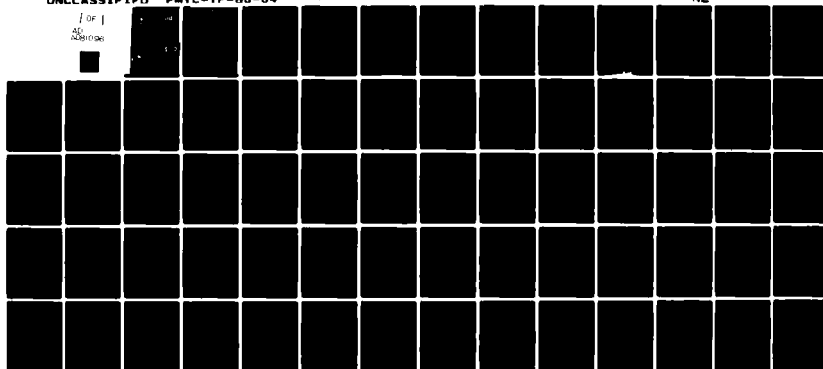


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TIDAL AND LUNAR DATA FOR POINT MUGU, SAN NICOLAS ISLAND, AND TH--ETC(U)
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This report was compiled by Mr. Robert de Villedel with the assistance of Mr. Richard W. Elgen and Mr. Stephen Williams.

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CONTENTS

	Page
INTRODUCTION	1
DATA SOURCE AND TIME REFERENCES	1
TIDAL DATA	2
LUNAR DATA	2
APPENDIXES	
A. Height of the Tide at Any Time	A-1
B. Equinoxes, Solstices, and Lunar Phases During 1980	B-1
TABLES	
1. Tidal Ranges for Point Mugu and San Nicolas Island	2
2. Tidal Ranges for Port Allen	2
3. Moonrise and Moonset, Point Mugu, California, 1980	3
4. Point Mugu Tides, January 1980	4
5. San Nicolas Island Tides, January 1980	4
6. Point Mugu Tides, February 1980	6
7. San Nicolas Island Tides, February 1980	6
8. Point Mugu Tides, March 1980	8
9. San Nicolas Island Tides, March 1980	8
10. Point Mugu Tides, April 1980	10
11. San Nicolas Island Tides, April 1980	10
12. Point Mugu Tides, May 1980	12
13. San Nicolas Island Tides, May 1980	12
14. Point Mugu Tides, June 1980	14
15. San Nicolas Island Tides, June 1980	14
16. Point Mugu Tides, July 1980	16
17. San Nicolas Island Tides, July 1980	16
18. Point Mugu Tides, August 1980	18
19. San Nicolas Island Tides, August 1980	18
20. Point Mugu Tides, September 1980	20
21. San Nicolas Island Tides, September 1980	20
22. Point Mugu Tides, October 1980	22
23. San Nicolas Island Tides, October 1980	22
24. Point Mugu Tides, November 1980	24
25. San Nicolas Island Tides, November 1980	24

CONTENTS (Concluded)

	Page
TABLES (Concluded)	
26. Point Mugu Tides, December 1980	26
27. San Nicolas Island Tides, December 1980	26
28. Moonrise and Moonset, Barking Sands, Hawaii, 1980	29
29. Port Allen Tides, January 1980	30
30. Port Allen Tides, February 1980	32
31. Port Allen Tides, March 1980	34
32. Port Allen Tides, April 1980	36
33. Port Allen Tides, May 1980	38
34. Port Allen Tides, June 1980	40
35. Port Allen Tides, July 1980	42
36. Port Allen Tides, August 1980	44
37. Port Allen Tides, September 1980	46
38. Port Allen Tides, October 1980	48
39. Port Allen Tides, November 1980	50
40. Port Allen Tides, December 1980	52
A-1. Height of the Tide at Any Time	A-2
B-1. Equinoxes and Solstices, 1980, Point Mugu and San Nicolas Island	B-1
B-2. Lunar Phases, 1980, Point Mugu and San Nicolas Island	B-1
FIGURES	
1. Tidal Graph for Point Mugu, January 1980	5
2. Tidal Graph for Point Mugu, February 1980	7
3. Tidal Graph for Point Mugu, March 1980	9
4. Tidal Graph for Point Mugu, April 1980	11
5. Tidal Graph for Point Mugu, May 1980	13
6. Tidal Graph for Point Mugu, June 1980	15
7. Tidal Graph for Point Mugu, July 1980	17
8. Tidal Graph for Point Mugu, August 1980	19
9. Tidal Graph for Point Mugu, September 1980	21
10. Tidal Graph for Point Mugu, October 1980	23
11. Tidal Graph for Point Mugu, November 1980	25
12. Tidal Graph for Point Mugu, December 1980	27
13. Tidal Graph for Port Allen, January 1980	31
14. Tidal Graph for Port Allen, February 1980	33
15. Tidal Graph for Port Allen, March 1980	35
16. Tidal Graph for Port Allen, April 1980	37
17. Tidal Graph for Port Allen, May 1980	39
18. Tidal Graph for Port Allen, June 1980	41
19. Tidal Graph for Port Allen, July 1980	43
20. Tidal Graph for Port Allen, August 1980	45
21. Tidal Graph for Port Allen, September 1980	47
22. Tidal Graph for Port Allen, October 1980	49
23. Tidal Graph for Port Allen, November 1980	51
24. Tidal Graph for Port Allen, December 1980	53
A-1. Tidal Curve for Solution of the Problem	A-3

INTRODUCTION

This publication combines into a single source all tidal and lunar data for operational locations of the Pacific Missile Test Center for use in Calendar Year 1980.

The data presentations are in two main divisions: one for Point Mugu and San Nicolas Island, and the other for the Barking Sands area. Within each division, the times of moonrise and moonset and tidal data are given. An appendix provides information regarding lunar phases. Since all such data change from year to year, this publication will be reissued annually.

Sunrise-sunset times for these locations, and associated solar data which do not change significantly from year to year, are issued as a single, permanent publication. Further information regarding any of these data may be obtained from the Geophysics Division of the Range Operations Department.

DATA SOURCE AND TIME REFERENCES

The data given here have been prepared from information contained in Tide Tables for the West Coast of North and South America including the Hawaiian Islands, 1980.*

For Point Mugu and San Nicolas Island, all times listed are Pacific Standard Time (PST); add eight hours to obtain Greenwich Mean Time (GMT or Z).**

For the Barking Sands area, all times listed are Alaska-Hawaii Standard Time (AHST); add 10 hours to obtain GMT. Daylight Savings Time is not observed in Hawaii.

*National Ocean Survey, Tide Tables for the West Coast of North and South America Including the Hawaiian Islands, 1980. Washington, D.C., GPO, 1979.

**When Daylight Saving Time (PDT) is in effect, 1 hour is to be added to the times given. In 1980, Pacific Daylight Time is scheduled to commence at 0200 PST on Sunday, 27 April (add 1 hour), and to end at 0200 PDT on Sunday, 26 October (subtract 1 hour).

TIDAL DATA

The ranges of tidal heights that may be expected at Point Mugu and San Nicolas Island are shown in table 1. The range of heights for the primary harbor in the Barking Sands area, Port Allen, is shown in table 2. The times and heights of high and low tides for 1980 at Point Mugu are given in the even-numbered tables 4 through 26, and at San Nicolas Island in the odd-numbered tables 5 through 27. Similar tide data for Port Allen are given in tables 29 through 40.

Table 1. Tidal Ranges for Point Mugu and San Nicolas Island

Tidal Levels	Point Mugu	San Nicolas Island
	Height (Feet)	Height (Feet)
Extreme high water	7.3	6.7
Mean higher high water	5.3	4.9
Mean high water	4.5	4.1
Mean tide level*	2.7	2.5
Mean low water	0.9	0.8
Mean lower low water	0.0	0.0
Extreme low water	-2.0	-1.8

*The mean tide level is also called mean sea level.

Table 2. Tidal Ranges for Port Allen

Tidal Levels	Height (Feet)
Extreme high water	2.6
Mean higher high water	1.6
Mean high water	1.2
Mean tide level*	0.7
Mean low water	0.2
Mean lower low water	0.0
Extreme low water	-0.4

*The mean tide level is also called mean sea level.

Tidal graphs prepared from the Point Mugu data are presented in figures 1 through 12, and graphs prepared from the Port Allen tables are presented in figures 13 through 24. (Because of their close similarity to the Point Mugu graphs, graphical presentations of the San Nicolas Island data are not included in this publication.)

These tables list the times and heights of high and low tide for each month of the year and chronologically through each day. The heights are all measured from mean lower low water (see tables 1 and 2) and are values for a sea unaffected by wind waves or swell. The height and character of the sea surface are influenced by factors other than the predictable positions of the moon and sun, and is thus likely to be higher or lower than computed values may indicate. Information regarding the height of the tide at any time will be found in appendix A.

LUNAR DATA

Times of moonrise and moonset for the Point Mugu-San Nicolas Island area in 1980 are given in table 3, and for the Barking Sands area in table 28, preceding the tidal data for the respective stations. Information regarding the phases of the moon in 1980 will be found in appendix B.

Table 3. Moonrise and Moonset, Point Mugu, California, 1980

Date	January		February		March		April		May		June		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	1647	0612	1816	0712	1758	0623	1927	0632	2008	0616	2142	0719	1
2	1741	0704	1911	0748	1852	0656	2022	0704	2104	0656	2231	0817	2
3	1835	0752	2005	0822	1945	0727	2117	0739	2159	0741	2316	0919	3
4	1931	0835	2058	0854	2038	0758	2212	0816	2253	0830	2358	1022	4
5	2025	0914	2151	0926	2132	0830	2308	0857	2344	0925	---	1126	5
6	2120	0949	2245	0957	2227	0903	---	0943	---	1023	0038	1232	6
7	2213	1022	2339	1029	2322	0938	0003	1034	0031	1125	0116	1337	7
8	2306	1054	---	1103	---	1017	0056	1131	0116	1229	0154	1444	8
9	---	1125	0034	1140	0018	1100	0146	1232	0157	1335	0233	1551	9
10	0000	1156	0131	1221	0114	1149	0234	1336	0237	1443	0315	1657	10
11	0054	1230	0229	1308	0210	1243	0319	1444	0317	1551	0359	1803	11
12	0150	1306	0327	1401	0303	1344	0401	1553	0356	1659	0448	1905	12
13	0247	1346	0424	1500	0355	1449	0443	1703	0438	1808	0541	2003	13
14	0346	1431	0518	1605	0443	1557	0523	1813	0522	1916	0636	2056	14
15	0446	1522	0609	1714	0528	1707	0605	1923	0610	2021	0734	2142	15
16	0545	1619	0656	1824	0611	1818	0649	2031	0701	2121	0831	2223	16
17	0641	1722	0740	1934	0653	1929	0735	2137	0755	2216	0928	2300	17
18	0734	1829	0822	2043	0734	2038	0823	2238	0851	2305	1023	2334	18
19	0822	1937	0902	2151	0816	2146	0915	2334	0948	2348	1118	---	19
20	0906	2045	0942	2257	0900	2251	1009	---	1044	---	1211	0006	20
21	0947	2153	1023	---	0946	2352	1104	0025	1139	0026	1305	0036	21
22	1026	2258	1106	0001	1034	---	1159	0110	1233	0101	1359	0107	22
23	1105	---	1151	0102	1125	0050	1253	0150	1327	0133	1453	0139	23
24	1143	0003	1239	0201	1218	0142	1348	0226	1420	0205	1549	0213	24
25	1224	0106	1330	0255	1311	0229	1441	0300	1514	0235	1646	0250	25
26	1307	0208	1422	0345	1405	0311	1534	0332	1608	0306	1744	0332	26
27	1352	0308	1516	0430	1500	0350	1628	0403	1704	0339	1841	0418	27
28	1441	0405	1610	0511	1553	0425	1722	0434	1800	0415	1936	0511	28
29	1533	0458	1705	0549	1647	0458	1816	0505	1857	0454	2027	0608	29
30	1627	0547	---	---	1740	0529	1912	0539	1954	0537	2115	0710	30
31	1722	0631	---	---	1833	0600	---	---	2050	0626	---	---	31

Date	July		August		September		October		November		December		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	2159	0814	2235	1028	2325	1239	2358	1324	0040	1410	0116	1347	1
2	2239	0919	2314	1134	---	1339	---	1412	0135	1443	0210	1417	2
3	2318	1025	2355	1239	0015	1436	0054	1455	0229	1514	0303	1448	3
4	2355	1130	---	1343	0107	1527	0150	1533	0323	1545	0357	1520	4
5	---	1235	0039	1445	0203	1613	0245	1608	0416	1615	0452	1555	5
6	0033	1341	0127	1544	0259	1654	0340	1640	0510	1646	0547	1633	6
7	0113	1446	0218	1639	0355	1732	0434	1711	0604	1719	0643	1716	7
8	0155	1550	0312	1729	0451	1806	0528	1742	0659	1755	0738	1803	8
9	0241	1653	0408	1814	0545	1838	0621	1812	0754	1835	0831	1855	9
10	0331	1752	0505	1855	0640	1909	0715	1844	0848	1919	0921	1952	10
11	0424	1846	0602	1932	0733	1940	0809	1918	0942	2007	1008	2051	11
12	0520	1935	0658	2005	0826	2011	0903	1955	1033	2100	1051	2153	12
13	0618	2018	0753	2037	0920	2043	0958	2036	1122	2157	1131	2256	13
14	0715	2058	0846	2108	1014	2118	1052	2121	1207	2258	1209	---	14
15	0812	2133	0940	2138	1108	2156	1145	2211	1250	---	1246	0001	15
16	0907	2206	1033	2210	1203	2239	1236	2307	1330	0001	1323	0106	16
17	1002	2237	1127	2244	1258	2327	1324	---	1409	0106	1402	0212	17
18	1055	2307	1222	2320	1351	---	1410	0006	1447	0212	1443	0320	18
19	1148	2338	1317	---	1443	0021	1453	0110	1527	0321	1529	0429	19
20	1242	---	1413	0001	1532	0120	1535	0216	1608	0430	1619	0537	20
21	1337	0011	1509	0047	1619	0224	1615	0324	1653	0541	1714	0642	21
22	1433	0046	1604	0139	1702	0331	1655	0434	1742	0651	1813	0743	22
23	1530	0125	1656	0237	1744	0440	1737	0545	1836	0759	1914	0837	23
24	1628	0209	1745	0340	1825	0550	1821	0657	1933	0902	2014	0925	24
25	1724	0259	1830	0446	1906	0701	1908	0807	2032	0959	2113	1007	25
26	1818	0354	1912	0555	1948	0812	1958	0916	2131	1049	2211	1044	26
27	1908	0455	1953	0704	2032	0921	2052	1019	2230	1132	2306	1117	27
28	1955	0600	2033	0813	2119	1028	2149	1117	2327	1211	---	1148	28
29	2038	0706	2113	0922	2209	1132	2246	1209	---	1245	0001	1219	29
30	2118	0814	2154	1029	2303	1231	2343	1254	0022	1317	0054	1249	30
31	2157	0921	2238	1135	---	---	---	1335	---	---	0148	1320	31

TABLE 4
POINT MUGO TIDES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER JANUARY 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0150	1.8	0759	6.4	1516	-1.0	2133	3.9
2	0230	1.9	0834	6.3	1553	-1.0	2215	3.9
3	0307	2.0	0909	6.1	1627	-0.8	2253	3.9
4	0344	2.2	0944	5.7	1703	-0.5	2332	3.8
5	0423	2.3	1019	5.3	1739	-0.2	---	---
6	0501	3.8	0508	2.5	1055	4.9	1812	0.2
7	0540	3.8	0601	2.5	1137	4.3	1854	0.6
8	0619	3.8	0715	2.6	1226	3.7	1936	1.0
9	0658	3.9	0853	2.5	1339	3.2	2024	1.4
10	0735	4.2	1032	2.1	1528	2.9	2117	1.7
11	0822	4.4	1138	1.5	1710	2.8	2215	1.9
12	0903	4.8	1224	0.9	1821	3.0	2312	2.0
13	0942	5.2	1306	0.3	1914	3.3	2357	2.0
14	1021	5.6	1340	-0.3	1945	3.5	---	---
15	1100	2.0	0657	6.0	1416	-0.8	2032	3.8
16	1124	1.9	0736	6.3	1452	-1.1	2113	4.0
17	1210	1.7	0815	6.5	1530	-1.4	2149	4.1
18	1252	1.6	0857	6.6	1609	-1.4	2229	4.3
19	1340	1.6	0940	6.4	1649	-1.2	2313	4.4
20	1431	1.6	1028	5.9	1732	-0.9	2359	4.5
21	1529	1.6	1120	5.3	1817	-0.6	---	---
22	0050	4.6	0640	1.7	1222	4.5	1906	0.2
23	0145	4.7	0806	1.6	1338	3.8	2001	0.9
24	0244	4.9	0944	1.3	1522	3.2	2106	1.4
25	0351	5.1	1110	0.7	1707	3.1	2216	1.7
26	0451	5.4	1214	0.2	1829	3.3	2322	1.9
27	0544	5.6	1309	-0.3	1925	3.5	---	---
28	0620	1.9	0632	5.8	1351	-0.7	2010	3.7
29	0106	1.9	0714	6.0	1430	-0.8	2049	3.9
30	0144	1.8	0750	6.0	1502	-0.9	2120	4.0
31	0224	1.8	0825	5.9	1533	-0.8	2149	4.0

TABLE 5
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART OF COAST JANUARY 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0200	1.6	0806	5.9	1526	-0.9	2140	3.6
2	0240	1.7	0841	5.8	1603	-0.9	2222	3.6
3	0317	1.4	0916	5.6	1637	-0.7	2300	3.6
4	0354	2.0	0951	5.3	1713	-0.5	2339	3.5
5	0433	2.1	1026	4.9	1749	-0.2	---	---
6	0511	3.5	0518	2.3	1102	4.6	1827	0.2
7	0107	3.5	0611	2.4	1144	4.0	1904	0.5
8	0155	3.5	0725	2.5	1233	3.5	1946	0.9
9	0244	3.6	0903	2.3	1346	3.0	2034	1.3
10	0342	3.9	1042	1.9	1535	2.7	2127	1.5
11	0429	4.1	1148	1.4	1717	2.6	2225	1.7
12	0510	4.5	1234	0.8	1828	2.4	2322	1.8
13	0549	4.8	1316	0.3	1921	3.1	0007	1.4*
14	0626	5.2	1350	-0.3	2002	3.3	---	---
15	0052	1.8	0704	5.6	1426	-0.7	2039	3.5
16	0134	1.7	0743	5.4	1502	-1.0	2120	3.7
17	0220	1.5	0822	6.0	1540	-1.3	2156	3.8
18	0302	1.5	0904	6.1	1619	-1.3	2236	4.0
19	0350	1.5	0947	5.9	1659	-1.1	2320	4.1
20	0441	1.5	1035	5.5	1742	-0.8	0006	4.2*
21	0534	1.5	1127	4.9	1827	-0.4	---	---
22	0057	4.3	0650	1.5	1229	4.2	1916	6.2
23	0152	4.4	0816	1.5	1345	3.5	2011	6.4
24	0255	4.6	0955	1.2	1529	3.0	2116	1.3
25	0354	4.7	1120	0.6	1714	2.9	2226	1.5
26	0458	5.0	1224	0.2	1836	3.1	2332	1.7
27	0551	5.2	1319	-0.3	1932	3.3	---	---
28	0030	1.7	0639	5.4	1401	-0.5	2017	3.5
29	0116	1.7	0721	5.6	1440	-0.7	2056	3.6
30	0154	1.6	0757	5.6	1512	-0.8	2127	3.7
31	0234	1.6	0832	5.5	1543	-0.7	2154	3.7

* -- TIME OCCURS ON NEXT DATE.

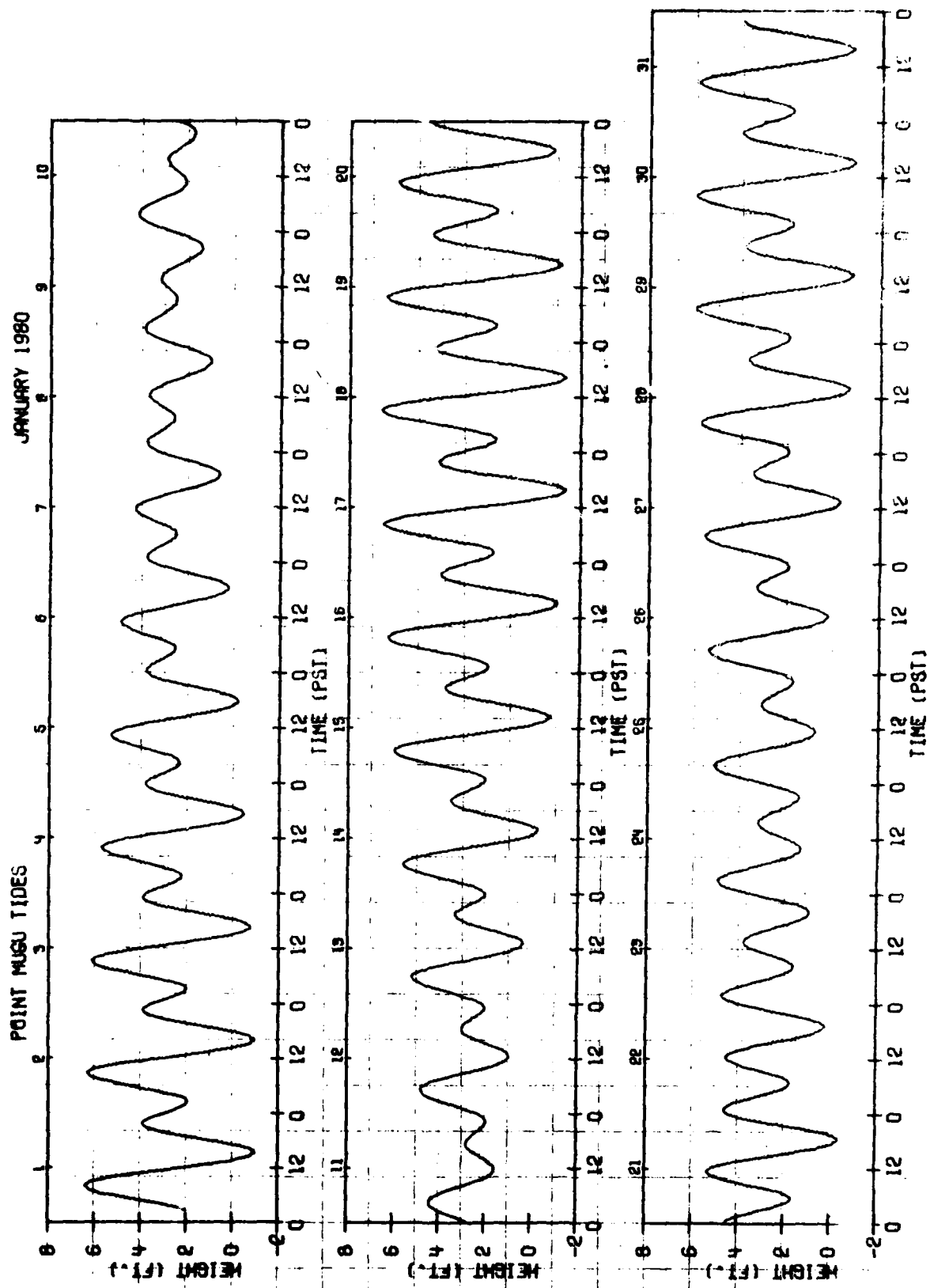


Figure 1. Tidal Graph for Point Mugu, January 1980.

