

Navigation Practice

Now that you've been through this entire course, test yourself by answering the following questions to determine how well you learned the subject.

You may refer to Chart #1 Symbols & Abbreviations, and you will need chart 1210Tr and the attached *Appendices G* and *I* to complete the plotting exercises. Correct magnetic variation to the date given in the questions and round off to the nearest whole degree. Use the following deviation table for all questions:

<u>Ship's Heading</u> °M	<u>Deviation</u> °	<u>Ship's Heading</u> °psc
358	2W	0
27	3W	30
56	4W	60
86	4W	90
117	3W	120
148	2W	150
179	1W	180
210	0	210
241	1E	240
271	1E	270
300	0	300
329	1W	330
358	2W	360

Part I- Questions 1 to 9 contain 33 answers valued at 1 point each. Max points = 33.

1. What do the following abbreviations found on US nautical charts mean:

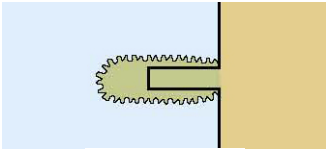



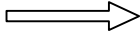

a. Fl 6sec 64ft 15M HORN _____

b. Gp Occ (1+2) 15sec 65ft 16M Racon _____

c. KGR _____

d. GR "A" Fl (2+1) G 6s _____

2. What do the following symbols found on US nautical charts mean:

- a.  _____
- b.  _____
- c.  _____
- d.  _____
- e.  _____
- f.  _____
- g. MLLW _____
- h. PD _____

3. List three types of navigational information that can be obtained from nautical charts:

- a. _____
- b. _____
- c. _____

4. List four types of information that can be obtained from a USCG Light List:

- a. _____
- b. _____
- c. _____
- d. _____

5. List four navigational publications or charts that can be downloaded from the internet:

- a. _____
- b. _____

c.

d. _____

6. Where can you determine the date of the latest edition of US navigational charts?

.....

7. Green navigational aids are normally left to the _____ side of your boat in US waters when heading out to sea.

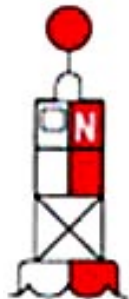
8. What are two sources of information for updating navigational charts:

a.

b.

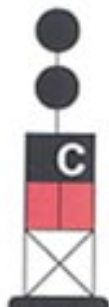
9. Identify the following navigation aids:

Red & White



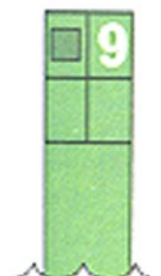
a. _____

Black & Red

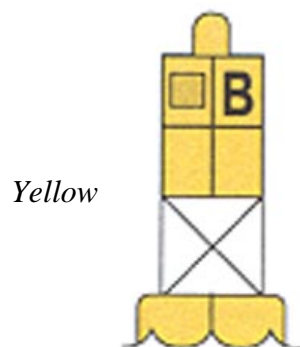


b. _____

Green

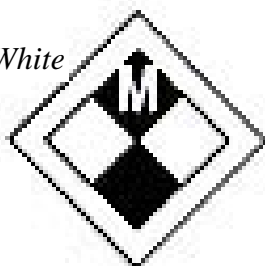


c. _____



Yellow

d. _____



Black & White

e. _____

Part II- Questions 10 to 15 contain 32 answers valued at 2 points each. Max points = 64.

**10. On June 18, 2004 you are sailing in Vineyard Sound on a course of $C = 246^\circ$ psc at a speed of $S = 4.9$ knots. At 0900 you pass close by buoy R"26" Fl R 4 sec Bell near the NE end of the sound. At 1130 you notice that the E end of Nashawena Island aligns perfectly with the W end of Pasque Island. At this moment you take the following compass bearings:
 316° psc on Cuttyhunk Light, Qk Fl 63ft 12M
 153° psc on Gay Head Light, Alt Gp Fl(3) W&(1)R 40 sec 170ft 17M**

a. What is your 1130 DR position?

Lat _____ Long _____

b. What is your 1130 Fix position?

Lat _____ Long _____

c. What was the average current Set & Drift for the past 2-1/2 hours?

Set _____ $^\circ$ T, Drift _____ knots

d. Continuing at the same course and speed, what is your 1200 DR position?

Lat _____ Long _____

11. Later that same day you are located at buoy BW "VS" Whistle about 8 NM to the WNW of Nomans Land. There is a current of Set = 20°T and Drift = 1.6 knots. Boat speed S = 5.1 knots. Plot a course to buoy R"2" Fl R 4 sec Whistle located S of Nomans Land.

- a. What is that course (Track) and distance?

_____ °T _____ °M _____ NM

- b. What course (CTS) should you steer to stay on Track?

_____ °T _____ °psc

- c. What will be your speed over ground (SOG)? _____ knots.

- d. If you depart the first buoy at 1300, what time will you arrive at the second buoy?

_____ Hours & Minutes.

12. Later that same day you decide to sail from buoy R"2" Fl R 4 sec Whistle located S of Nomans Island and return to buoy BW "VS" Whistle. The current is now slack, but a strong NE wind has begun to blow giving you a 7° leeway.

- a. What is the course (Track)?

_____ °T _____ °psc

- b. What course will you need to steer?

_____ °T _____ °psc

13. At 0800 on June 19, 2004 you are S of Mishaum Ledge and abeam of buoy G "5" Fl G 4 sec Gong at the entrance to Buzzards Bay, and plan to sail on a course of 90°psc up the bay. The chart shows a sunken wreck at latitude 41°30'N, longitude 70°54'W just N of your intended track. To assist you in remaining S of this wreck you draw a line on the chart from your position to buoy BW "BB" Mo(A) Bell.

- a. What is the bearing of that line?

_____ °T _____ °psc

- b. In order to avoid the wreck as you proceed on your course, should your compass bearing to buoy BW "BB" Mo(A) Bell remain more than or less than the bearing line of 13a above?

14. At 1000 on June 20, 2004 you depart BW "BB" Mo(A) Bell at 6.2 knots on a course of 62°psc headed for Cleveland Ledge Channel Fl 10 sec 74ft 16M HORN R Bn 308. At 1020 the tower at the S end of West Island bears 354°psc; at 1040 it bears 297°psc.

a. What is your 1040 running fix position?

Lat _____ Long _____

b. What was your course over ground from 1000 to 1040?

_____ °T _____ °psc

c. Assuming that the current is slack and the difference between C and COG to be due to wind leeway, what was the wind leeway?

_____ °

d. From the 1040 RFix position what is the course (Track) to Cleveland Ledge Channel light?

_____ °T _____ °psc

e. What course will you need to steer to sail directly toward Cleveland Ledge Channel light?

_____ °psc

15. Later, while sailing on a course of 344°psc, you observe that the Monument and the Lookout Tower on Cuttyhunk Island are in line. You use a pelorus and determine that the range formed by these two towers is 98° off your starboard bow. Based on these observations, calculate your compass Deviation for this heading. Does this agree with the above deviation table?

Deviation per this observation _____ Deviation per table _____

Part III- Questions 16 to 20 contain 10 answers valued at 1 point each. Max points = 10.
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16. What is the time and height of the lowest tide at Newport, RI on January 29, 1997?

Time _____ EST, Height _____ Feet

17. What is the time and height of the lowest tide at Portland Head Light on February 18, 1997?

Time _____ EST, Height _____ Feet

18. How do you convert Eastern Standard Time to Eastern Daylight Time?

EDT = _____

19. What is the time of the maximum flood current at Boston Harbor, Deer Island Light on February 19, 1997?

Time _____ EST, Velocity _____ Knots

20. What is the direction, velocity and time of the maximum ebb current at Wareham River off Barneys Point on January 23, 1997?

