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TIDAL BENCH MARKS

STATE OF RHODE ISLAND

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By

L. A. COLE

Associate Mathematician, U. S. Coast and Geodetic Survey

Special Publication No. 128

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TIDAL BENCH MARKS, STATE OF RHODE ISLAND

By L. A. COLE, *Associate Mathematician, United States Coast and Geodetic Survey*

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INTRODUCTION

In connection with its hydrographic operations the United States Coast and Geodetic Survey has established from time to time many tidal bench marks along our coasts. Numerous requests from engineers and others for descriptions and elevations of these bench marks have led the bureau to begin publishing the data which are in manuscript form in the files, in order to be able to furnish the information more promptly and economically. In addition to the bench marks established by this survey, it is proposed to include in these publications the descriptions and elevations of any well determined bench marks which have been furnished by other organizations, such as municipal, State, and Federal engineers.

It is planned to make this information available by sections of the coast. Because of the many requests for this information for the vicinity of New York City, the first section to be published was that for the State of New York as given in Special Publication No. 83, issued in 1922. The second section covering the District of Columbia, is given in Special Publication No. 119, issued in 1925. The present publication is the third of the series and will be followed by similar publications from time to time covering other sections of the coast.

STANDARD DATUM

In all engineering work where it is necessary to determine differences in elevation by spirit levels, and especially where it is desired to coordinate the work of various surveys, it is in the interest

of efficiency and economy that a uniform datum be used. It has frequently happened that the various engineers operating in the same locality have used different arbitrary datums, which has led to much confusion. This condition can be obviated by the adoption of a single reliable datum. Datums based on tidal definition are the best for both practical and scientific work, since they may be recovered even though all bench-mark connections be destroyed.

Of all the tidal datums mean sea level is the most nearly fixed and therefore the best. It is now used by this bureau as the datum for all land surveys. By a network of first-order levels it has been carried to many parts of the interior of the country, and new lines are being added to this level net each year.

Mean sea level, as determined at the primary tide stations on the open coast, may be considered for all practical engineering and surveying purposes to be in the same equipotential surface and may be defined as the level about which the tide oscillates. As determined by this bureau, it is derived from the hourly heights of the tide as referred to the zero of a fixed tide staff which has been connected with a primary bench mark by spirit levels. Because of the disturbing influences of wind and weather an accurate determination of mean sea level must be based on observations extending over a considerable period of time. In general a series of tidal observations three years in length will, when corrected by comparison with the results from a suitably located primary station, determine mean sea level within 0.02 foot; observations covering a period of a year will determine it to 0.05 foot, and a month of observations may be considered to determine it within 0.10 foot.

DATUM PLANES USED

The elevations of the bench marks in this publication are referred to five different tidal datums. Those marks which have been connected with the first-order level net are referred to mean sea level which is the standard datum for that work. All other bench marks are referred to mean tide level. In addition to either mean sea level or mean tide level, as the case may be, the elevations are also referred to mean high water, mean low water, highest tide, and lowest tide.

Mean tide level is determined from the high and low water readings and is a datum midway between mean high water and mean low water. It should be carefully distinguished from mean sea level which is determined from the hourly heights of the tide.

For most places on the open coast mean tide level does not differ appreciably from mean sea level and for practical purposes the two planes are frequently used as if there were no difference between the two; but on inside waters, especially on the upper reaches of tidal rivers, there may be a considerable difference in the elevations of the two planes. The relation between these two planes is fairly constant and for places where the relation has been accurately determined the one datum may readily be derived from the other.

For the vicinity of Narragansett Bay, based on two years of automatic gauge readings at Providence and one year at Newport, mean tide level has been determined to be approximately 0.1 foot

above mean sea level, while at Westerly on the Pawcatuck River where the data are not yet sufficient to make a reliable determination of this relation, the two datums may be assumed to be at the same elevation.

Mean high water is the mean height of all the high waters, and mean low water the mean height of all low waters for the period of the observations. The difference in height between mean high water and mean low water corresponds to the mean range of tide. The relation of mean high water and mean low water to mean tide level at any point is equal to one-half the mean range of tide above and below that datum. The mean range of tide varies considerably from place to place depending in a large measure on the location, depth of water, and configuration of the coast line. Therefore mean high water and mean low water are not uniform datums over a large area like mean sea level and mean tide level, but vary in accordance with the differences in the range of tide over that area. Mean low water on the Atlantic coast of the United States is of importance as the hydrographic datum to which all soundings on charts and the predicted heights in tide tables are referred.

The highest and lowest tides represent the probable extreme heights for each locality and, in places where long series of observations are not available, have been estimated to the nearest half-foot based on the highest and lowest values observed in that region.

EXPLANATION OF TABLES

For convenience of reference the bench marks in this publication have been given consecutive serial numbers and arranged in a general way according to their order of occurrence along the coast from east to west.

The bench marks have been divided into two lists. The first list contains bench marks Serial Nos. 1-91 which have been established by this bureau and the United States Army Engineers in connection with hydrographic work from time to time, together with such first-order level net bench marks as appear to be located near enough to the coast to be available for hydrographic purposes. The second list contains bench marks Serial Nos. 92-124 established by the United States Army Engineers on a line running from near Hamilton, Narragansett Bay to Graves Neck, Pawtucket River.

The table of elevations at the beginning of each list gives the elevations of the bench marks above five principal tidal planes. Following the table of elevations there is given a detailed description of each bench mark in the list under the same serial number as used in the table. In addition to the serial number there is also given the number assigned to the bench mark by the organization establishing it or furnishing its description and elevation. Except in cases where the bench mark is a Coast and Geodetic Survey standard disk, the initials of the organization are given in parentheses following the number as follows:

Name	Initials
United States Coast and Geodetic Survey	(C. & G. S.)
United States Army Engineers	(U. S. E.)

ACCURACY OF THE ELEVATIONS

The accuracy of the elevations of the bench marks above the different tide planes varies in accordance with the length of the tidal series upon which they depend. The elevations of the bench marks which have been connected with the first-order level net are based on the standard datum of mean sea level as used in the adjustment of the first-order level line from Westerly to Providence. A well-determined and uniform plane of reference is thus afforded for all such bench marks. Bench marks not connected with this datum are referred to the mean-tide level as determined independently in each locality from observed high and low waters. Bench marks referred to mean-tide level in different localities have not been, in general, connected by spirit levels. Elevations referred to mean-sea level or to mean-tide level are given to hundredths of a foot.

The elevations above the planes of mean high water and mean low water are obtained from mean sea level or mean tide level through the local mean range of tide and are given to the nearest tenth of a foot.

The elevations above the planes of highest and lowest tides are based on values estimated to the nearest half foot above and below mean low water. These estimated values have been adopted after consideration of all the highest and lowest observed values for the region. The purpose of these elevations is to give engineers an approximation of the extreme stages of the water that may occur in that locality.

If accurate differences in elevation between bench marks are desired, the values for the elevations above mean sea level and mean tide level which are given to hundredths of a foot should be used. Mean sea level, being the datum of the first order level net, shows the relative elevations of all bench marks referred to it, while mean tide level, based on local tidal observations with different lengths of series at each place will give accurate relations for bench marks in the same group and only approximate relations for bench marks in different groups.

STANDARD BENCH MARK

Various kinds of bench marks have been used to indicate the point to which levels have been run. Among these are nails in piles or other structures, small crosses and squares cut in curbstones and doorsteps, bolts in ledges, bowlders, and the foundations of buildings, and sometimes just a well defined point on a fixed object has been used. Since such marks may lack permanence and are often hard to identify, this bureau has adopted a standard brass disk identification mark. The standard brass disk is $3\frac{5}{8}$ inches in diameter and has a shank or stem on the back 3 inches long for insertion in a building or other substantial support.