TABLE 6
POINT MUGU TIDES
34 DEG 06 MIN N - 119 DEG 06 MIN W - OCEAN PIER

FEbruary 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0254	1.7	0857	5.8	1601	-0.7	2214	4.0
2	0334	1.7	0924	5.6	1630	-0.4	2248	4.0
3	0409	1.7	1001	5.2	1659	-0.1	2317	4.0
4	0447	1.8	1032	4.8	1726	0.3	2349	4.0
5	0527	1.9	1109	4.3	1755	0.7	---	---
6	0623	4.0	0621	2.0	1151	3.7	1825	1.1
7	0105	4.0	0730	2.0	1246	3.1	1858	1.6
8	0154	4.0	0912	1.9	1429	2.6	1944	2.0
9	0301	4.2	1049	1.5	1649	2.6	2103	2.3
10	0404	4.5	1151	0.9	1816	2.9	2229	2.4
11	0501	4.9	1237	0.2	1902	3.2	2338	2.2
12	0550	5.3	1316	-0.4	1938	3.6	---	---
13	0628	2.0	0638	5.8	1352	-0.9	2010	3.9
14	0117	1.6	0721	6.2	1429	-1.2	2045	4.2
15	0201	1.3	0806	6.4	1506	-1.4	2120	4.5
16	0247	1.0	0848	6.4	1545	-1.4	2155	4.8
17	0335	0.7	0935	6.2	1623	-1.1	2234	4.9
18	0426	0.6	1024	5.7	1703	-0.6	2316	5.0
19	0521	0.7	1114	5.0	1742	0.0	---	---
20	0602	5.0	0624	0.8	1217	4.2	1829	0.7
21	0055	4.9	0742	0.9	1335	3.4	1918	1.4
22	0156	4.8	0916	0.8	1524	3.0	2027	1.9
23	0310	4.4	1048	0.5	1718	3.1	2203	2.2
24	0426	4.9	1159	0.1	1832	3.4	2323	2.2
25	0531	5.1	1252	-0.3	1922	3.7	---	---
26	0623	2.0	0620	5.3	1332	-0.5	1957	3.9
27	0104	1.8	0707	5.4	1409	-0.6	2026	4.0
28	0144	1.6	0741	5.5	1439	-0.6	2052	4.2
29	0214	1.4	0813	5.5	1504	-0.5	2116	4.2

TABLE 7
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N - 119 DEG 30 MIN W - CENTRAL PART NE COAST

FEbruary 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0304	1.5	0904	5.4	1611	-0.6	2225	3.7
2	0344	1.5	0936	5.2	1640	-0.4	2255	3.7
3	0414	1.5	1008	4.8	1709	-0.1	2324	3.7
4	0457	1.6	1039	4.5	1736	0.3	2356	3.7
5	0537	1.7	1116	4.0	1805	0.6	---	---
6	0630	3.7	0631	1.8	1158	2.5	1835	1.0
7	0112	3.7	0740	1.8	1253	2.9	1904	1.5
8	0205	3.7	0922	1.7	1436	2.5	1954	1.4
9	0304	3.9	1059	1.4	1656	2.5	2113	2.1
10	0411	4.2	1201	0.8	1823	2.7	2239	2.2
11	0504	4.6	1247	0.2	1909	3.0	2344	2.0
12	0557	4.9	1326	-0.4	1945	3.4	---	---
13	0638	1.8	0645	5.4	1402	-0.8	2017	3.6
14	0127	1.5	0728	5.7	1439	-1.1	2052	3.9
15	0211	1.2	0813	5.9	1516	-1.3	2127	4.2
16	0257	0.9	0855	5.9	1555	-1.3	2202	4.5
17	0345	0.6	0942	5.7	1633	-1.0	2241	4.6
18	0436	0.5	1031	5.3	1713	-0.5	2323	4.6
19	0531	0.6	1121	4.6	1752	0.0	---	---
20	0604	4.6	0634	0.7	1224	3.4	1839	0.6
21	0102	4.6	0752	0.8	1342	3.2	1924	1.3
22	0203	4.5	0826	0.7	1531	2.8	2037	1.7
23	0317	4.5	0924	0.5	1725	2.9	2213	2.0
24	0433	4.6	1034	0.1	1839	3.2	2333	2.0
25	0534	4.7	1302	-0.3	1929	3.5	---	---
26	0633	1.4	0627	4.4	1342	-0.5	2004	3.6
27	0114	1.6	0709	5.0	1419	-0.5	2033	3.7
28	0156	1.5	0748	5.1	1449	-0.5	2059	3.9
29	0224	1.3	0820	5.1	1514	-0.5	2121	3.9

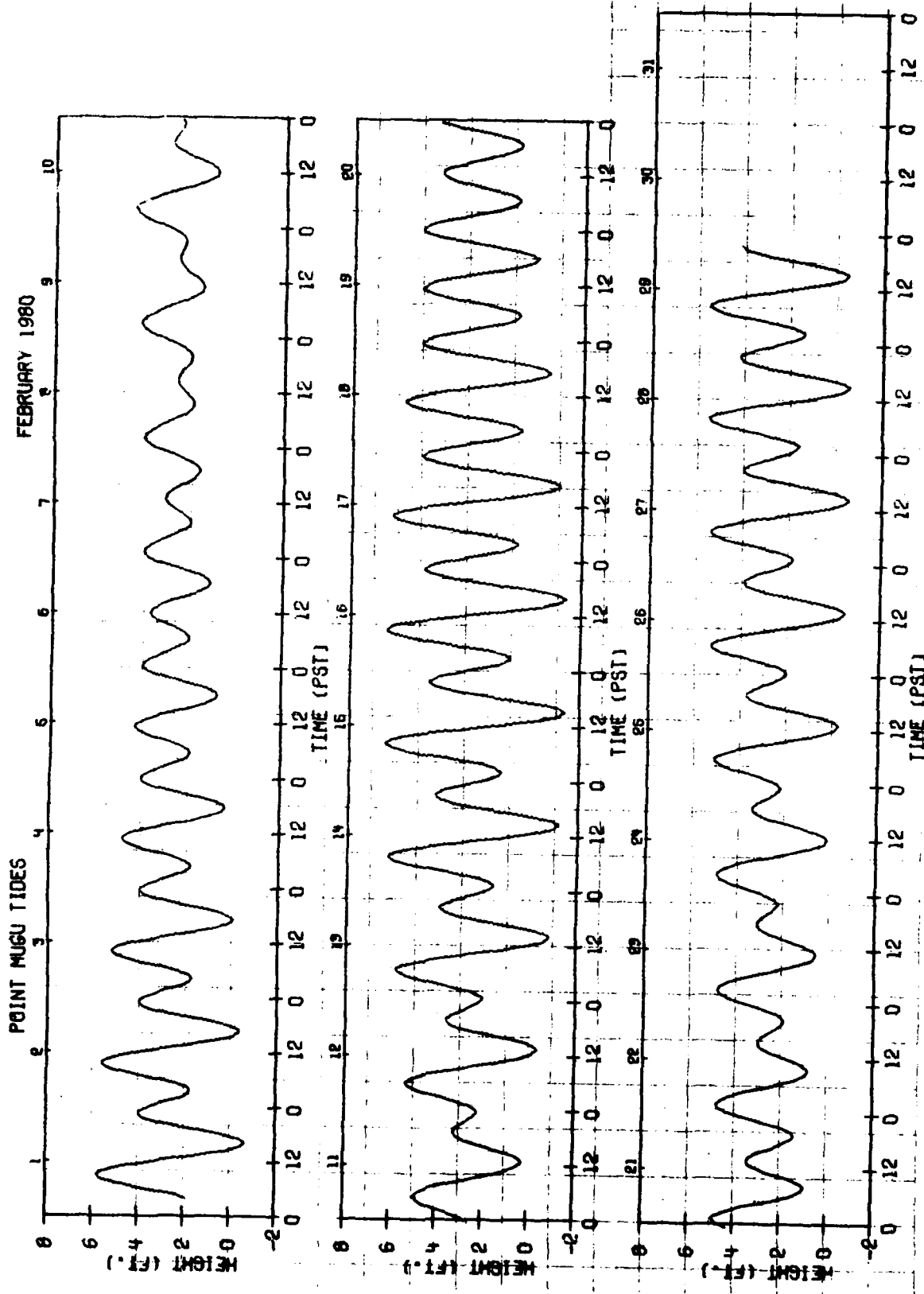


Figure 2. Tidal Graph for Point Mugu, February 1980.

TABLE 8

POINT MUGU TIDES

34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

MARCH 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0244	1.2	0845	5.4	1529	-0.3	2139	4.3
2	0320	1.1	0915	5.2	1554	-0.1	2200	4.4
3	0352	1.0	0945	4.9	1614	0.2	2227	4.4
4	0424	1.0	1019	4.5	1641	0.6	2251	4.4
5	0503	1.1	1051	4.0	1705	1.0	2317	4.3
6	0544	1.2	1135	3.5	1777	1.4	2353	4.2
7	0643	1.3	1227	3.0	1756	1.4	---	---
8	0731	4.2	0803	1.4	1409	2.6	1834	2.2
9	0835	4.1	0943	1.1	1646	2.6	2000	2.5
10	0930	4.2	1106	0.7	1800	3.0	2204	2.5
11	0422	4.5	1200	0.1	1837	3.4	2325	2.3
12	0527	5.0	1244	-0.4	1909	3.8	---	---
13	0621	1.8	0620	5.4	1321	-0.8	1941	4.2
14	0104	1.2	0706	5.8	1400	-1.0	2012	4.7
15	0154	0.6	0754	6.0	1437	-1.1	2044	5.0
16	0240	0.2	0839	6.0	1515	-0.9	2120	5.3
17	0324	-0.2	0928	5.7	1551	-0.5	2157	5.5
18	0414	-0.3	1017	5.2	1629	0.0	2237	5.5
19	0510	-0.3	1112	4.5	1704	0.6	2320	5.4
20	0604	-0.1	1215	3.8	1752	1.3	---	---
21	0004	5.1	0718	0.2	1335	3.3	1846	1.9
22	0104	4.8	0847	0.3	1530	3.1	2004	2.4
23	0227	4.5	1017	0.3	1715	3.3	2158	2.5
24	0353	4.4	1128	0.1	1815	3.6	2322	2.3
25	0509	4.5	1221	-0.1	1857	3.9	---	---
26	0620	1.4	0605	4.7	1303	-0.2	1926	4.1
27	0103	1.6	0650	4.8	1336	-0.2	1951	4.3
28	0135	1.2	0725	4.8	1402	-0.1	2013	4.4
29	0206	0.9	0759	4.8	1430	0.0	2034	4.6
30	0237	0.7	0830	4.8	1452	0.2	2055	4.7
31	0306	0.5	0902	4.6	1514	0.4	2117	4.8

TABLE 9

SAN NICOLAS ISLAND TIDES

33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

MARCH 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0254	1.1	0852	5.0	1539	-0.3	2146	4.0
2	0330	1.0	0922	4.8	1604	-0.1	2207	4.1
3	0402	0.9	0952	4.6	1624	0.2	2234	4.1
4	0434	0.9	1024	4.2	1651	0.5	2254	4.1
5	0513	1.0	1054	3.7	1715	0.9	2324	4.0
6	0554	1.1	1142	3.3	1737	1.3	0000	3.9*
7	0653	1.2	1234	2.4	1804	1.6	---	---
8	0034	3.9	0413	1.3	1416	2.5	1844	2.0
9	0142	3.8	0953	1.0	1653	2.5	2010	2.4
10	0310	3.9	1116	0.6	1807	2.8	2216	2.4
11	0429	4.2	1210	0.1	1844	3.2	2335	2.1
12	0534	4.6	1254	-0.4	1916	3.5	---	---
13	0631	1.6	0627	5.0	1331	-0.7	1944	3.9
14	0114	1.1	0713	5.4	1410	-0.9	2019	4.4
15	0204	0.5	0801	5.6	1447	-1.0	2051	4.6
16	0250	0.2	0846	5.4	1525	-0.4	2127	4.9
17	0334	-0.2	0935	5.3	1601	-0.5	2204	5.1
18	0428	-0.3	1024	4.8	1639	0.0	2244	5.1
19	0520	-0.3	1114	4.2	1714	0.5	2327	5.0
20	0619	-0.1	1222	3.5	1802	1.2	---	---
21	0015	4.7	0728	0.2	1342	3.1	1854	1.7
22	0115	4.5	0857	0.3	1537	2.9	2014	2.2
23	0234	4.2	1027	0.3	1722	3.1	2204	2.3
24	0400	4.1	1134	0.1	1822	3.4	2332	2.1
25	0514	4.2	1231	-0.1	1904	3.6	---	---
26	0630	1.7	0612	4.4	1313	-0.2	1939	3.8
27	0113	1.5	0657	4.5	1346	-0.2	1954	4.0
28	0145	1.1	0732	4.5	1412	-0.1	2020	4.1
29	0216	0.4	0806	4.5	1440	0.0	2041	4.3
30	0247	0.6	0837	4.5	1502	0.2	2102	4.4
31	0316	0.5	0909	4.3	1524	0.4	2124	4.5

* -- TIDE OCCURS ON NEXT DATE.

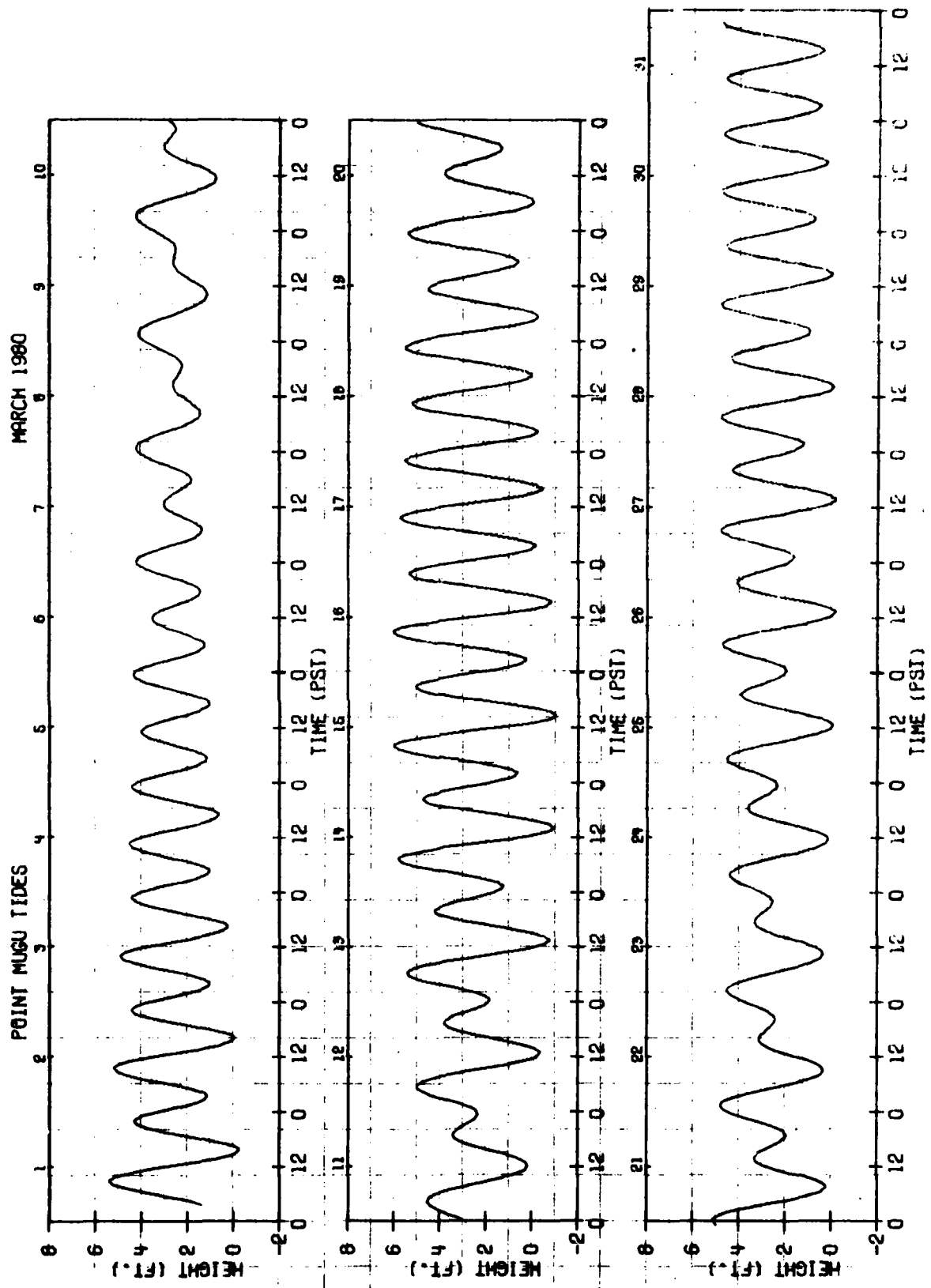


Figure 3. Tidal Graph for Point Mugu, March 1980.

TABLE 10
POINT MUGU TIDES
34 DEG 06 MIN N. 119 DEG 06 MIN W - OCFAN PIER

APRIL 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0337	0.4	0935	4.4	1536	0.7	2138	4.8
2	0409	0.3	1010	4.0	1600	1.0	2203	4.8
3	0447	0.3	1048	3.7	1622	1.4	2229	4.7
4	0526	0.4	1133	3.3	1647	1.8	2301	4.6
5	0622	0.6	1238	2.9	1716	2.1	2340	4.4
6	0728	0.7	1420	2.7	1801	2.5	---	---
7	0839	4.2	0854	0.6	1826	2.9	1944	2.7
8	0207	4.1	1014	0.4	1726	3.3	2155	2.5
9	0343	4.3	1114	0.0	1758	3.7	2315	2.1
10	0459	4.6	1202	-0.3	1830	4.2	---	---
11	0612	1.4	0601	4.9	1284	-0.5	1904	4.7
12	0100	0.7	0653	5.2	1324	-0.6	1937	5.2
13	0146	0.0	0743	5.3	1404	-0.5	2009	5.6
14	0233	-0.5	0834	5.2	1440	-0.2	2046	5.9
15	0319	-0.9	0923	5.0	1518	0.2	2123	6.0
16	0406	-1.0	1015	4.6	1557	0.7	2201	5.9
17	0458	-0.9	1111	4.1	1639	1.3	2244	5.6
18	0556	-0.7	1215	3.6	1721	1.8	0024	5.2*
19	0659	-0.3	1338	3.3	1820	2.3	---	---
20	0826	4.7	0811	0.0	1821	3.3	1948	2.6
21	0139	4.3	0931	0.2	1644	3.5	2145	2.5
22	0311	4.0	1041	0.2	1739	3.8	2309	2.3
23	0433	3.9	1133	0.2	1816	4.1	0005	1.8*
24	0534	4.0	1215	0.3	1845	4.3	---	---
25	0647	1.4	0625	4.1	1251	0.3	1908	4.5
26	0120	1.0	0706	4.2	1319	0.5	1930	4.7
27	0152	0.6	0743	4.2	1345	0.6	1952	4.9
28	0221	0.3	0817	4.1	1409	0.8	2014	5.1
29	0253	0.0	0852	4.0	1434	1.0	2037	5.2
30	0325	-0.2	0927	3.9	1456	1.3	2100	5.3

* -- TIME OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 11
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N. 119 DEG 30 MIN W - CENTRAL PART NE COAST

APRIL 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0347	0.4	0942	4.1	1546	0.6	2145	4.5
2	0414	0.3	1017	3.7	1610	0.9	2210	4.5
3	0457	0.3	1055	3.5	1632	1.3	2236	4.4
4	0536	0.4	1140	3.1	1657	1.6	2308	4.3
5	0632	0.5	1245	2.7	1726	1.9	2347	4.1
6	0734	0.6	1427	2.5	1811	2.3	---	---
7	0846	3.9	0904	0.5	1833	2.7	1954	2.5
8	0214	3.8	1024	0.4	1733	3.1	2205	2.4
9	0350	4.0	1124	0.0	1805	3.5	2325	1.9
10	0506	4.3	1212	-0.3	1837	3.9	---	---
11	0622	1.3	0604	4.6	1254	-0.5	1911	4.4
12	0110	0.6	0700	4.8	1334	-0.5	1944	4.8
13	0156	0.0	0750	4.9	1414	-0.5	2016	5.2
14	0243	-0.5	0841	4.8	1450	-0.2	2053	5.5
15	0329	-0.8	0930	4.6	1528	0.2	2130	5.6
16	0416	-0.9	1022	4.3	1607	0.6	2208	5.5
17	0504	-0.8	1118	3.8	1649	1.2	2251	5.2
18	0606	-0.6	1222	3.4	1731	1.6	0031	4.8*
19	0709	-0.3	1345	3.1	1830	2.1	---	---
20	0833	4.4	0821	0.0	1828	3.1	1958	2.5
21	0146	4.0	0941	0.2	1651	3.3	2155	2.4
22	0318	3.7	1051	0.2	1746	3.5	2319	2.1
23	0440	3.6	1143	0.2	1823	3.8	0015	1.6*
24	0541	3.7	1225	0.3	1852	4.0	---	---
25	0657	1.3	0632	3.8	1301	0.3	1915	4.2
26	0130	0.9	0713	3.9	1329	0.5	1937	4.4
27	0202	0.5	0750	3.9	1355	0.5	1959	4.6
28	0231	0.3	0824	3.8	1419	0.7	2021	4.7
29	0303	0.0	0859	3.7	1444	0.9	2044	4.8
30	0335	-0.2	0934	3.6	1506	1.2	2107	4.9

* -- TIME OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

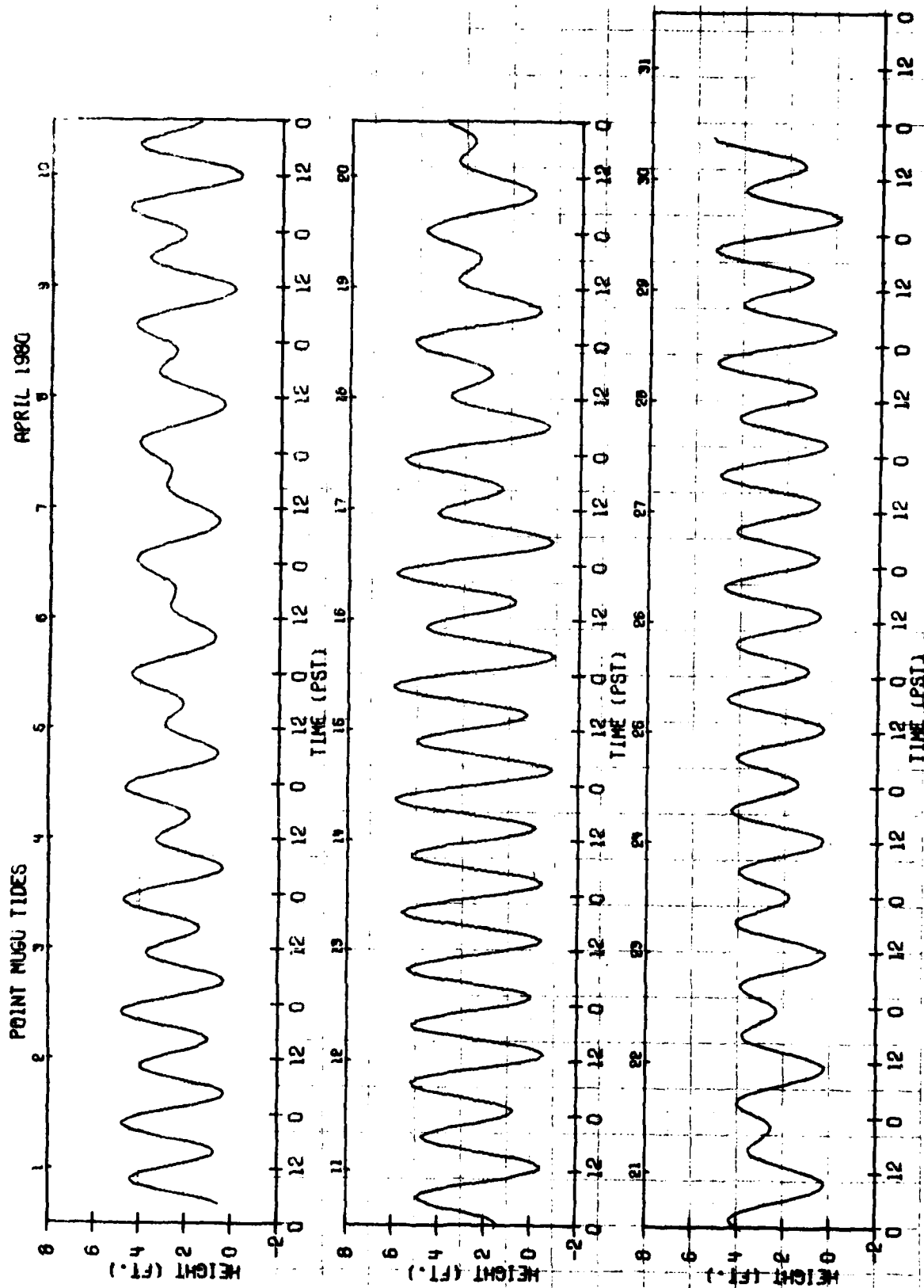


Figure 4. Tidal Graph for Point Mugu, April 1980.

TABLE 12
POINT MUGU TIDES
34 DEG 06 MIN N 119 DEG 06 MIN W - OCFAN PIER MAY 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0357	-0.3	1009	3.7	1521	1.5	2124	5.2
2	0436	-0.3	1050	3.5	1550	1.4	2154	5.2
3	0518	-0.2	1141	3.2	1622	2.2	2232	5.0
4	0606	-0.1	1249	3.1	1700	2.5	2316	4.7
5	0706	0.1	1415	3.1	1806	2.6	---	---
6	0815	4.5	0816	0.1	1538	3.3	1956	2.7
7	0937	4.2	0926	0.1	1636	3.7	2148	2.5
8	0311	4.1	1027	0.0	1715	4.2	2304	1.9
9	0436	4.2	1120	0.0	1752	4.7	0002	1.1*
10	0542	4.3	1205	0.0	1826	5.2	---	---
11	0652	0.3	0643	4.5	1247	0.1	1901	5.7
12	0140	-0.4	0737	4.5	1329	0.4	1938	6.1
13	0226	-1.0	0830	4.5	1407	0.6	2016	6.3
14	0312	-1.3	0921	4.3	1447	1.0	2055	6.4
15	0357	-1.4	1014	4.1	1528	1.4	2134	6.2
16	0446	-0.9	1111	3.9	1610	1.8	2216	5.8
17	0537	-0.9	1214	3.6	1700	2.2	2259	5.3
18	0633	-0.6	1323	3.5	1758	2.5	2350	4.8
19	0731	-0.2	1439	3.5	1821	2.7	---	---
20	0834	0.2	1554	3.7	1854	3.7	2106	2.6
21	0939	0.4	1647	4.0	1947	4.0	2238	2.4
22	1037	3.6	1725	4.2	2028	4.2	2338	1.9
23	1117	0.8	1757	4.5	---	---	---	---
24	1204	1.4	1822	4.8	---	---	---	---
25	1252	0.9	1852	5.0	1922	5.0	1922	5.0
26	1344	0.5	1925	5.3	2004	5.3	2004	5.3
27	1438	0.1	2006	5.6	2084	5.6	2084	5.6
28	1534	-0.2	2085	5.7	2164	5.7	2164	5.7
29	1634	-0.5	2164	5.7	2244	5.7	2244	5.7
30	1734	-0.6	2244	5.7	2324	5.7	2324	5.7
31	1827	-0.7	2324	5.7	2404	5.7	2404	5.7

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 13
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST MAY 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0407	-0.3	1016	3.5	1531	1.4	2135	4.8
2	0446	-0.3	1057	3.3	1600	1.6	2205	4.8
3	0524	-0.2	1148	3.0	1632	2.0	2239	4.6
4	0616	-0.1	1256	2.9	1710	2.3	2323	4.4
5	0716	0.1	1422	2.9	1814	2.5	---	---
6	0822	4.2	0826	0.1	1545	3.1	2006	2.5
7	0944	3.4	0936	0.1	1643	3.5	2158	2.3
8	0316	3.8	1037	3.9	1722	1.7	2314	1.7
9	0443	3.9	1130	0.0	1759	4.4	0012	1.0*
10	0544	4.0	1215	0.0	1833	4.4	---	---
11	0642	0.3	0650	4.2	1257	0.1	1908	5.3
12	0150	-0.4	0744	4.2	1339	0.4	1945	5.6
13	0236	-0.9	0837	4.2	1417	0.5	2023	5.4
14	0322	-1.2	0928	4.0	1457	0.9	2102	5.9
15	0407	-1.3	1021	3.8	1538	1.3	2141	5.7
16	0456	-1.1	1118	3.6	1620	1.6	2223	5.4
17	0547	-0.8	1221	3.4	1710	2.0	2306	4.9
18	0643	-0.5	1330	3.3	1808	2.4	2357	4.5
19	0741	-0.2	1446	3.3	1931	2.5	---	---
20	0859	3.9	0844	0.2	1601	3.5	2116	2.5
21	0959	3.5	0949	0.4	1654	3.7	2248	2.2
22	1044	3.4	1042	0.5	1732	3.9	2348	1.7
23	1127	3.3	1127	0.7	1804	4.2	---	---
24	1204	1.3	0559	3.3	1204	0.8	1829	4.5
25	1252	0.4	0650	3.4	1238	1.0	1853	4.6
26	1344	0.5	0732	3.4	1308	1.2	1914	4.9
27	1438	0.1	0813	3.5	1337	1.3	1945	5.1
28	1534	-0.2	0852	3.5	1405	1.5	2011	5.2
29	1634	-0.5	0932	3.4	1437	1.6	2040	5.3
30	1734	-0.5	1014	3.4	1509	1.7	2111	5.3
31	1827	-0.6	1100	3.3	1541	2.0	2147	5.2

