$)	$\alpha+\frac{\Delta\alpha}{2}$	21° 31′ 36.0
log sin ϕ_m	9.7847408 (log F)	log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.5645882
log sec $\frac{\Delta\phi}{2}$	(log b)	log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.9685988
log a	1.7201120	log s_1	3.7608962
a	5249	cor. arc−sin	3.7608958
b		log s	3.7608960
$-\Delta\alpha$ (secs.)	−52.49	S =	576629
$\frac{\Delta\alpha}{2}$	− 26.24		
	+ 00 + 26.24		
$\alpha+\frac{\Delta\alpha}{2}$	21° 31′ 36.0		
α (1 to 2)	21° 32′ 02.24		
$\Delta\alpha$	− 52.49		
	180		
α' (2 to 1)	201° 31′ 89.75		

* Use the table on the back of this form for correction of arc to sin.



Note—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed [illegible] or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—81070-1

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

U. S. GOVERNMENT PRINTING OFFICE 16—81070-1

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. 1942

INVERSE POSITION COMPUTATION

Comp-ICET

DIK

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which $\log \Delta\lambda_1 = \log(\lambda'-\lambda)$ − correction for arc to sin*; $\log \Delta\phi_1 = \log(\phi'-\phi)$ − correction for arc to sin*; and $\log s = \log s_1$ + correction for arc to sin*.

	NAME OF STATION					
1. ϕ	37°	30′	20.072	Dumbarton West λ	122°	07′	03.080
2. ϕ'	37	36	38.519	IVE d/o. 5 st λ'	122	10	25.480
$\frac{\Delta\phi}{\Delta\phi}$ $(=\phi'-\phi)$		+ 06	18.447	$\frac{\Delta\lambda}{\Delta\lambda}$ $(=\lambda'-\lambda)$		+ 03	22.400
$\frac{\Delta\phi}{2}$		03	09.223	$\frac{\Delta\lambda}{2}$		01	41.200
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	33	29.295		12		
$\Delta\phi$ (secs.)	+378.447			$\Delta\lambda$ (secs.)	+202.400		

$\log \Delta\phi$	2.5780050	$\log \Delta\lambda$	2.3062105
cor. arc−sin	−	cor. arc−sin	−
$\log \Delta\phi_1$	2.5780050	$\log \Delta\lambda_1$	2.3062105
$\log \cos\frac{\Delta\lambda}{2}$		$\log \cos\phi_m$	9.8991281
$\operatorname{colog} B_m$	1.4889643	$\operatorname{colog} A_m$	1.4908202
$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.0669693 (opposite in sign to $\Delta\phi$)	$\log\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.6961588
		$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	4.0669693
$\log \Delta\lambda$	2.3062105 (3 log Δλ)	$\log \tan\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.6291895
$\log \sin\phi_m$	9.7850208 (log F)	$\alpha+\frac{\Delta\alpha}{2}$	156 - 56 - 19.53
$\log \sec\frac{\Delta\phi}{2}$	(log b)	$\log \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.5932107
$\log a$	2.0912313	$\log \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.9638214
a	12338	$\log s_1$	4.1031981
b		cor. arc−sin	4.103 + 1479
$-\Delta\alpha$ (secs.)	+ − 123.38	log s	4.1033481
$\frac{\Delta\alpha}{2}$	+ -61.69	S =	12685133
$\alpha+\frac{\Delta\alpha}{2}$	+01 - 01.69 / 156 56 - 19.53		
α (1 to 2)	156 57 17.84		
$\frac{\Delta\alpha}{\Delta\alpha}$	+ 02 03.38		
	180		
α' (2 to 1)	336 53 09.6		

* Use the table on the back of this form for correction of arc to sin.

Note.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

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Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
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INVERSE POSITION COMPUTATION

DIK

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which $\log \Delta\lambda_1=\log(\lambda'-\lambda)-$correction for arc to sin*; $\log \Delta\phi_1=\log(\phi'-\phi)-$correction for arc to sin*; and $\log s=\log s_1+$ correction for arc to sin*.

NAME OF STATION

1. ϕ	37°	33′	14.065	Red Hill Top	λ	122°	05′	36.907
2. ϕ'	37	36	38.519	IVE	λ'	122	10	25.480
$\Delta\phi\ (=\phi'-\phi)$		+ 03	24.454		$\Delta\lambda\ (=\lambda'-\lambda)$		04	48.573
$\frac{\Delta\phi}{2}$		01	42.227		$\frac{\Delta\lambda}{2}$		02	24.286
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	34	56.292					
$\Delta\phi$ (secs.)	+ 204.454				$\Delta\lambda$ (secs.)	+ 288.573		

$\log \Delta\phi$	2.3105956		$\log \Delta\lambda$	2.4602557	
cor. arc−sin	−		cor. arc−sin	−	
$\log \Delta\phi_1$	2.3105956		$\log \Delta\lambda_1$	2.4602557	
$\log \cos\frac{\Delta\lambda}{2}$	8.5110340		$\log \cos\phi_m$	9.8989872	
$\operatorname{colog} B_m$	1.4889660		$\operatorname{colog} A_m$	1.4908209	
$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.7995616	(opposite in sign to $\Delta\phi$)	$\log\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.8500638	
			$\log\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.7995616	
			$\log \tan\left(\alpha+\frac{\Delta\alpha}{2}\right)$	0.0505022	
$\log \Delta\lambda$	2.4602557	$3\log\Delta\lambda$	$\alpha+\frac{\Delta\alpha}{2}$	131° 40′	34.1″
$\log \sin\phi_m$	9.7852589	log F	$\log \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.8732713	
$\log \sec\frac{\Delta\phi}{2}$		log b	$\log \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.8227689	
$\log a$	2.2455146		$\log s_1$	3.9767925	
a	176.004		cor. arc−sin	3.9767927	
b			log s	3.9767925	
$-\Delta\alpha$ (secs.)	176.00″				
$-\frac{\Delta\alpha}{2}$	88.00				
	+ 01′	28.0″			
$\alpha+\frac{\Delta\alpha}{2}$	131° 40′	34.1″			
α (1 to 2)	131	42 02.1			
$\Delta\alpha$	− 02	56.0			
	180				
α' (2 to 1)	311 − 39 − 06.1				

* Use the table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—81070-1

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

U. S. GOVERNMENT PRINTING OFFICE 16—31070-1

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DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. 1942

INVERSE POSITION COMPUTATION

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$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

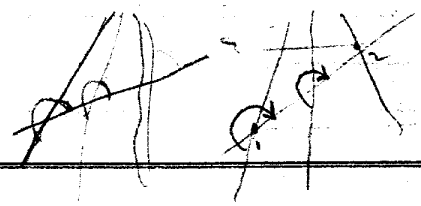
in which log $\Delta\lambda_1$=log $(\lambda'-\lambda)$−correction for arc to sin*; log $\Delta\phi_1$=log $(\phi'-\phi)$−correction for arc to sin*; and log s=log s_1+ correction for arc to sin*.

NAME OF STATION

1. ϕ	37°	34′	59.″613	San Mateo Br West	λ	122°	15′	01.″589
2. ϕ'	37	36	45.126	FOR	λ'	122	10	03.243
$\Delta\phi$ $(=\phi'-\phi)$	+	01	45.513		$\Delta\lambda$ $(=\lambda'-\lambda)$	−	04	58.346
$\frac{\Delta\phi}{2}$		00	52.756		$\frac{\Delta\lambda}{2}$		02	29.173
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	35	52.369					
$\Delta\phi$ (secs.)	+ 105.513				$\Delta\lambda$ (secs.)	− 298.346		