At present there are two types of the standard disk bench mark as shown in Figures 1 and 2. The type shown in Figure 1 was formerly used in all leveling work of the bureau but is now used chiefly by hydrographic parties running short lines of levels; while

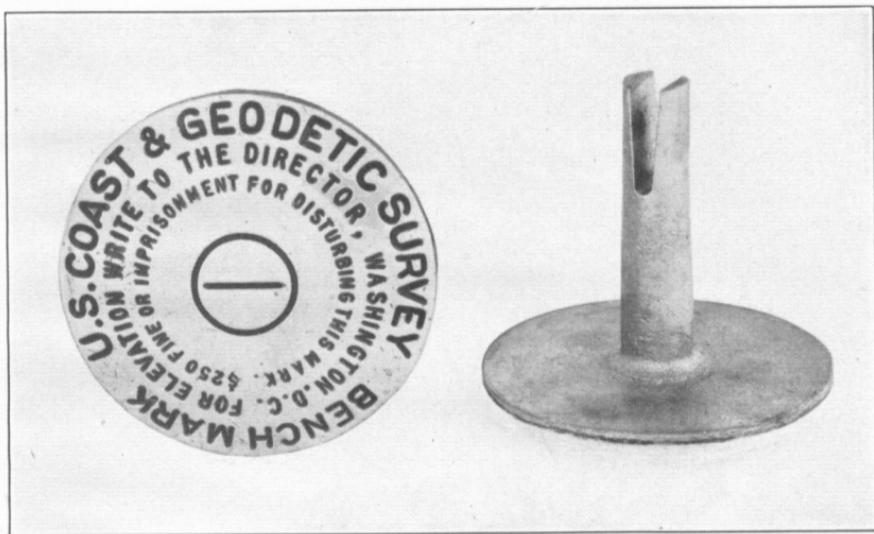


FIG. 1.—STANDARD BENCH MARK

the type shown in Figure 2, which provides a place for inserting the elevation above mean sea level, is used for lines of the first order level net of the United States. The other forms of the standard brass disk shown in Figure 2, though not intended primarily for bench marks, may be used as such when their elevations have been determined.

CHANGES IN ELEVATION

Although a bench mark may appear to be quite permanent in character and correspond with its description, the elevation may have changed materially since its determination because of settling of the immediate locality from construction work or from other causes. Engineers are therefore cautioned to make use of at least two bench marks where possible. They will confer a favor on the profession and on this bureau by reporting to the Director, United States Coast and Geodetic Survey, any changes in elevation or destruction of bench marks noted, in order that information in regard to these marks may be kept up to date and this publication revised when necessary.

ELEVATIONS OF BENCH MARKS, SERIAL NOS. 1 TO 91, STATE OF RHODE ISLAND

Serial Number	Locality	Elevation of bench marks above—					
		Highest tide	Mean high water	Mean tide level	Mean sea level	Mean low water	Lowest tide
		<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>
1	Bakonnet Harbor.....	4.2	7.4	9.04	-----	10.7	13.2
2	do.....	4.3	7.5	9.19	-----	10.8	13.3
3	do.....	3.5	6.7	8.38	-----	10.0	12.5
4	Newport Harbor.....	10.9	13.9	15.67	-----	17.4	19.9
5	do.....	2.0	5.0	6.77	-----	8.5	11.0
6	do.....	12.1	15.1	16.84	-----	18.6	21.1
7	do.....	10.7	13.7	15.40	-----	17.2	19.7
8	do.....	8.8	11.8	13.58	-----	15.3	17.8
9	do.....	4.6	7.6	9.86	-----	11.1	13.6
10	do.....	2.1	5.1	6.88	-----	8.6	11.1
11	do.....	12.3	15.3	17.01	-----	18.8	21.3
12	Coasters Harbor Island.....	2.2	5.2	6.96	-----	8.7	11.2
13	do.....	1.7	4.7	6.41	-----	8.2	10.7
14	Jamesstown, Conanicut Island.....	-4.2	-1.3	0.47	-----	2.3	4.8
15	do.....	11.6	14.5	16.32	-----	18.1	20.6
16	do.....	-3.6	-0.7	1.14	-----	2.9	5.4
17	do.....	-0.6	2.3	4.08	-----	5.9	8.4
18	do.....	1.2	4.1	5.91	-----	7.7	10.2
19	do.....	-1.9	1.0	2.83	-----	4.6	7.1
20	do.....	3.5	6.4	8.16	-----	10.0	12.5
21	Coggeshall Point, R. I.....	0.9	3.5	5.40	-----	7.4	9.9
22	Portsmouth (Bristol Ferry).....	20.8	24.3	26.33	-----	28.3	31.3
23	do.....	3.0	6.5	8.53	-----	10.5	13.5
24	do.....	6.4	9.9	11.86	-----	13.9	16.9
25	do.....	12.0	15.5	17.49	-----	19.5	22.5
26	Bristol Ferry, Bristol Neck.....	2.7	6.2	8.14	-----	10.2	13.2
27	do.....	5.6	9.1	11.08	-----	13.1	16.1
28	do.....	0.8	4.3	6.30	-----	8.3	11.3
29	do.....	5.8	9.3	11.31	-----	13.3	16.3
30	Bristol, Bristol Harbor.....	-2.7	0.7	2.68	-----	4.8	7.8
31	do.....	1.7	5.1	7.17	-----	9.2	12.2
32	do.....	5.4	8.8	10.80	-----	12.9	15.9
33	do.....	3.0	6.4	8.41	-----	10.5	13.5
34	Nayat Point.....	-3.6	-0.7	1.58	-----	3.9	6.9
35	do.....	-4.1	-1.2	1.08	-----	3.4	6.4
36	do.....	-1.7	1.2	3.50	-----	5.8	8.8
37	Riverside.....	37.7	40.6	42.90	-----	45.2	48.2
38	do.....	0.9	3.8	6.14	-----	8.4	11.4
39	Silver Spring.....	-3.0	-0.2	2.10	-----	4.5	7.5
40	do.....	4.8	7.6	9.94	-----	12.3	15.3

Elevations of bench marks, serial Nos. 1 to 91, State of Rhode Island—Continued

Serial number	Locality	Elevation of bench marks above—					
		Highest tide	Mean high water	Mean tide level	Mean sea level	Mean low water	Lowest tide
		Feet	Feet	Feet	Feet	Feet	Feet
41	East Providence	2.0	4.9	7.24	-----	9.5	12.5
42	do.	-1.5	1.4	3.71	-----	6.0	9.0
43	do.	8.1	11.0	13.29	-----	15.6	18.6
44	Pawtucket	1.4	4.3	6.62	-----	8.9	11.9
45	do.	1.3	4.2	6.49	-----	8.8	11.8
46	Pawtucket	67.9	70.8	-----	73.24	75.4	78.4
47	do.	65.5	68.4	-----	70.75	73.0	76.0
48	Providence	24.0	26.9	-----	29.28	31.5	34.5
49	do.	19.0	21.9	-----	24.34	26.5	29.5
50	do.	10.1	13.0	-----	15.45	17.6	20.6
51	do.	127.1	130.0	-----	132.44	134.6	137.6
52	do.	38.7	41.6	-----	43.99	46.2	49.2
53	do.	14.9	17.8	20.12	-----	22.4	25.4
54	Rocky Point	-4.0	-0.9	1.30	-----	3.5	6.5
55	do.	1.3	4.4	6.58	-----	8.8	11.8
56	Apponaug	19.1	21.7	-----	24.04	26.1	29.1
57	East Greenwich	0.9	3.5	5.67	-----	7.9	10.9
58	do.	2.3	4.9	-----	7.23	9.3	12.3
59	do.	22.0	24.6	-----	26.87	29.0	32.0
60	do.	25.8	28.4	-----	30.74	32.8	35.8
61	do.	27.9	30.5	-----	32.78	34.9	37.9
62	Wickford	0.5	2.9	4.92	-----	7.0	9.5
63	do.	1.0	3.4	5.49	-----	7.5	10.0
64	do.	-1.7	0.7	2.77	-----	4.8	7.3
65	Plum Beach	3.7	6.6	8.40	-----	10.2	12.7
66	Point Judith	3.5	5.9	7.45	-----	9.0	11.5
67	do.	-0.9	1.9	3.03	-----	4.6	7.1
68	do.	6.1	8.5	10.04	-----	11.6	14.1
69	do.	10.7	13.1	14.08	-----	16.2	18.7
70	do.	15.5	17.9	19.42	-----	21.0	23.5
71	do.	21.7	24.1	25.62	-----	27.2	29.7
72	do.	4.7	7.1	8.67	-----	10.2	12.7
73	do.	8.1	10.5	12.05	-----	13.6	16.1
74	do.	5.0	7.7	9.27	-----	10.8	13.3
75	do.	6.0	8.4	9.85	-----	11.5	14.0
76	do.	6.3	8.7	10.21	-----	11.8	14.3
77	do.	16.3	18.7	20.30	-----	21.8	24.3
78	Harbor of Refuge, Block Island	15.9	18.4	19.67	-----	21.4	23.9
79	New Harbor, Block Island	1.3	3.2	4.44	-----	5.8	7.8
80	do.	8.5	10.4	11.71	-----	13.0	15.0
81	do.	11.3	13.2	14.45	-----	15.8	17.8
82	do.	1.2	3.2	4.49	-----	5.8	7.8
83	do.	3.7	5.6	6.91	-----	8.2	10.2
84	New Harbor Entrance, Block Island	8.7	10.4	11.83	-----	13.2	15.2
85	do.	6.1	7.8	9.19	-----	10.6	12.6
86	Outer Breakwater, Block Island	2.3	4.0	5.36	-----	6.8	8.8
87	do.	2.5	4.2	5.58	-----	7.0	9.0
88	Westerly	1.0	3.5	-----	4.72	6.0	9.0
89	do.	0.5	3.0	-----	4.27	5.5	8.5
90	do.	1.3	3.8	-----	5.01	6.3	9.3
91	do.	30.8	33.3	-----	34.57	35.8	38.8