* -- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 14
POINT MUGU TIDES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER

JUNE 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0509	-0.6	1145	3.5	1614	2.4	2219	5.4
2	0555	-0.5	1244	3.5	1705	2.5	2304	5.1
3	0646	-0.4	1346	3.6	1818	2.6	---	---
4	0003	4.7	0742	-0.1	1448	3.9	1953	2.6
5	0119	4.3	0842	0.1	1543	4.2	2131	2.3
6	0248	3.9	0942	0.3	1633	4.7	2251	1.6
7	0417	3.4	1035	0.5	1715	5.2	2354	0.8
8	0534	3.8	1126	0.7	1755	5.7	---	---
9	0648	0.1	1214	1.0	1834	6.1	1834	6.1
10	0135	-0.6	0739	4.0	1300	1.2	1914	6.4
11	0221	-1.0	0832	4.6	1343	1.4	1952	6.5
12	0306	-1.3	0923	4.0	1425	1.6	2034	6.5
13	0351	-1.3	1011	4.0	1509	1.9	2113	6.3
14	0433	-1.2	1103	3.4	1551	2.1	2153	6.0
15	0518	-0.9	1154	3.8	1637	2.4	2235	5.5
16	0604	-0.5	1247	3.8	1732	2.5	2317	5.0
17	0649	-0.1	1349	3.8	1840	2.7	---	---
18	0010	4.4	0736	0.3	1445	3.9	2005	2.7
19	0104	3.9	0829	0.7	1537	4.1	2139	2.5
20	0231	3.4	0918	1.0	1623	4.3	2259	2.1
21	0401	3.2	1008	1.3	1659	4.6	2351	1.6
22	0518	3.1	1056	1.6	1731	4.9	---	---
23	0036	1.0	0621	3.2	1134	1.7	1803	5.2
24	0114	0.5	0713	3.3	1213	1.8	1835	5.5
25	0150	0.1	0755	3.5	1251	1.9	1906	5.7
26	0222	-0.3	0838	3.6	1327	2.0	1937	6.0
27	0257	-0.6	0917	3.7	1402	2.0	2014	6.1
28	0335	-0.8	0957	3.8	1444	2.1	2050	6.2
29	0413	-0.9	1037	3.9	1526	2.2	2129	6.1
30	0452	-0.9	1122	3.9	1612	2.3	2213	5.9

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 15
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST

JUNE 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0519	-0.5	1152	3.3	1624	2.2	2226	5.0
2	0605	-0.5	1251	3.3	1715	2.4	2311	4.7
3	0656	-0.4	1353	3.4	1828	2.5	---	---
4	0010	4.4	0752	-0.1	1455	3.6	2003	2.5
5	0126	4.0	0852	0.1	1550	3.9	2141	2.1
6	0255	3.6	0952	0.3	1640	4.4	2301	1.5
7	0424	3.5	1045	0.5	1722	4.4	0004	0.7*
8	0541	3.5	1136	0.6	1802	5.3	---	---
9	0658	0.1	1224	3.6	1884	0.9	1841	5.6
10	0145	-0.5	0746	3.7	1310	1.1	1921	5.9
11	0231	-0.9	0839	3.7	1353	1.3	1959	6.0
12	0316	-1.2	0930	3.7	1435	1.5	2041	6.0
13	0401	-1.2	1018	3.7	1519	1.7	2120	5.8
14	0443	-1.1	1110	3.6	1601	1.9	2200	5.6
15	0528	-0.8	1201	3.5	1647	2.2	2242	5.1
16	0614	-0.5	1254	3.5	1742	2.4	2324	4.6
17	0659	-0.1	1356	3.5	1850	2.5	---	---
18	0017	4.1	0746	0.3	1452	3.6	2015	2.5
19	0116	3.6	0839	0.6	1544	3.8	2149	2.3
20	0238	3.2	0928	0.9	1630	4.0	2309	1.9
21	0408	3.0	1018	1.2	1706	4.3	0001	1.5*
22	0525	2.9	1106	1.5	1738	4.6	---	---
23	0046	0.9	0628	3.0	1144	1.5	1810	4.4
24	0124	0.5	0720	3.1	1223	1.6	1842	5.1
25	0200	0.1	0802	3.3	1301	1.7	1913	5.3
26	0232	-0.3	0845	3.4	1337	1.8	1944	5.6
27	0307	-0.5	0924	3.5	1412	1.8	2021	5.6
28	0345	-0.7	1004	3.5	1454	1.9	2057	5.7
29	0423	-0.8	1044	3.6	1536	2.0	2136	5.6
30	0502	-0.8	1129	3.6	1622	2.1	2220	5.5

* -- TIME OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

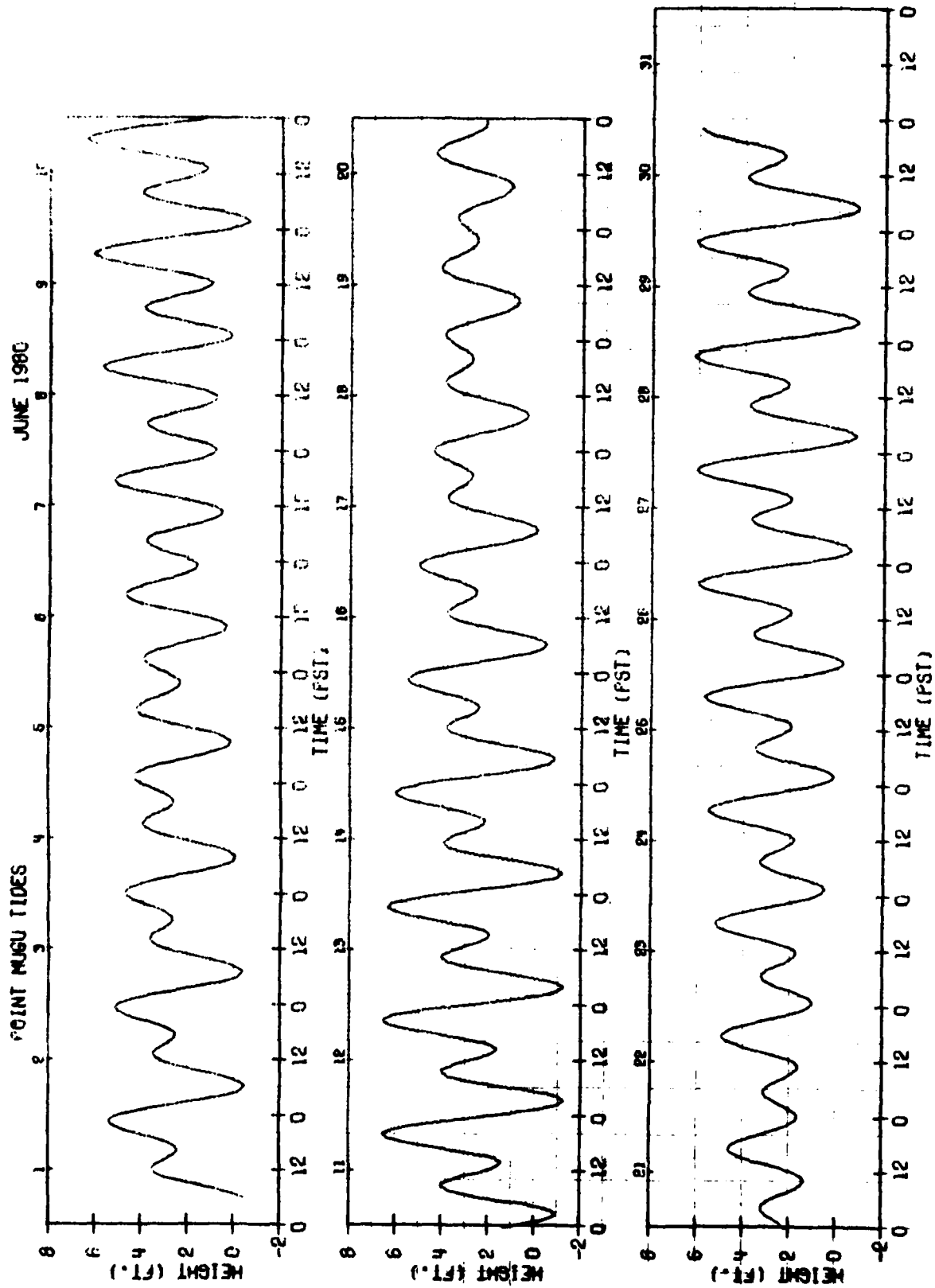


Figure 6. Tidal Graph for Point Mugu, June 1980.

TABLE 16
POINT MUGU TIDES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER
JULY 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0535	-0.7	1210	4.0	1708	2.3	2302	5.5
2	0621	-0.4	1303	4.2	1817	2.4	2357	4.9
3	0707	0.0	1358	4.4	1941	2.3	---	---
4	0107	4.3	0803	0.4	1855	4.7	2114	1.9
5	0234	3.8	0859	0.8	1548	5.1	2240	1.3
6	0409	3.5	0958	1.2	1638	5.5	2346	0.6
7	0536	3.5	1057	1.5	1728	5.9	---	---
8	0644	0.0	0649	3.6	1152	1.7	1813	6.2
9	0133	-0.5	0743	3.8	1244	1.8	1858	6.4
10	0215	-0.9	0834	3.9	1330	1.9	1938	6.5
11	0257	-1.0	0918	4.0	1412	2.0	2020	6.5
12	0336	-1.0	1000	4.1	1455	2.0	2059	6.3
13	0415	-0.9	1037	4.1	1534	2.1	2135	6.0
14	0451	-0.6	1119	4.1	1620	2.2	2213	5.6
15	0526	-0.3	1158	4.1	1703	2.4	2252	5.1
16	0603	0.2	1240	4.1	1758	2.5	2330	4.6
17	0640	0.6	1324	4.1	1802	2.5	---	---
18	0019	4.0	0719	1.1	1414	4.2	2026	2.5
19	0129	3.4	0802	1.5	1506	4.3	2203	2.2
20	0301	3.0	0853	1.9	1554	4.5	2315	1.7
21	0449	3.0	0952	2.1	1641	4.8	---	---
22	0611	1.2	0606	3.1	1048	2.3	1726	5.2
23	0052	0.7	0701	3.3	1141	2.3	1803	5.5
24	0129	0.2	0743	3.5	1226	2.3	1841	5.9
25	0202	-0.3	0819	3.8	1308	2.2	1920	6.2
26	0239	-0.6	0854	4.0	1350	2.0	1958	6.4
27	0313	-0.9	0932	4.2	1433	1.9	2040	6.5
28	0349	-0.9	1008	4.4	1519	1.8	2122	6.4
29	0428	-0.9	1047	4.5	1607	1.7	2205	6.1
30	0508	-0.6	1129	4.7	1703	1.7	2253	5.6
31	0550	-0.1	1214	4.8	1806	1.7	2353	4.9

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 17
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST
JULY 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0545	-0.6	1217	3.7	1718	2.1	2309	5.1
2	0631	-0.4	1310	3.9	1827	2.2	0004	4.6*
3	0717	0.0	1405	4.1	1951	2.1	---	---
4	0114	4.0	0813	0.4	1502	4.4	2124	1.7
5	0241	3.5	0909	0.7	1555	4.7	2250	1.2
6	0416	3.3	1008	1.1	1645	5.1	2356	0.5
7	0543	3.3	1107	1.4	1735	5.5	---	---
8	0654	0.0	0656	3.4	1202	1.5	1820	5.7
9	0143	-0.5	0750	3.5	1254	1.6	1905	5.4
10	0225	-0.8	0841	3.6	1340	1.7	1945	6.0
11	0307	-0.9	0925	3.7	1422	1.8	2027	6.0
12	0346	-0.9	1007	3.8	1505	1.8	2106	5.8
13	0425	-0.8	1044	3.8	1544	1.9	2142	5.6
14	0501	-0.5	1126	3.8	1630	2.0	2220	5.2
15	0536	-0.3	1205	3.8	1713	2.2	2259	4.7
16	0613	0.2	1247	3.8	1808	2.3	2337	4.3
17	0650	0.5	1331	3.8	1912	2.4	---	---
18	0026	3.7	0729	1.0	1421	3.9	2036	2.3
19	0136	3.2	0812	1.4	1513	4.0	2213	2.0
20	0308	2.8	0903	1.7	1601	4.2	2325	1.5
21	0456	2.8	1002	1.9	1648	4.5	---	---
22	0621	1.1	0613	2.9	1058	2.1	1733	4.8
23	0102	0.6	0708	3.1	1151	2.1	1810	5.1
24	0138	0.2	0750	3.3	1236	2.1	1848	5.5
25	0212	-0.3	0826	3.5	1318	2.0	1927	5.7
26	0244	-0.5	0901	3.7	1400	1.8	2005	5.4
27	0323	-0.8	0939	3.9	1443	1.7	2047	6.0
28	0359	-0.8	1015	4.1	1529	1.6	2129	5.9
29	0438	-0.8	1054	4.2	1617	1.5	2212	5.6
30	0518	-0.5	1136	4.4	1713	1.5	2300	5.2
31	0600	-0.1	1221	4.5	1816	1.5	0000	4.6*

* --- TIDE OCCURS ON NEXT DATE.
ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

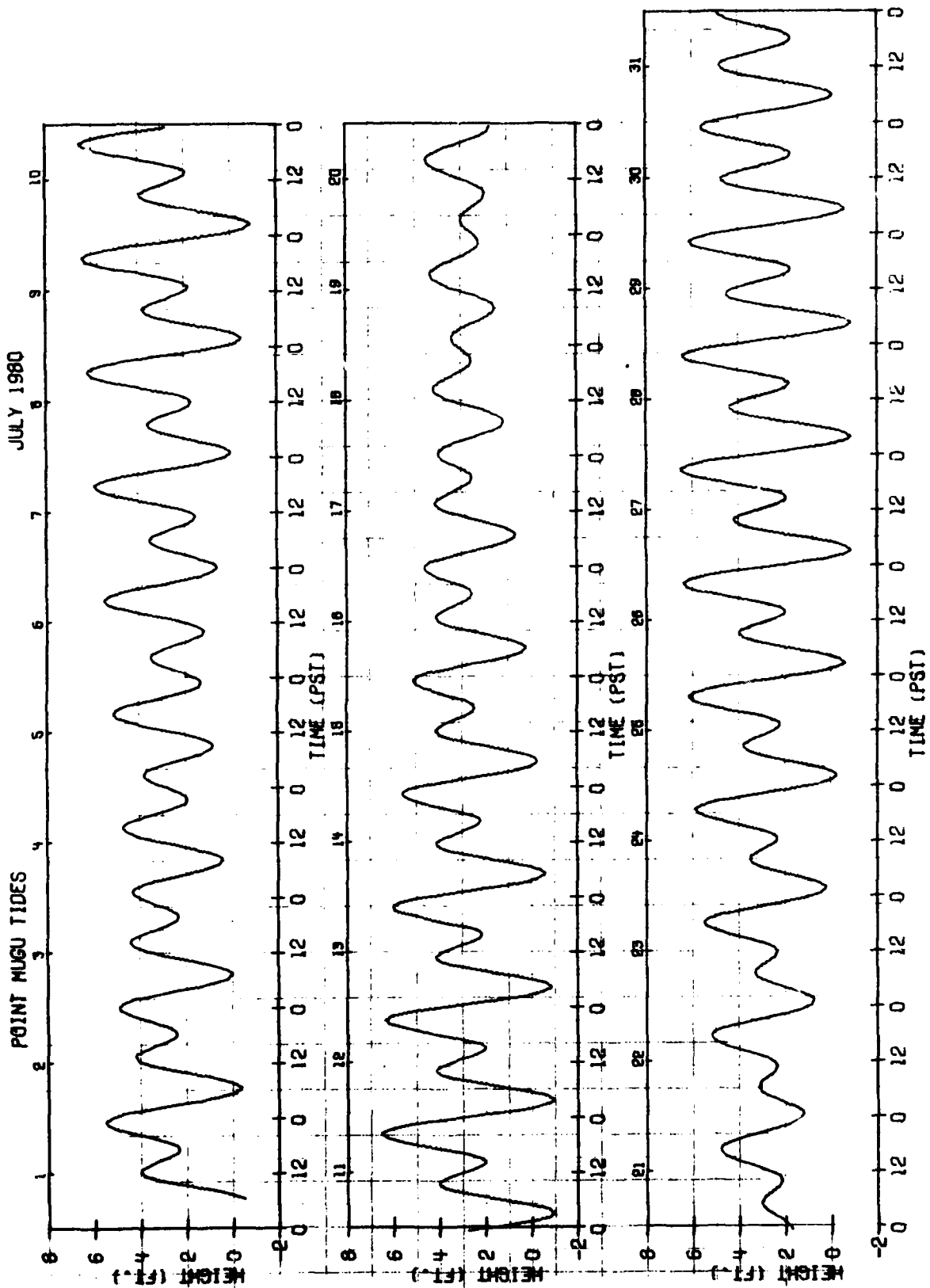


Figure 7. Tidal Graph for Point Mugu, July 1980.

TABLE 18
POINT MUGU TIDES

34 DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER

AUGUST 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0633	0.4	1305	5.0	1922	1.7	2052	1.5
2	0103	4.2	0725	1.0	1405	5.1	2052	1.5
3	0234	3.6	0823	1.6	1507	5.3	2224	1.0
4	0419	3.4	0932	2.0	1612	5.5	2337	0.5
5	0552	3.5	1045	2.2	1710	5.8	---	---
6	0736	0.0	0658	3.8	1803	6.2	---	---
7	0124	-0.4	0743	4.0	1242	2.1	1849	6.2
8	0206	-0.6	0829	4.2	1329	2.0	1931	6.3
9	0242	-0.6	0901	4.3	1409	1.9	2004	6.2
10	0315	-0.6	0933	4.4	1445	1.9	2044	6.1
11	0347	-0.4	1001	4.4	1524	1.8	2119	5.8
12	0415	-0.1	1030	4.4	1559	1.8	2154	5.5
13	0444	0.2	1101	4.4	1638	1.9	2227	5.1
14	0513	0.6	1133	4.4	1719	2.0	2304	4.5
15	0542	1.1	1205	4.4	1807	2.1	2348	4.0
16	0611	1.5	1244	4.4	1917	2.2	---	---
17	0642	3.4	0648	2.0	1333	4.4	2046	2.1
18	0214	3.0	0730	2.4	1438	4.4	2222	1.8
19	0434	3.0	0840	2.6	1541	4.6	2335	1.3
20	0600	3.2	1012	2.7	1644	5.0	---	---
21	0020	0.7	0649	3.5	1122	2.5	1734	5.4
22	0059	0.2	0721	3.8	1213	2.4	1819	5.4
23	0133	-0.2	0753	4.2	1258	2.1	1901	6.2
24	0204	-0.5	0825	4.5	1344	1.7	1946	6.4
25	0243	-0.7	0854	4.8	1426	1.3	2024	6.5
26	0321	-0.7	0929	5.0	1512	1.1	2111	6.4
27	0357	-0.5	1007	5.3	1600	0.9	2200	6.0
28	0434	-0.1	1046	5.4	1652	0.8	2251	5.4
29	0514	0.4	1130	5.4	1753	0.9	2350	4.7
30	0556	1.1	1214	5.4	1846	1.0	---	---
31	0103	4.0	0648	1.7	1318	5.3	2033	1.0

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 19
SAN NICOLAS ISLAND TIDES

33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST

AUGUST 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0643	0.4	1312	4.6	1932	1.5	---	---
2	0116	3.9	0735	0.9	1412	4.7	2102	1.4
3	0241	3.4	0833	1.5	1514	4.9	2234	0.9
4	0426	3.2	0942	1.8	1619	5.1	2347	0.5
5	0554	3.3	1055	2.0	1717	5.4	---	---
6	0706	0.0	0705	3.5	1200	2.0	---	---
7	0134	-0.4	0750	3.7	1252	1.9	1810	5.6
8	0216	-0.5	0836	3.9	1339	1.8	1856	5.7
9	0252	-0.5	0908	4.0	1419	1.7	1938	5.8
10	0325	-0.5	0940	4.1	1455	1.7	2015	5.7
11	0357	-0.4	1008	4.1	1534	1.6	2051	5.6
12	0425	-0.1	1037	4.1	1609	1.6	2126	5.4
13	0454	0.2	1108	4.1	1648	1.7	2201	5.1
14	0523	0.5	1140	4.1	1729	1.8	2234	4.7
15	0552	1.0	1212	4.1	1817	1.9	2311	4.2
16	0621	1.4	1251	4.1	1927	2.0	2355	3.7
17	0649	3.2	0658	1.8	1340	4.1	---	---
18	0224	2.8	0740	2.2	1445	4.3	2056	1.9
19	0443	2.8	0850	2.5	1548	4.3	2232	1.6
20	0607	3.0	1022	2.5	1651	4.6	2345	1.2
21	0030	0.6	0656	3.3	1132	2.4	---	---
22	0109	0.2	0728	3.5	1223	2.2	1741	5.0
23	0143	-0.2	0800	3.9	1308	1.9	1824	5.4
24	0214	-0.5	0832	4.2	1354	1.5	1904	5.7
25	0253	-0.6	0901	4.5	1436	1.2	1953	5.9
26	0331	-0.6	0936	4.6	1522	1.0	2035	6.0
27	0407	-0.5	1014	4.9	1610	0.8	2118	5.9
28	0446	-0.1	1053	5.0	1702	0.7	2207	5.6
29	0524	0.4	1137	5.0	1803	0.4	2258	5.0
30	0606	1.0	1225	5.0	1916	0.9	2357	4.4
31	0110	3.7	0658	1.5	1325	4.9	---	---

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

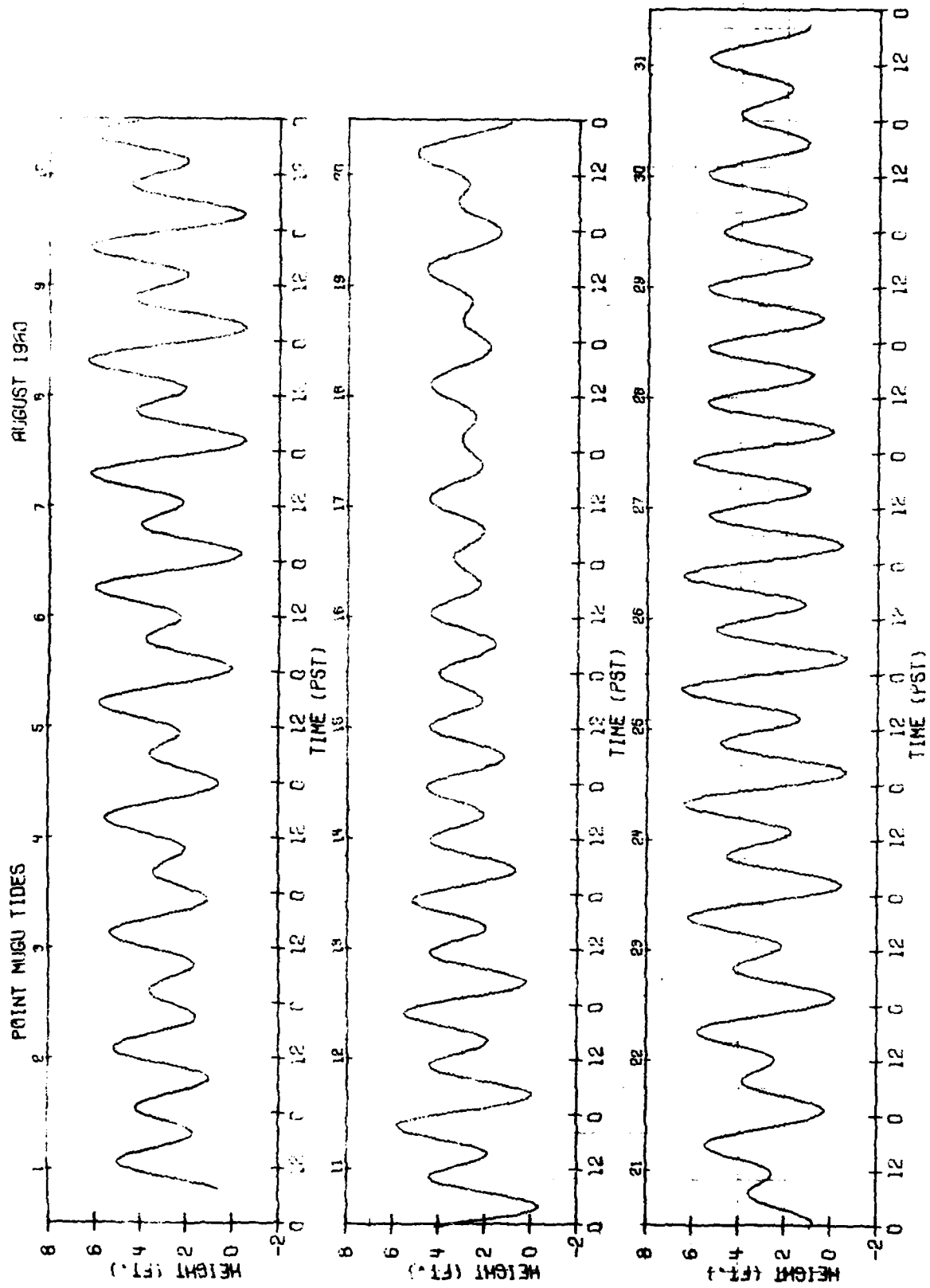


Figure 8. Tidal Graph for Point Mugu, August 1980.