Direction _____ °T

Velocity _____ Knots

Time _____ EST, hours & minutes

A score of 80% is considered the minimum passing grade for this important subject. Add up your total points earned and divide by 107 to calculate your score.

	<u>Points Earned:</u>	
Part I	_____	
Part II	_____	
Part III	_____	
Total	_____	÷ 107 = _____
		Score

[Stations marked with an asterisk (*) are reference stations for which daily predictions are given in table 1. Page numbers of reference stations are given in parentheses.]

G- 10

INDEX TO STATIONS

	No.		No.
St. Jones River entrance, Del.....	1969	Santa Rosa Sound, Fla.....	4523
St. Joseph Bay, Fla.....	4501	Santana, Recifes de, Brazil.....	5041
St. Joseph Sound, Fla.....	4401	Santee River, S. C.....	2999,3001
St. Laurent d'Orleans, Quebec.....	351	Santos, Brazil * (188).....	5115
St. Lawrence River.....	315-371	Sao Francisco do Sul, Brazil.....	5121
St. Lucia, Lesser Antilles.....	4929,4931	Sao Joao da Barra, Brazil.....	5097
St. Lucie, Fla.....	3733	Sao Luiz, Brazil.....	5039
St. Lucie River, Fla.....	3749-3755	Sao Sebastiao, Brazil.....	5113
St. Margarets Bay, Nova Scotia.....	499	Saona, Isla, Dominican Republic.....	4873
St. Marks, Fla.....	4469	Sapelo Island, Ga.....	3475
St. Marks River entrance, Fla. * (136).....	4467	Sapelo River, Ga.....	3459-3463
St. Martins River, Fla.....	4433	Sapelo Sound, Ga.....	3425-3469,3475
St. Mary Bay, Nova Scotia.....	525-529	Sarasota, Fla.....	4361
St. Mary Harbour, Newfoundland.....	237	Sasanoa River, Maine.....	789-793
St. Mary River, Nova Scotia.....	483	Sassafras River, Md.....	2339
St. Marys, Ga.....	3553	Satilla River, Ga.....	3529-3535
St. Marys City, Md.....	2447	Saugatuck River, Conn.....	1263
St. Marys Entrance, Ga.....	3541	Saunders Wharf, Va.....	2567
St. Marys River, Ga. and Fla.....	3553-3561	Savage Creek, S. C.....	3349
St. Marys River, Md.....	2445,2447	Savage Island, S. C.....	3349
St. Michaels, Md.....	2295	Savannah, Ga. * (108).....	3383
St. Michaels, Miles River, Md.....	2305	Savannah River, Ga.....	3377-3391
St. Nicolaas Bay, Aruba.....	4943	Savannah River entrance, Ga. * (104)...	3379
St. Nicolas, Quebec.....	355	Sawpit Creek, Fla.....	3591,3593
St. Paul Island, Nova Scotia.....	431	Sawyer Key, Fla.....	4201,4203
St. Peter Bay, Cape Breton Island.....	469	Saybrook Jetty, Conn.....	1213
St. Peters Bay, Prince Edward Island...	417	Saybrook Point, Conn.....	1215
St. Petersburg Beach Causeway, Fla.....	4391	Sayreville, N. J.....	1667
St. Petersburg, Fla. * (132).....	4381	Sayville (Brown Creek), N. Y.....	1465
St. Pierre Creek, S. C.....	3185	Scarborough, Tobago.....	4939
St. Pierre Harbor.....	247	Schooner Bay, Va.....	2207
St. Simons Light, Ga.....	3495	Schooner Harbour, Baffin Island.....	129
St. Simons Sound, Ga.....	3493-3515	Schottegat, Curacao.....	4941
St. Simons Sound Bar, Ga.....	3493	Schuylkill River, Pa.....	2077-2079
St. Thomas Island, Virgin Islands.....	4913,4915	Scituate, Mass.....	981
Sakonnet, R. I.....	1145	Scotia Bay, S. Orkney Islands.....	5271
Sakonnet River, R. I.....	1147	Scotland, Va.....	2687
Salem, Mass.....	925	Scott Creek, S. C.....	3183
Salem, N. J.....	2017	Sea Bright, Shrewsbury River, N. J.....	1695
Salem Nuclear Plant, N. J.....	1999	Sea Grape Point, Fla.....	3921
Salem Canal entrance, N. J.....	2041	S.C.L. RR. bridge, Savannah River, Ga..	3389
Salem River, N. J.....	2015-2023	Seabrook, S. C.....	3209
Salinopolis, Brazil.....	5033	Seacamp Dock, Ga.....	3547
Salisbury, Md.....	2247	Seal Cove, New Brunswick.....	579
Salisbury, New Brunswick.....	563	Seapoint, Maine.....	883
Salmon Falls River, N. H.....	901	Seaside Heights, N. J.....	1723
Salsbury Cove, Maine.....	665	Seaside Park, N. J.....	1739
Salt Water Creek, S. C.....	3375	Seavey Island, Maine.....	893
Salvador, Brazil.....	5073	Sebastian, Fla.....	3725
Salvesbarg Landing, S. C.....	3323	Sebastian Inlet, Fla.....	3723
Salt River, Fla.....	4439	Secaucus, N. J.....	1627
Sam Worth Game Management Area, S. C...	2953	Secessionville, S. C.....	3119
Sampit River, S. C.....	2933-2937	Sedge Islands, N. J.....	1755
San Carlos Bay, Fla.....	4321,4323	Sedgwick, Maine.....	691
San Juan, P. R. * (160).....	4907	Seminole Shores, Fla.....	3759
San Juan del Norte, Nicaragua.....	4749	Sept Iles, Quebec.....	311
San Luis Pass, Texas.....	4689	Setauket Harbor, N. Y.....	1387
San Marino Island, Fla.....	3885	Seven Island, N. J.....	1799
San Roman, Argentina.....	5189	Sevenfoot Knoll Light, Md.....	2365
San Salvador, Bahamas.....	4785	Severn River, Md.....	2383-2387
Sanchez, Dominican Republic.....	4871	Severn River, Va.....	2597
Sand Key Lighthouse, Fla.....	4275	Sewall Point, Fla.....	3755
Sand Shoal Inlet, Va.....	2185	Sewee Bay, S. C.....	3021
Sandblasters, S. C.....	3137	Shady Side, Md.....	2399
Sands Key, Fla.....	3911	Shallotte Inlet, N. C.....	2865
Sandy Hook, N. J. * (68).....	1687	Shark Key, Fla.....	4251
Sandy Point, Maine.....	727	Shark River entrance, Fla.....	4281
Sandy Point, Md.....	2379	Shark River Hills, N. J.....	1703
Santa Barbara de Samana, Dominican Rep.	4869	Shark River Island, N. J.....	1701
Santa Cruz Cabralia, Brazil.....	5085	Sharkfin Shoal Light, Md.....	2241
Santa Cruz (Punta Quilla), Argentina...	5245	Sharps Island Light, Md.....	2273
Santa Domingo, Dominican Republic.....	4877	Sharptown, Md.....	2253
Santa Elena, Puerto, Argentina.....	5217	Shediac Bay, New Brunswick.....	403
Santa Marta, Colombia.....	4955	Sheep Island, Mass.....	963