DESCRIPTIONS AND ELEVATIONS OF BENCH MARKS, SERIAL NOS. 1 TO 91,
STATE OF RHODE ISLAND

Serial No. 1. Sakonnet Harbor.—B. M. 1/17 is a Coast and Geodetic Survey standard disk set with stem vertical in a ledge of rock very close to the road about 50 feet east of the junction of the breakwater and the solid rock, and about 5 feet north of the northern face of the clam house. Elevation: 10.7 feet above mean low water; 9.04 feet above mean tide level.

Serial No. 2. Sakonnet Harbor.—B. M. 2/17 is a Coast and Geodetic Survey standard disk set obliquely in a ledge of rock close to the edge of the planks of the dock, 3.6 feet north of the center concrete pier of the pavilion and 25.4 feet southeast of the iron grating at the head of the dock. Elevation: 10.8 feet above mean low water; 9.19 feet above mean tide level.

Serial No. 3. Sakonnet Harbor.—B. M. 3/17 is a Coast and Geodetic Survey standard disk set obliquely in a ledge of rock about 75 feet east of the road at a point 175 feet from the head of the dock. The mark is about 104 feet

southeast of the southeast foundation post of the porch of the pavilion. Elevation: 10 feet above mean low water; 8.38 feet above mean tide level.

Serial No. 4. Newport Harbor.—B. M. 1 (U. S. E.) is the top of granite water table at southwest corner of Savings Bank of Newport Building on north corner of Thames and Green Streets, Newport, R. I. Elevation: 17.4 feet above mean low water; 15.67 feet above mean tide level.

Serial No. 5. Newport Harbor.—B. M. 2 (U. S. E.) at Fort Adams is at the southwest corner of top stone of granite wall fronting the stone steps which are built into the wall forming the east side of the basin at permanent wharf. (It is reported that elevation of B. M. may have changed slightly in recent years.) Elevation: 8.5 feet above mean low water; 6.77 feet above mean tide level.

Serial No. 6. Newport Harbor.—B. M. 3 (U. S. E.) at Fort Adams is top of brass bolt set horizontally in face of granite wall of northeast bastion of old Fort Adams; bolt is about 1.5 feet east from the northwest corner of the north face of the bastion and about 1.5 feet above the ground and projects about 1 inch from the face of wall. Elevation: 18.6 feet above mean low water; 16.84 feet above mean tide level.

Serial No. 7. Newport Harbor.—B. M. 4 (C. & G. S.) is on the northeast corner of second granite step from the sidewalk at the main entrance to the Aquidneck National Bank Building. The B. M. is next to the red stone facing and about 1 foot above the sidewalk. Elevation: 17.2 feet above mean low water; 15.40 feet above mean tide level.

Serial No. 8. Newport Harbor.—B. M. 5 (C. & G. S.) is a point on the top surface of the granite sill at the extreme southeast corner of the building occupied by the Western Union Telegraph Co., about 3 inches above the sidewalk. Elevation: 15.3 feet above mean low water; 13.58 feet above mean tide level.

Serial No. 9. Newport Harbor.—B. M. (U. S. E.) is top of hydrant in front of waiting room at south dock Fort Adams. Elevation: 11.1 feet above mean low water; 9.36 feet above mean tide level.

Serial No. 10. Newport Harbor.—B. M. (U. S. E.) is bolt in concrete bound between road and wall on point north of south dock at Fort Adams. Elevation: 8.6 feet above mean low water; 6.88 feet above mean tide level.

Serial No. 11. Newport Harbor.—B. M. (U. S. E.) is a base line brass bolt at easterly end of northerly side of old Fort Adams, 20 feet from northeast corner. Elevation: 18.8 feet above mean low water; 17.01 feet above mean tide level.

Serial No. 12. Coasters Harbor Island.—B. M. (U. S. E.) is highest point of water table at southeast corner of gymnasium building on Coasters Harbor Island. Elevation: 8.7 feet above mean low water; 6.96 feet above mean tide level.

Serial No. 13. Coasters Harbor Island.—B. M. (U. S. E.) is extreme southwest corner of stone threshold of eastern doorway in south face of gymnasium building on Coasters Harbor Island. Elevation: 8.2 feet above mean low water; 6.41 feet above mean tide level.

Serial No. 14. Jamestown, Conanicut Island.—B. M. 1 (C. & G. S.), at East Ferry, is the highest point of a bowlder standing about 5 feet above the ground and located 145 feet out from high-water line on shore and about 410 feet south of the wharf. The point is marked by a flat place about 2 by 3 inches surrounded by an irregular cut, and the letters C. S. are cut crudely near the mark. Elevation: 2.3 feet above mean low water; 0.47 feet above mean tide level.

Serial No. 15. Jamestown, Conanicut Island.—B. M. 2 (C. & G. S.), at East Ferry, is the top of the brass nut on top of the iron fire hydrant at the foot of Lincoln Avenue, corner of Walcott Street, on south side of street about 10 feet from the corner. Elevation: 18.1 feet above mean low water; 16.32 feet above mean tide level.

Serial No. 16. Jamestown, Conanicut Island.—B. M. 3, at East Ferry, is a Coast and Geodetic Survey standard disk set with cement in the top of a large bowlder 10 by 10 by 3 feet high at low water. The bowlder is about 25 feet inshore from the one on which B. M. 1 is cut. These two bowlders are the only prominent ones in the water south of Ferry Wharf at Jamestown. Elevation: 2.9 feet above mean low water; 1.14 feet above mean tide level.

Serial No. 17. Jamestown, Conanicut Island.—B. M. 4 (C. & G. S.), at West Jamestown, is a cross cut in a quartz ledge a short distance above high water mark and about 500 feet northeast of Ferry Wharf. It is in line

with the south side of a small house on the bank above and 48.5 feet from the southwest corner; distance from B. M. 4 to B. M. 5 is 75.3 feet. Elevation: 5.9 feet above mean low water; 4.08 feet above mean tide level.