log $\Delta\phi$	2.0233060		log $\Delta\lambda$	2.4747202	
cor. arc−sin	−		cor. arc−sin	−	
log $\Delta\phi_1$	2.0233060		log $\Delta\lambda_1$	2.4747202	
log cos $\frac{\Delta\lambda}{2}$			log cos ϕ_m	9.8988964	
colog B_m	1.4889672		colog A_m	1.4908212	
log $\{s_1 \cos(\alpha+\frac{\Delta\alpha}{2})\}$	3.5122732	(opposite in sign to $\Delta\phi$)	log $\{s_1 \sin(\alpha+\frac{\Delta\alpha}{2})\}$	3.8644378 n	
			log $\{s_1 \cos(\alpha+\frac{\Delta\alpha}{2})\}$	3.5122732 n	
log $\Delta\lambda$	2.4747202	3 log $\Delta\lambda$	log tan $(\alpha+\frac{\Delta\alpha}{2})$	0.3521646	
log sin ϕ_m	9.7854124	log F	$\alpha+\frac{\Delta\alpha}{2}$	246° 02′ 11.″9	
log sec $\frac{\Delta\phi}{2}$		log b	log sin $(\alpha+\frac{\Delta\alpha}{2})$	9.9608537	
log a	2.2601326		log cos $(\alpha+\frac{\Delta\alpha}{2})$	9.6086890	
a	182.03		log s_1	3.9035841	
b			cor. arc−sin	3.9035842 +	
$-\Delta\alpha$ (secs.)	− 182.″03		log s	3.9035841	
$-\frac{\Delta\alpha}{2}$	− 91.″01		S =	8009.11	
	− 01′ 31.″01				
$\alpha+\frac{\Delta\alpha}{2}$	246° 02′ 11.″90				
α (1 to 2)	246° 00′ 40.″89				
$\Delta\alpha$	+ 03′ 02.″03				
180					
α' (2 to 1)	66° 03′ 42.″92				

* Use the table on the back of this form for correction of arc to sin.



NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—31070-1

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
5. 062	59	3. 571	5. 451	354	3. 960	5. 656	909	4. 165
5. 076	63	3. 585	5. 457	364	3. 966	5. 660	925	4. 169
5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

U. S. GOVERNMENT PRINTING OFFICE 16—31070-1

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. 1942

INVERSE POSITION COMPUTATION

Comp ICET
ICET

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

MUD

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which $\log \Delta\lambda_1$=log ($\lambda'-\lambda$)−correction for arc to sin*; $\log \Delta\phi_1$=log ($\phi'-\phi$)−correction for arc to sin*; and $\log s$=$\log s_1$+ correction for arc to sin*.

NAME OF STATION

1. ϕ	37°	36′	05.465	TEN	λ	122°	12′	16.675
2. ϕ'	37	36	45.126	FOR	λ'	122	10	03.243
$\Delta\phi$ (=$\phi'-\phi$)	+	00	39.661		$\Delta\lambda$ (=$\lambda'-\lambda$)	−	02	13.432
$\frac{\Delta\phi}{2}$		00	19.830		$\frac{\Delta\lambda}{2}$		01	06.716
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	36	25.295					
$\Delta\phi$ (secs.)	+ 39.661				$\Delta\lambda$ (secs.)	−133.432		

log $\Delta\phi$	1.5983637	log $\Delta\lambda$	2.1252600
cor. arc−sin	−	cor. arc−sin	−
log $\Delta\phi_1$	1.5983637	log $\Delta\lambda_1$	2.1252600
log cos $\frac{\Delta\lambda}{2}$		log cos ϕ_m	9.8988429
colog B_m	1.4889680	colog A_m	1.4908215
log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.0873317 (opposite in sign to $\Delta\phi$)	log $\left\{s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.5149244 n
		log $\left\{s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)\right\}$	3.0873317 n
		log tan $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	0.4275927
log $\Delta\lambda$	2.1252600 3 log $\Delta\lambda$	$\alpha+\frac{\Delta\alpha}{2}$	249° 30′ 51.45
log sin ϕ_m	9.7855023 log F	log sin $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.9716281
log sec $\frac{\Delta\phi}{2}$	log b	log cos $\left(\alpha+\frac{\Delta\alpha}{2}\right)$	9.5440355
log a	1.9107623	log s_1	3.5432963
a	81.42	cor. arc−sin	3.5432962 +
b		log s	3.5432962
$-\Delta\alpha$ (secs.)	− 81.42		
$-\frac{\Delta\alpha}{2}$	− 40.71	S =	34937.2
	° ′ − 40.71		
$\alpha+\frac{\Delta\alpha}{2}$	249° 30′ 51.45		
α (1 to 2)	249 30 10.74		
$\frac{\Delta\alpha}{2}$	+ 01 21.42		
180			
α' (2 to 1)	69 31 32.16		

* Use the table on the back of this form for correction of arc to sin.

NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—81070-1

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
4. 526	5	3. 035	5. 260	147	3. 769	5. 543	541	4. 052
4. 566	6	3. 075	5. 269	153	3. 778	5. 548	553	4. 057
4. 599	7	3. 108	5. 279	160	3. 788	5. 553	565	4. 062
4. 628	8	3. 137	5. 287	166	3. 796	5. 557	577	4. 066
4. 654	9	3. 163	5. 294	172	3. 803	5. 561	588	4. 070
4. 677	10	3. 186	5. 303	179	3. 812	5. 566	600	4. 075
4. 697	11	3. 206	5. 311	186	3. 820	5. 570	613	4. 079
4. 716	12	3. 225	5. 318	192	3. 827	5. 575	625	4. 084
4. 734	13	3. 243	5. 326	199	3. 835	5. 579	637	4. 088
4. 750	14	3. 259	5. 334	206	3. 843	5. 583	650	4. 092
4. 765	15	3. 274	5. 341	213	3. 850	5. 587	663	4. 096
4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
4. 876	25	3. 385	5. 383	259	3. 892	5. 612	743	4. 121
4. 892	27	3. 401	5. 390	267	3. 899	5. 616	757	4. 125
4. 915	30	3. 424	5. 396	275	3. 905	5. 620	771	4. 129
4. 936	33	3. 445	5. 403	284	3. 912	5. 624	785	4. 133
4. 955	36	3. 464	5. 409	292	3. 918	5. 628	800	4. 137
4. 972	39	3. 481	5. 415	300	3. 924	5. 632	814	4. 141
4. 988	42	3. 497	5. 422	309	3. 931	5. 636	829	4. 145
5. 003	45	3. 512	5. 428	318	3. 937	5. 640	845	4. 149
5. 017	48	3. 526	5. 434	327	3. 943	5. 644	861	4. 153
5. 035	52	3. 544	5. 440	336	3. 949	5. 648	877	4. 157
5. 051	56	3. 560	5. 446	345	3. 955	5. 652	893	4. 161
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5. 090	67	3. 599	5. 462	373	3. 971	5. 663	941	4. 172
5. 102	71	3. 611	5. 468	383	3. 977	5. 667	957	4. 176
5. 114	75	3. 623	5. 473	392	3. 982	5. 671	973	4. 180
5. 128	80	3. 637	5. 479	402	3. 988	5. 674	989	4. 183
5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
5. 163	94	3. 672	5. 495	433	4. 004			
5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

U. S. GOVERNMENT PRINTING OFFICE 16—31070-1

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 662
Rev. Sept. 1942

INVERSE POSITION COMPUTATION

Comp KEO
HEC
MUD

$$s_1 \sin\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{\Delta\lambda_1 \cos\phi_m}{A_m}$$

$$s_1 \cos\left(\alpha+\frac{\Delta\alpha}{2}\right)=\frac{-\Delta\phi_1 \cos\frac{\Delta\lambda}{2}}{B_m}$$

$$-\Delta\alpha=\Delta\lambda \sin\phi_m \sec\frac{\Delta\phi}{2}+F(\Delta\lambda)^3$$

in which $\log \Delta\lambda_1 = \log(\lambda'-\lambda)$ − correction for arc to sin*; $\log \Delta\phi_1 = \log(\phi'-\phi)$ − correction for arc to sin*; and $\log s = \log s_1$ + correction for arc to sin*.