TABLE 2 – TIDAL DIFFERENCES AND OTHER CONSTANTS

No.	PLACE	POSITION		DIFFERENCES				RANGES		Mean Tide Level
		Latitude	Longitude	Time		Height		Mean	Spring	
				High Water	Low Water	High Water	Low Water			
		North	West	h m	h m	ft	ft	ft	ft	
MAINE, Casco Bay—cont. Time meridian, 75° W										
on Portland, p.32										
833	Little Flying Point, Maquoit Bay	43° 50'	70° 03'	-0 01	-0 01	*0.99	*0.99	9.0	10.3	4.8
835	South Freeport	43° 49'	70° 06'	+0 12	+0 10	*0.99	*0.99	9.0	10.3	4.8
837	Chebeague Point, Great Chebeague Island	43° 46'	70° 06'	-0 04	-0 09	*0.99	*0.99	9.0	10.4	4.8
839	Prince Point	43° 46'	70° 10'	0 00	0 00	*1.01	*1.00	9.2	10.6	4.9
841	Doyle Point	43° 45'	70° 08'	-0 02	-0 03	*1.00	*0.88	9.2	10.5	4.9
843	Falmouth Foreside	43° 44'	70° 12'	+0 01	0 00	*1.00	*1.03	9.1	10.5	4.9
845	Great Chebeague Island	43° 43'	70° 08'	+0 03	+0 03	*1.00	*1.00	9.1	10.5	4.9
847	Cliff Island, Luckse Sound	43° 42'	70° 07'	-0 02	-0 02	*1.00	*1.00	9.1	10.4	4.9
849	Vaill Island	43° 41'	70° 09'	+0 05	+0 01	*0.98	*1.03	9.0	10.3	4.8
851	Long Island	43° 41'	70° 10'	-0 01	0 00	*1.00	*1.00	9.1	10.4	4.9
853	Cow Island	43° 41'	70° 11'	-0 01	0 00	*1.00	*1.00	9.1	10.5	4.9
855	Presumpscot River Bridge	43° 41'	70° 15'	+0 01	+0 04	*1.01	*1.06	9.2	10.6	5.0
857	Back Cove	43° 41'	70° 15'	+0 02	+0 06	*0.97	*0.97	9.1	10.5	4.9
859	Great Diamond Island	43° 40'	70° 12'	-0 01	0 00	*0.99	*1.00	9.0	10.4	4.9
861	Peaks Island	43° 39'	70° 12'	-0 04	-0 08	*0.99	*0.99	9.0	10.4	4.8
863	Cushing Island	43° 39'	70° 12'	+0 01	0 00	*0.99	*1.00	9.0	10.4	4.9
865	PORTLAND	43° 40'	70° 15'	Daily predictions				9.1	10.4	4.9
867	Fore River	43° 38'	70° 17'	+0 02	+0 02	*1.00	*1.00	9.1	10.5	4.9
869	Portland Head Light	43° 37'	70° 12'	-0 02	-0 02	*0.97	*0.97	8.9	10.2	4.8
MAINE, outer coast—cont.										
871	Richmond Island	43° 33'	70° 14'	-0 03	-0 03	*0.98	*0.98	8.9	10.1	4.8
873	Old Orchard Beach	43° 31'	70° 22'	0 00	-0 06	*0.97	*0.97	8.8	10.1	4.7
875	Wood Island Harbor	43° 27'	70° 21'	+0 02	-0 04	*0.96	*0.96	8.7	9.9	4.7
877	Cape Porpoise	43° 22'	70° 26'	+0 12	+0 14	*0.95	*0.95	8.7	9.9	4.7
879	Kennebunkport	43° 21'	70° 28'	+0 16	+0 16	*0.94	*0.94	8.6	9.9	4.6
881	York Harbor	43° 08'	70° 38'	+0 03	+0 13	*0.95	*0.95	8.6	9.9	4.6
883	Seapoint, Cutts Island	43° 05'	70° 40'	+0 01	-0 04	*0.96	*0.96	8.8	10.1	4.7
MAINE and NEW HAMPSHIRE										
Portsmouth Harbor										
885	Jaffrey Point	43° 03'	70° 43'	-0 03	-0 05	*0.95	*0.95	8.7	10.0	4.7
887	Gerrish Island	43° 04'	70° 42'	-0 02	-0 03	*0.95	*0.95	8.7	10.0	4.7
889	Fort Point	43° 04'	70° 43'	+0 03	+0 07	*0.94	*0.94	8.6	9.9	4.6
891	Kittery Point	43° 05'	70° 42'	-0 07	+0 01	*0.96	*0.96	8.7	10.0	4.7
893	Seavey Island	43° 05'	70° 45'	+0 20	+0 18	*0.89	*0.89	8.1	9.4	4.4
895	Portsmouth	43° 05'	70° 45'	+0 22	+0 17	*0.86	*0.86	7.8	9.0	4.2
Piscataqua River										
897	Atlantic Heights	43° 05'	70° 46'	+0 37	+0 28	*0.82	*0.82	7.5	8.6	4.0
899	Dover Point	43° 07'	70° 50'	+1 33	+1 27	*0.70	*0.70	6.4	7.4	3.4
901	Salmon Falls River entrance	43° 11'	70° 50'	+1 35	+1 52	*0.75	*0.75	6.8	7.8	3.6
903	Squamscott River RR. Bridge	43° 03'	70° 55'	+2 19	+2 41	*0.75	*0.75	6.8	7.8	3.6
905	Gosport Harbor, Isles of Shoals	42° 59'	70° 37'	+0 02	-0 02	*0.93	*0.93	8.5	9.8	4.5
907	Hampton Harbor	42° 54'	70° 49'	+0 14	+0 32	*0.91	*0.91	8.3	9.5	4.5
MASSACHUSETTS, outer coast										
909	Merrimack River entrance	42° 49'	70° 49'	+0 20	+0 24	*0.91	*0.91	8.3	9.5	4.4
911	Newburyport, Merrimack River	42° 49'	70° 52'	+0 31	+1 11	*0.86	*0.86	7.8	9.0	4.2
913	Plum Island Sound (south end)	42° 43'	70° 47'	+0 12	+0 37	*0.94	*0.94	8.6	9.9	4.6
915	Annisquam	42° 39'	70° 41'	0 00	-0 07	*0.96	*0.96	8.7	10.1	4.7
917	Rockport	42° 40'	70° 37'	+0 04	+0 02	*0.94	*0.94	8.6	10.0	4.6
on Boston, p.36										
919	Gloucester Harbor	42° 36'	70° 40'	-0 01	-0 04	*0.91	*0.91	8.7	10.1	4.6
921	Manchester Harbor	42° 34'	70° 47'	0 00	-0 04	*0.92	*0.92	8.8	10.2	4.7
923	Beverly	42° 32'	70° 53'	+0 02	-0 03	*0.94	*0.94	9.0	10.4	4.8
925	Salem	42° 31'	70° 53'	+0 04	+0 03	*0.92	*0.92	8.8	10.2	4.7
927	Marblehead	42° 30'	70° 51'	0 00	-0 04	*0.95	*0.95	9.1	10.6	4.8
Broad Sound										
929	Nahant	42° 25'	70° 55'	+0 01	0 00	*0.94	*0.94	9.0	10.4	4.8
931	Lynn Harbor	42° 27'	70° 58'	+0 10	+0 06	*0.96	*0.96	9.2	10.7	4.9
Boston Harbor										
933	Boston Light	42° 20'	70° 53'	+0 02	+0 03	*0.94	*0.94	9.0	10.4	4.8
935	Lovell Island, The Narrows	42° 20'	70° 56'	+0 04	+0 03	*0.95	*0.95	9.1	10.6	4.8
937	Deer Island (south end)	42° 21'	70° 58'	+0 01	0 00	*0.97	*0.97	9.3	10.8	4.9
939	Belle Isle Inlet entrance	42° 23'	71° 00'	+0 20	+0 17	*1.00	*1.00	9.5	11.0	5.0
941	Castle Island	42° 20'	71° 01'	0 00	+0 02	*0.99	*0.99	9.4	10.9	5.0
943	BOSTON	42° 21'	71° 03'	Daily predictions				9.5	11.0	5.1
945	Dover St. Bridge, Fort Point Channel	42° 21'	71° 04'	+0 06	+0 08	*1.01	*1.01	9.6	11.0	5.1
Charles River										
947	Charlestown Bridge	42° 22'	71° 04'	+0 04	+0 04	*1.00	*1.00	9.5	11.0	5.0
949	Charles River Dam	42° 22'	71° 04'	+0 07	+0 06	*1.00	*1.00	9.5	11.0	5.0
951	Charlestown	42° 22'	71° 03'	0 00	+0 01	*1.00	*1.00	9.5	11.0	5.0
953	Chelsea St. Bridge, Chelsea River	42° 23'	71° 01'	+0 01	+0 06	*1.01	*1.01	9.6	11.1	5.1
955	Neponset, Neponset River	42° 17'	71° 02'	-0 02	+0 03	*1.00	*1.00	9.5	11.0	5.0
957	Moon Head	42° 19'	70° 59'	+0 01	+0 04	*0.99	*0.99	9.4	10.9	5.0
959	Rainsford Island, Nantasket Roads	42° 19'	70° 57'	0 00	+0 02	*0.95	*0.95	9.1	10.6	4.8