Serial No. 18. Jamestown, Conanicut Island.—B. M. 5 (C. & G. S.), at West Jamestown, is a cross cut on the same ledge as B. M. 4, with the letters U. S. cut near it. It is in line with the north side of the steps leading into the house on the bank above and 38 feet from the house. The distance from B. M. 5 to B. M. 6 is 27 feet. Elevation: 7.7 feet above mean low water; 5.91 feet above mean tide level.

Serial No. 19. Jamestown, Conanicut Island.—B. M. 6 (C. & G. S.), at West Jamestown, is a cross with the letters U. S. cut on a bowlder about 3 feet wide on the beach just south of the ledge. The distance from B. M. 6 to Ferry Wharf is 403 feet. Elevation: 4.6 feet above mean low water; 2.83 feet above mean tide level.

Serial No. 20. Jamestown, Conanicut Island.—B. M. 7, at West Jamestown, is a Coast and Geodetic Survey standard disk set in the top of a cement block 8" x 8" x 24", set flush with the surface of the ground, 307 feet east of the shore end of the north ferry slip and on the north side of the road, in the angle formed by the east end of a stable and a stone wall. Elevation: 10.0 feet above mean low water; 8.16 feet above mean tide level.

Serial No. 21. Coggeshall Point.—B. M. 1 (C. & G. S.) is on top of stone breakwater and is marked by a cross cut in the top of a granite stone about one foot from its edges. It was reported in 1912 that, "the end of the bridge pier where this B. M. was located has been covered with a concrete bed-plate for an electric hoist approximately 9 inches thick over the B. M. This bed-plate extends 3 feet over the sides of the pier. The electric hoist has been removed and the B. M. could be recovered by taking off the bed-plate." Elevation: 7.4 feet above mean low water; 5.40 feet above mean tide level.

Serial No. 22. Portsmouth (Bristol Ferry).—B. M. (U. S. E.) is the highest point of a milestone (11 to Newport—58 to Boston) on northwest side of railroad, 40 feet northerly from road crossing tracks and 300 feet northerly from Bristol Ferry Station (Portsmouth). Elevation: 28.3 feet above mean low water; 26.33 feet above mean tide level.

Serial No. 23. Portsmouth (Bristol Ferry).—B. M. (U. S. E.) is on the northwest corner of bridge seat on easterly abutment of short bridge over waterway. First bridge east of Bristol Ferry Station (Portsmouth). Elevation: 10.5 feet above mean low water; 8.53 feet above mean tide level.

Serial No. 24. Portsmouth (Bristol Ferry).—B. M. (U. S. E.) is the top of southwest anchor bolt holding end of truss on south side of bridge seat, of westerly abutment of New York, New Haven & Hartford Railroad bridge over Sakonnet River. Elevation: 13.9 feet above mean low water; 11.86 feet above mean tide level.

Serial No. 25. Portsmouth (Bristol Ferry).—B. M. (U. S. E.) is a shallow drill hole 3 inches from southeast corner of highest stone in south side of westerly abutment of New York, New Haven & Hartford Railroad bridge over Sakonnet River. Elevation: 19.5 feet above mean low water; 17.49 feet above mean tide level.

Serial No. 26. Bristol Ferry (Bristol Neck).—B. M. 1 (C. & G. S.) is top of head of 1/2-inch iron bolt set in a large rock about 8 feet in diameter and 3 feet above ground and 50 feet from high-water mark, between the light-house and Captain West's house. The bolt projects 4 inches horizontally from the southwest side of the bowlder and is about 1-1/2 feet above the ground. Elevation: 10.2 feet above mean low water; 8.14 feet above mean tide level.

Serial No. 27. Bristol Ferry (Bristol Neck).—B. M. 2 is a Coast and Geodetic Survey standard disk set in cement in a hole in the top of the large "rock" (bowlder) carrying B. M. 1. The upper surface of the disk at its center is the B. M. It is 2.94 feet above B. M. 1. Elevation: 13.1 feet above mean low water; 11.08 feet above mean tide level.

Serial No. 28. Bristol Ferry (Bristol Neck).—B. M. 3 (C. & G. S.) is a small cross cut on the upper surface of the granite door sill to the entrance to the light keeper's dwelling at Bristol Lighthouse. The cross is about 8 inches from the south (right as you enter) side of the door. The surface of the door sill at the cross is the B. M. Elevation: 8.3 feet above mean low water; 6.30 feet above mean tide level.

Serial No. 29. Bristol Ferry (Bristol Neck).—B. M. 4 is a Coast and Geodetic Survey standard disk set in cement on the top of the rocky ledge on the point, west of the lighthouse, where there are remains of the old stone piers. It is 7.5 meters inshore from the high-water mark on edge of ledge, and 89 meters easterly along beach from easterly edge of dock. It is 52.6 meters from B. M. 2 and 2 meters north of range of B. M. 2 with southeast corner of barn. Elevation: 13.3 feet above mean low water; 11.31 feet above mean tide level.

Serial No. 30. Bristol, Bristol Harbor.—B. M. 3 is a Coast and Geodetic Survey standard disk set in the face of a large stone in the south side of the wharf of the National India Rubber Co., at the foot of Church Street. It is 15.75 feet from the east or rear end of the slip and 4.7 feet below the top of the cap log of the wharf. Elevation: 4.8 feet above mean low water; 2.68 feet above mean tide level.

Serial No. 31. Bristol, Bristol Harbor.—B. M. 4 is a Coast and Geodetic Survey standard disk set in the top of a block of cement 8 inches square and 22 inches long which is buried with its top projecting about 1 inch above ground on the south side of the chimney at the rear of the pumping station of the National India Rubber Co., at the northwest corner of Church and Water Streets. Elevation: 9.2 feet above mean low water; 7.17 feet above mean tide level.

Serial No. 32. Bristol, Bristol Harbor.—B. M. 5 (C. & G. S.) is the top of an iron bolt projecting a few inches from the top of a granite post set first inside the curb line at the northeast corner of Church and Water Streets. This post is apparently for hitching purposes and stands about 3 feet high. Elevation: 12.9 feet above mean low water; 10.80 feet above mean tide level.

Serial No. 33. Bristol, Bristol Harbor.—B. M. 6 is a Coast and Geodetic Survey standard disk set into the wall $1\frac{1}{2}$ feet above the ground, and 1 foot east of the northwest corner of the granite armory at the foot of Church Street. Elevation: 10.5 feet above mean low water; 8.41 feet above mean tide level.

Serial No. 34. Nayat Point.—B. M. 1 (C. & G. S.) is a copper bolt driven into the north side of a large boulder on the beach, 80 meters off-shore, 67 meters south of the small private wharf in front of J. C. McCoy's residence, and 164 meters north of the old lighthouse. Elevation: 3.9 feet above mean low water; 1.58 feet above mean tide level.

Serial No. 35. Nayat Point.—B. M. 2 is a Coast and Geodetic Survey standard disk set with cement in the top of a boulder at the end of a shell point covered with grass, 80 meters north of the old lighthouse. The point covers at high water. Elevation: 3.4 feet above mean low water; 1.08 feet above mean tide level.

Serial No. 36. Nayat Point.—B. M. 3 (C. & G. S.) is a cross with the letters B. M. roughly cut on the top of the rock in which B. M. 1 is set. Elevation: 5.8 feet above mean low water; 3.50 feet above mean tide level.

Serial No. 37. Riverside.—B. M. (U. S. E.) is on the northeast corner of threshold of west door of Riverside trolley car barn (brick addition) on Knowlton Street. Elevation: 45.2 feet above mean low water; 42.90 feet above mean tide level.

Serial No. 38. Riverside.—B. M. (U. S. E.) is the highest part of guard stone at opening in concrete curb east of walk, 100 feet west of Bluff Street. Elevation: 8.4 feet above mean low water; 6.14 feet above mean tide level.