TABLE 20
POINT MUGU TIDES
34 DEG 06 MIN N, 119 DEG 06 MIN W - OCEAN PIER
SEPTEMBER 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0245	3.5	0757	2.3	1429	5.2	2206	0.7
2	0438	3.5	0923	2.5	1545	5.3	2322	0.4
3	0557	3.8	1050	2.5	1659	5.4	---	---
4	0020	0.1	0651	4.1	1158	2.4	1755	5.6
5	0105	-0.1	0730	4.3	1247	2.1	1842	5.8
6	0143	-0.2	0802	4.5	1327	1.8	1922	5.8
7	0217	-0.2	0830	4.7	1403	1.6	1957	5.8
8	0244	-0.1	0854	4.8	1436	1.4	2032	5.7
9	0312	0.1	0919	4.8	1507	1.3	2104	5.5
10	0336	0.4	0942	4.9	1539	1.3	2135	5.2
11	0401	0.7	1006	4.9	1615	1.3	2208	4.8
12	0424	1.1	1031	4.8	1650	1.3	2245	4.3
13	0448	1.5	1059	4.8	1732	1.5	2325	3.8
14	0513	2.0	1130	4.6	1827	1.6	---	---
15	0526	3.4	0540	2.4	1211	4.5	1947	1.7
16	0205	3.0	0617	2.7	1311	4.4	2123	1.5
17	0439	3.1	0747	3.0	1432	4.4	2245	1.2
18	0547	3.4	0953	3.0	1559	4.7	2338	0.7
19	0619	3.8	1109	2.6	1704	5.1	---	---
20	0021	0.3	0648	4.2	1205	2.3	1756	5.5
21	0058	-0.1	0714	4.6	1248	1.7	1845	5.9
22	0133	-0.3	0746	5.0	1333	1.1	1931	6.1
23	0210	-0.4	0818	5.4	1416	0.6	2016	6.2
24	0247	-0.3	0850	5.8	1502	0.2	2105	6.0
25	0324	0.0	0928	6.0	1551	0.0	2153	5.5
26	0359	0.5	1005	6.1	1642	-0.1	2247	5.0
27	0439	1.1	1048	6.0	1739	0.1	2349	4.4
28	0524	1.7	1137	5.7	1848	0.3	---	---
29	0610	3.8	0617	2.3	1233	5.4	2010	0.5
30	0255	3.6	0736	2.7	1350	5.0	2137	0.5

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 21
SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N, 119 DEG 30 MIN W - CENTRAL PART NE COAST
SEPTEMBER 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0252	3.3	0807	2.1	1436	4.8	2216	0.6
2	0445	3.3	0933	2.4	1552	4.9	2332	0.4
3	0604	3.5	1100	2.4	1706	5.0	---	---
4	0030	0.1	0658	3.8	1208	2.2	1802	5.2
5	0115	-0.1	0737	4.0	1257	1.9	1849	5.4
6	0153	-0.2	0809	4.2	1337	1.6	1929	5.4
7	0227	-0.2	0837	4.4	1413	1.5	2004	5.4
8	0254	-0.1	0901	4.5	1446	1.3	2039	5.3
9	0322	0.1	0926	4.5	1517	1.2	2111	5.1
10	0346	0.4	0949	4.6	1549	1.2	2142	4.8
11	0411	0.6	1013	4.6	1625	1.2	2215	4.5
12	0434	1.0	1038	4.5	1700	1.2	2252	4.0
13	0458	1.4	1106	4.5	1742	1.4	2332	3.5
14	0523	1.8	1137	4.3	1837	1.5	---	---
15	0033	3.2	0550	2.2	1218	4.2	1957	1.5
16	0212	2.8	0627	2.5	1318	4.1	2133	1.4
17	0446	2.9	0757	2.8	1439	4.1	2255	1.1
18	0554	3.2	1003	2.5	1606	4.4	2348	0.6
19	0626	3.5	1119	2.5	1711	4.7	---	---
20	0031	0.3	0655	3.9	1215	2.1	1803	5.1
21	0104	-0.1	0721	4.3	1258	1.5	1952	5.5
22	0143	-0.3	0753	4.6	1343	1.0	1938	5.6
23	0220	-0.4	0825	5.0	1426	0.5	2023	5.7
24	0257	-0.3	0857	5.4	1512	0.2	2112	5.4
25	0334	0.0	0935	5.6	1601	0.0	2200	5.1
26	0409	0.5	1012	5.6	1652	-0.1	2254	4.6
27	0449	1.0	1055	5.6	1749	0.1	2356	4.1
28	0534	1.5	1144	5.3	1858	0.3	---	---
29	0617	3.5	0627	2.1	1240	5.0	2020	0.5
30	0302	3.4	0746	2.5	1357	4.6	2147	0.5

ADD ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

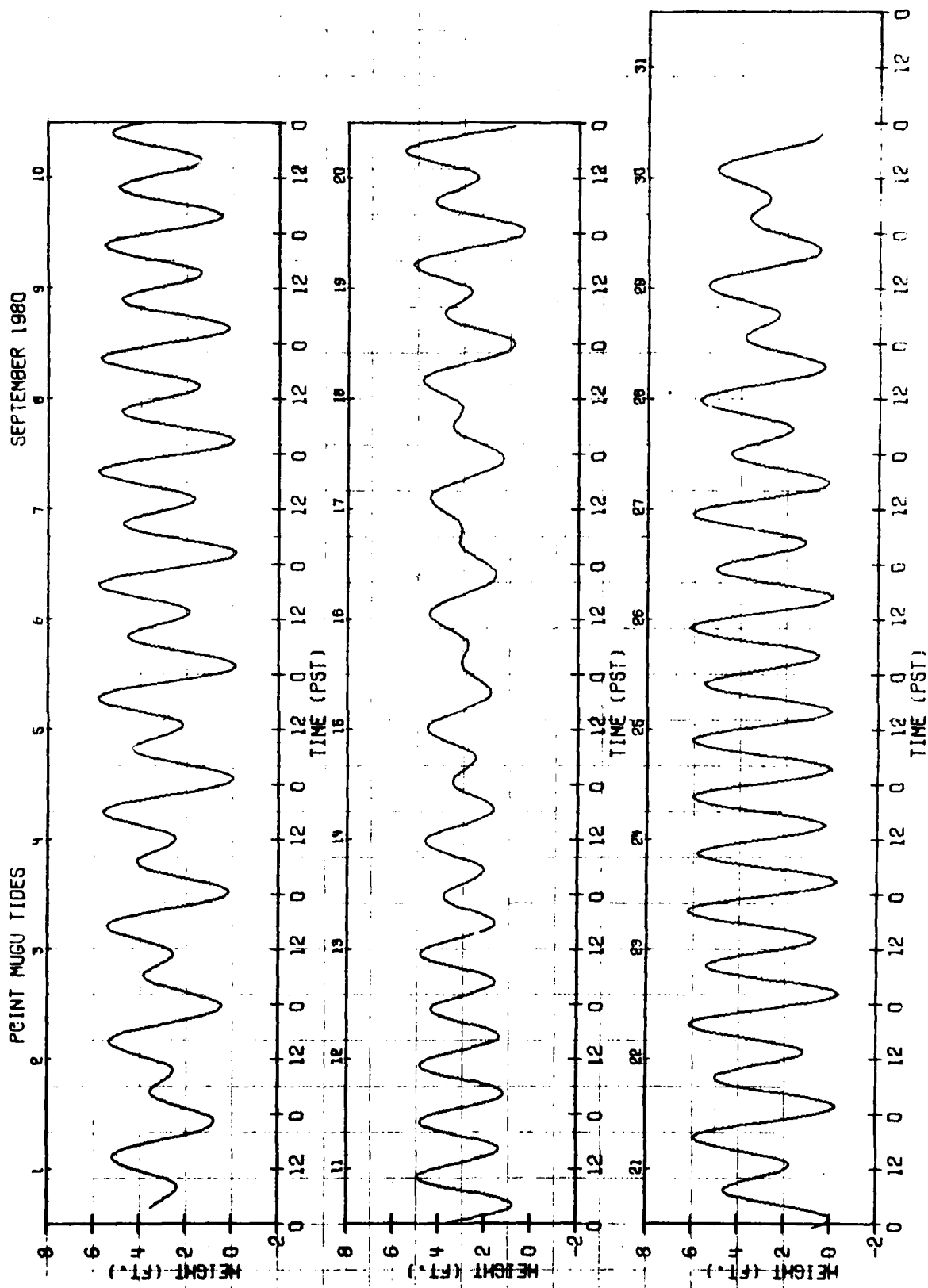


Figure 9. Tidal Graph for Point Mugu, September 1980.

TABLE 22
POINT MUGU TIDES
34 DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER

OCTOBER 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0438	3.8	0924	2.8	1520	0.4	2253	0.4
2	0544	4.1	1058	2.6	1639	0.2	2351	0.2
3	0627	4.4	1159	2.3	1741	---	---	---
4	0702	4.7	1244	1.9	1830	5.2	1909	5.2
5	0728	4.9	1320	1.5	1909	5.2	1944	5.2
6	0753	5.0	1352	1.2	1944	5.2	2017	5.1
7	0813	5.1	1424	0.9	2017	5.1	2049	4.9
8	0836	5.2	1452	0.7	2049	4.9	2123	4.6
9	0856	5.3	1524	0.6	2123	4.6	2159	4.3
10	0920	5.3	1556	0.6	2159	4.3	2235	4.0
11	0943	5.3	1631	0.6	2235	4.0	2321	3.6
12	1008	5.2	1710	0.8	2321	3.6	---	---
13	1037	5.0	1802	0.9	---	---	1904	1.1
14	1049	2.6	1814	4.8	1904	1.1	2027	1.1
15	0523	2.9	1202	4.5	2027	1.1	2147	0.9
16	0718	3.2	1333	4.4	2147	0.9	2248	0.6
17	0945	3.1	1514	4.4	2248	0.6	2336	0.3
18	1054	2.6	1632	4.7	2336	0.3	---	---
19	1151	2.0	1734	5.0	---	---	1829	5.3
20	0014	0.1	1829	1.2	1829	5.3	1919	5.5
21	0056	0.0	1909	0.5	1919	5.5	2008	5.3
22	0134	0.1	1945	-0.2	2008	5.3	2057	5.3
23	0210	0.3	1951	-0.8	2057	5.3	2150	4.9
24	0244	0.6	1951	-0.8	2150	4.9	2247	4.5
25	0327	1.1	1934	6.5	2247	4.5	2351	4.1
26	0409	1.6	1916	6.3	2351	4.1	---	---
27	0452	2.1	1829	-0.3	---	---	1941	0.1
28	0550	2.5	1829	5.4	1941	0.1	2059	0.3
29	0717	2.9	1808	4.8	2059	0.3	2209	0.4
30	0813	2.9	1837	4.4	2209	0.4	2309	0.5
31	0513	2.5	1607	4.3	2309	0.5	---	---

AD(1) ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

TABLE 23

SAN NICOLAS ISLAND TIDES

OCTOBER 1980

33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0445	3.5	0934	2.6	1527	4.6	2303	0.4
2	0551	3.8	1108	2.5	1646	4.6	0001	0.2
3	0634	4.1	1209	2.1	1748	4.6	---	---
4	0709	4.4	1300	1.7	1837	4.8	1837	4.8
5	0735	4.6	1330	1.4	1916	4.8	1916	4.8
6	0753	4.6	1402	1.1	1951	4.8	2024	4.7
7	0820	4.7	1434	0.8	2024	4.7	2056	4.6
8	0843	4.8	1502	0.6	2056	4.6	2130	4.3
9	0903	4.9	1534	0.5	2130	4.3	2206	4.0
10	0927	4.9	1606	0.5	2206	4.0	2242	3.7
11	0950	4.9	1641	0.5	2242	3.7	2328	3.4
12	1015	4.8	1720	0.7	2328	3.4	---	---
13	1044	4.6	1812	0.8	---	---	1914	1.0
14	1049	2.5	1121	4.5	1914	1.0	2037	1.0
15	0533	2.7	1209	4.2	2037	1.0	2157	0.8
16	0728	3.0	1340	4.1	2157	0.8	2254	0.5
17	0955	2.9	1521	4.1	2254	0.5	---	---
18	1108	2.5	1639	4.4	---	---	1836	4.9
19	1201	1.8	1741	4.4	1836	4.9	1926	5.1
20	0645	4.7	1247	1.1	1926	5.1	2104	4.9
21	0716	5.2	1333	0.5	2104	4.9	2157	4.6
22	0749	5.6	1418	-0.2	2157	4.6	2254	4.2
23	0824	5.9	1505	-0.5	2254	4.2	2358	3.8
24	0902	6.1	1551	-0.7	2358	3.8	---	---
25	0941	6.0	1641	-0.7	---	---	1951	0.1
26	1023	5.8	1737	-0.5	1951	0.1	2109	0.3
27	1110	5.5	1839	-0.3	2109	0.3	2219	0.4
28	1204	5.0	1939	-0.3	2219	0.4	2319	0.5
29	0600	2.4	1204	5.0	2319	0.5	---	---
30	0727	2.7	1315	4.5	---	---	---	---
31	0923	2.7	1444	4.1	---	---	---	---

* -- TIME OCCURS ON NEXT DATE.

AD(1) ONE HOUR WHEN DAYLIGHT SAVINGS TIME IS IN EFFECT.

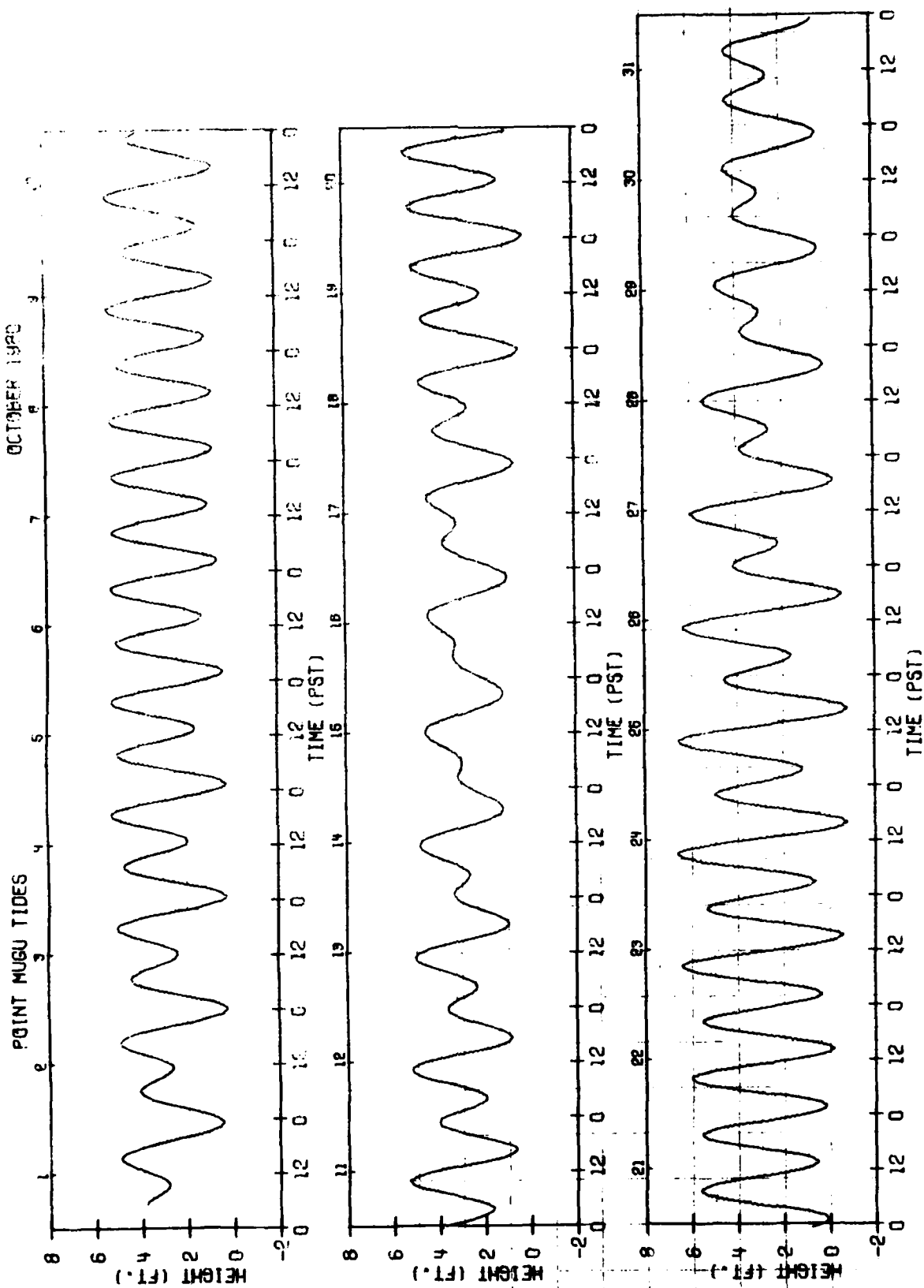


Figure 10. Tidal Graph for Point Mugu, October 1980.

TABLE 24

POINT MUGU TIDES
34 DEG 06 MIN N° 119 DEG 06 MIN W - OCEAN PFR NOVEMBER 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0555	4.6	1151	2.1	1715	4.3	2352	0.5
2	0627	4.9	1231	1.7	1808	4.4	---	---
3	0658	0.7	0652	5.1	1308	1.2	1853	4.4
4	0100	0.8	0714	5.3	1342	0.8	1930	4.4
5	0124	1.0	0735	5.4	1411	0.5	2007	4.4
6	0150	1.2	0757	5.6	1440	0.3	2041	4.3
7	0215	1.4	0821	5.7	1512	0.1	2117	4.1
8	0240	1.7	0843	5.7	1544	0.0	2153	3.9
9	0305	1.9	0909	5.6	1619	0.0	2235	3.7
10	0330	2.2	0939	5.5	1700	0.1	2325	3.5
11	0359	2.5	1008	5.3	1745	0.2	---	---
12	0426	3.3	0430	2.7	1045	5.1	1838	0.4
13	0452	3.3	0526	3.0	1135	4.7	1942	0.5
14	0518	3.5	0710	3.2	1251	4.4	2052	0.5
15	0547	3.9	0917	2.9	1430	4.2	2155	0.5
16	0552	4.4	1043	2.4	1600	4.2	2248	0.5
17	0527	4.9	1140	1.6	1715	4.4	2335	0.5
18	0601	5.5	1229	0.8	1816	4.5	---	---
19	0629	0.6	0637	6.0	1317	0.0	1912	4.7
20	0100	0.7	0712	6.4	1403	-0.7	2005	4.7
21	0141	0.9	0751	6.8	1448	-1.1	2058	4.6
22	0220	1.2	0829	6.9	1534	-1.3	2150	4.4
23	0302	1.5	0910	6.8	1622	-1.3	2244	4.2
24	0347	1.9	0952	6.5	1714	-1.0	2343	4.0
25	0433	2.3	1035	6.0	1806	-0.6	---	---
26	0527	3.9	0532	2.6	1126	5.4	1905	-0.2
27	0609	3.9	0651	2.9	1226	4.7	2008	0.2
28	0624	4.0	0833	2.9	1345	4.1	2111	0.5
29	0622	4.3	1016	2.5	1514	3.8	2211	0.8
30	0507	4.6	1124	2.1	1637	3.7	2258	1.0

TABLE 25

SAN NICOLAS ISLAND TIDES
33 DEG 16 MIN N° 119 DEG 30 MIN W - CENTRAL PART NE COAST NOVEMBER 1980

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0602	4.3	1201	1.9	1722	4.0	0002	0.5*
2	0634	4.6	1241	1.5	1815	4.1	---	---
3	0638	0.6	0659	4.7	1318	1.1	1400	4.1
4	0110	0.7	0721	4.9	1352	0.7	1937	4.1
5	0134	0.9	0742	5.0	1421	0.5	2014	4.1
6	0200	1.1	0804	5.2	1450	0.3	2048	4.0
7	0225	1.3	0828	5.3	1522	0.1	2124	3.8
8	0315	1.5	0850	5.3	1554	0.0	2200	3.6
9	0315	1.7	0916	5.2	1629	0.0	2242	3.5
10	0340	2.0	0946	5.1	1710	0.1	2332	3.3
11	0409	2.3	1015	4.9	1755	0.2	---	---
12	0433	3.1	0440	2.5	1852	4.7	1848	0.4
13	0459	3.1	0536	2.8	1142	4.4	1952	0.5
14	0525	3.3	0720	3.0	1258	4.1	2102	0.5
15	0524	3.6	0927	2.7	1437	3.9	2205	0.5
16	0559	4.1	1053	2.2	1607	3.9	2254	0.5
17	0534	4.6	1150	1.5	1722	4.1	2345	0.5
18	0604	5.1	1239	0.7	1823	4.2	---	---
19	0630	0.5	0644	5.6	1327	0.0	1914	4.4
20	0110	0.6	0719	5.9	1413	-0.6	2012	4.4
21	0151	0.8	0758	6.3	1458	-1.0	2105	4.3
22	0230	1.1	0836	6.4	1544	-1.2	2157	4.1
23	0312	1.4	0917	6.3	1632	-1.2	2251	3.9
24	0357	1.7	0959	6.0	1724	-0.9	2350	3.7
25	0443	2.1	1042	5.6	1816	-0.5	---	---
26	0559	3.6	0542	2.5	1133	5.0	1915	-0.2
27	0716	3.6	0701	2.7	1233	4.4	2018	0.2
28	0831	3.7	0843	2.7	1352	3.8	2121	0.5
29	0829	4.0	1026	2.4	1521	3.5	2221	0.7
30	0514	4.3	1134	1.9	1644	3.5	2308	0.9

* -- TIDE OCCURS ON NEXT DATE.

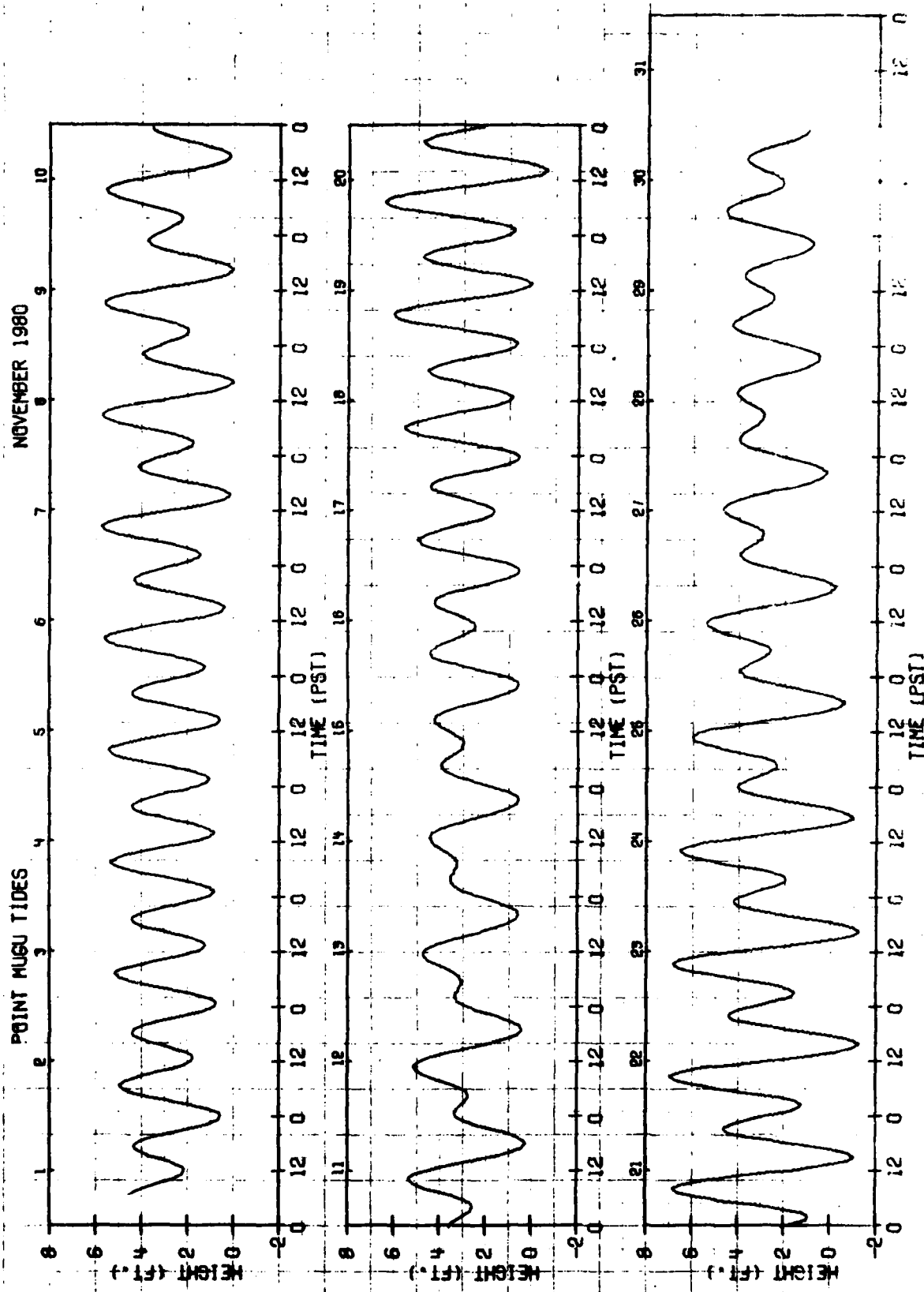


Figure 11. Tidal Graph for Point Mugu, November 1980.