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No.	PLACE	POSITION		DIFFERENCES				RANGES		Mean Tide Level
		Latitude	Longitude	Time		Height		Mean	Spring	
				High Water	Low Water	High Water	Low Water			
		North	West	h m	h m	ft	ft	ft	ft	ft
MASSACHUSETTS—cont. Vineyard Sound Time meridian, 75° W				on Newport, p.40						
1085	Nobska Point	41° 31'	70° 39'	+0 41	+2 05	*0.43	*0.43	1.5	1.9	0.8
	Woods Hole									
1087	Little Harbor	41° 31'	70° 40'	+0 32	+2 21	*0.40	*0.40	1.4	1.8	0.8
1089	Oceanographic Institution	41° 32'	70° 40'	+0 22	+1 59	*0.52	*0.50	1.8	2.3	1.0
1091	Uncatena Island (south side)	41° 31'	70° 42'	+0 12	+0 22	*1.02	*1.02	3.6	4.5	1.9
1093	Tarpaulin Cove	41° 28'	70° 46'	+0 11	+1 23	*0.54	*0.54	1.9	2.4	1.0
	Quicks Hole									
1095	South side	41° 26'	70° 51'	-0 10	+0 09	*0.71	*0.71	2.5	3.1	1.3
1097	Middle	41° 27'	70° 51'	0 00	+0 10	*0.85	*0.85	3.0	3.7	1.6
1099	North side	41° 27'	70° 51'	-0 08	-0 08	*0.99	*0.99	3.5	4.4	1.8
Buzzards Bay										
1101	Cuttyhunk Pond entrance	41° 25'	70° 55'	+0 01	+0 01	*0.97	*0.97	3.4	4.2	1.8
1103	Penikese Island	41° 27'	70° 55'	-0 17	-0 16	*0.97	*0.97	3.4	4.2	1.8
1105	Kettle Cove	41° 29'	70° 47'	+0 09	+0 02	*1.08	*1.08	3.8	4.7	2.1
1107	Chappaquoit Point, West Falmouth Harbor	41° 36'	70° 39'	+0 10	+0 20	*1.10	*1.07	3.9	4.9	2.1
1109	West Falmouth Harbor	41° 36'	70° 39'	+0 21	+0 18	*1.14	*1.14	4.0	5.0	2.2
1111	Barlows Landing, Pocasset Harbor	41° 41'	70° 38'	+0 24	+0 18	*1.14	*1.14	4.0	5.0	2.2
1113	Abiels Ledge	41° 42'	70° 40'	+0 11	+0 16	*1.11	*1.11	3.9	4.9	2.2
1115	Monument Beach	41° 43'	70° 37'	+0 23	+0 18	*1.14	*1.14	4.0	5.0	2.2
1117	Cape Cod Canal, RR. bridge <6>	41° 44'	70° 37'	+1 15	— —	*0.99	*0.99	3.5	4.1	1.9
1119	Great Hill	41° 43'	70° 43'	+0 12	+0 11	*1.15	*1.21	4.0	5.0	2.2
1121	Wareham, Wareham River	41° 45'	70° 43'	+0 22	+0 16	*1.16	*1.16	4.1	5.1	2.2
1123	Bird Island	41° 40'	70° 43'	+0 05	-0 02	*1.19	*1.19	4.2	5.2	2.3
1125	Marion, Sippican Harbor	41° 42'	70° 46'	+0 10	+0 12	*1.13	*1.29	4.0	4.9	2.2
1127	Mattapoisett, Mattapoisett Harbor	41° 39'	70° 49'	+0 11	+0 20	*1.09	*1.00	3.9	4.8	2.1
1129	West Island (west side)	41° 36'	70° 50'	+0 09	+0 08	*1.05	*1.05	3.7	4.6	1.9
1131	Clarks Point	41° 36'	70° 54'	+0 14	+0 24	*1.06	*1.00	3.6	4.5	2.0
1133	New Bedford	41° 38'	70° 55'	+0 07	+0 07	*1.05	*1.05	3.7	4.6	1.9
1135	Belleville, Acushnet River	41° 40'	70° 55'	+0 07	+0 09	*1.08	*1.08	3.8	4.7	2.1
1137	South Dartmouth, Apponagansett Bay	41° 35'	70° 57'	+0 25	+0 33	*1.05	*1.05	3.7	4.6	1.9
1139	Dumping Rocks	41° 32'	70° 55'	+0 01	-0 02	*1.05	*1.05	3.7	4.6	1.9
	Westport River									
1141	Westport Harbor	41° 30'	71° 06'	+0 09	+0 33	*0.85	*0.85	3.0	3.7	1.6
1143	Hix Bridge, East Branch	41° 34'	71° 04'	+1 40	+2 30	*0.77	*0.77	2.7	3.4	1.4
RHODE ISLAND, Narragansett Bay										
1145	Sakonnet	41° 28'	71° 12'	-0 13	-0 01	*0.88	*0.86	3.1	3.9	1.7
1147	Anthony Point, Sakonnet River	41° 38'	71° 13'	-0 02	-0 02	*1.09	*1.07	3.8	4.8	2.1
1149	Beavertail Point	41° 27'	71° 24'	-0 05	+0 04	*0.99	*1.00	3.5	4.3	1.9
1151	Castle Hill	41° 28'	71° 22'	-0 05	+0 12	*0.94	*0.93	3.3	4.1	1.8
1153	NEWPORT	41° 30'	71° 20'			Daily predictions		3.5	4.4	1.9
1155	Conanicut Point	41° 34'	71° 22'	+0 07	-0 06	*1.07	*1.07	3.8	4.7	2.0
1157	Prudence Island, (south end)	41° 35'	71° 19'	+0 08	-0 04	*1.08	*1.07	3.8	4.8	2.0
1159	Bristol Point	41° 39'	71° 16'	+0 18	+0 07	*1.14	*1.14	4.0	5.0	2.1
1161	Bristol Highlands	41° 42'	71° 18'	+0 08	-0 07	*1.18	*1.21	4.2	5.2	2.2
1163	Bristol Ferry	41° 38'	71° 15'	+0 16	+0 01	*1.16	*1.14	4.1	5.1	2.2
1165	Fall River, State Pier	41° 42'	71° 10'	+0 19	-0 01	*1.25	*1.25	4.4	5.5	2.4
RHODE ISLAND and MASSACHUSETTS Narragansett Bay—cont.										
1167	Fall River, Massachusetts	41° 44'	71° 08'	+0 28	+0 29	*1.26	*1.26	4.4	5.5	2.4
1169	Taunton, Taunton River, Massachusetts	41° 53'	71° 06'	+1 06	+2 21	*0.79	*0.79	2.8	3.5	1.5
1171	Bristol, Bristol Harbor	41° 40'	71° 17'	+0 13	0 00	*1.16	*1.14	4.1	5.1	2.2
1173	Warren	41° 44'	71° 17'	+0 18	-0 01	*1.31	*1.29	4.6	5.7	2.5
1175	Nayatt Point	41° 43'	71° 20'	+0 09	-0 02	*1.31	*1.29	4.6	5.7	2.5
1177	Providence, State Pier #1	41° 48'	71° 24'	+0 11	-0 01	*1.28	*1.29	4.5	5.6	2.4
1179	Pawtucket, Seekonk River	41° 52'	71° 23'	+0 18	+0 09	*1.31	*1.29	4.6	5.8	2.5
1181	East Greenwich	41° 40'	71° 27'	+0 13	+0 03	*1.14	*1.14	4.0	5.0	2.1
1183	Wickford	41° 34'	71° 27'	+0 09	+0 02	*1.08	*1.07	3.8	4.7	2.0
1185	Narragansett Pier	41° 25'	71° 27'	-0 11	+0 11	*0.91	*0.93	3.2	4.0	1.7
RHODE ISLAND, Outer Coast										
1187	Point Judith Harbor of Refuge	41° 22'	71° 29'	-0 10	+0 17	*0.88	*0.86	3.1	3.9	1.6
1189	Block Island (Great Salt Pond)	41° 11'	71° 35'	+0 02	+0 07	*0.74	*0.71	2.6	3.2	1.4
1191	Block Island (Old Harbor)	41° 10'	71° 33'	-0 17	+0 12	*0.83	*0.86	2.9	3.6	1.5
1193	Watch Hill Point	41° 18'	71° 52'	+0 41	+1 16	*0.74	*0.71	2.6	3.2	1.4
				on New London, p.48						
1195	Westerly, Pawcatuck River	41° 23'	71° 50'	-0 21	+0 03	*1.02	*1.00	2.6	3.1	1.5
CONNECTICUT, Long Island Sound										
1197	Stonington, Fishers Island Sound	41° 20'	71° 54'	-0 32	-0 41	*1.05	*1.05	2.7	3.2	1.5
1199	Noank, Mystic River entrance	41° 19'	71° 59'	-0 22	-0 08	*0.89	*0.90	2.3	2.7	1.4
1201	West Harbor, Fishers Island, N.Y.	41° 16'	72° 00'	0 00	-0 06	*0.97	*0.97	2.5	3.0	1.4
1203	Silver Eel Pond, Fishers Island, N.Y.	41° 15'	72° 02'	-0 16	-0 04	*0.89	*0.89	2.3	2.7	1.3