Serial No. 39. Silver Spring.—B. M. 1 (C. & G. S.) is a copper bolt driven into the solid rock on shore, facing westward, and about 25 feet north of the center of the wharf, and $1\frac{1}{2}$ feet from top of rock. A circle was cut in the stone around the copper bolt, and two lines were cut in the end of the copper bolt forming a cross. Elevation: 4.5 feet above mean low water; 2.10 feet above mean tide level.

Serial No. 40. Silver Spring.—B. M. 2 is a Coast and Geodetic Survey standard disk set in cement in the face of the rock bluff on the east bank of Providence River at Silver Spring Landing, $2\frac{1}{2}$ miles south of Providence. It is 27 feet south of the middle of the wharf and one-half foot below top of the bluff. The name "Silver Spring" is painted on the house at the wharf. Elevation: 12.3 feet above mean low water; 9.94 feet above mean tide level.

Serial No. 41. East Providence.—B. M. (U. S. E.) is a copper bolt sunk into the rock at Kettle Point 20 feet from the mean-high-water line at the south-

west face of rock, 10 feet from the mean-high-water line at the northwest face of rock and 40 feet southeast from the pier of the Mexican Petroleum Corporation on line with its inshore side. Elevation: 9.5 feet above mean low water; 7.24 feet above mean tide level.

Serial No. 42. East Providence.—B. M. (U. S. E.) is a drill hole and cross in bridge seat of north abutment of railroad bridge across Watchemoket Cove, about 2 feet west of west edge of bridge. Elevation: 6 feet above mean low water; 3.71 feet above mean tide level.

Serial No. 43. East Providence.—B. M. (U. S. E.) is northwest corner of stone retaining wall on the east side of railroad tracks, near Devils Hand Rock and just north of railroad station "Gulf." Elevation: 15.6 feet above mean low water; 13.29 feet above mean tide level.

Serial No. 44. Pawtucket.—B. M. (U. S. E.) is the extreme southwest corner of the water table of that pier of the Division Street bridge which is on the wharf line on the east side of river. The corner is marked by a crow-foot cut in surface of water table. Elevation: 8.9 feet above mean low water; 6.62 feet above mean tide level.

Serial No. 45. Pawtucket.—B. M. (U. S. E.) is southeast corner of water table of fourth pier from the west abutment, Division Street bridge. Elevation: 8.8 feet above mean low water; 6.49 feet above mean tide level.

Serial No. 46. Pawtucket.—B. M. G 2 is a Coast and Geodetic Survey standard disk, $9\frac{1}{2}$ rails south of the south end of the New York, New Haven & Hartford Railroad depot platform, in ledge rock 12 feet east of the east rail, 3 feet above ground. Elevation: 75.4 feet above mean low water; 73.24 feet above mean sea level.

Serial No. 47. Pawtucket.—B. M. K 2 is a Coast and Geodetic Survey standard disk about $\frac{1}{2}$ mile north of Pawtucket, 8 rails north of interlocking tower No. 156 at the junction of the Worcester and the Boston branches of the New York, New Haven & Hartford Railroad, 16 rails south of culvert No. 38.60, in a rock cut 13 feet west of the west rail and $3\frac{1}{2}$ feet above track. Elevation: 73.0 feet above mean low water; 70.75 feet above mean sea level.

Serial No. 48. Providence.—B. M. C 2 is a Coast and Geodetic Survey standard disk in top of a concrete post, 18 feet north of the New York, New Haven & Hartford Railroad depot at Dike Street, at the corner of the railroad boundary fence, 22 feet west of the west rail of the main line. Elevation: 31.5 feet above mean low water; 29.28 feet above mean sea level.

Serial No. 49. Providence.—B. M. D 2 is a Coast and Geodetic Survey standard disk on the front face of the New York, New Haven & Hartford Railroad depot, 75 feet east of the main entrance to the trains and $2\frac{1}{2}$ feet above the ground. Elevation: 26.5 feet above mean low water; 24.34 feet above mean sea level.

Serial No. 50. Providence.—B. M. E 2 is a Coast and Geodetic Survey standard disk just north of the main steps on the west side of the post-office building, in the top of the balustrade $3\frac{1}{2}$ feet above the sidewalk. Elevation: 17.6 feet above mean low water; 15.45 feet above mean sea level.

Serial No. 51. Providence.—City B. M. 420 is at the east entrance steps to former Brown University Library on the north side of Waterman Street 81.70 feet east of Prospect Street, on the south end at the top of the east steps. The southeast corner of the top of the granite buttress. Elevation: 134.6 feet above mean low water; 132.44 feet above mean sea level.

Serial No. 52. Providence.—B. M. F 2 is a Coast and Geodetic Survey standard disk set in the top of a concrete post, on the New York, New Haven & Hartford Railroad, 8 telegraph poles south of bridge No. 2.00 and 15 feet west of the boundary fence between the street and the railroad property. Elevation: 46.2 feet above mean low water; 43.99 feet above mean sea level.

Serial No. 53. Providence.—B. M. (U. S. E.) is the top of granite underpinning at the southwest corner of the draw tenders' house, Red Bridge, Pawtucket (Seekonk) River. Elevation: 22.4 feet above mean low water; 20.12 feet above mean tide level.

Serial No. 54. Rocky Point.—B. M. 1 (C. & G. S.) is a copper bolt driven into a drill hole in the sloping face of a large rock south of wharf. It is 23 meters outside of the wall built along the shore line at Rocky Point, 2 meters south of wharf. The boulder is covered at high water and many barnacles are growing on it. Elevation: 3.5 feet above mean low water; 1.30 feet above mean tide level.

Serial No. 55. Rocky Point.—B. M. 2 is a Coast and Geodetic Survey standard disk set in the top (not the highest portion) of a large boulder 16 meters outside the wall built along the shore line at Rocky Point, and 20 meters south of the wharf. The boulder is 5 feet high above the beach which is uncovered at low water. Elevation: 8.8 feet above mean low water; 6.58 feet above mean tide level.

Serial No. 56. Apponaug.—B. M. J 2 is a Coast and Geodetic Survey standard disk, 6½ rails north of the New York, New Haven & Hartford Railroad depot, in the west end of the south abutment of bridge No. 51.72 over the highway, 6 feet west of the west rail. Elevation: 26.1 feet above mean low water; 24.04 feet above mean sea level.

Serial No. 57. East Greenwich.—B. M. 2 is a Coast and Geodetic Survey standard disk set in the face of a large rock in the north side of the wharf at the southeast corner of the East Greenwich Yacht Club House. B. M. 2 is 2 feet below the top of the wharf and 2 feet 7 inches west of the eastern end of the rock. Elevation: 7.9 feet above mean low water; 5.67 feet above mean tide level.

Serial No. 58. East Greenwich.—B. M. 4 (C. & G. S.) is the southwest corner of the top of the boundary stone, between East Greenwich and Warwick townships, which stands at about high-water mark at the foot of Division Street, 249 feet north of the clubhouse. The stone is 8 inches square and projects 33 inches above the ground. (In 1923, stone not believed to be very firm in the ground.) Elevation: 9.3 feet above mean low water; 7.23 feet above mean sea level.

Serial No. 59. East Greenwich.—B. M. 5 is a Coast and Geodetic Survey standard disk at the northeast quarter of the intersection of Division Street with the New York, New Haven & Hartford Railroad, on the east face of the Starch Manufacturing building on the William Farrington Estate, 6 feet below the window ledge and 5 feet from the southeast corner of the building. Elevation: 29 feet above mean low water; 26.87 feet above mean sea level.

Serial No. 60. East Greenwich.—B. M. Y 1 is a Coast and Geodetic Survey standard disk set in the top of a concrete post, in flower bed attached to the New York, New Haven & Hartford Railroad depot grounds, 16 feet west of the crossing tender's house on Linden Street, 3 feet south of the fence on this street and 28 feet west of the west rail. Elevation: 32.8 feet above mean low water; 30.74 feet above mean sea level.