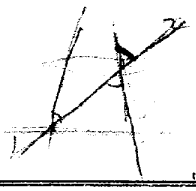
NAME OF STATION

1. ϕ	37°	34′	59.613″	San Mateo Br West	λ	122°	15′	01.589″
2. ϕ'	37	36	05.465″	TEN	λ'	122	12	16.675″
$\Delta\phi\ (=\phi'-\phi)$	+	01	05.852		$\Delta\lambda\ (=\lambda'-\lambda)$	−	02	44.914
$\frac{\Delta\phi}{2}$		00	32.926		$\frac{\Delta\lambda}{2}$		01	22.457
$\phi_m\left(=\phi+\frac{\Delta\phi}{2}\right)$	37	35	32.539					
$\Delta\phi$ (secs.)	+ 65.852				$\Delta\lambda$ (secs.)	−164.914		

log $\Delta\phi$	1.8185690			log $\Delta\lambda$	2.2172575		
cor. arc−sin	−			cor. arc−sin	−		
log $\Delta\phi_1$	1.8185690			log $\Delta\lambda_1$	2.2172575		
log cos $\frac{\Delta\lambda}{2}$				log cos ϕ_m	9.8989286		
colog B_m	1.4889668			colog A_m	1.4908211		
log $\{s_1 \cos(\alpha+\frac{\Delta\alpha}{2})\}$	3.3075358		(opposite in sign to $\Delta\phi$)	log $\{s_1 \sin(\alpha+\frac{\Delta\alpha}{2})\}$	3.6070072 n		
				log $\{s_1 \cos(\alpha+\frac{\Delta\alpha}{2})\}$	3.3075358 n		
log $\Delta\lambda$	2.2172575	3 log $\Delta\lambda$		log tan $(\alpha+\frac{\Delta\alpha}{2})$	0.2994714		
log sin ϕ_m	9.7853580	log F		$\alpha+\frac{\Delta\alpha}{2}$	243°	21′	09.40″
log sec $\frac{\Delta\phi}{2}$		log b		log sin $(\alpha+\frac{\Delta\alpha}{2})$	9.9512324		
log a	2.0026155			log cos $(\alpha+\frac{\Delta\alpha}{2})$	9.6517610		
a	100.60			log s_1	3.6557748		
b					3.6557748		
$-\Delta\alpha$ (secs.)	− 100.60			cor. arc−sin	+		
$-\frac{\Delta\alpha}{2}$	− 50.30			log s	3.6557748		
$\alpha+\frac{\Delta\alpha}{2}$	243°	21′	09.40″				
α (1 to 2)	243	20	19.10				
$\Delta\alpha$	+ 01	40.60					
	180						
α' (2 to 1)	63	21	59.70				

S = 452663

* Use the table on the back of this form for correction of arc to sin.



NOTE.—For log s up to 4.0 and for $\Delta\phi$ or $\Delta\lambda$ (or both) up to 3′, omit all terms below the heavy line except those printed (in whole or in part) in heavy type or those underscored, if using logarithms to 7 decimal places.

16—81070-1

Table of arc-sin corrections for inverse position computations

log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$	log s_1	Arc-sin correction in units of seventh decimal of logarithms	log $\Delta\phi$ or log $\Delta\lambda$
4. 177	1	2. 686	5. 223	124	3. 732	5. 525	497	4. 034
4. 327	2	2. 836	5. 234	130	3. 743	5. 530	508	4. 039
4. 415	3	2. 924	5. 243	136	3. 752	5. 534	519	4. 043
4. 478	4	2. 987	5. 253	142	3. 762	5. 539	530	4. 048
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4. 779	16	3. 288	5. 349	221	3. 858	5. 591	674	4. 100
4. 792	17	3. 301	5. 356	228	3. 865	5. 595	687	4. 104
4. 804	18	3. 313	5. 363	236	3. 872	5. 600	702	4. 109
4. 827	20	3. 336	5. 369	243	3. 878	5. 604	716	4. 113
4. 857	23	3. 366	5. 376	251	3. 885	5. 608	729	4. 117
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5. 139	84	3. 648	5. 484	412	3. 993	5. 678	1005	4. 187
5. 151	89	3. 660	5. 489	422	3. 998			
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5. 172	98	3. 681	5. 500	443	4. 009			
5. 183	103	3. 692	5. 505	453	4. 014			
5. 193	108	3. 702	5. 510	464	4. 019			
5. 205	114	3. 714	5. 515	474	4. 024			
5. 214	119	3. 723	5. 520	486	4. 029			

U. S. GOVERNMENT PRINTING OFFICE 16—81070-1

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

LIST OF DIRECTIONS

Station DIK State CALIFORNIA

Chief of party HGC Date 1/31/56 Computed by KET

Observer KET Instrument WILD - 27016 Checked by GWG

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	′ ″	″	° ′ ″	′ ″
West Tower Light, [illegible] Bridge	0 00 00.00			0 00 00.00	
KGO - Center Transmitting Tower	325 52 33.8				
RED Hill Top	249 33 55.6				
Transmission Tower # 5 IVE	146 06 11.0				
TRANSMISSION TOWER # 8 ATE	135 32 42.4				
West Tower Light, San Mateo Bridge	109 57 54.4				

GWG

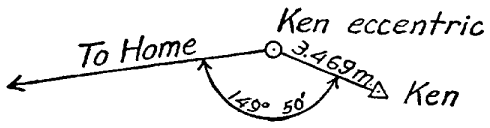
* These columns are for office use and should be left blank in the field.

Station: Ken | *State:* Maryland

Chief of party: C. V. H. | *Date:* 1917 | *Computed by:* O. P. S.

Observer: C. V. H. | *Instrument:* No. 168 | *Checked by:* W. F. R.

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction	Corrected direction with zero initial	Adjusted direction
	° ′ ″	′ ″	″	° ′ ″	′ ″
Chevy	0 00 00.00	− 7.31		0 00 00.00	
Tank west of △ Dulce	29 03 37.0	−1 09.8		29 02 34.5	
Ken (center), 3.469 meters	176 42				
Forest Glen standpipe	313 24 53.0	+3 01.2		313 28 01.5	
Home	326 31 30.21	+ 31.93		326 32 09.45	
Bureau of Standards, wireless pole	352 17 20.8	+ 5.7		352 17 33.8	
Reno	357 28 48.63	− 1.16		357 28 54.78	
Reference mark, 16.32 m	358 31 20				



This form, with the first three and fifth columns properly filled out and checked, must be furnished by field parties. *To be acceptable it must contain every direction observed at the station.*

It should be used for observations with both repeating and direction theodolites.

The directions at only one station should be placed on a page.

If a repeating theodolite is used, do not abstract the angles in tertiary triangulation. The local adjustment corrections (to close horizon only) are to be written in the Horizontal Angle Record, and the List of Directions is to be made from that record directly.

Choose as an initial for Form 24a some station involved in the local adjustment, and preferably one which has been used as an initial for a round of directions on objects not in the main scheme. Use but one initial at a station. Call the direction of the initial 0° 00′ 00.″ 00, and by applying the corrected angles to this, fill in opposite each station its direction reckoned *clockwise* around the whole circumference regardless of the direction of graduation of the instrument. The clockwise reckoning is necessary for uniformity and to make the directions comparable with azimuths.

If a station has been occupied eccentrically, reduce to the center and enter in this form, in ink, the resulting corrections to the observed directions in the column provided for them. If an eccentric reduction is necessary, but not made in the field, leave the column blank. If the station was occupied centrally, and no eccentric reduction is required, put dashes in the column to show that no corrections are necessary.

Directions in the main scheme should be entered to hundredths of seconds in first-order triangulation; otherwise to tenths only. Points observed upon but once, direct and reverse, should be carried to tenths in first-order and second-order triangulation, and to even seconds only in third-order triangulation. In general, but two uncertain figures should be given.