TABLE 26
POINT MUGU TIDES

34 DEG 06 MIN N 119 DEG 06 MIN W - OCEAN PIER

DECEMBER 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0542	4.8	1214	1.6	1747	3.7	2341	1.2
2	0609	5.1	1252	1.1	1835	3.7	1920	3.4
3	0015	1.4	0637	5.3	1328	0.6	1959	3.4
4	0045	1.5	0700	5.5	1401	0.2	2038	3.4
5	0114	1.7	0726	5.7	1431	0.1	2115	3.6
6	0143	1.8	0751	5.9	1503	0.3	2153	3.7
7	0212	2.0	0819	5.9	1535	0.4	2234	3.6
8	0239	2.1	0848	5.9	1610	0.5	2314	3.6
9	0312	2.3	0920	5.8	1644	0.5	2341	3.6
10	0350	2.5	0955	5.6	1727	0.3	1814	0.2
11	0012	3.6	0433	2.6	1037	5.3	1904	0.1
12	0108	3.6	0538	2.7	1126	4.9	2000	0.3
13	0211	3.8	0701	2.8	1232	4.4	2101	0.6
14	0307	4.2	0846	2.5	1358	4.0	2200	0.8
15	0359	4.6	1019	2.0	1535	3.7	2256	1.0
16	0445	5.1	1128	1.2	1702	3.7	2346	1.2
17	0527	5.6	1224	0.4	1813	3.8	1914	4.0
18	0608	6.1	1312	0.4	1914	4.0	2009	4.1
19	0034	1.3	0649	6.5	1350	1.0	2101	4.2
20	0119	1.4	0731	6.4	1443	1.4	2147	4.2
21	0204	1.5	0813	6.9	1527	1.5	2235	4.1
22	0248	1.7	0855	6.7	1612	1.4	2325	4.0
23	0332	1.9	0937	6.4	1655	1.2	1824	0.3
24	0420	2.2	1019	5.9	1740	0.8	1912	0.2
25	0017	4.0	0510	2.4	1801	5.3	2002	0.7
26	0111	4.0	0612	2.5	1847	4.7	2054	1.1
27	0212	4.0	0734	2.6	1947	4.0	2150	1.4
28	0311	4.1	0812	2.5	2045	3.4	2243	1.7
29	0402	4.3	0946	2.1	2144	3.1	2324	1.9
30	0446	4.6	1150	1.6	1715	3.0		
31	0524	4.8	1236	1.1	1821	3.1		

TABLE 27

SAN NICOLAS ISLAND TIDES

33 DEG 16 MIN N 119 DEG 30 MIN W - CENTRAL PART NE COAST

DECEMBER 1940

DATE	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT	TIME PST	HGT FT
1	0544	4.5	1224	1.5	1749	3.5	2351	1.1
2	0616	4.7	1302	1.0	1842	3.5	1927	3.5
3	0025	1.3	0644	4.9	1338	0.5	2006	3.5
4	0055	1.4	0707	5.1	1411	0.2	2085	3.5
5	0124	1.5	0733	5.3	1441	0.1	2122	3.5
6	0153	1.6	0758	5.5	1513	0.3	2200	3.5
7	0222	1.8	0826	5.5	1545	0.4	2240	3.5
8	0249	1.9	0855	5.5	1620	0.5	2325	3.4
9	0322	2.1	0927	5.4	1656	0.5	1737	0.3
10	0400	2.3	1002	5.2	1737	0.3	1824	0.2
11	0019	3.4	0443	2.5	1044	4.9	1914	0.1
12	0115	3.4	0546	2.5	1133	4.6	2010	0.3
13	0214	3.5	0711	2.6	1239	4.1	2111	0.5
14	0314	3.9	0856	2.4	1405	3.7	2210	0.7
15	0404	4.3	1029	1.8	1542	3.5	2306	0.9
16	0452	4.7	1138	1.1	1709	3.5	1820	3.5
17	0534	5.2	1234	0.4	1820	3.5	1921	3.7
18	0615	5.4	1322	0.4	1921	3.7	2016	3.8
19	0044	1.2	0656	6.0	1409	0.9	2108	3.9
20	0124	1.3	0738	6.3	1453	1.3	2154	3.9
21	0214	1.5	0820	6.4	1537	1.4	2242	3.8
22	0254	1.5	0902	6.2	1622	1.3	2332	3.7
23	0342	1.7	0944	5.9	1705	1.1	1834	0.3
24	0430	2.0	1026	5.5	1750	0.7	1922	0.2
25	0024	3.7	0520	2.2	1108	4.9	2012	0.6
26	0114	3.7	0622	2.4	1154	4.4	2104	1.0
27	0214	3.7	0744	2.5	1254	3.7	2200	1.3
28	0314	3.8	0822	2.4	1412	3.2	2253	1.5
29	0409	4.0	0956	1.9	1541	2.9	2338	1.7
30	0453	4.3	1056	1.5	1722	2.4		
31	0531	4.5	1244	1.0	1828	2.9		

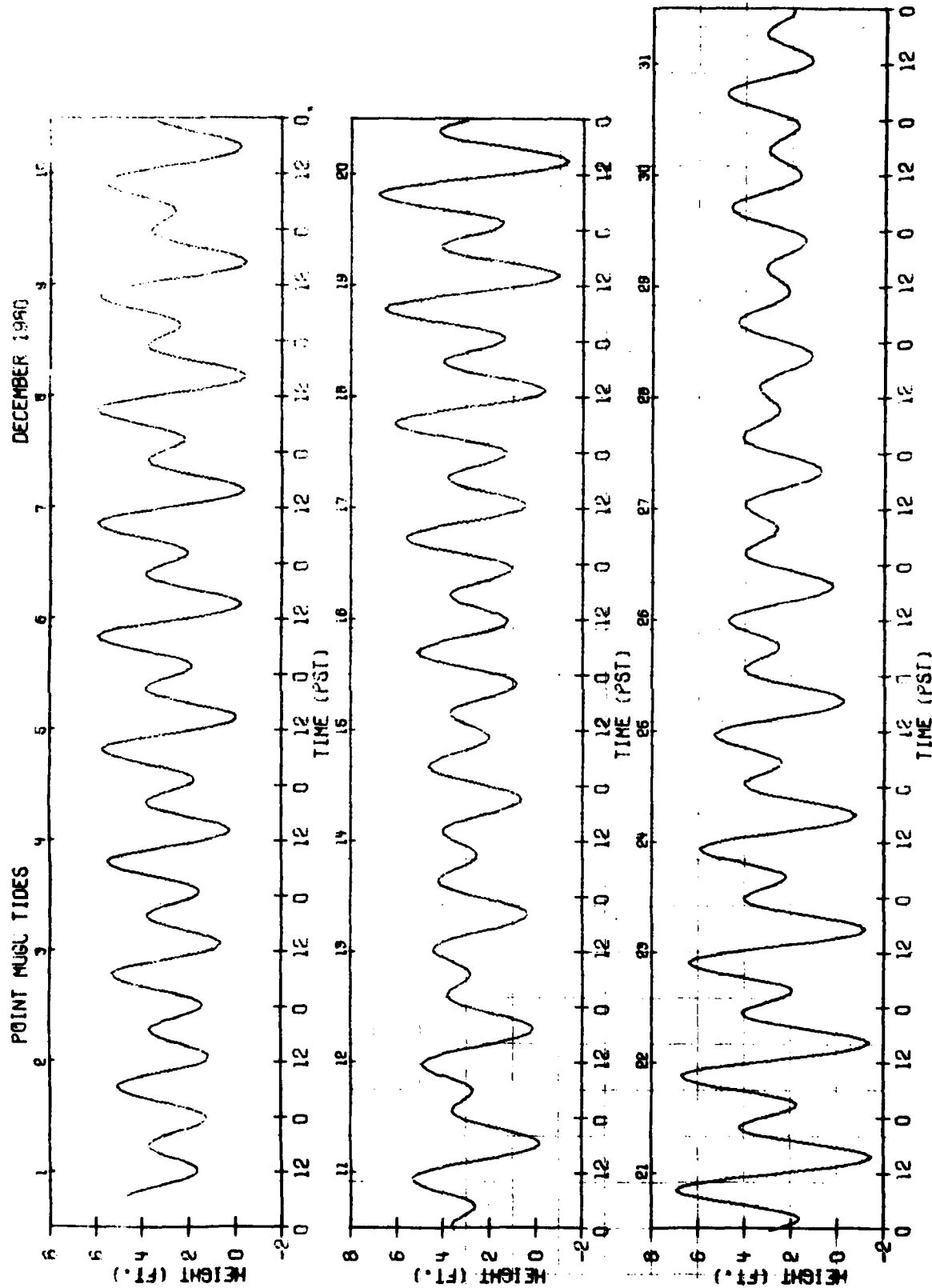


Figure 12. Tidal Graph for Point Mugu, December 1980.

Table 28. Moonrise and Moonset, Barking Sands, Hawaii, 1980

Date	January		February		March		April		May		June		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	1758	0638	1920	0742	1855	0700	2008	0724	2038	0720	2208	0832	1
2	1851	0730	2011	0822	1944	0736	2058	0801	2131	0804	2259	0929	2
3	1944	0819	2100	0900	2033	0812	2149	0840	2225	0851	2347	1027	3
4	2037	0904	2149	0936	2122	0847	2242	0921	2318	0942	2427	1127	4
5	2128	0946	2237	1012	2211	0923	2335	1006	2406	1037	2503	1226	5
6	2217	1025	2326	1047	2302	1001	2424	1054	2450	1134	2559	1326	6
7	2306	1102	2414	1124	2353	1040	2508	1146	2530	1232	2645	1426	7
8	2355	1137	2501	1202	2441	1123	2622	1242	2648	1332	2745	1527	8
9	2444	1213	2551	1244	2530	1209	2707	1341	2730	1433	2830	1628	9
10	0044	1249	0201	1329	0141	1300	0304	1442	0320	1535	0417	1730	10
11	0134	1327	0257	1419	0236	1355	0353	1545	0405	1637	0506	1832	11
12	0226	1407	0353	1513	0330	1454	0441	1648	0450	1740	0559	1932	12
13	0320	1452	0450	1612	0424	1557	0528	1752	0538	1844	0653	2029	13
14	0415	1540	0546	1715	0516	1701	0615	1857	0627	1947	0749	2121	14
15	0513	1634	0640	1820	0606	1806	0702	2001	0719	2048	0844	2210	15
16	0611	1732	0731	1925	0654	1911	0751	2104	0812	2147	0939	2254	16
17	0708	1833	0820	2029	0741	2015	0841	2206	0907	2241	1032	2334	17
18	0803	1937	0907	2132	0828	2119	0933	2305	1003	2331	1123	2427	18
19	0855	2040	0953	2234	0916	2221	1027	2397	1057	2407	1213	2521	19
20	0943	2143	1038	2335	1004	2322	1120	2480	1150	2457	1302	2628	20
21	1030	2245	1124	2437	1054	2414	1214	2531	1241	2508	1350	2730	21
22	1114	2345	1211	0034	1144	0020	1306	2638	1331	0137	1440	0158	22
23	1158	2444	1300	0132	1236	0116	1357	2722	1420	0213	1530	0235	23
24	1242	0044	1350	0228	1328	0207	1447	2800	1509	0249	1622	0313	24
25	1327	0143	1441	0321	1420	0256	1537	2858	1558	0324	1716	0355	25
26	1413	0240	1532	0410	1511	0340	1625	2944	1648	0400	1811	0440	26
27	1502	0337	1624	0457	1602	0421	1714	3029	1739	0437	1906	0530	27
28	1553	0431	1715	0541	1652	0500	1803	3114	1832	0517	2001	0623	28
29	1644	0524	1806	0621	1741	0537	1854	3200	1926	0600	2054	0720	29
30	1737	0613	1857	0709	1829	0613	1945	3247	2020	0647	2145	0820	30
31	1829	0659	1948	0747	1918	0648	2034	3294	2115	0738	2236	0919	31

Date	July		August		September		October		November		December		Date
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
1	2233	0920	2328	1114	2414	1308	0015	1350	0143	1445	0208	1433	1
2	2318	1021	2414	1215	2500	1406	0109	1439	0234	1522	0257	1508	2
3	2403	1121	2501	1315	2546	1501	0203	1524	0324	1557	0345	1543	3
4	0002	1221	0058	1414	0220	1552	0256	1605	0413	1632	0435	1620	4
5	0045	1320	0147	1513	0313	1640	0347	1644	0501	1707	0525	1659	5
6	0128	1420	0237	1610	0407	1724	0438	1720	0550	1743	0617	1741	6
7	0213	1520	0330	1704	0500	1805	0527	1756	0640	1821	0709	1827	7
8	0300	1620	0424	1755	0551	1843	0616	1831	0730	1901	0802	1916	8
9	0350	1720	0519	1842	0641	1920	0705	1906	0822	1944	0855	2009	9
10	0442	1817	0612	1926	0731	1955	0754	1943	0914	2030	0946	2104	10
11	0537	1911	0705	2006	0820	2030	0843	2021	1006	2120	1035	2201	11
12	0632	2001	0757	2044	0908	2106	0934	2102	1057	2213	1121	2258	12
13	0727	2048	0847	2120	0957	2143	1025	2145	1147	2308	1206	2356	13
14	0821	2130	0936	2155	1047	2222	1117	2233	1236	2397	1249	2447	14
15	0914	2209	1025	2231	1138	2304	1209	2324	1322	2485	1331	2539	15
16	1004	2246	1114	2307	1230	2350	1301	2400	1407	2550	1414	2637	16
17	1054	2322	1203	2345	1323	2443	1351	2450	1451	2630	1459	2717	17
18	1143	2357	1254	2420	1416	2509	1440	2516	1535	2705	1546	2803	18
19	1232	2444	1346	2505	1509	2557	1527	2526	1621	2754	1637	2851	19
20	1321	0032	1440	0110	1601	0231	1614	0317	1708	0511	1731	0605	20
21	1412	0109	1534	0158	1651	0332	1700	0420	1759	0616	1828	0708	21
22	1504	0149	1629	0252	1739	0435	1746	0524	1852	0722	1927	0807	22
23	1558	0232	1723	0349	1827	0538	1834	0629	1949	0826	2025	0902	23
24	1653	0319	1815	0450	1913	0643	1924	0735	2046	0927	2122	0952	24
25	1749	0411	1905	0552	2000	0747	2015	0840	2144	1024	2217	1037	25
26	1844	0507	1952	0656	2048	0852	2110	0944	2241	1115	2310	1118	26
27	1937	0606	2038	0800	2137	0956	2205	1045	2336	1201	2400	1216	27
28	2027	0708	2124	0903	2228	1058	2301	1142	2424	1243	2500	1322	28
29	2114	0810	2209	1005	2321	1159	2357	1235	2508	1322	2605	1407	29
30	2200	0912	2256	1107	2414	1256	2444	1322	2559	1419	2700	1514	30
31	2244	1014	2344	1208	2500	1356	2501	1405	2644	1500	2747	1618	31

TABLE 29

PORT ALLEN TIDES

JANUARY 1980

21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPPEE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0311	2.1	1037	0.2	1454	0.6	2034	-0.2
2	0344	2.1	1113	0.1	1535	0.6	2110	-0.1
3	0422	2.0	1151	0.1	1617	0.6	2143	0.0
4	0455	1.9	1226	0.1	1700	0.6	2220	0.1
5	0527	1.8	1302	0.2	1750	0.6	2254	0.2
6	0603	1.7	1337	0.2	1846	0.6	----	----
7	2341	0.4*	0635	1.6	1413	0.1	1955	0.7
8	0035	0.5	0714	1.4	1451	0.1	2113	0.8
9	0156	0.6	0755	1.2	1532	0.1	2227	1.0
10	0348	0.7	0847	1.0	1613	0.1	----	----
11	2325	1.2*	0543	0.6	0949	0.9	1655	0.0
12	0010	1.5	0707	0.6	1058	0.8	1734	0.0
13	0053	1.7	0806	0.5	1202	0.7	1816	-0.1
14	0132	1.8	0851	0.3	1300	0.6	1858	-0.2
15	0211	2.0	0930	0.2	1351	0.6	1938	-0.2
16	0249	2.1	1010	0.1	1437	0.6	2019	-0.3
17	0328	2.2	1047	0.0	1524	0.7	2104	-0.3
18	0405	2.2	1125	0.0	1610	0.7	2147	-0.2
19	0447	2.1	1204	-0.1	1703	0.7	2235	-0.1
20	0527	1.9	1243	-0.1	1802	0.8	2329	0.1
21	0609	1.7	1325	-0.1	1911	0.9	----	----
22	0033	0.3	0652	1.6	1410	-0.1	2027	1.0
23	0156	0.5	0741	1.3	1456	-0.1	2149	1.2
24	0345	0.6	0837	1.0	1546	-0.1	2301	1.4
25	0547	0.6	0949	0.8	1638	-0.1	----	----
26	0003	1.6	0717	0.5	1109	0.7	1730	-0.1
27	0053	1.7	0825	0.4	1221	0.6	1820	-0.1
28	0139	1.9	0905	0.2	1319	0.6	1905	-0.1
29	0220	1.9	0943	0.2	1406	0.6	1945	-0.1
30	0255	2.0	1015	0.1	1447	0.6	2025	-0.1
31	0328	1.9	1044	0.1	1525	0.7	2101	-0.1

* -- TIDE OCCURS ON PREVIOUS DATE.

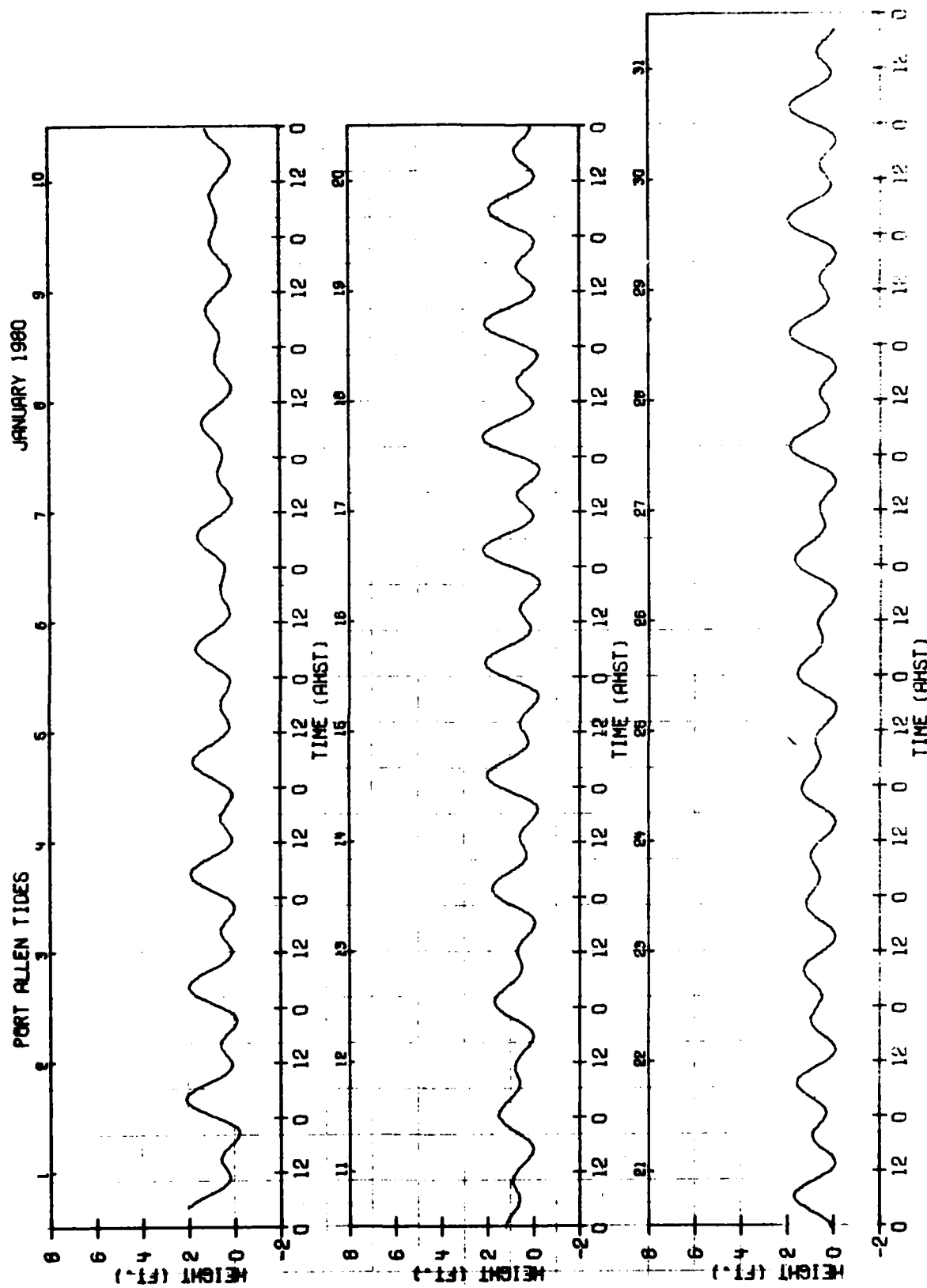


Figure 13. Tidal Graph for Port Allen, January 1980.

TABLE 30

PORT ALLEN TIDES

FEBRUARY 1980

21 DEG 54 MIN N - 159 DEG 35 MIN W - MANAPPE RAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0357	1.9	1109	0.1	1601	0.7	2136	0.0
2	0429	1.8	1138	0.1	1639	0.8	2211	0.1
3	0455	1.7	1206	0.1	1718	0.8	2250	0.2
4	0526	1.6	1235	0.1	1803	0.9	2332	0.3
5	0555	1.5	1302	0.1	1856	0.9	----	----
6	0024	0.5	0627	1.3	1335	0.1	2001	1.0
7	0133	0.6	0702	1.1	1412	0.1	2110	1.1
8	0319	0.6	0751	0.9	1458	0.1	2225	1.3
9	0522	0.6	0857	0.7	1552	0.1	----	----
10	2325	1.5*	0655	0.5	1026	0.6	1648	0.0
11	0018	1.7	0750	0.4	1149	0.6	1744	-0.1
12	0104	1.8	0829	0.2	1249	0.6	1836	-0.1
13	0145	1.9	0904	0.1	1340	0.7	1925	-0.2
14	0227	2.0	0936	0.0	1427	0.8	2014	-0.3
15	0305	2.1	1012	-0.1	1513	0.9	2102	-0.2
16	0345	2.0	1047	-0.1	1602	1.0	2151	-0.2
17	0424	1.9	1121	-0.1	1651	1.1	2243	-0.1
18	0503	1.7	1155	-0.1	1745	1.2	----	----
19	2337	0.1*	0541	1.6	1233	-0.1	1842	1.2
20	0043	0.3	0624	1.3	1315	-0.1	1951	1.3
21	0205	0.5	0712	1.0	1401	0.0	2104	1.4
22	0353	0.6	0811	0.8	1453	0.0	2223	1.5
23	0556	0.5	0937	0.6	1556	0.0	----	----
24	2331	1.6*	0712	0.4	1112	0.6	1701	0.0
25	0028	1.7	0804	0.3	1226	0.6	1800	0.0
26	0116	1.7	0839	0.2	1317	0.6	1853	0.0
27	0156	1.7	0908	0.1	1359	0.7	1938	0.0
28	0231	1.7	0936	0.1	1436	0.8	2020	0.0
29	0303	1.7	0959	0.1	1510	0.9	2056	0.0

* -- TIDE OCCURS ON PREVIOUS DATE.

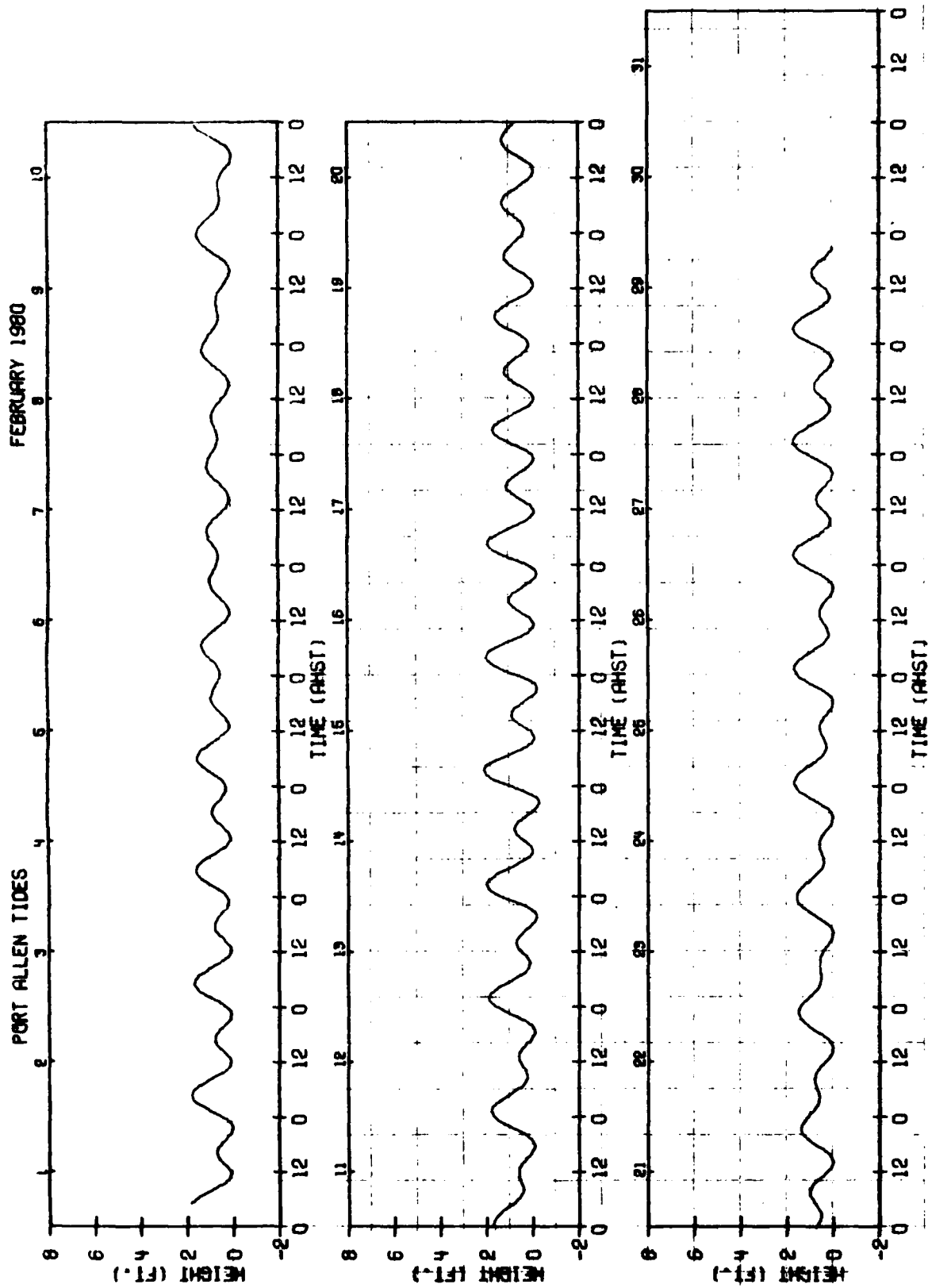


Figure 14. Tidal Graph for Port Allen, February 1980.