Portland, Maine, 1997

Times and Heights of High and Low Waters

January				February				March			
Time		Height		Time		Height		Time		Height	
	h m	ft	cm		h m	ft	cm		h m	ft	cm
1 W	0349	8.4	256	16 Th	0449	9.9	302	1 Sa	0308	9.2	280
	0954	1.5	46		1107	0.0	0		0927	0.6	18
	1604	8.3	253		1721	9.1	277		1540	8.4	256
2 Th	2215	1.1	34		2328	0.1	3		2143	0.9	27
3 F	0437	8.5	259	17 F	0552	9.8	299	2 Su	0359	9.2	280
	1048	1.4	43		1215	0.1	3		1022	0.6	18
	1657	8.1	247		1828	8.8	268		1636	8.3	253
	2305	1.2	37						2239	1.0	30
4 Sa	0527	8.7	265	18 Sa	0032	0.5	15	3 M	0457	9.3	283
	1144	1.3	40		0655	9.7	296		1125	0.5	15
	1754	8.0	244		1319	0.1	3		1740	8.3	253
	2358	1.1	34		1933	8.6	262		2342	0.9	27
5 Su	0619	8.9	271	19 Su	0132	0.6	18	4 Tu	0601	9.5	290
	1241	0.9	27		0753	9.7	296		1230	0.2	6
	1851	8.2	250		1418	0.0	0		1847	8.5	259
					2031	8.6	262				
6 M	0052	1.0	30	20 M	0228	0.6	18	5 W	0048	0.6	18
	0712	9.4	287		0846	9.8	299		0707	9.9	302
	1337	0.4	12		1511	-0.1	-3		1335	-0.2	-6
	1948	8.4	256		2123	8.7	265		1951	9.1	277
7 Tu	0145	0.7	21	21 Tu	0318	0.6	18	6 Th	0152	0.1	3
	0804	9.9	302		0934	9.9	302		0810	10.4	317
	1430	-0.2	-6		1557	-0.2	-6		1435	-0.8	-24
	2042	8.8	268		2209	8.8	268		2050	9.7	296
8 W	0238	0.3	9	22 W	0402	0.6	18	7 F	0252	-0.5	-15
	0855	10.5	320		1016	9.9	302		0909	10.9	332
	1521	-0.8	-24		1639	-0.3	-9		1530	-1.3	-40
	2134	9.3	283		2250	8.8	268		2144	10.4	317
9 Th	0329	-0.2	-6	23 Th	0442	0.5	15	8 Sa	0349	-1.2	-37
	0945	11.0	335		1055	9.9	302		1005	11.3	344
	1611	-1.3	-40		1716	-0.3	-9		1622	-1.7	-52
	2224	9.7	296		2327	8.9	271		2236	10.9	332
10 F	0420	-0.6	-18	24 F	0520	0.5	15	9 Su	0443	-1.6	-49
	1035	11.4	347		1131	9.8	299		1058	11.5	351
	1700	-1.7	-52		1751	-0.2	-6		1712	-1.9	-58
	2314	10.1	308						2326	11.3	344
11 Sa	0512	-0.9	-27	25 Sa	0002	8.9	271	10 M	0535	-1.9	-58
	1127	11.6	354		0555	0.6	18		1150	11.5	351
	1750	-2.0	-61		1206	9.7	296		1801	-1.8	-55
					1824	-0.1	-3				
12 Su	0005	10.3	314	26 Su	0036	8.9	271	11 Tu	0016	11.4	347
	0604	-1.0	-30		0631	0.6	18		0627	-1.8	-55
	1219	11.5	351		1241	9.5	290		1242	11.2	341
	1841	-1.9	-58		1857	0.1	3		1850	-1.5	-46
13 M	0058	10.5	320	27 M	0110	8.8	268	12 W	0106	11.2	341
	0659	-1.0	-30		0707	0.7	21		0720	-1.6	-49
	1313	11.2	341		1317	9.3	283		1335	10.6	323
	1934	-1.7	-52		1931	0.2	6		1941	-1.0	-30
14 Tu	0152	10.4	317	28 Tu	0145	8.8	268	13 Th	0157	10.8	329
	0756	-0.8	-24		0745	0.8	24		0814	-1.1	-34
	1410	10.8	329		1356	9.0	274		1430	10.0	305
	2028	-1.3	-40		2007	0.4	12		2034	-0.3	-9
15 W	0248	10.3	314	29 W	0222	8.8	268	14 F	0251	10.3	314
	0856	-0.5	-15		0826	0.9	27		0911	-0.5	-15
	1510	10.2	311		1437	8.7	265		1528	9.3	283
	2125	-0.8	-24		2046	0.7	21		2130	0.3	9
16 Th	0348	10.1	308	30 Th	0303	8.8	268	15 Sa	0348	9.8	299
	0954	-0.2	-6		0912	1.0	30		1012	0.1	3
	1614	9.6	293		1522	8.4	256		1629	8.7	265
	2226	-0.3	-9		2130	0.9	27		2230	0.9	27
17 F	0438	8.9	271	31 F	0348	8.8	268	16 Su	0348	9.8	299
	1058	1.0	30		1002	1.0	30		1012	0.1	3
	1709	8.1	247		1613	8.2	250		1629	8.7	265
	2313	1.1	34		2218	1.0	30		2230	0.9	27
18 Su	0438	8.9	271								
	1058	1.0	30								
	1709	8.1	247								
	2313	1.1	34								
19 M	0533	9.0	274								
	1158	0.7	21								
	1811	8.1	247								
20 Tu	0012	0.9	27								
	0632	9.4	287								
	1300	0.3	9								
	1914	8.4	256								
21 W	0113	0.6	18								
	0732	9.9	302								
	1401	-0.2	-6								
	2014	8.8	268								
22 Th	0212	0.2	6								
	0830	10.5	320								
	1457	-0.9	-27								
	2111	9.4	287								
23 F	0309	-0.4	-12								
	0926	11.0	335								
	1550	-1.5	-46								
	2204	10.0	305								
24 Sa	0403	-0.9	-27								
	1020	11.5	351								
	1641	-1.9	-58								
	2256	10.5	320								
25 Su	0457	-1.4	-43								
	1112	11.7	357								
	1732	-2.1	-64								
	2347	10.8	329								
26 M	0550	-1.6	-49								
	1205	11.6	354								
	1822	-2.1	-64								
27 Tu	0038	11.0	335								
	0644	-1.6	-49								
	1259	11.3	344								
	1913	-1.8	-55								
28 W	0130	10.9	332								
	0739	-1.3	-40								
	1354	10.8	329								
	2005	-1.3	-40								
29 Th	0224	10.7	326								
	0836	-0.9	-27								
	1451	10.1	308								
	2100	-0.7	-21								
30 F	0320	10.3	314								
	0937	-0.5	-15								
	1552	9.4	287								
	2159	-0.1	-3								
31 Sa	0420	9.9	302								
	1042	0.0	0								
	1657	8.9	271								
	2301	0.5	15								