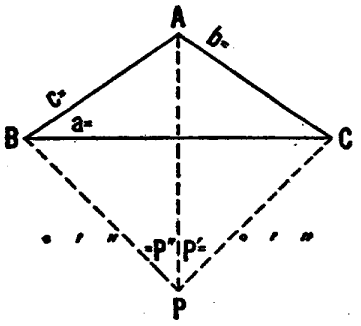
It is recommended that the following simple plan of observing be used with a repeating instrument: Measure each single angle in the scheme at each station and the outside angle necessary to close the horizon. *Measure no sum angles.* Follow each measurement of every angle immediately by a measurement of its explement. Six repetitions are to constitute a measurement. The local adjustment will consist simply of the distribution of the error of closure of the horizon.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 655
Ed. Sept., 1929

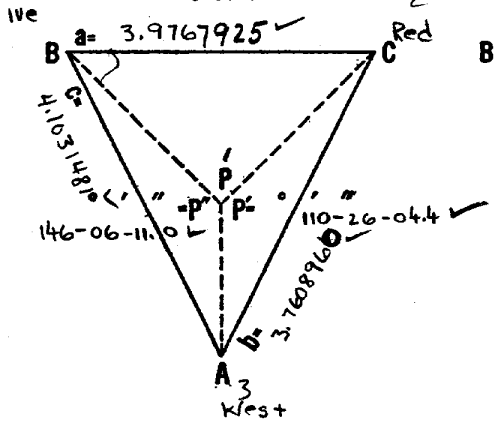
D k

COMPUTATION OF THREE-POINT PROBLEM

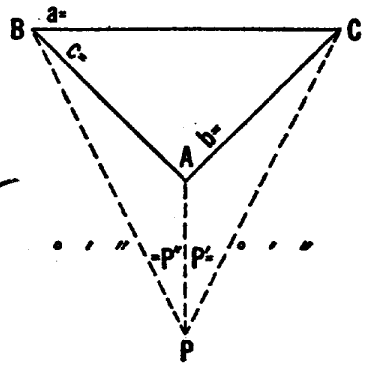
Case 1



Case 2



Case 3



Cases 1 and 2

P'	110	26	04.4
P"	146	06	11.0
A	44	33	56.7
Sum	301	06	12.1
½ Sum	150	33	06.0
S=180°−½ sum=	29	26	54.0

Case 3

P' _____
P" _____
Sum _____
A _____
A−sum
S=½ (A−sum)=

Log c =	4.1031481	+
Log sin P' =	9.9717728	+
Colog b =	6.2391040	+
Colog sin P" =	0.2535987	+
Sum=log tan Z=	20.5676236	+
Z=	74 51 24.4	
Z+45°=	119 51 24.4	
Log cot (Z+45°) =	9.7589287	−
Log tan S=	9.7517278	+
Sum=log tan ϵ=	9.5106565	(sign −)
ϵ	17 57 23.9	
S	29 26 54.0	

(Tan ϵ+)		(Tan ϵ−)
S+ϵ=angle ABP	11 29 30.1	S−ϵ=angle ABP
S−ϵ=angle ACP	47 24 17.9	S+ϵ=angle ACP

BPA	146	06	11.0	APC	110	26	04.4	PCB	62	45	42.0
ABP	11	29	30.1	PCA	47	24	17.9	CBP	13	46	33.4
PAB	22	24	18.9	CAP	22	09	37.7	BPC	103	27	44.6
	180	00	00.0		180	00	00.0		180	00	00.0

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

U. S. GOVERNMENT PRINTING OFFICE: 1929
11—9912

Form 25
(10-8-53)

U. S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

Dik

COMPUTATION OF TRIANGLES

State California

	Station	Observed angle	Corr'n	Spher'l angle	Spher'l excess	Plane angle and distance	Logarithm
	2-3 Red-West						3.7608960
	1 DIK	110 26 04.4					0.0282272
	2 RED	47 24 17.9					9.8669697
	3 WEST	22 09 37.7					9.5765739
	1-3 Dik-West						3.6560929
	1-2 Dik-Red						3.3656987
	2-3 West-IVE						4.1031481
	1 Dik	146 06 11.0					0.2535987
	2 West	22 24 18.9					9.5811017
	3 IVE	11 29 30.1					9.2993457
	1-3 Dik-IVE						3.9378485
	1-2 Dik-West						3.6560925
	2-3 IVE-RED						3.9767925
	1 DIK	103 27 44.6					0.0121001
	2 IVE	13 46 33.4					9.3768062
	3 Red	62 45 42.0					9.9489557
	1-3 Dik-Red						3.3656988
	1-2 Dik-IVE						3.9378483
	2-3 IVE-WEST						4.1031481
	1 Red	110 10 01.9					0.0274775
	2 West	44 33 56.7					9.8461684
	3 Ive	25 16 01.5					9.6302635
	1-3 R						3.9767940
	1-2 Red						3.7608891

Comm-DC 57715

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April 1945

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

D11C

				°	′	″								°	′	″			
α	2 Red	to 3 West		21	32	02.2	α	3 West	to 2 Red					201	31	09.7			
2d ∠	West	&	Dik	+47	24	17.9	3d ∠	Dik	&	Red				− 22	09	37.7			
α	2 Red	to 1	Dik	68	56	20.1	α	3 West	to 1	Dik				179	21	32.0			
Δα						−53.8	Δα									01.2			
				180	00	00.0								180	00	00.0			
α′	1	to 2		248	55	26.3	α′	1	to 3					359	21	30.8			
			First Angle of Triangle	110	26	04.4					359	21	30.7						
	°	′	″					°	′	″							°	′	″
φ	37	33	14.065	2 Red			λ	122	05	36.907	φ	37	30	20.072	3 West		λ	122	07	03.080
Δφ		−	27.065				Δλ		01	28.238	Δφ	+	02	26 928			Δλ			02.065
φ′	37	32	47.000	1 Dik			λ′	122	07	05.145	φ′	37	32	47 000	1 Dik		λ′	122	07	05.145

	Logarithms	Values in seconds
s	3.3656988	
Cos α	9.8555335	+
B	8.5110360	
h	1.4322683	1st term + 27.056
s²	6.7313976	
Sin² α	9.9399474	
C	1.29065	
	7.9619950	2d term + .009
h²	2.8645	
D	2.3774	
	5.2419	3d term + .0000
		−Δφ 27.065

	°	′	″	Logarithms	Values in seconds
½(φ+φ′)	37	33	00.532		
s				3.3656988	
Sin α				9.9699737	+
A′				8.5091801	
Sec φ′				0.1008034	
Δλ				1.9456560	88.238
Sin ½(φ+φ′)				9.7849407	
−Δα				1.7305967	53.777

	Logarithms	Values in seconds
s	3.6560929	
Cos α	9.9999728	−
B	8.5110396	
h	2.1671053	1st term − 146.928
s²	7.3121858	
Sin² α	6.0976032	
C	1.28983	
	4.6996190	2d term + .000
h²	4.3342	
D	2.3772	
	6.7114	3d term + .000
		−Δφ −146.928

	°	′	″	Logarithms	Values in seconds
½(φ+φ′)	37	31	33.536		
s				3.6560929	
Sin α				8.0488016	+
A′				8.5091801	
Sec φ′				0.1008034	
Δλ				0.3148780	+ 2.0648
Sin ½(φ+φ′)				9.7847036	
−Δα				0.0995816	− 1.2577

16—44238-1 U. S. GOVERNMENT PRINTING OFFICE

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

LIST OF DIRECTIONS

Station KEL *State* California

Chief of party HGC *Date* 1/31/56 *Computed by* KET

Observer KET *Instrument* WILD - 27016 *Checked by* GWG

U. S. GOVERNMENT PRINTING OFFICE: 1932 11-0802

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	′ ″	″	° ′ ″	′ ″
West Tower Light, San Mateo Bridge	0 00 00.00			0 00 00.00	
Transmission Tower #7 VEN	32 19 27.9				
Transmission Tower #3 IRB	50 48 39.3				
Red Hill Top	177 42 28.6				
KGO-Center transmitting tower	222 23 59.1				
West tower light, Dumbarton Br.	246 58 40.9				

GWG

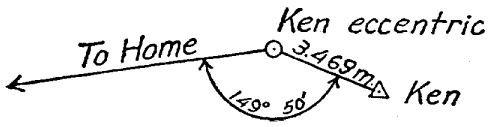
* These columns are for office use and should be left blank in the field.

Station: Ken | *State:* Maryland

Chief of party: C. V. H. | *Date:* 1917 | *Computed by:* O. P. S.

Observer: C. V. H. | *Instrument:* No. 168 | *Checked by:* W. F. R.