Serial No. 61. East Greenwich.—B. M. X 1 is a Coast and Geodetic Survey standard disk about 1 mile south of East Greenwich, on the New York, New Haven & Hartford Railroad, in the top of the east end of the north abutment of bridge No. 47.96 over the highway from East Greenwich to Mount View, 8 feet east of the east rail. Elevation: 34.9 feet above mean low water; 32.78 feet above mean sea level.

Serial No. 62. Wickford.—B. M. 2 is a Coast and Geodetic Survey standard disk set in a cement block 8 by 8 by 24 inches set flush with the ground in the angle of the wharf house on Reynolds wharf. B. M. 2 is 3 feet 4 inches south of the house and 4 feet 5 inches east of the short side of the angle which is 99 feet west of the east end of the house. Elevation: 7 feet above mean low water; 4.92 feet above mean tide level.

Serial No. 63. Wickford.—B. M. 3 is a Coast and Geodetic Survey standard disk set in a cement block 8 by 8 by 24 inches flush with the ground just outside the fence line of Mr. Reynolds's house and 33 feet north of the corner of the fence next Main Street. Elevation: 7.5 feet above mean low water; 5.49 feet above mean tide level.

Serial No. 64. Wickford.—B. M. (U. S. E.) is the top of a ringbolt projecting about 0.85 foot above the surface of a boulder about 40 feet east of the high-water line and a short distance east of the steamboat and railroad wharf. Elevation: 4.8 feet above mean low water; 2.77 feet above mean tide level.

Serial No. 65. Plum Beach.—B. M. (U. S. E.) is the surface within a circular mark cut on top of a flat ledge of rock about 70 feet west of the shore and opposite the slip in the wharf at Hazard Quarry. The B. M. is near the foot and on the west side of a cart path up the hill at the northeast corner of the quarry. Elevation: 10.2 feet above mean low water; 8.40 feet above mean tide level.

Serial No. 66. Point Judith.—B. M. (U. S. E.) is a hole drilled in a boulder on the beach at the inshore end of the eastern breakwater at Point Judith. The boulder is marked "U. S. B." Elevation: 9 feet above mean low water; 7.45 feet above mean tide level.

Serial No. 67. Point Judith.—B. M. 2 is a Coast and Geodetic Survey standard reference mark set in the top of a large boulder 6 feet long by 5 feet and standing $1\frac{1}{2}$ feet above high water. B. M. 2 is 97 feet from B. M. 1, 75 feet west of the breakwater and 78 feet outside of the high-water line. Elevation: 4.6 feet above mean low water; 3.03 feet above mean tide level.

Serial No. 68. Point Judith.—B. M. 3 is a Coast and Geodetic Survey standard disk set in a bed of cement in center of breakwater, 50 feet from end of breakwater. Elevation: 11.6 feet above mean low water; 10.04 feet above mean tide level.

Serial No. 69. Point Judith.—B. M. 4 is a Coast and Geodetic Survey standard disk set in cement, 4 feet off stone wall and about 150 feet east by north from B. M. 3 and 120 feet NNW. from B. M. 5. Elevation: 16.2 feet above mean low water; 14.68 feet above mean tide level.

Serial No. 70. Point Judith.—B. M. 5 is a Coast and Geodetic Survey standard disk set in cement about 18 paces NE. of fence and about 135 feet NE. of B. M. 3. Elevation: 21 feet above mean low water; 19.42 feet above mean tide level.

Serial No. 71. Point Judith.—B. M. (U. S. E.) is a cross cut in the top of base in the south face (the base is octagonal) of Point Judith Lighthouse. In this face is a window over which is the date "1816" and facing the window the cross is in the left hand angle of base. Elevation: 27.2 feet above mean low water; 25.62 feet above mean tide level.

Serial No. 72. Point Judith.—B. M. (U. S. E.) is a drill hole in top of first boulder west of "Money Pond" which is west of east shore arm breakwater. The letter "B" is cut in the top of rock near drill hole. Elevation: 10.2 feet above mean low water; 8.67 feet above mean tide level.

Serial No. 73. Point Judith.—B. M. (U. S. E.) is a drill hole in top of boulder at end of second bluff west of Lighthouse. The letter "B" is cut in the rock near drill hole. Elevation: 13.6 feet above mean low water; 12.05 feet above mean tide level.

Serial No. 74. Point Judith.—B. M. (U. S. E.) is a drill hole in top of big lon : boulder near present high water line about two-thirds the distance from east shore-arm to Sand Hill Cove. The letter "B" is cut in the rock near the drill hole. Elevation: 10.8 feet above mean low water; 9.27 feet above mean tide level.

Serial No. 75. Point Judith.—B. M. (U. S. E.) is a drill hole in top of boulder or spur of ledge rock in open pasture lot, the first on the right going from the wireless station toward the Breachway. The letter "B" is cut in the rock near the drill hole. Elevation: 11.5 feet above mean low water; 9.98 feet above mean tide level.

Serial No. 76. Point Judith.—B. M. (U. S. E.) is a drill hole in top of stone bound. The letters "U. S." are cut in the bound. The position of the bound is just south of a combination cottage and garage at the foot of the driftway leading to the Breachway. Elevation: 11.8 feet above mean low water; 10.21 feet above mean tide level.

Serial No. 77. Point Judith.—B. M. (U. S. E.) is a drill hole in top of stone bound. The letters "U. S." are cut in the top of bound. The bound is on the property line between the Sheldon and Smith cottages near the Breachway. Elevation: 21.8 feet above mean low water; 20.30 feet above mean tide level.

Serial No. 78. Harbor of Refuge, Block Island.—B. M. (U. S. E.) is the top of stone monument at the top of bluff opposite the shore end of the western breakwater. Elevation: 21.4 feet above mean low water; 19.87 feet above mean tide level.

Serial No. 79. New Harbor, Block Island.—B. M. 4 (C. & G. S.) is a ringbolt in rock in northwest corner of abutment at end of Ball Bays Dock, 230 feet southwest from gauge and 50 feet southeastward from spring house. Elevation: 5.8 feet above mean low water; 4.44 above mean tide level.

Serial No. 80. New Harbor, Block Island.—B. M. 5 (C. & G. S.) is a piece of three-fourths-inch brass shafting embedded in a rock $2\frac{1}{2}$ feet under ground. The rock is surrounded with concrete. A 3-inch pipe extending from the sur-

face of the ground to this bench mark gives access to the same. Elevation: 13 feet above mean low water; 11.71 feet above mean tide level.

Serial No. 81. *New Harbor, Block Island.*—B. M. 6 is a Coast and Geodetic Survey standard disk screwed to a section of 3-inch pipe, split and turned up at the bottom. This pipe is directly over B. M. 5 and rests on the rock. It is 128 feet southwest from B. M. 3, and 214 feet west from B. M. 4. Elevation: 15.8 feet above mean low water; 14.45 feet above mean tide level.

Serial No. 82. *New Harbor, Block Island.*—B. M. 9 is a Coast and Geodetic Survey standard disk set in a cement bed and situated in the first vacant lot on the left hand side of the road leading from the New Harbor Steamboat wharf. It is about 10 paces from the road in an easterly direction and 10 paces from the corner of an abandoned building used as a mess hall by the Navy during the summer of 1917. Elevation: 5.8 feet above mean low water; 4.49 feet above mean tide level.

Serial No. 83. *New Harbor, Block Island.*—B. M. 10 is a Coast and Geodetic Survey standard disk set in a concrete base and situated on the lawn of the Narragansett House, 12 paces from the end of steamboat wharf in a southerly direction. Elevation: 8.2 feet above mean low water; 6.91 feet above mean tide level.

Serial No. 84. *New Harbor entrance, Block Island.*—B. M. (U. S. E.) is the top of stone bound on the westerly side of the entrance channel to the pond and about 90 feet southerly from the southeast corner of the fog station building. Elevation: 13.2 feet above mean low water; 11.83 feet above mean tide level.

Serial No. 85. *New Harbor entrance, Block Island.*—B. M. (U. S. E.) is on the basement window sill on the south side of the fog station house, on the third brick from the west side of the window. Elevation: 10.6 feet above mean low water; 9.19 feet above mean tide level.