TABLE 31

PORT ALLEN TIDES

MARCH 1980

21 DEG 54 MIN N, 159 DEG 35 MIN W - MANAPPEE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0324	1.7	1022	0.1	1542	1.0	2134	0.0
2	0357	1.6	1045	0.1	1616	1.0	2210	0.1
3	0423	1.5	1107	0.1	1652	1.1	2249	0.2
4	0451	1.4	1132	0.1	1728	1.2	2332	0.3
5	0519	1.2	1157	0.1	1812	1.2	----	----
6	0024	0.4	0551	1.0	1227	0.1	1905	1.2
7	0132	0.5	0624	0.9	1301	0.1	2008	1.3
8	0306	0.6	0712	0.7	1347	0.1	2120	1.4
9	0501	0.5	0834	0.6	1450	0.2	2233	1.5
10	0622	0.4	1021	0.6	1605	0.1	----	----
11	2334	1.7*	0711	0.3	1144	0.6	1718	0.1
12	0028	1.7	0750	0.1	1242	0.7	1820	0.0
13	0116	1.8	0822	0.0	1334	0.8	1919	-0.1
14	0154	1.8	0856	-0.1	1417	1.0	2011	-0.2
15	0238	1.8	0929	-0.2	1504	1.2	2104	-0.2
16	0318	1.7	1001	-0.2	1546	1.3	2156	-0.1
17	0359	1.6	1033	-0.2	1635	1.5	2249	0.0
18	0438	1.4	1108	-0.2	1721	1.5	----	----
19	2348	0.1*	0519	1.2	1141	-0.1	1816	1.6
20	0054	0.3	0601	0.9	1220	-0.1	1915	1.6
21	0218	0.4	0653	0.7	1302	0.0	2021	1.6
22	0357	0.4	0803	0.6	1357	0.1	2134	1.6
23	0534	0.3	0943	0.6	1513	0.2	2248	1.6
24	0639	0.3	1120	0.6	1630	0.2	----	----
25	2347	1.6*	0721	0.2	1223	0.6	1745	0.2
26	0039	1.6	0753	0.1	1304	0.8	1842	0.2
27	0119	1.6	0822	0.1	1347	0.9	1929	0.1
28	0153	1.6	0846	0.0	1419	1.0	2015	0.1
29	0225	1.5	0908	0.0	1451	1.2	2054	0.1
30	0256	1.4	0930	0.0	1523	1.3	2134	0.1
31	0325	1.3	0951	0.0	1555	1.3	2213	0.2

* -- TIDE OCCURS ON PREVIOUS DATE.

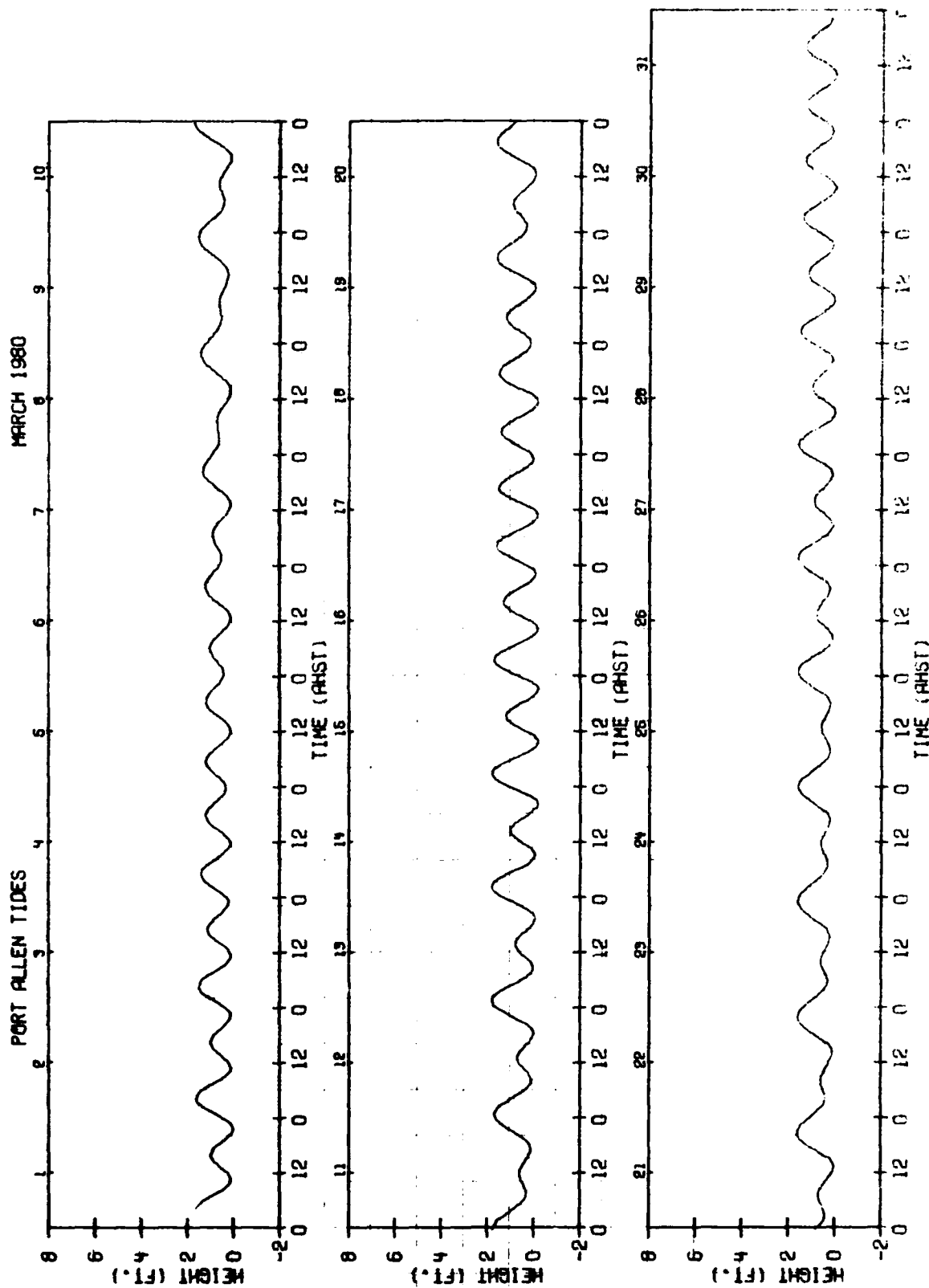


Figure 15. Tidal Graph for Port Allen, March 1980.

TABLE 32
PORT ALLEN TIDES APRIL 1980
21 DEG 54 MIN N 159 DEG 35 MIN W - HANAPEPE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0351	1.2	1011	0.0	1627	1.4	2254	0.2
2	0418	1.1	1036	0.0	1702	1.5	----	----
3	2340	0.3*	0450	0.9	1100	0.0	1741	1.5
4	0033	0.3	0522	0.8	1127	0.1	1825	1.5
5	0139	0.4	0604	0.6	1202	0.1	1922	1.5
6	0304	0.4	0707	0.6	1248	0.2	2027	1.5
7	0431	0.3	0840	0.6	1357	0.2	2140	1.6
8	0538	0.2	1027	0.6	1530	0.3	2245	1.6
9	0623	0.1	1141	0.7	1656	0.2	----	----
10	2346	1.7*	0704	0.0	1236	0.9	1812	0.2
11	0038	1.7	0736	-0.1	1321	1.1	1914	0.1
12	0124	1.6	0811	-0.2	1407	1.3	2013	0.0
13	0209	1.6	0843	-0.2	1449	1.5	2109	0.0
14	0251	1.4	0916	-0.3	1535	1.7	2204	0.0
15	0333	1.2	0948	-0.3	1617	1.7	2259	0.0
16	0415	1.0	1020	-0.2	1702	1.8	----	----
17	2358	0.1*	0457	0.8	1055	-0.2	1750	1.8
18	0107	0.2	0544	0.6	1132	-0.1	1843	1.7
19	0221	0.2	0641	0.6	1214	0.1	1941	1.7
20	0339	0.2	0803	0.5	1306	0.2	2046	1.6
21	0453	0.2	0946	0.6	1417	0.3	2152	1.5
22	0547	0.2	1112	0.6	1554	0.4	2254	1.5
23	0629	0.1	1208	0.7	1719	0.4	----	----
24	2346	1.4*	0657	0.1	1250	0.9	1826	0.4
25	0031	1.4	0726	0.0	1328	1.1	1921	0.3
26	0108	1.3	0750	0.0	1402	1.3	2009	0.3
27	0145	1.2	0814	-0.1	1432	1.4	2054	0.2
28	0217	1.1	0837	-0.1	1501	1.5	2136	0.2
29	0249	1.0	0857	-0.1	1533	1.6	2218	0.2
30	0321	0.9	0921	-0.1	1605	1.7	2303	0.2

* -- TIME OCCURS ON PREVIOUS DATE.

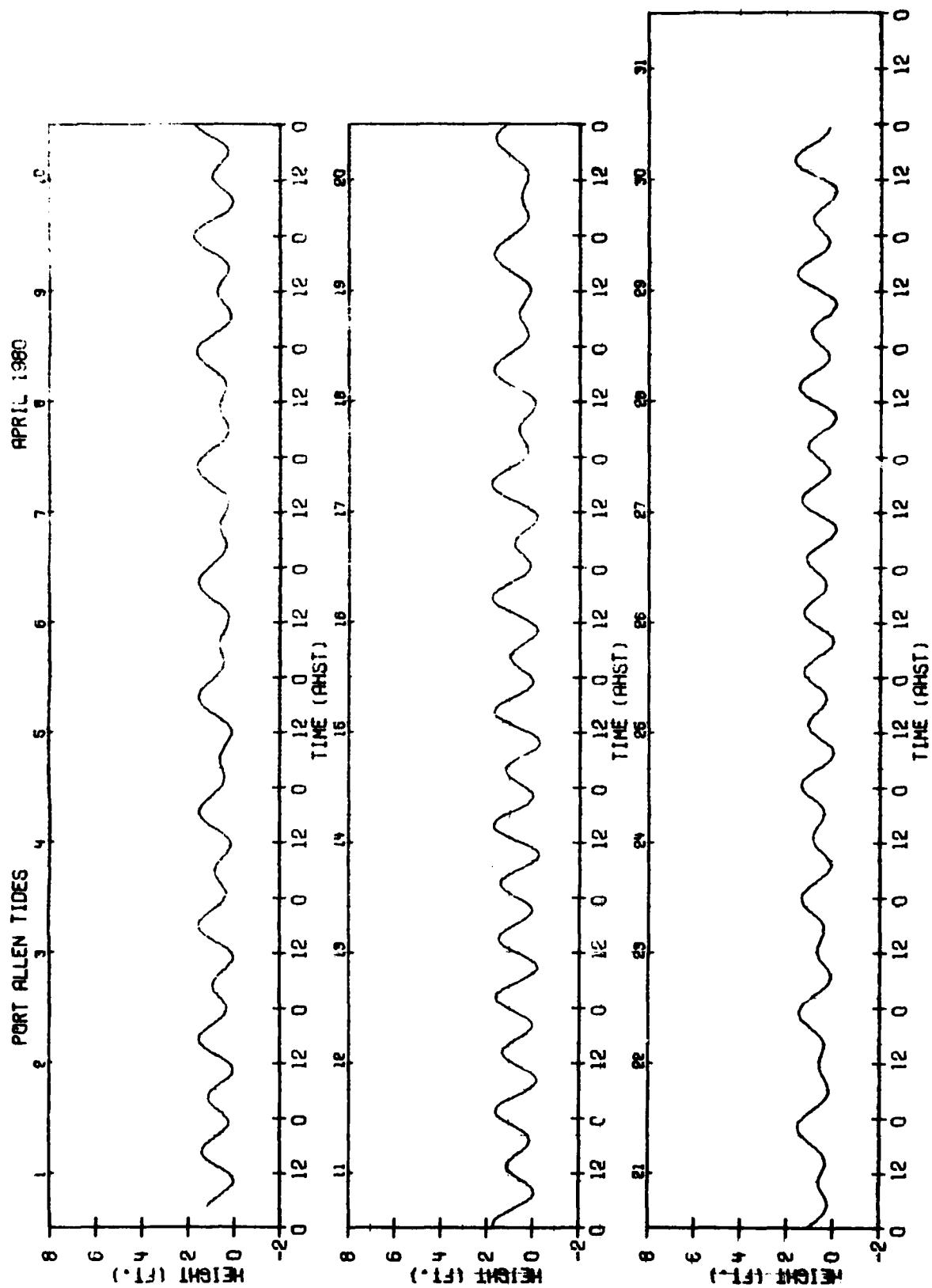


Figure 16. Tidal Graph for Port Allen, April 1980.

TABLE 33

PORT ALLEN TIDES

21 DEG 54 MIN N, 159 DEG 35 MIN W - HANAPEPE RAY

MAY 1980

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0344	0.8	0446	-0.1	1642	1.7	----	---
2	2349	0.2*	0428	0.7	1010	0.0	1719	1.7
3	0043	0.2	0510	0.6	1045	0.0	1804	1.7
4	0144	0.2	0600	0.6	1123	0.1	1853	1.7
5	0253	0.2	0715	0.5	1215	0.2	1950	1.7
6	0352	0.1	0852	0.5	1328	0.3	2055	1.6
7	0450	0.1	1022	0.6	1504	0.4	2158	1.6
8	0535	0.0	1131	0.8	1640	0.4	2300	1.5
9	0614	-0.1	1228	1.1	1806	0.3	----	---
10	2355	1.4*	0652	-0.2	1310	1.4	1916	0.3
11	0048	1.3	0726	-0.3	1355	1.6	2020	0.2
12	0137	1.2	0800	-0.3	1437	1.7	2119	0.1
13	0222	1.0	0835	-0.3	1519	1.9	2215	0.1
14	0307	0.8	0907	-0.3	1601	2.0	2310	0.1
15	0354	0.7	0941	-0.2	1646	2.0	----	---
16	0006	0.1	0438	0.6	1016	-0.2	1729	1.9
17	0104	0.1	0531	0.6	1052	0.0	1814	1.8
18	0204	0.1	0633	0.5	1133	0.1	1902	1.7
19	0306	0.1	0752	0.5	1222	0.3	1955	1.7
20	0358	0.1	0923	0.6	1335	0.4	2052	1.5
21	0444	0.1	1047	0.7	1508	0.5	2147	1.4
22	0523	0.0	1142	0.9	1645	0.6	2240	1.3
23	0556	0.0	1228	1.1	1806	0.6	----	---
24	2328	1.1*	0628	0.0	1303	1.3	1909	0.5
25	0017	1.0	0655	-0.1	1337	1.4	2006	0.4
26	0054	0.9	0721	-0.1	1410	1.6	2056	0.3
27	0138	0.8	0748	-0.1	1442	1.7	2138	0.3
28	0214	0.8	0813	-0.1	1514	1.8	2223	0.2
29	0252	0.7	0843	-0.2	1549	1.9	2308	0.2
30	0331	0.6	0912	-0.1	1624	1.9	----	---
31	2354	0.2*	0410	0.6	0944	-0.1	1703	1.9

* -- TIDE OCCURS ON PREVIOUS DATE.

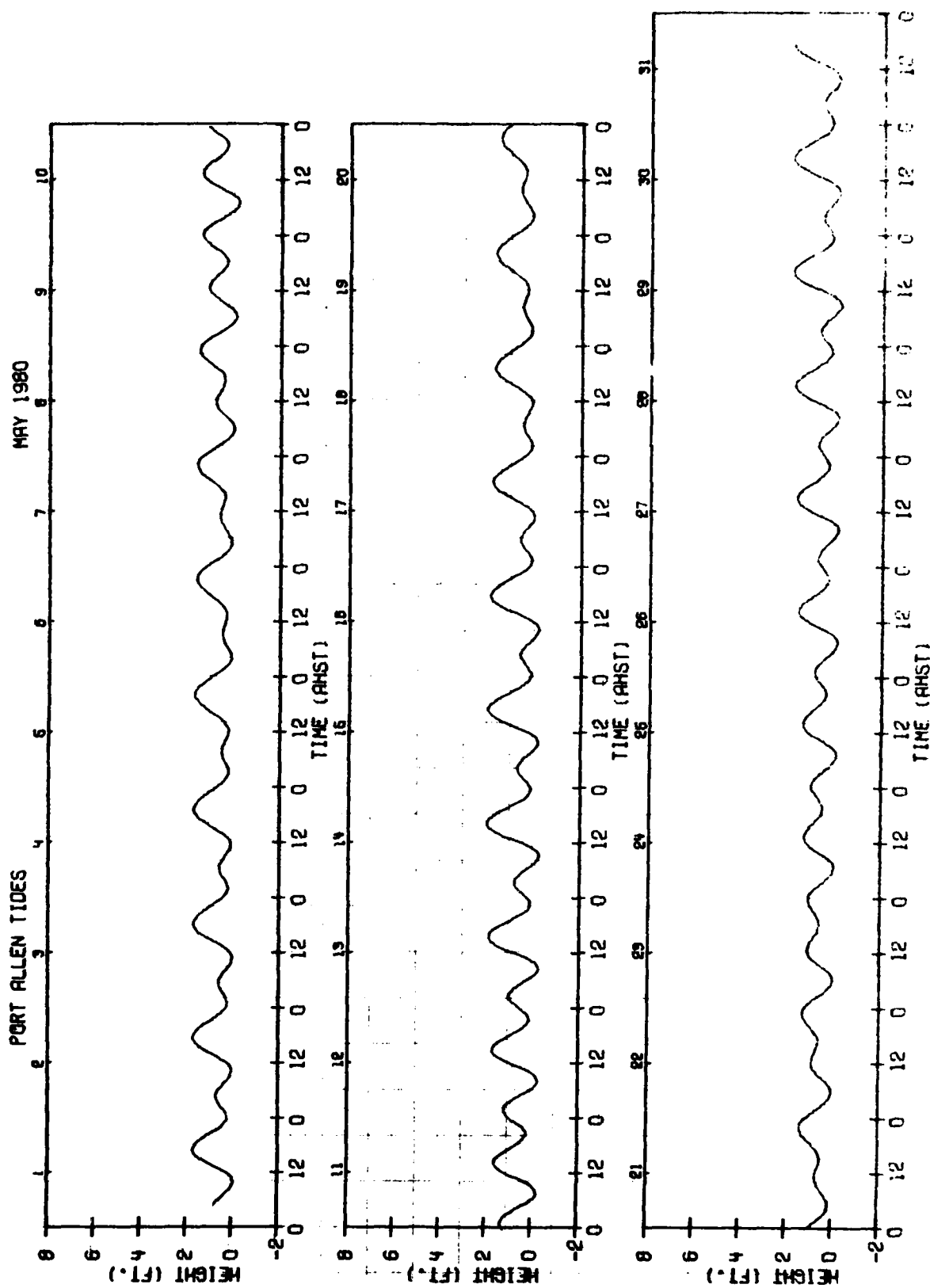


Figure 17. Tidal Graph for Port Allen, May 1980.

TABLE 34

PORT ALLEN TIDES

JUNE 1980

21 DEG 54 MIN N * 159 DEG 35 MIN W - HANAPPEE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0042	0.1	0459	0.6	1022	0.0	1745	1.9
2	0132	0.1	0601	0.5	1104	0.1	1830	1.8
3	0224	0.1	0715	0.6	1200	0.2	1920	1.7
4	0313	0.0	0841	0.6	1316	0.4	2016	1.7
5	0401	-0.1	1004	0.8	1452	0.5	2115	1.5
6	0446	-0.1	1115	1.0	1635	0.6	2217	1.3
7	0527	-0.2	1208	1.3	1810	0.5	2316	1.2
8	0607	-0.3	1258	1.6	1926	0.4	----	----
9	0015	1.0	0644	-0.3	1343	1.8	2032	0.3
10	0108	0.9	0724	-0.3	1425	2.0	2131	0.2
11	0201	0.7	0758	-0.3	1507	2.1	2223	0.1
12	0249	0.6	0836	-0.3	1546	2.1	2312	0.1
13	0337	0.6	0912	-0.2	1627	2.1	----	----
14	0001	0.1	0423	0.6	0950	-0.1	1708	2.0
15	0046	0.1	0513	0.6	1026	0.0	1745	1.9
16	0132	0.1	0611	0.6	1108	0.1	1825	1.8
17	0217	0.1	0718	0.6	1153	0.3	1907	1.7
18	0259	0.1	0835	0.6	1256	0.5	1950	1.5
19	0341	0.1	0954	0.8	1422	0.6	2039	1.3
20	0416	0.1	1059	1.0	1602	0.6	2130	1.2
21	0454	0.0	1152	1.2	1739	0.6	2222	1.0
22	0528	0.0	1234	1.4	1858	0.6	2321	0.9
23	0602	0.0	1309	1.6	1958	0.5	----	----
24	0013	0.8	0636	-0.1	1344	1.7	2054	0.4
25	0103	0.7	0708	-0.1	1420	1.8	2136	0.3
26	0148	0.6	0742	-0.2	1454	2.0	2218	0.2
27	0231	0.6	0814	-0.2	1530	2.1	2253	0.2
28	0315	0.6	0853	-0.2	1607	2.1	----	----
29	2335	0.1*	0402	0.6	0932	-0.1	1644	2.1
30	0017	0.1	0452	0.6	1014	0.0	1727	2.0

* -- TIDE OCCURS ON PREVIOUS DATE.

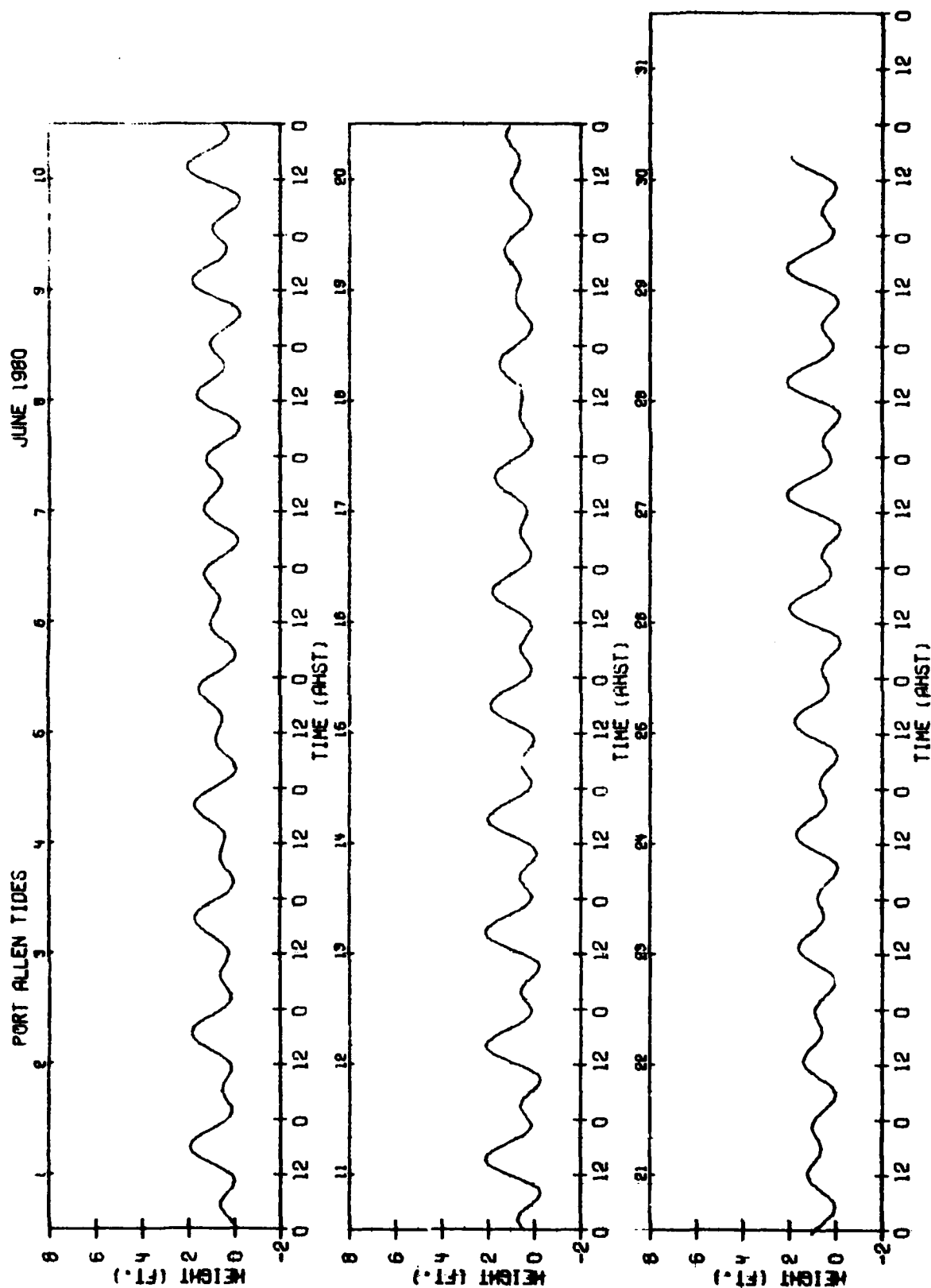


Figure 18. Tidal Graph for Port Allen, June 1980.

TABLE 35
PORT ALLEN TIDES
21 DEG 54 MIN N. 159 DEG 35 MIN W - HANAPEPE BAY JULY 1960

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0059	0.1	0552	0.6	1102	0.1	1809	1.9
2	0141	0.0	0659	0.7	1201	0.3	1852	1.7
3	0226	0.0	0816	0.8	1317	0.5	1941	1.6
4	0312	-0.1	0937	1.0	1450	0.6	2036	1.4
5	0357	-0.1	1048	1.3	1642	0.6	2136	1.1
6	0442	-0.1	1150	1.6	1822	0.6	2244	0.9
7	0529	-0.2	1242	1.7	1941	0.5	-----	---
8	2351	0.8*	0612	-0.2	1329	1.9	2044	0.4
9	0052	0.7	0654	-0.2	1412	2.1	2136	0.3
10	0148	0.6	0736	-0.2	1452	2.1	2218	0.2
11	0238	0.6	0818	-0.2	1532	2.2	2300	0.2
12	0323	0.6	0856	-0.1	1607	2.1	-----	---
13	2335	0.2*	0407	0.6	0935	0.0	1642	2.0
14	0010	0.2	0452	0.7	1011	0.1	1718	1.9
15	0045	0.2	0540	0.7	1052	0.2	1750	1.7
16	0118	0.2	0633	0.8	1138	0.4	1825	1.7
17	0152	0.2	0735	0.8	1233	0.6	1901	1.5
18	0229	0.2	0848	1.0	1344	0.6	1938	1.3
19	0308	0.2	0957	1.1	1523	0.7	2027	1.1
20	0348	0.2	1059	1.3	1718	0.7	2123	0.9
21	0430	0.1	1151	1.5	1847	0.6	2235	0.8
22	0514	0.1	1237	1.7	1953	0.6	-----	---
23	2341	0.7*	0556	0.0	1317	1.8	2035	0.5
24	0040	0.7	0635	0.0	1354	2.0	2117	0.3
25	0129	0.7	0720	-0.1	1431	2.1	2152	0.3
26	0217	0.7	0802	-0.1	1509	2.2	2227	0.2
27	0303	0.8	0844	-0.1	1548	2.2	2302	0.1
28	0351	0.8	0930	-0.1	1624	2.1	-----	---
29	2337	0.1*	0439	0.9	1015	0.0	1703	2.0
30	0017	0.1	0535	1.0	1108	0.2	1742	1.8
31	0052	0.0	0637	1.1	1210	0.4	1824	1.7

* -- TIDE OCCURS ON PREVIOUS DATE.