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction	Corrected direction with zero initial	Adjusted direction
	° ′ ″	′ ″	″	° ′ ″	′ ″
Chevy	0 00 00.00	− 7.31		0 00 00.00	
Tank west of △ Dulce	29 03 37.0	−1 09.8		29 02 34.5	
Ken (center), 3.469 meters	176 42				
Forest Glen standpipe	313 24 53.0	+3 01.2		313 28 01.5	
Home	326 31 30.21	+ 31.93		326 32 09.45	
Bureau of Standards, wireless pole	352 17 20.8	+ 5.7		352 17 33.8	
Reno	357 28 48.63	− 1.16		357 28 54.78	
Reference mark, 16.32 m	358 31 20				



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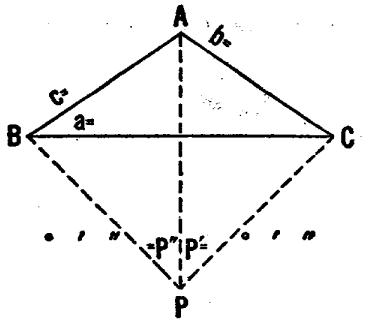
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 655
Ed. Sept., 1929

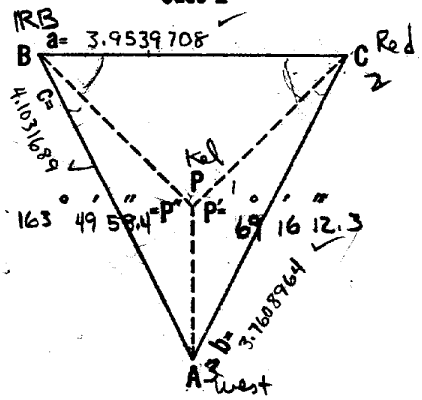
KEL

COMPUTATION OF THREE-POINT PROBLEM

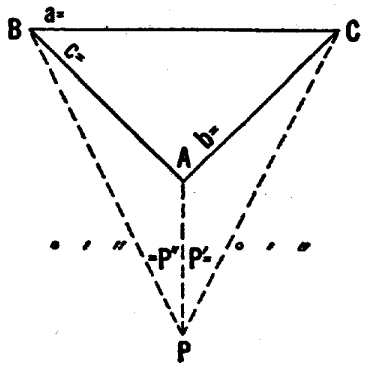
Case 1



Case 2



Case 3



Cases 1 and 2

P'	69	16	12.3
P"	163	49	58.4
A	39	18	07.3
Sum	272	24	18.0
½ Sum	136	12	09.0
S=180°−½ sum=	43	47	51.0

Case 3

P'			
P"			
Sum			
A			
S=½ (A−sum)=			

Log c =	4.1031689
Log sin P' =	9.9709320 +
Colog b =	6.2391636
Colog sin P" =	0.5552686 +
Sum=log tan Z=	0.8684731 +
Z=	82 17 26.4
Z+45°=	127 17 26.4
Log cot (Z+45°) =	9.8816918 −
Log tan S=	9.9817651 +
Sum=log tan ϵ=	9.8634569 n (sign −)
ϵ	36 08 16.3
S	43 47 51.0

(Tan ϵ+)
S+ϵ=angle ABP 7 39 34.7
S−ϵ=angle ACP 79 56 07.3

(Tan ϵ−)
S−ϵ=angle ABP
S+ϵ=angle ACP

BPA	163	49	58.4	APC	69	16	12.3	PCB	36	48	14.[illegible]
ABP	07	39	34.7	PCA	79	56	07.3	CBP	16	17	56.4
PAB	08	30	26.9	CAP	30	47	40.4	BPC	126	53	49.3
	180	120	120.0		180	120	60.0		180	120	120.0

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

U. S. GOVERNMENT PRINTING OFFICE: 1929
11—9912

Form 25
(10-8-53)

U. S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

COMPUTATION OF TRIANGLES

Kel

State California

	Station	Observed angle	Corr'n	Spher'l angle	Spher'l excess	Plane angle and distance	Logarithm
	2-3 Red - West						3.7608964
	1 Kel	69 16 12.3					0.0290680
	2 Red	79 56 07.3					9.9932648
	3 West	30 47 40.4					9.7092371
	1-3 Kel - West						3.7832292
	1-2 Kel - Red						3.4992015
	2-3 IRB - Red						3.9539708
	1 Kel	126 53 49.3					0.0970643
	2 Irb	16 17 56.4					9.4481650
	3 Red	36 48 14.3					9.7774841
	1-3 Kel - Red						3.4992001
	1-2 Kel - IRB						3.8285192
	2-3 IRB - West						4.1031689
	1 Kel	163 49 58.4					0.5552686
	2 IRB	07 39 34.7					9.1247913
	3 WEST	08 30 26.9					9.1700809
	1-3 Kel. West						3.7832288
	1-2 Kel - IRB						3.8285184
	2-3						
	1						
	2						
	3						
	1-3						
	1-2						

Comm-DC 57715

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KEL

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April 1945

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

			°	′	″
α	2 Red to 3 K/EST		21	32	02.2
2d ∠	KEL & WEST		+79	56	07.3
α	2 RED to 1 KEL		101	28	09.5
Δα			−	01	16.8
			180	00	00.0
α′	1 to 2		281	26	52.7

			°	′	″
α	3 WEST to 2 Red		201	31	09.7
3d ∠	KEL & RED		−30	47	40.4
α	3 WEST to 1 KEL		170	43	29.3
Δα			−	00	24.3
			180	00	00.0
α′	1 to 3		350	43	05.0

First Angle of Triangle 69-16-12.3

	°	′	″			°	′	″
φ	37	33	14.065	2 RED Hill Top λ	122	05	36.907
Δφ	+		20.339		Δλ	+ 02	06.038
φ′	37	33	34.404	1 KEL λ′	122	07	42.945

	°	′	″			°	′	″
φ	37	30	20.072	3 WEST Dumbarton Tower λ	122	07	03.080
Δφ	+	03	14.332		Δλ		39.865
φ′	37	33	34.404	1 KEL λ′	122	07	42.945

	Logarithms	Values in seconds	
s	3.4992015		
Cos α	9.2985102		
B	8.5110360		
h	1.3087477	1st term	20.358
s²	6.9984030		
Sin²α	9.9982480		
C	1.29059		
	8.27147	2d term	+.019
h²	2.61748		
D	2.3774		
	4.9848	3d term	+
		−Δφ	20.339

	°	′	″	Values in seconds
½(φ+φ′)	37	33	24.235	
	Logarithms			
s	3.4992015			
Sin α	9.9912400			
A′	8.5091798			
Sec φ′	0.1008801			
Δλ	2.1005014			126.038
Sin ½(φ+φ′)	9.7850068			
−Δα	1.8855088			+ 76.826

	Logarithms	Values in seconds	
s	3.7832292		
Cos α	9.9942844		
B	8.5410396		
h	2.2885532	1st term	194.334
s²	7.5664584		
Sin²α	8.4146036		
C	1.28983		
	7.26088	2d term	+.0018
h²	4.57700		
D	2.3772		
	6.9543	3d term	+ .0009
		−Δφ	−194.332

	°	′	″	Values in seconds
½(φ+φ′)	37	31	57.238	
	Logarithms			
s	3.7832292			
Sin α +	9.2073018			
A′	8.5091798			
Sec φ′	0.1008801			
Δλ	1.6005899			39.865
Sin ½(φ+φ′)	9.7847685			
−Δα	1.3953584			+ 24.292

16—44238-1 U. S. GOVERNMENT PRINTING OFFICE

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 24A
Rev. Oct., 1932

LIST OF DIRECTIONS

Station MUD *State* California

Chief of party HGC *Date* 2/6/56 *Computed by* KET

Observer KET *Instrument* WILD 27016 *Checked by* _____

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction*	Corrected direction with zero initial	Adjusted direction*
	° ′ ″	′ ″	″	° ′ ″	′ ″
West, San Mateo Br. Tower,	0 00 00.00			0 00 00.00	
# 19 Trans Tower (TEN)	20 45 11.4				
# 7 Trans Tower (VEN)	34 46 59.0				
# 4 Trans Tower (FOR)	55 08 38.6				

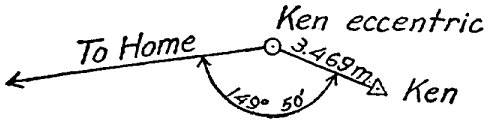
* These columns are for office use and should be left blank in the field.

Station: Ken | *State:* Maryland

Chief of party: C. V. H. | *Date:* 1917 | *Computed by:* O. P. S.

Observer: C. V. H. | *Instrument:* No. 168 | *Checked by:* W. F. R.