Serial No. 86. *Outer Breakwater, Block Island.*—B. M. 7 (C. & G. S.) is a piece of $\frac{3}{4}$ -inch brass shafting set in rock, surrounded by a 3-inch circle cut in the rock, 300 feet southeast from outer light. Elevation: 6.8 feet above mean low water; 5.36 feet above mean tide level.

Serial No. 87. *Outer Breakwater, Block Island.*—B. M. 8 (C. & G. S.) is a $\frac{3}{4}$ -inch hole drilled 2 inches deep horizontally in rock or breakwater, at intersection of horizontal and vertical lines, surrounded by a 4-inch circle cut in the rock, 56 feet southeast from outer light and 360 feet from outer end of breakwater. Elevation: 7 feet above mean low water; 5.58 feet above mean tide level.

Serial No. 88. *Westerly.*—B. M. 1 is a Coast and Geodetic Survey standard disk set in a flag stone 15 feet back from the sea wall in a walk leading down to the water from Margin Street, a short distance southwest from its intersection with Main Street. The mark is at the foot of the steps leading down from the street. Elevation: 6 feet above mean low water; 4.72 feet above mean sea level.

Serial No. 89. *Westerly.*—B. M. 2 is a Coast and Geodetic Survey standard disk set in the masonry 6 feet east of the south end of the sea wall, 328 feet from B. M. 1. Elevation: 5.5 feet above mean low water; 4.27 feet above mean sea level.

Serial No. 90. *Westerly.*—B. M. 3 is a Coast and Geodetic Survey standard disk in a section of the sea wall opposite the north wing of the Cottrell Shops, on the east side of the river and 550 feet north of the angle in the sea wall. Elevation: 6.3 feet above mean low water; 5.01 feet above mean sea level.

Serial No. 91. *Westerly.*—B. M. A. 1 is a Coast and Geodetic Survey standard disk about 400 feet west of the New York, New Haven & Hartford Railroad depot, almost due south of the gas tank at the gas works, in the north parapet of the east abutment of bridge No. 1831 over the Pawcatuck River, 7 feet north of the north rail and 1 foot below the track. Elevation: 35.8 feet above mean low water; 34.57 feet above mean sea level.

ELEVATIONS OF BENCH MARKS, SERIAL NOS. 92 TO 124¹

[Established by the U. S. Army Engineers on a line running from near Hamilton, Narraganset Bay, to Graves Neck, Pawcatuck River]

Serial No.	Locality	Elevation of bench marks above—				
		Highest tide	Mean high water	Mean tide level	Mean low water	Lowest tide
		<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>	<i>Feet</i>
92	Bissels Cove, near Hamilton.....	-0.9	2.1	3.90	5.6	8.1
93	Larned's barn, near Hamilton.....	12.6	15.6	17.32	19.1	21.6
94	Carr's pond, South of Hamilton.....	8.8	11.8	13.56	15.3	17.8
95	do.....	7.5	10.5	12.25	14.0	16.5
96	The Narrows, Pattaquamscott River.....	-2.7	0.3	2.10	3.8	6.3
97	Carpenter's farm, Pattaquamscott River.....	-1.0	2.0	3.73	5.5	8.0
98	Bridgetown, Pattaquamscott River.....	1.0	4.0	5.71	7.5	10.0
99	Jenck's farm, Pattaquamscott River.....	6.4	9.4	11.15	12.9	15.4
100	Middle Bridge, Pattaquamscott River.....	0.2	3.2	4.96	6.7	9.2
101	Mouth of Pattaquamscott River.....	18.2	21.2	22.98	24.7	27.2
102	The Cove, Pattaquamscott River.....	-0.6	2.4	4.13	5.9	8.4
103	Silver Lake.....	31.0	34.0	35.71	37.5	40.0
104	Point Judith, Upper Pond.....	2.5	4.9	6.43	8.0	10.5
105	Point Judith Pond.....	1.8	4.2	5.79	7.3	9.8
106	do.....	-1.7	0.7	2.27	3.8	6.3
107	do.....	1.0	3.4	4.94	6.5	9.0
108	Matunuck Beach.....	10.7	13.1	14.70	16.2	18.7
109	Browning Beach.....	3.2	5.7	7.16	8.7	11.2
110	Trustom Pond.....	0.2	2.7	4.16	5.7	8.2
111	Charlestown Beach.....	1.7	4.3	5.75	7.2	9.7
112	Charlestown Pond.....	-1.3	1.3	2.78	4.2	6.7
113	do.....	4.3	6.9	8.33	9.8	12.3
114	do.....	0.3	2.9	4.40	5.8	8.3
115	Quonochontaug Beach.....	1.3	4.0	5.36	6.8	9.3
116	do.....	5.1	7.8	9.15	10.6	13.1
117	Quonochontaug Pond.....	-0.8	1.9	3.32	4.7	7.2
118	Weekapaug.....	5.2	7.9	9.31	10.7	13.2
119	Pleasant View.....	-0.1	2.7	4.04	5.4	7.9
120	do.....	5.5	8.3	9.68	11.0	13.5
121	Watch Hill.....	13.8	16.6	17.96	19.3	21.8
122	do.....	1.7	4.5	5.80	7.2	9.7
123	Potters Cove, Pawcatuck River.....	0.2	3.0	4.38	5.7	8.2
124	Graves Neck, Pawcatuck River.....	4.9	7.7	9.01	10.4	12.9

¹ The elevations of these bench marks as furnished by the United States Army Engineers were referred to mean low water at Newport. In order to refer them to local tidal datums they were first reduced to mean tide level by applying the semirange of tide at Newport, then the elevations above mean high water, mean low water, and the highest and lowest tides were obtained in accordance with the local variations of the tide along the coast. The elevations of Serial Nos. 92 to 103 are based on the Newport tides while those for Serial Nos. 104 to 124 are based on the tides at different places along Block Island Sound.

DESCRIPTIONS AND ELEVATIONS OF BENCH MARKS, SERIAL NOS. 92 TO 124:

ESTABLISHED BY THE U. S. ARMY ENGINEERS ON A LINE RUNNING FROM NEAR HAMILTON, NARRAGANSETT BAY TO GRAVES NECK, PAWCATUCK RIVER

Serial No. 92. *Bissells Cove, near Hamilton.*—B. M. 29 (U. S. E.) is three drill holes in rock (west part of rock is white quartz) 150 feet east of causeway and 100 feet south of road at north end of Bissells Cove. Elevation: 5.6 feet above mean low water; 3.90 feet above mean tide level.

Serial No. 93. *Larned's barn, near Hamilton.*—B. M. 25 (U. S. E.) is three drill holes, 10 feet west of east edge of ledge north of G. H. Larned's barn. Elevation: 19.1 feet above mean low water; 17.32 feet above mean tide level.

Serial No. 94. *Carr's pond, south of Hamilton.*—B. M. 17 (U. S. E.) is three drill holes in bridge stone on south side of bridge in path leading to clubhouse on north side of Carr's pond. Elevation: 15.3 feet above mean low water; 13.56 feet above mean tide level.

Serial No. 95. *Carr's pond, south of Hamilton.*—B. M. 12 (U. S. E.) is three drill holes in large rock, 110 feet more or less southwest of Gilbert Stuart house at old snuff mill, 20 feet more or less south of brook and near the southeast extremity of Carr's pond. Elevation: 14 feet above mean low water; 12.25 feet above mean tide level.

Serial No. 96. *The Narrows, Pattaquamscott River.*—B. M. 7 (U. S. E.) is three drill holes in foundation stone in wall, about 90 feet west of high water line, on the west side of Pattaquamscott River at the Narrows. Elevation: 3.8 feet above mean low water; 2.10 feet above mean tide level.