Newport, R.I., 1997

Times and Heights of High and Low Waters

January				February				March			
Time	Height			Time	Height			Time	Height		
	h	m	ft		h	m	ft		h	m	ft
1 W O	0037	2.9	88	16 Th	0126	3.7	113	1 Sa	0007	3.2	98
	0537	0.5	15		0733	0.2	6		0527	0.2	6
	1255	2.8	85		1352	3.2	98		1234	2.8	85
	1802	0.3	9		1943	0.1	3		1742	0.1	3
2 Th	0130	3.0	91	17 F	0227	3.7	113	2 Su	0106	3.2	98
	0634	0.6	18		0859	0.3	9		0626	0.3	9
	1350	2.8	85		1453	3.1	94		1336	2.8	85
	1855	0.3	9		2055	0.2	6		1843	0.1	3
3 F	0225	3.1	94	18 Sa	0326	3.7	113	3 M	0210	3.3	101
	0738	0.6	18		1015	0.3	9		0735	0.2	6
	1446	2.8	85		1550	3.1	94		1441	2.9	88
	1954	0.2	6		2203	0.1	3		1953	0.1	3
4 Sa	0320	3.3	101	19 Su	0421	3.7	113	4 Tu	0313	3.5	107
	0846	0.4	12		1112	0.2	6		0850	0.1	3
	1542	2.9	88		1644	3.1	94		1543	3.2	98
	2056	0.1	3		2257	0.1	3		2109	-0.1	-3
5 Su	0412	3.6	110	20 M	0512	3.8	116	5 W	0413	3.8	116
	0951	0.2	6		1158	0.1	3		1002	-0.2	-6
	1635	3.2	98		1733	3.2	98		1641	3.6	110
	2157	-0.2	-6		2342	0.0	0		2220	-0.4	-12
6 M	0503	4.0	122	21 Tu	0558	3.9	119	6 Th	0509	4.1	125
	1051	-0.1	-3		1234	0.0	0		1104	-0.5	-15
	1727	3.4	104		1818	3.3	101		1735	4.0	122
	2254	-0.4	-12						2324	-0.7	-21
7 Tu	0553	4.3	131	22 W	0019	-0.1	-3	7 F	0602	4.4	134
	1146	-0.4	-12		0642	3.9	119		1158	-0.8	-24
	1817	3.7	113		1303	0.0	0		1827	4.3	131
	2349	-0.7	-21		1901	3.4	104				
8 W ●	0642	4.6	140	23 Th	0052	-0.1	-3	8 Sa	0020	-1.0	-30
	1237	-0.7	-21		0723	3.9	119		0653	4.6	140
	1907	3.9	119		1329	-0.1	-3		1248	-1.0	-30
					1942	3.5	107		1917	4.6	140
9 Th	0042	-0.9	-27	24 F	0124	-0.2	-6	9 Su	0113	-1.1	-34
	0731	4.7	143		0803	3.9	119		0743	4.6	140
	1326	-0.9	-27		1355	-0.1	-3		1335	-1.1	-34
	1956	4.1	125		2023	3.5	107		2006	4.7	143
10 F	0134	-1.0	-30	25 Sa	0155	-0.2	-6	10 M	0203	-1.2	-37
	0821	4.7	143		0843	3.8	116		0832	4.5	137
	1414	-0.9	-27		1422	-0.1	-3		1421	-1.0	-30
	2047	4.2	128		2103	3.4	104		2055	4.7	143
11 Sa	0226	-1.0	-30	26 Su	0228	-0.1	-3	11 Tu	0252	-1.0	-30
	0911	4.6	140		0922	3.6	110		0921	4.3	131
	1503	-0.9	-27		1452	-0.1	-3		1506	-0.8	-24
	2138	4.2	128		2143	3.4	104		2144	4.5	137
12 Su	0319	-0.8	-24	27 M	0302	0.0	0	12 W	0341	-0.7	-21
	1003	4.4	134		1001	3.4	104		1011	4.0	122
	1552	-0.8	-24		1524	-0.1	-3		1551	-0.6	-18
	2232	4.1	125		2224	3.2	98		2235	4.2	128
13 M	0413	-0.6	-18	28 Tu	0338	0.1	3	13 Th	0430	-0.4	-12
	1057	4.1	125		1041	3.2	98		1102	3.6	110
	1643	-0.6	-18		1558	0.0	0		1637	-0.2	-6
	2327	4.0	122		2307	3.1	94		2329	3.9	119
14 Tu	0511	-0.3	-9	29 W	0418	0.2	6	14 F	0522	0.0	0
	1153	3.8	116		1124	3.0	91		1157	3.3	101
	1737	-0.3	-9		1637	0.1	3		1726	0.1	3
					2353	3.1	94				
15 W O	0026	3.8	116	30 Th	0503	0.3	9	15 Sa	0025	3.6	110
	0616	0.0	0		1212	2.8	85		0622	0.3	9
	1252	3.5	107		1721	0.1	3		1255	3.0	91
	1836	-0.1	-3						1823	0.4	12
				31 F O	0045	3.0	91				
					0556	0.4	12				
					1307	2.7	82				
					1813	0.2	6				
								31 M O	0039	3.4	104
									0606	0.1	3
									1315	2.9	88
									1823	0.2	6

INDEX TO STATIONS
(Numbers refer to table 2)

[Stations marked with an asterisk (*) are reference stations for which daily predictions are given in table 1. Page numbers of reference stations are given in parentheses.]