OBSERVED STATION	Observed direction	Eccentric reduction	Sea level reduction	Corrected direction with zero initial	Adjusted direction
	° ′ ″	′ ″	″	° ′ ″	′ ″
Chevy	0 00 00.00	− 7.31		0 00 00.00	
Tank west of △ Dulce	29 03 37.0	−1 09.8		29 02 34.5	
Ken (center), 3.469 meters	176 42				
Forest Glen standpipe	313 24 53.0	+3 01.2		313 28 01.5	
Home	326 31 30.21	+ 31.93		326 32 09.45	
Bureau of Standards, wireless pole	352 17 20.8	+ 5.7		352 17 33.8	
Reno	357 28 48.63	− 1.16		357 28 54.78	
Reference mark, 16.32 m	358 31 20				



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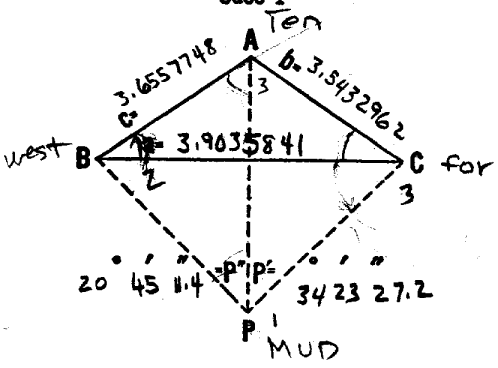
DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 655
Ed. Sept., 1929

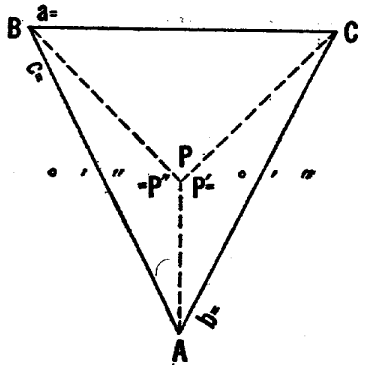
MUD

COMPUTATION OF THREE-POINT PROBLEM

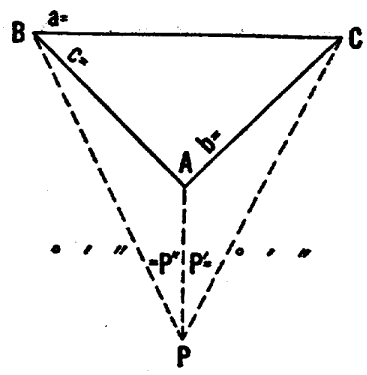
Case 1



Case 2



Case 3



Cases 1 and 2

P'	34	23	27.2
P"	20	45	11.4
A	173	51	49.0
Sum	229	00	27.6
½ Sum	114	30	13.8

S = 180° − ½ sum = 65 29 46.2

Case 3

P'
P"
Sum
A

S = ½ (A − sum) =

Log c =	3.6557748
Log sin P' =	9.7519222 +
Colog b =	6.4567038
Colog sin P" =	0.4505765 +
Sum = log tan Z =	0.3149773
Z =	64 09 49.8
Z + 45° =	109 09 49.8
Log cot (Z+45°) =	9.5409913 −
Log tan S =	0.3412189 +
Sum = log tan ϵ =	9.8822102 n (sign −)
ϵ	37 19 25.1
S	65 29 46.2

(Tan ϵ+)
S+ϵ = angle ABP
S−ϵ = angle ACP

28 10 21.1
102 49 11.3

(Tan ϵ−)
S−ϵ = angle ABP
S+ϵ = angle ACP

BPA	20	45	11.4	APC	34	23	27.2	PCB	99	21	22.1
ABP	28	10	21.1	PCA	102	49	11.3	CBP	25	29	59.3
PAB	131	04	27.5	CAP	42	47	21.5	BPC	55	08	38.6
	180	60	60.0		180	120	60.0		180	60	120.0

(For explanation of this form see Special Publication No. 138, pages 191 and 192, or Special Publication No. 145, pages 98–100)

U. S. GOVERNMENT PRINTING OFFICE: 1929
11—9912

Form 25
(10-8-53)

U. S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

MUD

COMPUTATION OF TRIANGLES

State California

Station	Observed angle	Corr'n	Spher'l angle	Spher'l excess	Plane angle and distance	Logarithm
2-3 Ten-for						3.5432962
1 MUD	34 23 27.2					0.2480778
2 TEN	42 47 21.5					9.8320644
3 FOR	102 49 11.3					9.9890370
1-3 MUD-FOR						3.6234384
1-2 MUD-TEN						3.7804110
2-3 West-Ten						3.6557748
1 MUD	20 45 16.4					0.4505765
2 WEST (SM.)	28 10 21.1					9.6740599
3 TEN	131 04 27.5					9.8772896
1-3 MUD TEN						3.7804112
1-2 MUD WEST						3.9836409
2-3 West for						3.9035841
1 MUD	55 08 38.6					0.0858729
2 WEST	25 29 59.3					9.6339812
3 FOR	99 21 22.1					9.9941938
1-3 MUD-For						3.6234382
1-2 MUD West						3.9836408
2-3 West Ten						
1 MUD						
2 WEST						
3 FOR						
1-3 MUD-For						
1-2 MUD-West						

Comm-DC 5771

Comp KET.

DEPARTMENT OF COMMERCE
U. S. COAST AND GEODETIC SURVEY
Form 27
Ed. April 1945

POSITION COMPUTATION, THIRD-ORDER TRIANGULATION

MUD

		°	′	″	
α	2 WEST to 3 FOR	246	00	40.9	
2d ∠	FOR & MUD	+ 25	29	59.3	
α	2 WEST to 1 MUD	271	30	40.2	
Δα		-	03	59.3	
		180	00	00.0	
α′	1 MUD to 2 WEST	91	26	40.9	

		°	′	″	
α	3 FOR to 2 WEST	66	03	42.92	
3d ∠	MUD & WEST	- 99	21	22.1	
α	3 FOR to 1 MUD	+ 326 / - 33	42 / 17	20.8 / 39.2	
Δα		-	00	57.4	
		180	00	00.0	
α′	1 MUD to 3 FOR	146	41	23.4	

FIRST ANGLE OF TRIANGLE

	°	′	″			°	′	″	
φ	37	34	59.613	2 WEST	λ	122	15	01.589	
Δφ		-	08.419		Δλ		06	32.350	
φ′	37	34	51.194	1 MUD	λ′	122	08	29.239	

	°	′	″			°	′	″	
φ	37	36	45.126	3 FOR	λ	122	10	03.243	
Δφ	-	01	53.932		Δλ	-	01	34.004	
φ′	37	34	51.194	1 MUD	λ′	122	08	29.239	

	Logarithms	Values in seconds
s	3.9836408	
Cos α	8.4211394	+
B	8.5110338	
h	0.9958140	1st term + 8.2377
s²	7.9672816	
Sin² α	9.9996978	
C	1.29104	
	9.2580019	2d term + .1811
h²	1.8316	
D	2.3775	
	4.2091	3d term + .0000
		−Δφ 8.4188

		°	′	″	
½(φ+φ′)		37	34	55.403	
	Logarithms				Values in seconds
s	3.9836408				
Sin α	− 9.9998489				
A′	8.5091792				
Sec φ′	+ 0.1019045				
Δλ	2.5936734				− 392.350
Sin ½(φ+φ′)	9.7852565				+
−Δα	2.3789299				− 239.293

	Logarithms	Values in seconds
s	3.6234383	
Cos α	9.9221349	+
B	8.5110317	
h	2.0566049	1st term 113.921
s²	7.2468766	
Sin² α	9.4790474	
C	1.29148	
	8.0174040	2d term + .0104
h²	4.1132	
D	2.3776	
	6.4908	3d term + .0003
		−Δφ 113.932

		°	′	″	
½(φ+φ′)		37	35	48.160	
	Logarithms				Values in seconds
s	3.6234383				
Sin α	9.7395237				n
A′	8.5091792				
Sec φ′	0.1010045				+
Δλ	1.9731457				− 94.004
Sin ½(φ+φ′)	9.7854008				+
−Δα	1.7585465				− 57.352

60
53

16—44238-1 U. S. GOVERNMENT PRINTING OFFICE

SMOOTH PLOTTER'S NOTES
To Accompany
DESCRIPTIVE REPORT
HYDROGRAPHIC SURVEY Reg. No. H-8210, Field No. WCSP-1256

San Francisco Bay, California

SMOOTH SHEET

The Smooth Sheet was ruled by hand by personnel of the Seattle Processing Office. Shoreline and topographic details as well as signals located by topographic methods were transferred to the Smooth Sheet with the use of blue line prints of manuscripts T-11070, T-11072, T-11073, T-11074, and T-11075. ✓

The shoreline and topography have been verified in accordance with paragraph 757 of the Hydrographic Manual.