Serial No. 97. *Carpenter farm, Pattaquamscott River.*—B. M. 6 (U. S. E.) is southwest corner of town-line monument between North Kingston and Narragansett. Monument is on the south line of the Carpenter farm about 5 feet south of south wall and about 5 feet east of east shore of Pattaquamscott River. Elevation: 5.5 feet above mean low water; 3.73 feet above mean tide level.

Serial No. 98. *Bridgeton, Pattaquamscott River.*—B. M. 1 (U. S. E.) is three drill holes at the corner on north side of west abutment of "Upper Bridge" across the Pattaquamscott River at Bridgetown. Elevation: 7.5 feet above mean low water; 5.71 feet above mean tide level.

Serial No. 99. *Jencks farm, Pattaquamscott River.*—B. M. 32 (U. S. E.) is the highest point on stone monument on the Jencks farm about 50 feet south of the first wall south of the Monroe farm south line, and 90 feet east of the Pattaquamscott River. Elevation: 12.9 feet above mean low water, 11.15 feet above mean tide level.

Serial No. 100. *Middle Bridge, Pattaquamscott River.*—B. M. 43 (U. S. E.) is three drill holes in stone at the south end of west pier at "Middle Bridge" across the Pattaquamscott River. Elevation: 6.7 feet above mean low water; 4.96 feet above mean tide level.

Serial No. 101. *Mouth of Pattaquamscott River.*—B. M. 48 (U. S. E.) is three drill holes on high point on west edge of cliff and on a line between south side of Potter cottage and south point of Bass Rock, on east side of Pattaquamscott River at its mouth. Elevation: 24.7 feet above mean low water; 22.98 feet above mean tide level.

Serial No. 102. *The Cove Pattaquamscott River.*—B. M. 64 (U. S. E.) is town-line monument between South Kingston and Narragansett, on old causeway across "The Cove" at south end of Pattaquamscott River. Elevation: 5.9 feet above mean low water; 4.13 feet above mean tide level.

Serial No. 103. *Silver Lake.*—B. M. 70 (U. S. E.) is town-line monument between Narragansett and South Kingston, east of road which is east of Silver Lake, and in line with second wall north of right angle in road. Elevation: 37.5 feet above mean low water; 35.71 feet above mean tide level.

Serial No. 104. *Point Judith Upper Pond.*—B. M. 74 (U. S. E.) is three drill holes in large boulder on point of land projecting into the Point Judith Upper Pond opposite boat houses. Elevation: 8 feet above mean low water; 6.43 feet above mean tide level.

Serial No. 105. *Point Judith Pond.*—B. M. 75 (U. S. E.) is three drill holes in rock about 40 feet south of north line of W. N. Congdon's farm and about 40 feet west of edge of bank of Point Judith Pond, and opposite the south end of "Foddering Place." Elevation: 7.3 feet above mean low water; 5.79 feet above mean tide level.

Serial No. 106. *Point Judith Pond.*—B. M. 81 (U. S. E.) is three drill holes in circumference of circle in large boulder, in water, about 500 feet north of concrete wharf owned by Willard Kent. Elevation: 3.8 feet above mean low water; 2.27 feet above mean tide level.

Serial No. 107. *Point Judith Pond.*—B. M. 100 (U. S. E.) is town-line monument between South Kingston and Narragansett on the north side of a creek and about 1500 feet west of Breachway into Point Judith Pond. Elevation: 6.5 feet above mean low water; 4.94 feet above mean tide level.

Serial No. 108. *Matunuck Beach.*—B. M. 106 (U. S. E.) is stone bound on south side of road about 100 feet southeast of the Marilla cottage at Matunuck Beach. Elevation: 16.2 feet above mean low water; 14.70 feet above mean tide level.

Serial No. 109. *Browning Beach.*—B. M. 112 (U. S. E.) is high point in $\frac{1}{4}$ -inch circle at northwest corner of retaining wall about 35 feet north of Babcock's farm at Browning Beach. Elevation: 8.7 feet above mean low water; 7.16 feet above mean tide level.

Serial No. 110. *Trustom Pond.*—B. M. 118 (U. S. E.) is highest point on large boulder about 30 feet north of southwest extremity of Trustom Pond, and marked with a drill hole and "S. V. R. R. 1905." Elevation: 5.7 feet above mean low water; 4.16 feet above mean tide level.

Serial No. 111. Charlestown Beach.—B. M. 130 (U. S. E.) is highest point on town line monument between South Kingston and Charlestown at Charlestown Beach, 100 feet east of road. Elevation: 7.2 feet above mean low water; 5.75 feet above mean tide level.

Serial No. 112. Charlestown Pond.—B. M. 134 (U. S. E.) is three drill holes in large boulder on east side of jetty about 300 feet south of its north end, on the east side of Breachway into Charlestown Pond. Elevation: 4.2 feet above mean low water; 2.78 feet above mean tide level.

Serial No. 113. Charlestown Pond.—B. M. 167 (U. S. E.) is three drill holes in large boulder about 300 feet north of shore line and about 60 feet east of small pond hole at Halls Point on the north shore of Charlestown Pond. Elevation: 9.8 feet above mean low water; 8.33 feet above mean tide level.

Serial No. 114. Charlestown Pond.—B. M. 150 (U. S. E.) is circle in large boulder at the southwest extremity of Charlestown Pond, about 10 feet from the corner of wall. Elevation: 5.8 feet above mean low water; 4.40 feet above mean tide level.

Serial No. 115. Quonochontaug Beach.—B. M. 166 (U. S. E.) is high point between three drill holes in top of retaining wall at Quonochontaug Life Saving Station about 10 feet from southeast end of wall. Elevation: 6.8 feet above mean low water; 5.36 feet above mean tide level.

Serial No. 116. Quonochontaug Beach.—B. M. 170 (U. S. E.) is highest point on town line monument between Charlestown and Westerly about 20 feet north of road running in rear of beach bank. Elevation: 10.6 feet above mean low water; 9.15 feet above mean tide level.

Serial No. 117. Quonochontaug Pond.—B. M. 176 (U. S. E.) is three drill holes in large boulder on Dodges Point, north of Weekapaug Inn, at west end of Quonochontaug Pond. Elevation: 4.7 feet above mean low water; 3.32 feet above mean tide level.

Serial No. 118. Weekapaug.—B. M. 182 (U. S. E.) is three drill holes in large boulder about 20 feet southeast of post office at Weekapaug. Elevation: 10.7 feet above mean low water; 9.31 feet above mean tide level.

Serial No. 119. Pleasant View.—B. M. 202 (U. S. E.) is three drill holes in boulder in retaining wall on east edge of road running north from beach at Pleasant View, about 100 feet north of car track. Elevation: 5.4 feet above mean low water; 4.04 feet above mean tide level.

Serial No. 120. Pleasant View.—B. M. 210 (U. S. E.) is the lowest step on windmill, west side of road leading to Golf Club House. Elevation: 11 feet above mean low water; 9.68 feet above mean tide level.

Serial No. 121. Watch Hill.—B. M. 216 (U. S. E.) is three drill holes in large boulder, 5 feet high, on edge of lawn and about 100 feet northwest from Russels Cottage at Watch Hill. Elevation: 19.3 feet above mean low water; 17.93 feet above mean tide level.

Serial No. 122. Watch Hill.—B. M. 255 (U. S. E.) is circle in large boulder on shore line at north side of Watch Hill Cove and about 40 feet west of east line of land owned by W. H. Peck. Elevation: 7.2 feet above mean low water; 5.80 feet above mean tide level.

Serial No. 123. Potters Cove, Pawcatuck River.—B. M. 251 (U. S. E.) is circle cut in rock on end of point on north side of Potters Cove, at mouth of Pawcatuck River. Elevation: 5.7 feet above mean low water; 4.38 feet above mean tide level.

Serial No. 124. Graves Neck, Pawcatuck River.—B. M. 247 (U. S. E.) is a circle cut in large rock about 80 feet east of southeast shore of Pawcatuck River and about 310 feet north of wall on north side of graveyard at end of Graves Neck. Elevation: 10.4 feet above mean low water; 9.01 feet above mean tide level.