A		No.		No.
Abiels Ledge.....	2086	Bay Ridge.....	3611	
Acabonack Harbor entrance.....	2586	Bay Ridge Channel.....	3616	
Accaceek Point.....	5506	Bay Shore Channel.....	4061±4066	
Adams Island.....	4721,4726	Beach Channel.....	3586	
Alafia River entrance.....	8366	Beach Hammock.....	7286	
Albany.....	3776	Bear Creek entrance.....	6081	
Aldridge Ledge.....	1151	Bear Mountain Bridge.....	3696	
Alligator Creek.....	6421	Bear River.....	7456±7471	
Allmondsville.....	5381	Beaufort Airport.....	7076	
Alloway Creek.....	4206,4211	Beaufort.....	7071	
Almy Point.....	2191	Beaufort Inlet.....	6246±6331	
Altamaha Sound.....	7611±7631	Beaufort River.....	7046,7051,7061±7076	
Ambrose Channel.....	3596	Beaufort River Entrance.....	7046	
Ambrose Light.....	3551	Beaver Head.....	2306	
Amoco Pier, Cooper R.....	6723	Beavertail Point.....	2311	
Anacostia River.....	5826,5831	Bees Ferry Bridge.....	6811	
Anclote Key.....	8421	Ben Davis Point.....	4151±4161	
Andrews Island.....	346	Benedict.....	5876	
Annapolis.....	6026	Bergen Point.....	3916	
Annisquam Harbor Light.....	971	Berkley.....	5181	
Apalachee Bay.....	8426±8436	Berkley Bridge.....	5171	
Appomattox River entrance.....	5291	Bermuda Hundred.....	5296	
Apponaganset Bay.....	2096	Big Stone Beach.....	4086	
Appoquinimink River.....	4191	Big Annessex River entrance.....	5576	
Aransas Pass * (96).....	8607	Big Sarasota Pass.....	8146	
Arnold Point.....	4176	Big Stone Beach.....	4081	
Arnold Point, Elk River.....	6131	Birch Island.....	246	
Arthur Kill.....	3896±3911	Bird Shoal.....	6311	
Artificial Island.....	4196	Biscayne Bay.....	7991	
Ashepoo Coosaw Cutoff.....	6936	Black Point, Long Island Sound....	2791,2796	
Ashepoo River.....	6931,6946	Black Point, Narragansett Bay.....	2186	
Ashe Island Cut.....	6961,6966	Black Rock Channel.....	1161	
Ashley River.....	6781±6811	Blackburn Bay.....	8131	
Astoria, East River.....	3381	Blair Channel.....	6226	
Avondale.....	2676	Blair Point.....	5436	
B		Blind Pass.....	8386	
Back Cove.....	746	Block Island.....	2401±2446	
Back Creek entrance.....	6146	Block Island Sound.....	2376±2576	
Back River, Md.....	6101	Blonde Rock.....	16	
Back River entrance, Beaufort Inlet....	6186	Bloody Point Bar Light.....	4856	
Back River entrance, St. Simon Sound...	7646	Bloody Point, New River.....	7156,7161	
Badgers Island.....	896,901	Bluff Head.....	586	
Bahia de San Juan.....	8671,8676	Bluff Point.....	3096,4656	
Bahia Honda Harbor.....	8011	Blundering Point.....	5371	
Bakers Haulover Cut.....	7911	Blynman Canal entrance.....	981	
Bald Eagle Point.....	5956	Boars Head.....	66	
Bald Head, Cape Fear River.....	6336	Boca Ciega Bay.....	8371±8406	
Bald Head, Kennebec River.....	581	Boca Grande Channel.....	8056	
Baltimore Harbor Approach * (48).....	4896	Boca Grande Pass.....	8091	
Bar Harbor.....	116	Bodie Island±Pea Island.....	6191	
Barataria Bay.....	8486±8506	Bolivar Roads.....	8571	
Barataria Pass.....	8496	Bonneau Ferry.....	6746	
Barnegat Inlet.....	3956	Boston Harbor and approaches.....	1101±1601	
Barnstable Harbor.....	1626	Boston Harbor (Deer I. Lt.) * (12)....	1196	
Barren Island.....	3576	Boston Light.....	1126	
Barrytown.....	3736	Bourne Highway Bridge.....	2161	
Bartlett Reef.....	2776	Bournedale.....	2166	
Bass Point.....	1046±1056	Bowlers Rock.....	5501	
Bath, Kennebec River.....	606	Bradbury Island.....	181	
Bay of Fundy.....	1±81	Braddock Point.....	7126	
Bay of Fundy entrance * (4).....	81	Bradley Point.....	7416	
Bay Point Island.....	7031	Branford Reef.....	2806,2811	
		Brandon Point.....	5271	
		Brandywine Range.....	4071±4076,4111	
		Brant Point.....	1786	
		Brazil Rock.....	1	

INDEX TO STATIONS

	No.
Red Hook Channel.....	3621
Red Point.....	5046
Reedy Island.....	4201
Reedy Point.....	4221±4231
Reedy Point Radio Tower.....	6171
Remley Point.....	6751
Ribbon Reef.....	2046
Rikers Island Channel.....	3361
Riverdale.....	3661
Riverview Beach.....	4281
Roanoke Point.....	2946,2951
Roaring Point.....	5631
Robins Reef Lt.....	3626
Robinsons Hole.....	1951,2001±2011
Robins Island.....	2656
Robins Point.....	5001
Rockaway Inlet Jetty.....	3836
Rockaway Inlet.....	3566,3571
Rockaway Point.....	3561
Rocketts.....	5306
Rockland Harbor Breakerwater.....	431
Rockland Shoal Channel.....	5226±5236
Rockland Harbor Breakerwater.....	431
Rock Point.....	5756
Rocky Hill.....	2856
Rocky Point, Block Island Sound.....	2576
Rocky Point, Elk Neck.....	5041
Rocky Point, Long Island Sound....	2881,3161
Rogue Point.....	5476
Roosevelt Inlet.....	4046
Roosevelt Island.....	3401,3421
Rose Island.....	2236±2246
Ross Island.....	8321
Russ Island.....	141

S

Sabine.....	8551
Sabine Bank.....	8611
Sabine Pass.....	8546±8561
Sachem Head.....	2936,2941,2956
Saddle Island.....	456
Sagamore Beach.....	1636
Sagamore Bridge.....	2171
St. Andrews Sound.....	7681±7696
St. Catherines Sound.....	7456±7516
St. Clements Bay entrance.....	5741
St. Clements Island.....	5746±5751
St. George Bridge.....	6166
St. Helena Sound.....	6941,6951,6966
St. Johns Bluff.....	7806
St. Johns Point.....	7776
St. Johns River.....	7776±7861
St. Johns River entrance * (64).....	7781
St. Jones River.....	4131
St. Joseph Sound.....	8411±8421
St. Marks.....	8436
St. Marks River.....	8426±8436
St. Marys River, Md.....	5701
St. Marys River±Cumberland Sound..	7701±7751
St. Simons Sound.....	7636±7676
Sakonnet River.....	2181±2201
Salamander Point.....	816,821
Salem River.....	4236
Salisbury.....	5621
Sampit River entrance.....	6476
Sampson Island.....	6911,6916
Sams Point.....	7001
Sand Point.....	1066
Sandwich Harbor.....	1631
Sandy Hook.....	3786±3796
Sandy Hook Approach.....	3556
Sandy Hook Bay.....	3846,3851
Sandy Hook Channel.....	3786,3791