SHORELINE AND TOPOGRAPHY

The shoal and snags just south of and parallel to the San Mateo Bridge were transferred directly from the Boat Sheet. ✓

ADEQUACY OF SURVEY

This survey makes a satisfactory junction with H-8275 along Long. 122° 10'00" W. at which junction depth curves can be adequately drawn. ✓

COMPARISON WITH PRIOR SURVEYS

No comparison is herein made as no copy of the prior surveys of this area have been made available to this activity. See attached note. ✓ See par. 5 Review

COMPARISON WITH CHART

A comparison is herein made with chart 5531; 54-5/17. ✓

Generally the soundings of this survey are from ½ to2 feet deeper than those shown on the chart. However, the general contour of the bottom has remained unchanged. See par 3 & 6 Review

The shallow channel which is shown on the chart as running into Ravenswood Slough appears to have filled in and no longer exists.

The piles charted at Lat. 37° ~~34~~ 35' 50" N, Long. 122° 09'10" W were not

COMPARISON WITH CHART (Cont'd.)

mentioned in the records of this survey and appear to no longer exist.

Tide was 8' on c day at the time these soundings were taken. Considering the 100 meter spacing of lines and generally the muddy condition of water. It is not considered that these piles are disproved. ∴ carried forward from H-5129(1931) to present Survey.

Respectfully Submitted,

Clinton D. Upham
LTJG, USC&GS

L.S.S.

APPROVED AND FORWARDED:

Frank G. Johnson
Captain, USC&GS
Seattle District Officer

COMPARISON WITH PRIOR SURVEYS

Comparisons with H-5131 and H-5135 were madenin the Seattle processing Office. The note in the Field Report appears to cover the subject adequately. See Review ✓

The channel, shown on H-5135, entering Ravenswood Slough has filled and no longer exists.

Respectfully submitted

William M. Martin

William M. Martin
Cartographer-in-Charge S.P.O.

GEOGRAPHIC NAMES

HYDROGRAPHIC SURVEY Reg. No. H-8210, Field No. WCSP-1256

ALAMEDA CREEK
COYOTE HILLS SLOUGH
DUMBARTON BRIDGE
MT. EDEN SLOUGH
RAVENSWOOD POINT
RAVENSWOOD SLOUGH
REDWOOD POINT
REDWOOD SLOUGH
Westpointslough

GEOGRAPHIC NAMES

Survey No. H-8210

Name on Survey	A On Chart No.	B On previous survey No.	C On U. S. quadrangle Maps	D From local information	E On local Maps	F P. O. Guide or Map	G Rand McNally Atlas	H U. S. Light List	K	
California		}	for title						BFX	1
San Mateo Bridge		}								2
(San Mateo - Hayward Bridge = full name)										3
San Francisco Bay										4
Redwood Point									BFX	5
Redwood Creek										6
Westpoint Slough										7
Ravenswood Slough										8
Ravenswood Point										9
Dumbarton Bridge										10
Coyote Hills Slough (Chart 5531 corrected to this spelling)										11
Alameda Creek										12
Mt Eden Slough										13
										14
					Names approved					15
					10-19-56. H. Heck					16
										17
										18
										19
										20
										21
										22
										23
										24
										25
										26
										27

M 234

Hydrographic Surveys (Chart Division)

HYDROGRAPHIC SURVEY NO. 8210

Records accompanying survey:

Boat sheets 1; sounding vols. 8; wire drag vols. 0;

bomb vols. 0; graphic recorder rolls 4-Envelopes

special reports, etc. 1-Descriptive report and 1-Smooth sheet.

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

Number of positions on sheet		1596
Number of positions checked		124
Number of positions revised		
Number of soundings revised (refers to depth only)		256
Number of soundings erroneously spaced		2
Number of signals erroneously plotted or transferred		0
Topographic details	Time	2 hrs.
Junctions	Time	0
Verification of soundings from graphic record	Time	12 hrs.

Verification by W. E. Roig Total time 120 hrs Date 6/20/56

Reviewed by [signature] Time 56. Date 4 Sept 1958

M-2232-1

DIVISION OF CHARTS

REVIEW SECTION - NAUTICAL CHART BRANCH

REVIEW OF HYDROGRAPHIC SURVEY

REGISTRY NO. H-8210 FIELD NO. WCSP-1256

California, South San Francisco Bay
Mt. Eden Slough to Ravenswood Point

Surveyed February-March, 1956 Scale 1:10,000

Project No. 1256

Soundings:

808 Depth Recorder
EDO Depth Recorder

Control:

Sextant fixes on shore signals

Chief of Party - H. G. Conerly
Surveyed by - H. G. Conerly
Protracted by - C. D. Upham
Soundings plotted by - C. D. Upham
Verified and inked by - W. E. Roig
Reviewed by - L. S. Straw Date: 9/4/58
Inspected by - R. H. Carstens

1. Shoreline and Signals

The shoreline originates with the unreviewed manuscripts of air-photographic surveys T-11070, T-11072, T-11073, T-11074 and T-11075 of 1952-53.

The source of the control is given in the Descriptive Report.

2. Sounding Line Crossings

Cross lines were run to about 3% of the regular system of lines although the instructions called for about 8%. A zig-zag line could have been run to check the depths in the main channel more adequately however, depths at the crossings on cross lines that were run are in adequate agreement.

3. Depth Curves and Bottom Configuration

The lower part of San Francisco Bay is characterized by large flat areas divided by a 40 to 50 foot natural channel. The usual depth curves, supplemented by the 3-ft. curve, were adequately developed and delineate the extensive shoal flats.

4. Junctions with Contemporary Surveys

The junctions with surveys H-8027 (1956) on the north, H-8275 (1956) on the west and H-8281 (1956) on the south will be considered in the reviews of those surveys.

5. Comparison with Prior Surveys

a. H-628 (1857-58) 1:20,000
H-629 (1857-58) 1:10,000
H-637 (1858) 1:10,000
H-638 (1858) 1:10,000
H-2304 (1897) 1:20,000
H-2413 (1898) 1:10,000

In the large natural channel just north of the Dumbarton Bridge the mid-channel depths on the present survey are 2 feet shoaler and decrease progressively to 5 feet shoaler than prior depths in lat. 37°31.8', long. 122°09.65'. Over the large flat areas the differences in depth are from 1 to 2 feet, but generally present depths are about 1 foot shoaler. In lat. 37°32.7', long. 122°09.6' shoaling from 4 to 5 feet has occurred over a considerable area. Radical changes in the location of small natural channels at the mouths of several creeks and sloughs as well as changes in shoreline have taken place in the past 60 to 100 years. The present survey supersedes these surveys within the common area.

b. H-5129 (1931) 1:20,000
H-5131 (1931) 1:10,000
H-5135 (1931) 1:10,000

A comparison of the 1931 surveys and the present survey reveals that only minor changes in depth have occurred in the past 25 years. The low-water shoal in lat. 37°31.2', long. 122°08.9' has washed away to depths of 1-2 feet on the present survey. The channel leading to the mouth of Ravenswood Slough having former depths of 1 to 6 feet has filled to zero depths at lat. 37°30.5', long. 122°09.7'. The depths in the deep channel have not changed appreciably, except in lat. 37°31.95', long. 122°09.7' where scouring has increased depths about 2 feet and in lat. 37°31.06', long. 122°07.8' where silting has decreased depths on the north side of the channel about 3 feet. Over the shallow flat areas from Dumbarton Bridge to San Mateo Bridge the present survey is 1/2 to 1 foot shoaler in some places and is deeper by about the same amount in others.