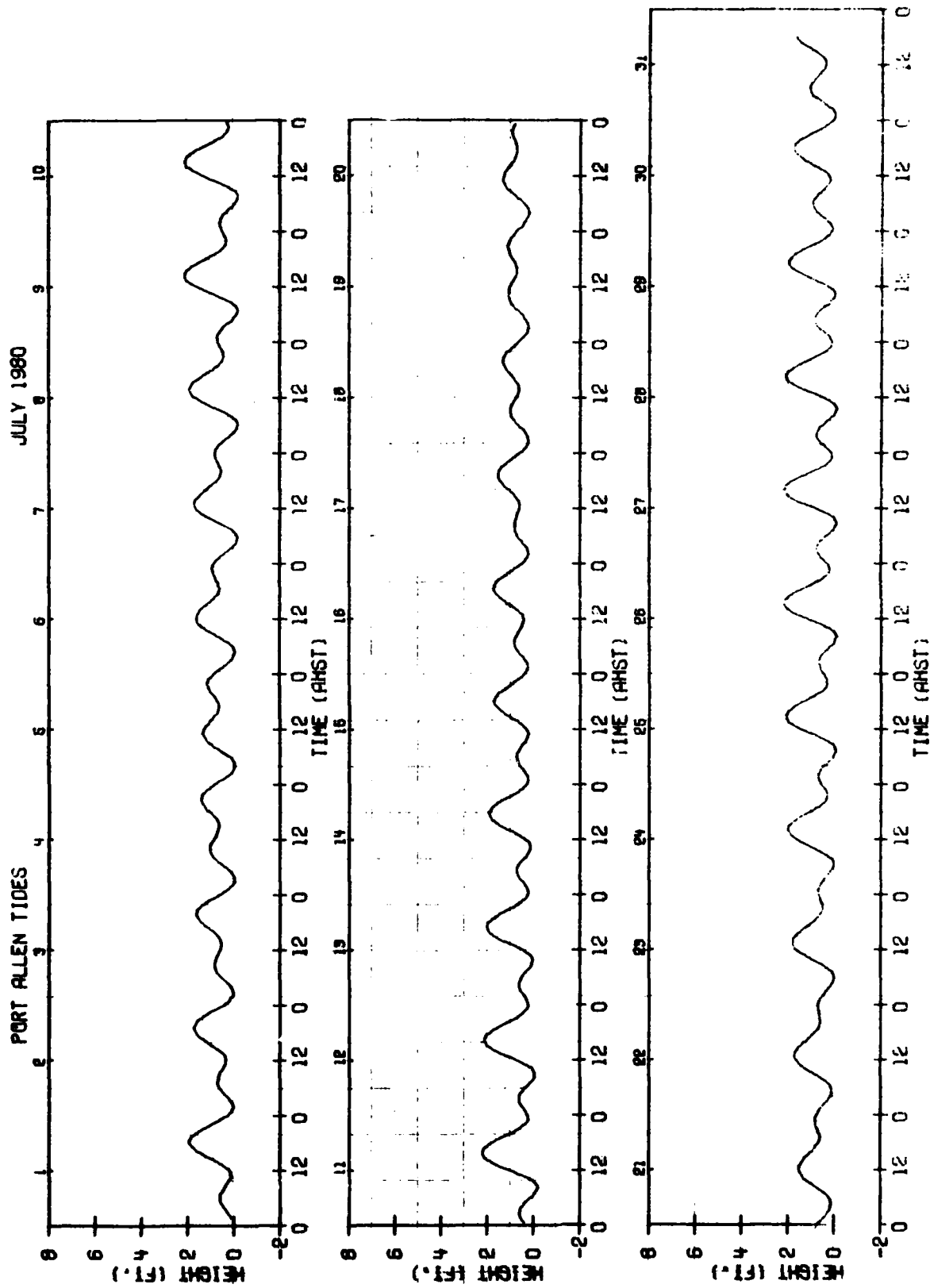


Figure 19. Tidal Graph for Port Allen, July 1980.

TABLE 36

PORT ALLEN TIDES

AUGUST 1940

21 DEG 54 MIN N - 159 DEG 35 MIN W - HANAPPEE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0134	0.0	0747	1.2	1323	0.6	1911	1.5
2	0214	0.0	0902	1.4	1501	0.6	2003	1.2
3	0309	0.0	1019	1.6	1657	0.6	2113	1.0
4	0403	0.0	1126	1.7	1839	0.6	2232	0.8
5	0457	0.0	1223	1.8	1949	0.5	----	----
6	2351	0.7*	0550	0.0	1311	2.0	2038	0.4
7	0055	0.7	0639	0.0	1355	2.1	2120	0.3
8	0145	0.7	0727	0.0	1434	2.1	2155	0.3
9	0231	0.8	0809	0.0	1509	2.1	2224	0.2
10	0310	0.9	0848	0.1	1544	2.0	2253	0.2
11	0348	0.9	0926	0.1	1613	1.9	2318	0.3
12	0426	1.0	1005	0.2	1643	1.8	----	----
13	2346	0.3*	0505	1.0	1644	0.3	1713	1.7
14	0014	0.3	0550	1.1	1729	0.5	1742	1.6
15	0042	0.3	0643	1.1	1818	0.6	1814	1.4
16	0114	0.3	0738	1.2	1925	0.7	1849	1.2
17	0152	0.3	0844	1.3	1502	0.7	1935	1.0
18	0237	0.3	1000	1.4	1659	0.7	2040	0.9
19	0329	0.3	1102	1.6	1832	0.6	2213	0.8
20	0428	0.3	1157	1.7	1926	0.6	----	----
21	2330	0.8*	0522	0.2	1242	1.9	2006	0.5
22	0031	0.8	0616	0.1	1323	2.0	2041	0.3
23	0121	0.9	0705	0.1	1402	2.1	2113	0.3
24	0207	1.0	0754	0.0	1442	2.1	2145	0.2
25	0250	1.1	0839	0.0	1522	2.1	2217	0.1
26	0335	1.2	0931	0.0	1557	2.0	2251	0.1
27	0424	1.3	1020	0.1	1637	1.8	2324	0.1
28	0516	1.4	1116	0.3	1718	1.7	----	----
29	0001	0.1	0611	1.5	1219	0.5	1800	1.5
30	0040	0.1	0714	1.6	1336	0.6	1846	1.2
31	0125	0.2	0827	1.7	1516	0.6	1948	1.0

* -- TIDE OCCURS ON PREVIOUS DATE.

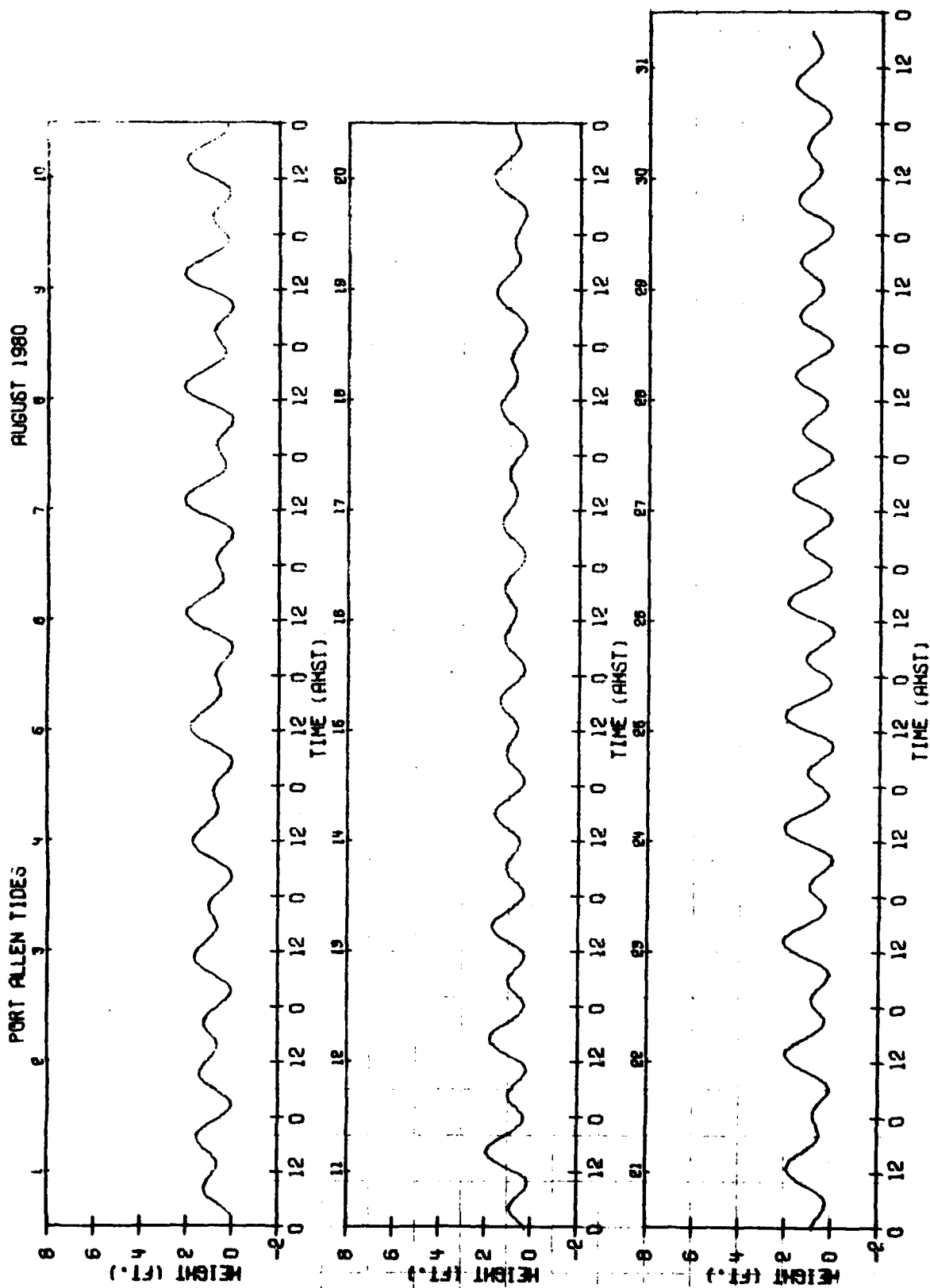


Figure 20. Tidal Graph for Port Allen, August 1980.

TABLE 37

PORT ALLEN TIDES

SEPTEMBER 1940

21 DEG 54 MIN N 159 DEG 35 MIN W - HANAPPEE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0216	0.2	0942	1.7	1709	0.6	2107	0.8
2	0322	0.3	1054	1.8	1841	0.6	2245	0.7
3	0424	0.3	1157	1.9	1930	0.4	----	----
4	0002	0.8	0537	0.3	1244	1.9	2009	0.4
5	0058	0.9	0629	0.2	1330	2.0	2041	0.3
6	0143	1.0	0722	0.2	1408	1.9	2110	0.3
7	0222	1.1	0804	0.2	1440	1.9	2135	0.3
8	0257	1.2	0846	0.2	1512	1.8	2200	0.3
9	0324	1.3	0924	0.3	1541	1.7	2222	0.3
10	0401	1.3	1003	0.3	1609	1.7	2247	0.3
11	0436	1.4	1042	0.4	1634	1.5	2308	0.3
12	0515	1.4	1126	0.5	1703	1.4	----	----
13	2336	0.3*	0553	1.5	1717	0.6	1735	1.2
14	0002	0.4	0645	1.5	1323	0.6	1813	1.0
15	0035	0.4	0744	1.5	1453	0.7	1902	0.9
16	0120	0.4	0854	1.6	1640	0.6	2021	0.8
17	0223	0.5	1006	1.7	1756	0.6	2206	0.7
18	0335	0.4	1107	1.7	1848	0.5	----	----
19	2324	0.8*	0453	0.4	1200	1.8	1923	0.4
20	0025	0.9	0600	0.3	1247	1.9	1956	0.3
21	0113	1.1	0656	0.2	1329	2.0	2027	0.2
22	0156	1.3	0750	0.2	1411	1.9	2059	0.1
23	0234	1.5	0841	0.1	1453	1.9	2131	0.0
24	0322	1.6	0934	0.2	1532	1.7	2202	0.0
25	0404	1.7	1028	0.2	1611	1.6	2235	0.0
26	0457	1.8	1126	0.3	1654	1.4	2310	0.1
27	0546	1.8	1232	0.5	1735	1.1	----	----
28	2344	0.1*	0645	1.8	1351	0.5	1830	0.9
29	0032	0.2	0748	1.8	1524	0.6	1939	0.8
30	0125	0.3	0902	1.8	1700	0.5	2124	0.7

* -- TIDE OCCURS ON PREVIOUS DATE.

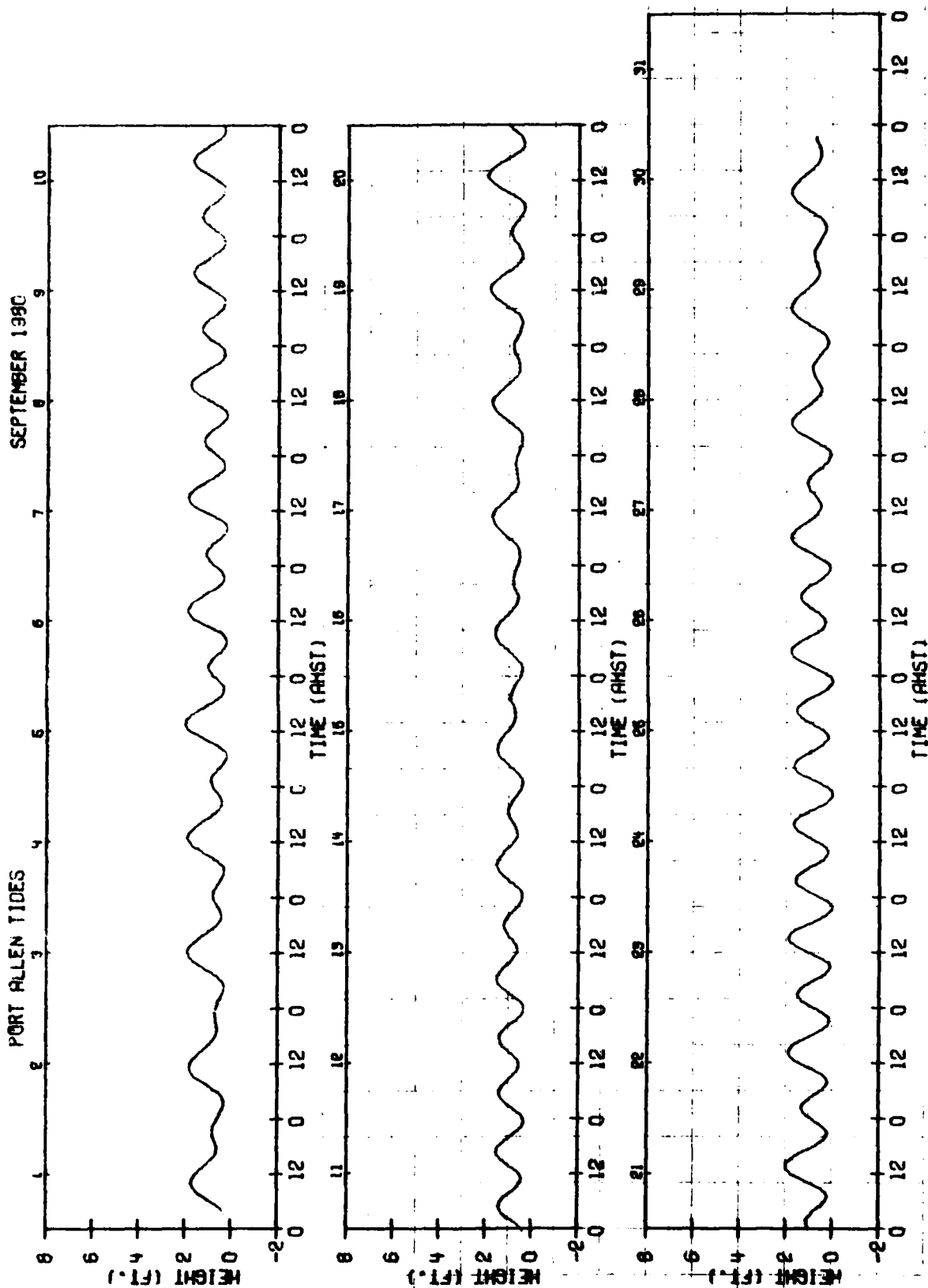


Figure 21. Tidal Graph for Port Allen, September 1980.

TABLE 38
PORT ALLEN TIDES OCTOBER 1980
21 DEG 54 MIN N 159 DEG 35 MIN W - HANAPPEE HAY

DATE	TIME AMST	HGT FT	TIME AMST	HGT FT	TIME AMST	HGT FT	TIME AMST	HGT FT
1	0237	0.4	1013	1.8	1806	0.4	2301	0.8
2	0359	0.5	1117	1.8	1855	0.4	----	---
3	0007	0.9	0522	0.5	1210	1.8	1929	0.3
4	0055	1.0	0623	0.4	1255	1.7	1956	0.3
5	0133	1.2	0716	0.4	1333	1.7	2022	0.2
6	0206	1.3	0802	0.4	1405	1.7	2046	0.2
7	0238	1.5	0844	0.4	1437	1.6	2107	0.2
8	0309	1.6	0924	0.4	1506	1.5	2128	0.2
9	0341	1.7	1004	0.4	1533	1.4	2150	0.2
10	0410	1.7	1046	0.5	1602	1.2	2212	0.2
11	0446	1.7	1129	0.5	1631	1.1	2236	0.3
12	0521	1.7	1222	0.6	1702	0.9	2303	0.3
13	0606	1.7	1328	0.6	1748	0.8	2334	0.4
14	0659	1.7	1445	0.6	1843	0.7	----	---
15	0014	0.4	0800	1.7	1608	0.5	2025	0.7
16	0120	0.5	0908	1.7	1717	0.4	2208	0.7
17	0253	0.6	1016	1.7	1759	0.3	----	---
18	2322	0.9*	0429	0.5	1114	1.7	1836	0.2
19	0015	1.1	0545	0.5	1205	1.7	1908	0.1
20	0101	1.3	0651	0.4	1253	1.7	1941	0.0
21	0143	1.6	0750	0.3	1339	1.7	2013	0.0
22	0226	1.7	0845	0.2	1422	1.6	2045	-0.1
23	0308	1.9	0942	0.2	1506	1.4	2118	-0.1
24	0353	2.0	1039	0.2	1548	1.2	2153	-0.1
25	0439	2.1	1137	0.3	1631	1.0	2229	0.0
26	0527	2.0	1244	0.3	1719	0.8	2304	0.1
27	0616	2.0	1355	0.4	1819	0.7	----	---
28	2346	0.2*	0715	1.9	1512	0.4	1941	0.6
29	0038	0.4	0816	1.8	1628	0.3	2126	0.6
30	0147	0.5	0921	1.7	1722	0.3	2259	0.8
31	0324	0.6	1027	1.7	1804	0.2	----	---

* -- TIDE OCCURS ON PREVIOUS DATE.

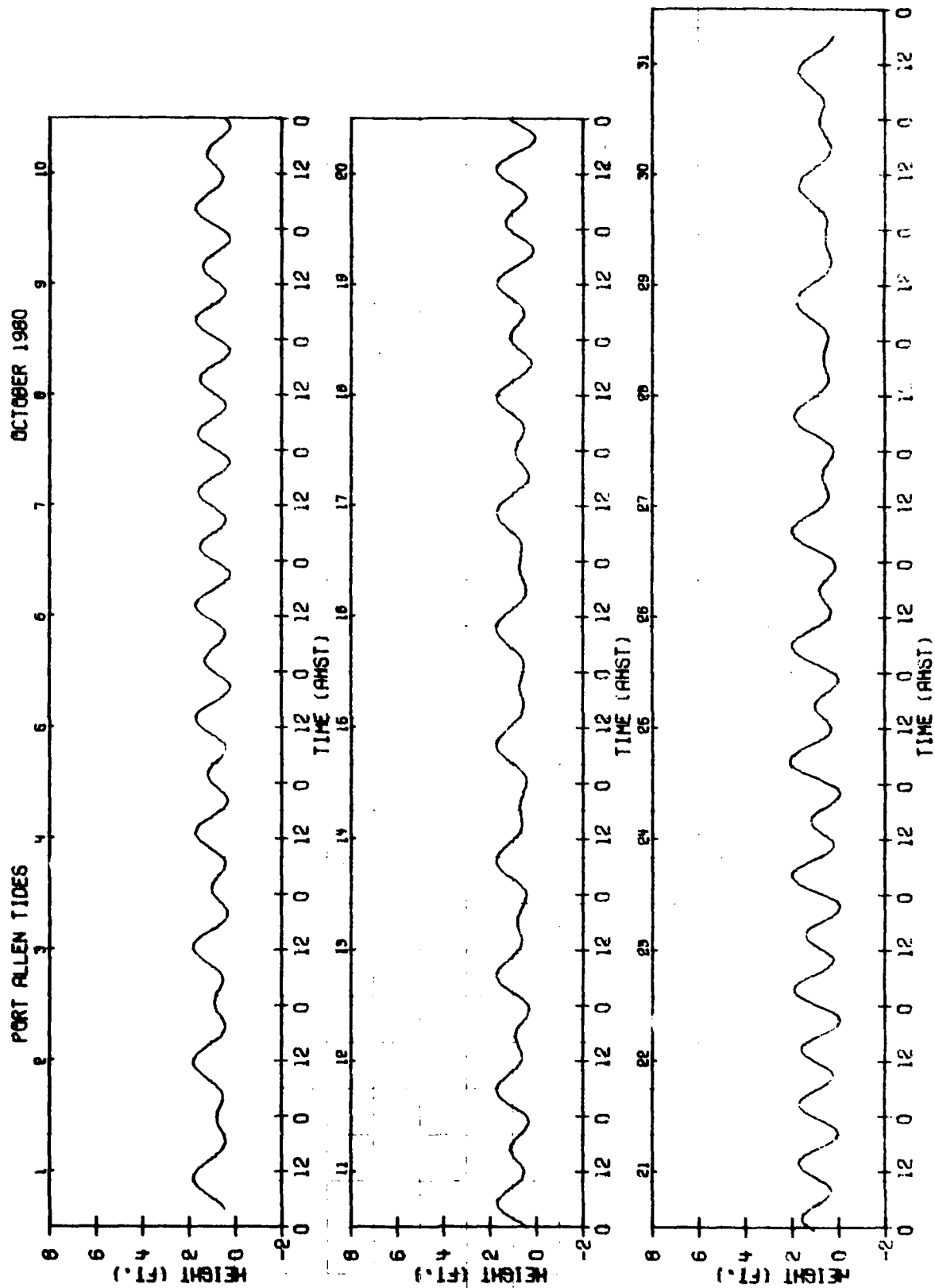


Figure 22. Tidal Graph for Port Allen, October 1980.

TABLE 39

PORT ALLEN TIDES

NOVEMBER 1940

21 DEG 54 MIN N - 154 DEG 35 MIN W - MANAPPEE BAY

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	2358	1.0*	0458	0.6	1120	1.6	1836	0.2
2	0040	1.2	0612	0.6	1208	1.5	1905	0.2
3	0119	1.3	0711	0.6	1250	1.4	1929	0.1
4	0151	1.5	0800	0.5	1325	1.3	1953	0.1
5	0222	1.7	0845	0.5	1357	1.2	2018	0.1
6	0251	1.7	0926	0.4	1429	1.1	2041	0.1
7	0320	1.8	1008	0.4	1501	1.0	2102	0.1
8	0351	1.8	1051	0.4	1533	0.9	2128	0.1
9	0423	1.9	1136	0.4	1608	0.8	2153	0.1
10	0501	1.9	1227	0.4	1647	0.7	2221	0.2
11	0541	1.9	1323	0.4	1732	0.6	2253	0.2
12	0627	1.8	1426	0.4	1843	0.6	---	---
13	2337	0.3*	0720	1.8	1528	0.3	2019	0.6
14	0044	0.5	0819	1.7	1621	0.2	2158	0.7
15	0217	0.6	0921	1.7	1706	0.1	2309	0.9
16	0407	0.6	1026	1.6	1746	0.0	---	---
17	0601	1.2	0538	0.6	1122	1.5	1823	-0.1
18	0049	1.5	0652	0.5	1215	1.4	1857	-0.1
19	0132	1.7	0756	0.4	1308	1.3	1932	-0.2
20	0214	1.9	0856	0.3	1355	1.1	2007	-0.2
21	0256	2.1	0952	0.2	1441	1.0	2043	-0.2
22	0338	2.2	1047	0.2	1526	0.8	2118	-0.2
23	0423	2.2	1143	0.2	1615	0.7	2154	-0.1
24	0505	2.2	1242	0.2	1704	0.6	2231	0.0
25	0550	2.1	1341	0.2	1806	0.6	2311	0.2
26	0638	1.9	1440	0.2	1924	0.6	---	---
27	0002	0.3	0731	1.8	1535	0.2	2057	0.6
28	0102	0.5	0824	1.7	1624	0.2	2227	0.8
29	0241	0.6	0921	1.5	1706	0.1	---	---
30	2329	1.0*	0424	0.6	1016	1.4	1741	0.1

* -- TIDE OCCURS ON PREVIOUS DATE.