The 3-pile cluster in lat. 37°35.8', long. 122°09.15' was not proved or disproved by the present survey and is therefore carried forward. Bottom characteristics from the 1931 surveys have been carried forward to supplement those on the present survey.

With the addition of these bottom characteristics and the pile cluster referred to above, the present survey, within the common area, is adequate to supersede the prior surveys.

6. Comparison with Chart 5531 (Reconstruction Dwg. No. 18)

A. Hydrography

The present survey was applied to the reconstruction drawing before verification and review. No discrepancies with the present depths are noted.

The pile cluster in lat. 37°35.8', long. 122°09.15' and supplementary bottom characteristics should be retained from the prior surveys.

B. Aids to Navigation

The lighted buoy "12" (FLW) located on the present survey in lat. 37°30.86', long. 122°07.93' is in substantial agreement with the reconstruction drawing and properly marks the feature intended.

7. Condition of Survey

a. The sounding records and Descriptive Report are complete and comprehensive.

b. The smooth plotting was accurately done.

8. Compliance with Project Instructions

The survey complies with the Project Instructions except as noted in paragraph 2.

9. Additional Field Work

This is a good basic survey and no additional field work is recommended.

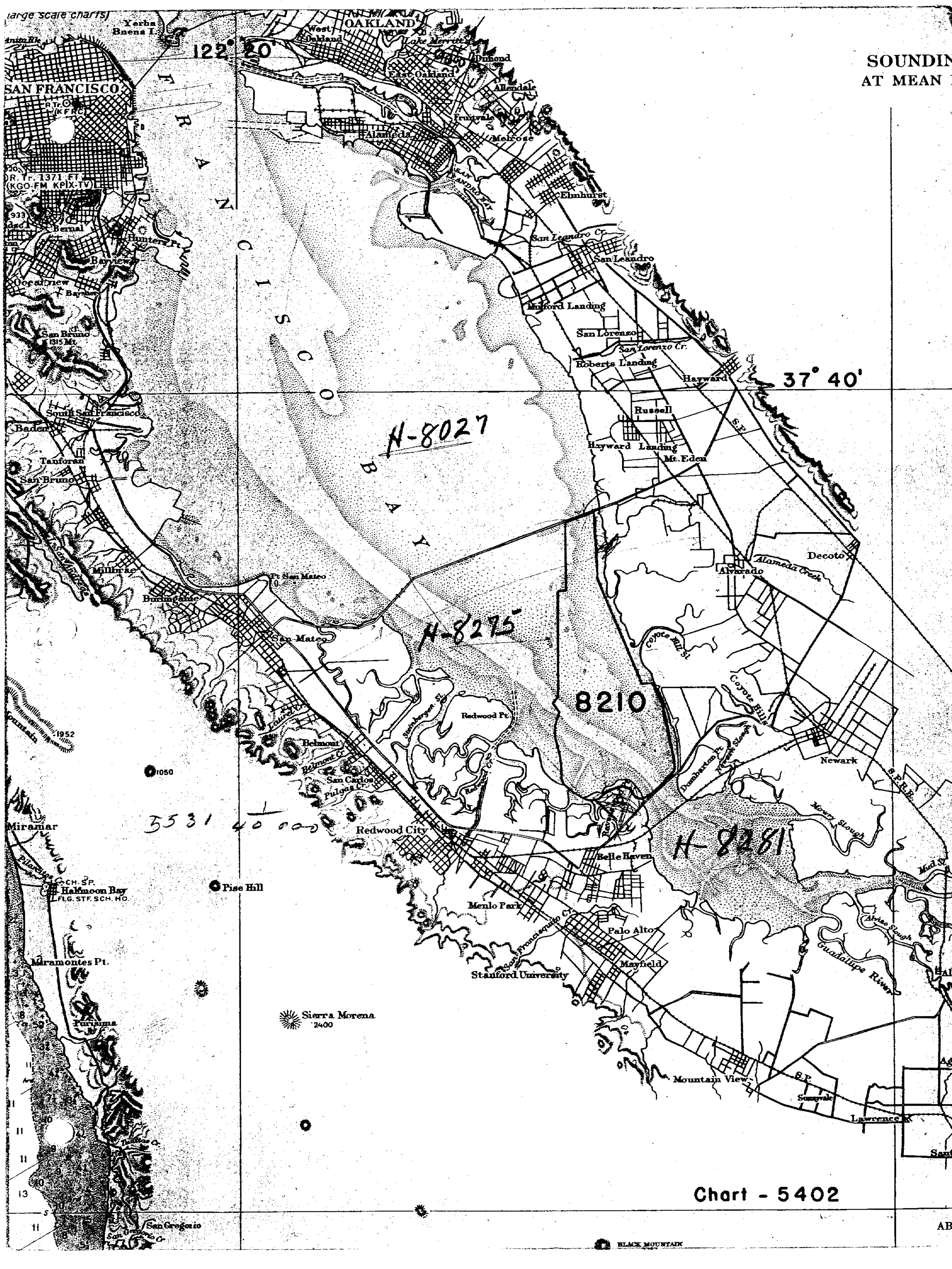
Examined and approved:

Max G. Ricketts
Chief, Nautical Chart Branch

Ernest B. Lewey
Chief, Division of Charts

Karl B. Jeffers
Chief, Hydrography Branch

Samuel B. Grenell
Chief, Division of Coastal Surveys



SOUNDIN
AT MEAN
122° 20'
37° 40'
SAN FRANCISCO
OAKLAND
West Oakland
East Oakland
Yerba Buena I.
Alameda
Fruitvale
Melrose
Elmhurst
Allendale
Dimond
Lake Merritt
San Leandro
San Leandro Cr.
Mulford Landing
San Lorenzo
San Lorenzo Cr.
Roberts Landing
Hayward
Russell
Hayward Landing
Mt. Eden
S.P.
Decoto
Alvarado
Alameda Creek
Coyote Hill Sl.
Coyote Hill
Newark
S.P.R.R.
Mowry Slough
Dumbarton Pt.
Hunters Pt.
Bayview
Bernal
San Bruno
South San Francisco
Baden
Tanforan
Millbrae
Burlingame
Pt San Mateo
San Mateo
Belmont
San Carlos
Redwood Pt.
Redwood City
Belle Haven
Menlo Park
Palo Alto
Mayfield
Stanford University
Guadalupe River
Alviso Slough
Mountain View
Sunnyvale
Lawrence
Miramar
Halfmoon Bay
Pise Hill
Miramontes Pt.
Purisima
Sierra Morena
2400
1050
1952
San Gregorio
BLACK MOUNTAIN
F R A N C I S C O
B A Y
H-8027
H-8275
8210
H-8281
5531 1/40 000
Chart - 5402

RHC

Form 712
DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
Rev. Apr. 1950

TIDE NOTE FOR HYDROGRAPHIC SHEET

10/25/56

~~Division of Coast and Surveys~~

Division of Charts: R. H. Carsten

Plane of reference approved in
8 volumes of sounding records for

HYDROGRAPHIC SHEET 8210

Locality South San Francisco Bay, Calif.

Chief of Party: H. G. Conerly in 1956
Plane of reference is mean lower low water, reading
2.7 ft. on tide staff at Dumbarton Bridge
17.4 ft. below B. M. 6A (1931)

2.4 ft. on tide staff at San Mateo Bridge
29.6 ft. below B. M. A7 (1912)

Height of mean high water above plane of reference is:

Dumbarton Bridge.... 7.8 ft.
San Mateo Bridge.... 7.0 ft.

Condition of records satisfactory except as noted below:

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

J. M. Seymour

U. S. GOVERNMENT PRINTING OFFICE 877933

NAUTICAL CHARTS BRANCH

SURVEY NO. H-8210

Reviewed 9-4-'58

Record of Application to Charts

DATE	CHART	CARTOGRAPHER	REMARKS
11/24/57	RECONSTR. 5531	SG McGann	Before ~~After~~ Verification and Review
1-12-60	5531	J. M. Albert	Re-examined to clear standard ~~Before~~ After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review
			Before After Verification and Review

M-2168-1

A basic hydrographic or topographic survey supersedes all information of like nature on the uncorrected chart. Give reasons for deviations, if any, from recommendations made under "Comparison with Charts" in the Review.