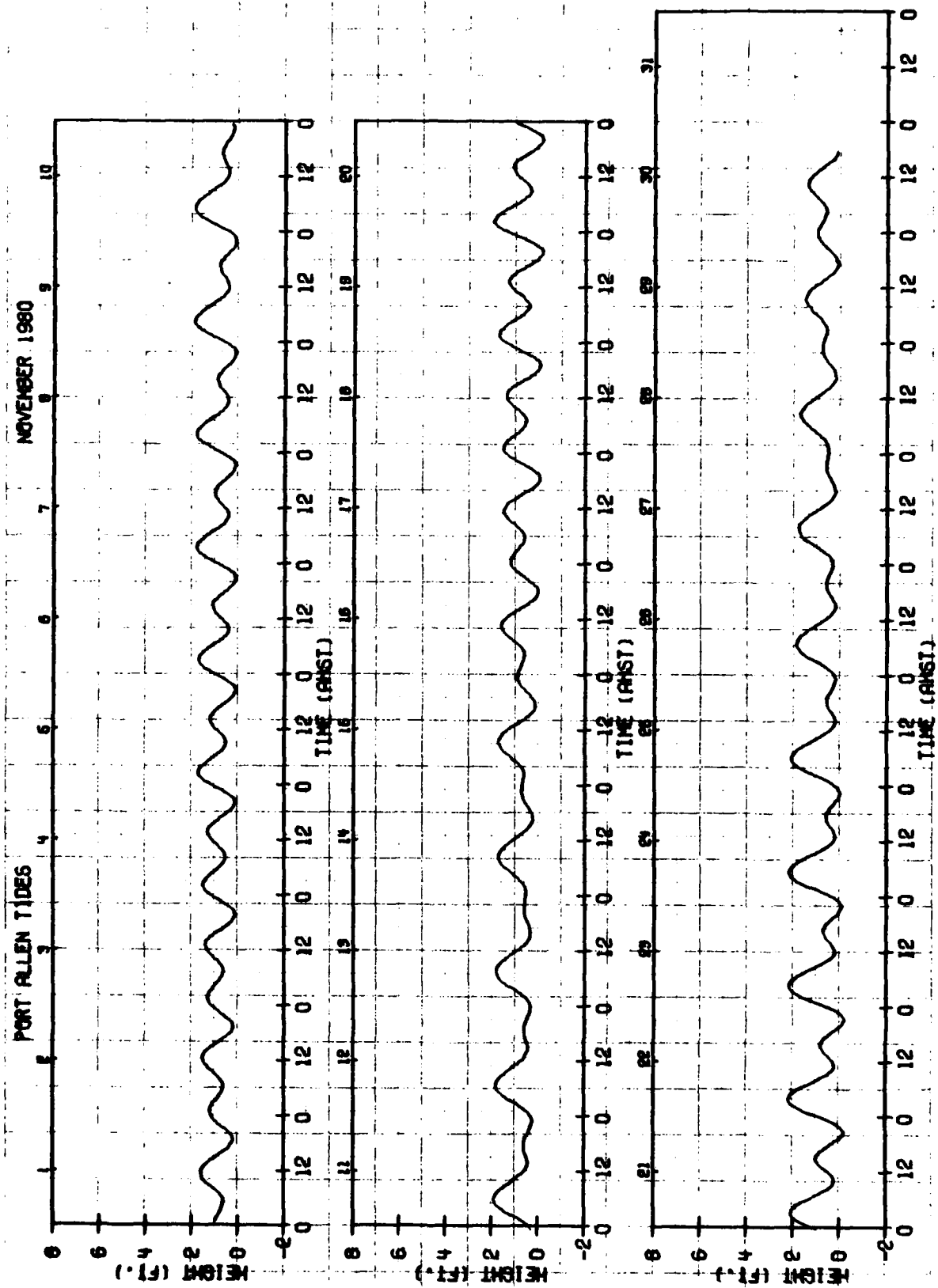


Figure 23. Tidal Graph for Port Allen, November 1980.

TABLE 40
PORT ALLEN TIDES
21 DEG 54 MIN N 159 DEG 35 MIN W - HANAPPE RAY
DECEMBER 1940

DATE	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT	TIME AHST	HGT FT
1	0018	1.2	0556	0.6	1109	1.2	1810	0.1
2	0052	1.4	0705	0.6	1157	1.1	1839	0.0
3	0127	1.6	0759	0.6	1239	1.0	1908	0.0
4	0200	1.7	0846	0.5	1321	0.9	1934	0.0
5	0232	1.8	0933	0.4	1400	0.8	2002	-0.1
6	0304	1.9	1013	0.3	1439	0.8	2027	-0.1
7	0336	2.0	1054	0.3	1514	0.7	2056	-0.1
8	0408	2.0	1136	0.3	1553	0.6	2128	0.0
9	0444	2.0	1219	0.2	1635	0.6	2200	0.0
10	0521	2.0	1302	0.2	1727	0.6	2241	0.1
11	0603	1.9	1350	0.2	1835	0.6	2330	0.3
12	0649	1.8	1439	0.1	1958	0.6	----	---
13	0032	0.4	0739	1.7	1528	0.1	2127	0.8
14	0202	0.6	0835	1.6	1613	0.0	2243	1.0
15	0355	0.6	0934	1.4	1656	-0.1	----	---
16	2342	1.3*	0538	0.6	1040	1.2	1738	-0.2
17	0034	1.6	0703	0.5	1143	1.0	1818	-0.2
18	0114	1.8	0809	0.4	1241	0.9	1857	-0.3
19	0202	2.0	0908	0.3	1337	0.8	1938	-0.3
20	0244	2.2	1000	0.2	1425	0.7	2017	-0.3
21	0326	2.3	1049	0.1	1515	0.6	2055	-0.2
22	0407	2.2	1137	0.1	1603	0.6	2134	-0.2
23	0447	2.2	1220	0.1	1651	0.6	2213	0.0
24	0526	2.0	1305	0.1	1745	0.6	2255	0.1
25	0607	1.9	1347	0.1	1849	0.6	----	---
26	2340	0.3*	0647	1.7	1431	0.1	2001	0.7
27	0032	0.5	0729	1.6	1513	0.1	2127	0.8
28	0152	0.6	0815	1.4	1553	0.1	2240	1.0
29	0339	0.7	0904	1.2	1634	0.1	----	---
30	2335	1.2*	0530	0.7	1002	1.0	1712	0.0
31	0021	1.4	0655	0.6	1101	0.9	1747	0.0

* -- TIDE OCCURS ON PREVIOUS DATE.

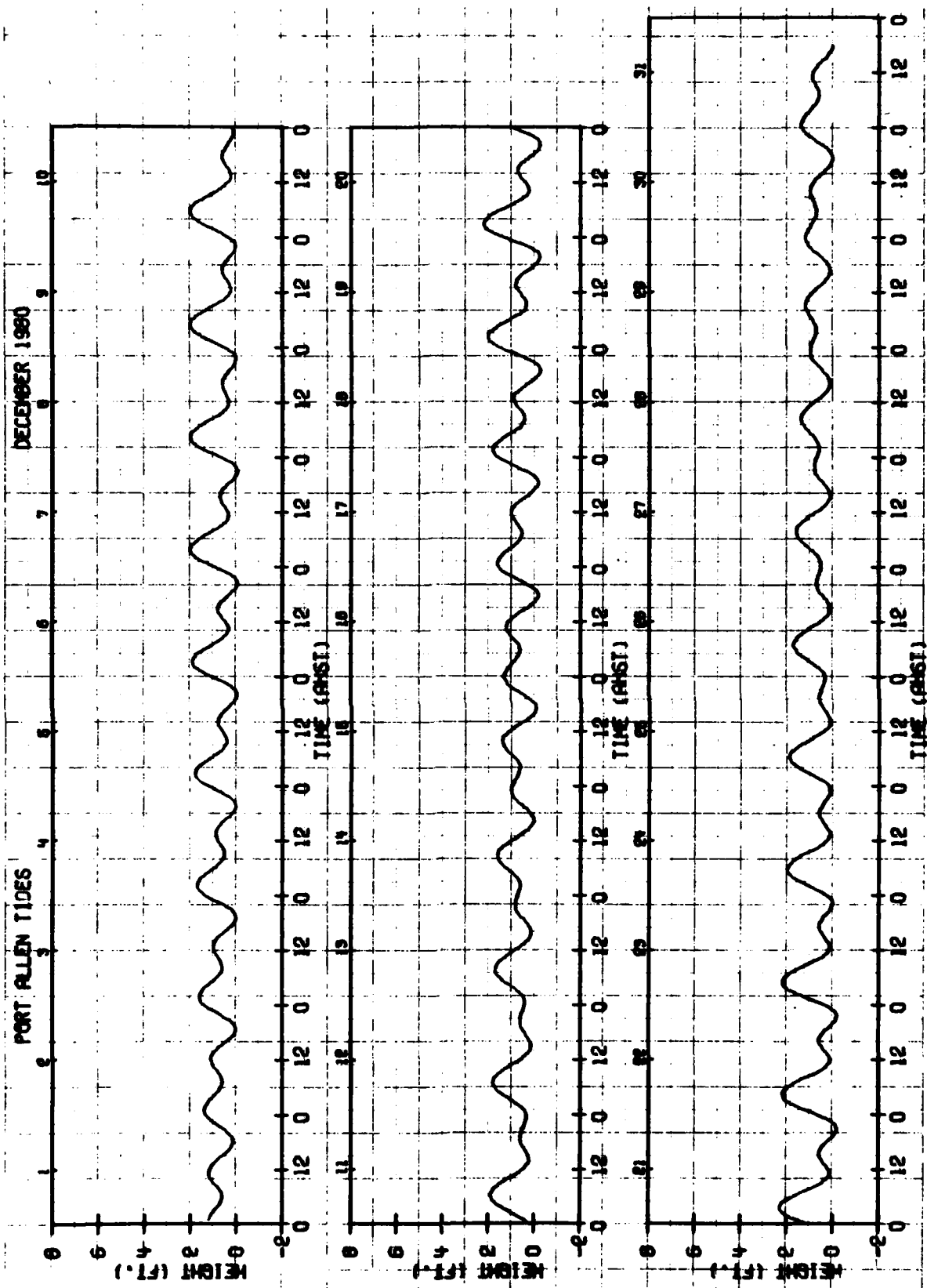


Figure 24. Tidal Graph for Port Allen, December 1980.

APPENDIX A

HEIGHT OF THE TIDE AT ANY TIME*

The height of the tide at times intermediate to the times of high and low water is needed on occasion, and may be computed by either numerical or graphical methods. One example of each method is presented here, using the predicted tides for a day at Point Mugu.

Problem: Given that the predicted times and heights of the tides are:

Time	Height	Time	Height	Time	Height	Time	Height
0039	4.9	0814	0.2	1510	3.1	1933	2.4

Find the height of the tide at 0300.

Numerical Method

The duration of fall is $08^h 14^m - 00^h 39^m = 7^h 35^m$.

The time after high water for which the height is required is $03^h 00^m - 00^h 39^m = 02^h 21^m$.

The range of tide is $4.9 - 0.2 = 4.7$ feet.

Entering table A-1 at the duration of fall of $7^h 40^m$, which is the nearest value to $7^h 35^m$, the nearest value on the horizontal line to $2^h 21^m$ is $2^h 18^m$ after high water. Following down this column to its intersection with a range of 4.5 feet which is the nearest tabular value to 4.7 feet, one obtains 0.9 which, being calculated from high water, must be subtracted from it. The approximate height at $03^h 00^m$ is, therefore, $4.9 - 0.9 = 4.0$ feet.

When the duration of rise or fall is greater than $10^h 40^m$, enter the table with one-half the given duration and with one-half the time from the nearest high or low water; but if the duration of rise or fall is less than 4 hours, enter the table with double the given duration and with double the time from the nearest high or low water.

*This information is adapted from table 3 of the data source for this publication (see page 1).

Table A-1. Height of the Tide at Any Time

		Time from the nearest high water or low water															
		A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.	A. m.
Duration of rise or fall, see footnote.	4 00	0 08	0 16	0 24	0 32	0 40	0 48	0 56	1 04	1 12	1 20	1 28	1 36	1 44	1 52	2 00	
	4 20	0 09	0 17	0 26	0 35	0 43	0 52	1 01	1 09	1 18	1 27	1 35	1 44	1 53	2 01	2 10	
	4 40	0 09	0 19	0 28	0 37	0 47	0 56	1 05	1 15	1 24	1 33	1 43	1 52	2 01	2 11	2 20	
	5 00	0 10	0 20	0 30	0 40	0 50	1 00	1 10	1 20	1 30	1 40	1 50	2 00	2 10	2 20	2 30	
	5 20	0 11	0 21	0 32	0 43	0 53	1 04	1 15	1 25	1 36	1 47	1 57	2 08	2 19	2 29	2 40	
	5 40	0 11	0 23	0 34	0 45	0 57	1 08	1 19	1 31	1 42	1 53	2 05	2 16	2 27	2 39	2 50	
	6 00	0 12	0 24	0 36	0 48	1 00	1 12	1 24	1 36	1 48	2 00	2 12	2 24	2 36	2 48	3 00	
	6 20	0 13	0 25	0 38	0 51	1 03	1 16	1 29	1 41	1 54	2 07	2 19	2 32	2 45	2 57	3 10	
	6 40	0 13	0 27	0 40	0 53	1 07	1 20	1 33	1 47	2 00	2 13	2 27	2 40	2 53	3 07	3 20	
	7 00	0 14	0 28	0 42	0 56	1 10	1 24	1 38	1 52	2 06	2 20	2 34	2 48	3 02	3 16	3 30	
	7 20	0 15	0 29	0 44	0 59	1 13	1 28	1 43	1 57	2 12	2 27	2 41	2 56	3 11	3 25	3 40	
	7 40	0 15	0 31	0 46	1 01	1 17	1 32	1 47	2 03	2 18	2 33	2 49	3 04	3 19	3 35	3 50	
	8 00	0 16	0 32	0 48	1 04	1 20	1 36	1 52	2 08	2 24	2 40	2 56	3 12	3 28	3 44	4 00	
	8 20	0 17	0 33	0 50	1 07	1 23	1 40	1 57	2 13	2 30	2 47	3 03	3 20	3 37	3 53	4 10	
	8 40	0 17	0 35	0 52	1 09	1 27	1 44	2 01	2 19	2 36	2 53	3 11	3 28	3 45	4 03	4 20	
	9 00	0 18	0 36	0 54	1 12	1 30	1 48	2 06	2 24	2 42	3 00	3 18	3 36	3 54	4 12	4 30	
	9 20	0 19	0 37	0 56	1 15	1 33	1 52	2 11	2 29	2 48	3 07	3 25	3 44	4 03	4 21	4 40	
	9 40	0 19	0 39	0 58	1 17	1 37	1 56	2 15	2 35	2 54	3 13	3 33	3 52	4 11	4 31	4 50	
	10 00	0 20	0 40	1 00	1 20	1 40	2 00	2 20	2 40	3 00	3 20	3 40	4 00	4 20	4 40	5 00	
	10 20	0 21	0 41	1 02	1 23	1 43	2 04	2 25	2 45	3 06	3 27	3 47	4 08	4 29	4 49	5 10	
	10 40	0 21	0 43	1 04	1 25	1 47	2 08	2 29	2 51	3 12	3 33	3 55	4 16	4 37	4 59	5 20	
		Correction to height															
		Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.	Ft.
Range of tide, see footnote.	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2
	1.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5
	1.5	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.8
	2.0	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.0
	2.5	0.0	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.2
	3.0	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.5	0.6	0.8	0.9	1.0	1.2	1.3	1.5	1.5
	3.5	0.0	0.0	0.1	0.2	0.2	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.4	1.6	1.8	1.8
	4.0	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.7	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.0
	4.5	0.0	0.0	0.1	0.2	0.3	0.4	0.6	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2	2.2
	5.0	0.0	0.1	0.1	0.2	0.3	0.5	0.6	0.8	1.0	1.2	1.5	1.7	2.0	2.2	2.5	2.5
	5.5	0.0	0.1	0.1	0.2	0.4	0.5	0.7	0.9	1.1	1.4	1.6	1.9	2.2	2.5	2.8	2.8
	6.0	0.0	0.1	0.1	0.3	0.4	0.6	0.8	1.0	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.0
	6.5	0.0	0.1	0.2	0.3	0.4	0.6	0.8	1.1	1.3	1.6	1.9	2.2	2.6	2.9	3.2	3.2
	7.0	0.0	0.1	0.2	0.3	0.5	0.7	0.9	1.2	1.4	1.8	2.1	2.4	2.8	3.1	3.5	3.5
	7.5	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.2	1.5	1.9	2.2	2.6	3.0	3.4	3.8	3.8
	8.0	0.0	0.1	0.2	0.3	0.5	0.8	1.0	1.3	1.6	2.0	2.4	2.8	3.2	3.6	4.0	4.0
	8.5	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4	1.8	2.1	2.5	2.9	3.4	3.8	4.2	4.2
	9.0	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.5	1.9	2.2	2.7	3.1	3.6	4.0	4.5	4.5
	9.5	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.6	2.0	2.4	2.8	3.3	3.8	4.3	4.8	4.8
	10.0	0.0	0.1	0.2	0.4	0.7	1.0	1.3	1.7	2.1	2.5	3.0	3.5	4.0	4.5	5.0	5.0
	10.5	0.0	0.1	0.3	0.5	0.7	1.0	1.3	1.7	2.2	2.6	3.1	3.6	4.2	4.7	5.2	5.2
	11.0	0.0	0.1	0.3	0.5	0.7	1.1	1.4	1.8	2.3	2.8	3.3	3.8	4.4	4.9	5.5	5.5
	11.5	0.0	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	2.9	3.4	4.0	4.6	5.1	5.8	5.8
	12.0	0.0	0.1	0.3	0.5	0.8	1.1	1.5	2.0	2.5	3.0	3.6	4.1	4.8	5.4	6.0	6.0
	12.5	0.0	0.1	0.3	0.5	0.8	1.2	1.6	2.1	2.6	3.1	3.7	4.3	5.0	5.6	6.2	6.2
	13.0	0.0	0.1	0.3	0.6	0.9	1.2	1.7	2.2	2.7	3.2	3.9	4.5	5.1	5.8	6.5	6.5
	13.5	0.0	0.1	0.3	0.6	0.9	1.3	1.7	2.2	2.8	3.4	4.0	4.7	5.3	6.0	6.8	6.8
	14.0	0.0	0.2	0.3	0.6	0.9	1.3	1.8	2.3	2.9	3.5	4.2	4.8	5.5	6.3	7.0	7.0
	14.5	0.0	0.2	0.4	0.6	1.0	1.4	1.9	2.4	3.0	3.6	4.3	5.0	5.7	6.5	7.2	7.2
	15.0	0.0	0.2	0.4	0.6	1.0	1.4	1.9	2.5	3.1	3.8	4.4	5.2	5.9	6.7	7.5	7.5
	15.5	0.0	0.2	0.4	0.7	1.0	1.5	2.0	2.6	3.2	3.9	4.6	5.4	6.1	6.9	7.8	7.8
	16.0	0.0	0.2	0.4	0.7	1.1	1.5	2.1	2.6	3.3	4.0	4.7	5.5	6.3	7.2	8.0	8.0
	16.5	0.0	0.2	0.4	0.7	1.1	1.6	2.1	2.7	3.4	4.1	4.9	5.7	6.5	7.4	8.2	8.2
	17.0	0.0	0.2	0.4	0.7	1.1	1.6	2.2	2.8	3.5	4.2	5.0	5.9	6.7	7.6	8.5	8.5
	17.5	0.0	0.2	0.4	0.8	1.2	1.7	2.2	2.9	3.6	4.4	5.2	6.0	6.9	7.8	8.8	8.8
	18.0	0.0	0.2	0.4	0.8	1.2	1.7	2.3	3.0	3.7	4.5	5.3	6.2	7.1	8.1	9.0	9.0
	18.5	0.1	0.2	0.5	0.8	1.2	1.8	2.4	3.1	3.8	4.6	5.5	6.4	7.3	8.3	9.2	9.2
	19.0	0.1	0.2	0.5	0.8	1.3	1.8	2.4	3.1	3.9	4.8	5.6	6.6	7.5	8.5	9.5	9.5
	19.5	0.1	0.2	0.5	0.8	1.3	1.9	2.5	3.2	4.0	4.9	5.8	6.7	7.7	8.7	9.8	9.8
	20.0	0.1	0.2	0.5	0.9	1.3	1.9	2.6	3.3	4.1	5.0	5.9	6.9	7.9	9.0	10.0	10.0

Obtain from the predictions the high water and low water, one of which is before and the other after the time for which the height is required. The difference between the times of occurrence of these tides is the duration of rise or fall, and the difference between their heights is the range of tide for the above table. Find the difference between the nearest high or low water and the time for which the height is required.

Enter the table with the duration of rise or fall, printed in heavy-faced type, which most nearly agrees with the actual value, and on that horizontal line find the time from the nearest high or low water which agrees most nearly with the corresponding actual difference. The correction sought is in the column directly below, on the line with the range of tide.

When the nearest tide is high water, subtract the correction.

When the nearest tide is low water, add the correction.

Graphical Method

If the height of the tide is required for a number of times on a certain day the full tide curve for the day may be obtained by the *one-quarter, one-tenth rule*. The procedure is as follows:

1. On cross-section paper plot the high and low water points in the order of their occurrence for the day, measuring time horizontally and height vertically. These are the basic points for the curve.
2. Draw light straight lines connecting the points representing successive high and low waters.
3. Divide each of these straight lines into four equal parts. The halfway point of each line gives another point for the curve.
4. At the quarter point adjacent to high water, draw a vertical line above the point, and at the quarter point adjacent to low water, draw a vertical line below the point, making the length of these lines equal to one-tenth of the range between the high and low waters used. The points marking the ends of these vertical lines give two additional intermediate points for the curve.
5. Draw a smooth curve through the points of high and low waters and the intermediate points, making the curve well rounded near high and low waters. This curve will approximate the actual tide curve and heights for any time of the day may be readily scaled from it. The resulting graph is shown in figure A-1.

CAUTION

Both methods presented are based on the assumption that the rise and fall conform to simple cosine curves. Therefore the heights obtained will be approximate. The roughness of approximation will vary as the tide curve differs from a cosine curve.

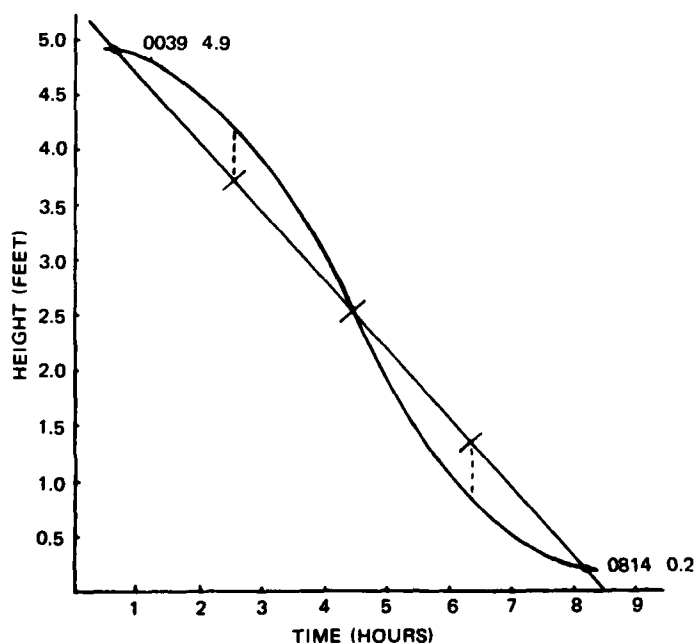


Figure A-1. Tidal Curve for Solution of the Problem.

APPENDIX B

EQUINOXES, SOLSTICES, AND LUNAR PHASES DURING 1980

The dates and times for Vernal and Autumnal Equinoxes and Summer and Winter Solstices during 1980 are listed in table B-1. The 1980 dates and times for phases of the moon are given in table B-2. Both tables have been calculated for Point Mugu and San Nicolas Island. Two hours must be subtracted for times in the Barking Sands area.

Table B-1. Equinoxes and Solstices, 1980, Point Mugu and San Nicolas Island

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for Barking Sands area.

Vernal Equinox	20 March, 0310 PST	Beginning of Spring; day and night of equal length.
Summer Solstice	20 June, 2147 PST	Beginning of Summer; greatest duration of daylight.
Autumnal Equinox	22 September, 1309 PST	Beginning of Autumn; day and night of equal length.
Winter Solstice	21 December, 0856 PST	Beginning of Winter; greatest duration of darkness.

Table B-2. Lunar Phases, 1980, Point Mugu and San Nicolas Island

NOTE: All times are Pacific Standard Time; add 1 hour when Daylight Savings Time (PDT) is in effect. Subtract 2 hours for times in the Barking Sands area.

Phase	January		February		March		April	
	Date	Time	Date	Time	Date	Time	Date	Time
Full Moon	02	0102	---	---	---	---	---	---
Last Quarter	10	0349	08	2335	09	1549	08	0406
New Moon	17	1319	16	0051	16	1056	14	1946
First Quarter	24	0558	22	1614	23	0431	21	1859
Full Moon	31	1821	29	1300	31	0714	29	2335
Phase	May		June		July		August	
	Date	Time	Date	Time	Date	Time	Date	Time
Last Quarter	07	1251	05	1853	04	2327	03	0400
New Moon	14	0400	12	1238	11	2246	10	1109
First Quarter	21	1116	20	0432	19	2151	18	1428
Full Moon	29	1328	28	0102	27	1054	25	1942
Phase	September		October		November		December	
	Date	Time	Date	Time	Date	Time	Date	Time
Last Quarter	01	1008	---	---	---	---	---	---
New Moon	09	0200	08	1850	07	1243	07	0635
First Quarter	17	0554	16	1947	15	0747	14	1747
Full Moon	24	0408	23	1252	21	2239	21	1008
Last Quarter	30	1918	30	0833	29	0159	28	2232

Because the earth's period of revolution about the sun (365.24+ days) is not evenly divisible by the moon's period of revolution about the earth (27.32+ days), the dates and times of lunar phases, moonrise and moonset, and tidal data must be recomputed for each year. The following information, however, is based on geometrical relationships and holds true for all times:

1. The New Moon rises at sunrise, crosses the meridian at noon, and sets at sunset.
2. The First Quarter Moon rises at noon, crosses the meridian at sunset, and sets at midnight.
3. The Full Moon rises at sunset, crosses the meridian at midnight, and sets at sunrise.
4. The Last Quarter Moon rises at midnight, crosses the meridian at sunrise, and sets at noon.

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