Sandy Hook Point.....	3796
Sandy Point.....	4886±4891
Sandy Point, Block I....	2406,2411,2446,2456
Sandy Point,Great Wicomico River.....	5661
Sandy Point, Nanticoke River.....	5626
Sandy Point, Patuxent River.....	5856
Sandy Point, Solomons Island.....	5856
Sapelo River Entrance.....	7536
Sapelo Sound.....	7521±7561
Sarasota Bay.....	8146±8171
Sasanoa River.....	561,571
Sassafras River.....	6116,6126
Saugatuck River.....	3091,3096
Saugerties.....	3741
Savannah.....	7246,7251
Savannah Light.....	7186
Savannah River.....	7186±7281
Savannah River entrance * (60).....	7191
Sawpit Creek entrance.....	7756
Saybrook Breakwater.....	2866
Saybrook Point.....	2826
Schuylkill River.....	4336±4341
Srcag Island.....	191
Seabrook Bridge, New Orleans.....	8511
Seal Island.....	21
Sears Island.....	301
Seavey Island.....	841,846,861
Seekonk River.....	2366,2371
Seguine Point.....	3871
Severn River.....	6021±6031
Sewells Point.....	5121,5131
Shackleford Banks.....	6246
Shackleford Point.....	6316
Shagwong Reef.....	2531
Shapleigh Island Bridge.....	881
Sharp Island Lt.....	4806±4816
Sharps.....	5496
Sheep Island, Hingham Bay.....	1546
Sheep Island, Penobscot Bay.....	401
Sheep Island Slue.....	6236
Sheepscot River.....	556
Sheffield Island Harbor.....	3106
Sheffield Island Tower.....	3101
Shell Point.....	8301
Sheridan Point.....	5871
Shinnecock Bay.....	3521
Shinnecock Canal.....	3516
Shinnecock Inlet.....	3526
Shippan Point.....	3156
Shipyard Creek.....	6661
Shoal Point.....	3081
Shrewsbury River.....	3846,3851
Shutes Folly Island.....	6576
Shutes Reach.....	6622
Silver Point.....	3746
Sippican Harbor.....	2131
Sisters Creek entrance.....	7801
Six Mile Reef.....	2901,2906
Skidaway Narrows.....	7366
Skidaway River.....	7336
Skull Creek.....	7086,7146
Smith Cove.....	2751
Smith Island.....	4701
Smith Island Shoal.....	4431
Smith Point Light.....	4671±4696
Smoking Point.....	3901
Smuggedy Swamp.....	6926
Smyrna River.....	4181
Snake Island.....	6821
Snell Isle.....	8316
Snake Island.....	1231
Snow Point.....	6716
Snows Cut.....	6386
Snub Point.....	341

TABLE 2 – CURRENT DIFFERENCES AND OTHER CONSTANTS

No.	PLACE	Meter Depth	POSITION		TIME DIFFERENCES				SPEED RATIOS		AVERAGE SPEEDS AND DIRECTIONS			
			Latitude	Longitude	Min. before Flood	Flood	Min. Ebb	Ebb	Flood	Ebb	Minimum before Flood	Maximum Flood	Minimum before Ebb	Maximum Ebb
		ft	North	West	h m	h m	h m	h m			knots	Dir.	knots	Dir.
	MASSACHUSETTS COAST—cont. Time meridian, 75° W				on Boston Harbor, p. 12									
971	Annisquam Harbor Light		42° 40.1'	70° 41.1'	+0 42	+0 49	+0 58	+0 03	0.9	1.1	0.0	—	0.0	—
976	Gloucester Harbor entrance		42° 34.9'	70° 40.5'	-0 28	+0 01	-0 29	-0 36	0.3	0.2	0.0	—	0.0	—
981	Bynman Canal ent., Gloucester Harbor		42° 36.6'	70° 40.4'	-0 06	+0 05	-0 15	-0 39	2.7	2.8	0.0	—	0.0	—
986	Marblehead Channel		42° 30'	70° 49'	+1 09	+1 09	+1 09	+1 09	0.4	0.3	0.0	—	0.0	—
991	Ram Island, 0.2 n.mi. NNE of	10	42° 28.75'	70° 51.68'	See Rotary tidal currents, table 2.									
996	Ram Island, 0.2 n.mi. southeast of	10	42° 28.45'	70° 51.55'	See Rotary tidal currents, table 2.									
1001	Great Pig Rocks, southeast of	10	42° 27.53'	70° 50.70'	See Rotary tidal currents, table 2.									
1006	Galoupes Point, 0.4 n.mi. south of	10	42° 27.24'	70° 53.70'	See Rotary tidal currents, table 2.									
1011	Little Nahant, 0.9 n.mi. northeast of	10	42° 26.85'	70° 54.84'	See Rotary tidal currents, table 2.									
1016	Egg Rock, 0.2 n.mi. north of	10	42° 26.25'	70° 53.93'	See Rotary tidal currents, table 2.									
1021	Egg Rock, southwest of	10	42° 25.85'	70° 54.20'	See Rotary tidal currents, table 2.									
1026	Nahant, 1.8 n.mi. NE of East Point	45	42° 26.00'	70° 52.02'	+0 32	+0 49	+0 15	+1 00	0.6	0.6	0.0	—	0.1	291°
	do.	80	42° 26.00'	70° 52.02'	-0 21	+1 04	+1 14	-0 31	0.3	0.2	0.0	—	0.0	—
1031	Nahant, 0.4 n.mi. east of East Point	15	42° 25.23'	70° 53.63'	+0 04	-0 41	+0 15	+0 22	0.4	0.5	0.2	118°	0.0	—
1036	do.	25	42° 25.23'	70° 53.63'	+0 03	-0 26	+0 08	+0 29	0.4	0.4	0.1	102°	0.1	282°
1041	Nahant, 1 n.mi. SE of East Point	70	42° 23.83'	70° 51.17'	+0 04	+1 04	+1 13	+0 14	0.3	0.2	0.0	—	0.0	—
	do.	15	42° 24.63'	70° 54.13'	-0 22	-0 04	+0 19	-0 01	0.2	0.2	0.0	—	0.0	—
1046	Pea Island, 0.4 n.mi. southeast of	65	42° 24.63'	70° 54.13'	+0 53	+0 55	+0 42	-0 01	0.5	0.4	0.0	—	0.1	161°
	do.	10	42° 24.12'	70° 55.07'	-0 22	+1 20	+0 58	-0 14	0.3	0.3	0.0	—	0.0	—
	do.	45	42° 24.12'	70° 55.07'	-0 29	+1 10	+0 52	-0 29	0.3	0.2	0.0	—	0.0	—
	do.	60	42° 24.12'	70° 55.07'	-0 29	+1 10	+0 52	-0 29	0.3	0.2	0.0	—	0.0	—
1051	Bass Point, 0.5 n.mi. SSW of	15	42° 24.57'	70° 56.53'	See Rotary tidal currents, table 2.									
1056	Bass Point, 0.7 n.mi. west of	10	42° 25.13'	70° 57.25'	-0 02	-0 26	+1 32	+0 46	0.4	0.4	0.0	—	0.1	137°
1061	Little Nahant Cupola, 0.6 n.mi. west of	10	42° 25.87'	70° 56.83'	+0 04	-0 17	+1 00	+0 27	0.5	0.4	0.0	—	0.0	—
1066	Sand Point, Black Marsh Channel	10	42° 27.27'	70° 58.52'	+0 29	-0 26	+2 35	+1 25	0.2	0.2	0.0	—	0.0	—
1071	Lynn Harbor	6	42° 25.97'	70° 57.53'	+0 05	+0 19	+1 08	+0 41	0.4	0.5	0.0	—	0.0	—
1076	Point of Pines, 0.5 n.mi. south of	10	42° 26.52'	70° 57.62'	-0 01	+1 05	+0 26	-0 02	0.8	1.0	0.0	—	0.0	—
1081	Point of Pines, 0.1 n.mi. northeast of	10	42° 22.17'	70° 55.42'	-0 11	+0 50	+0 36	+0 28	0.5	0.6	0.0	—	0.2	295°
1086	Finn's Ledger Bell, 0.2 n.mi. west of	25	42° 22.17'	70° 55.42'	-0 11	+0 50	+0 36	+0 28	0.3	0.4	0.0	—	0.0	—
	do.	10	42° 21.93'	70° 56.52'	-1 12	+0 19	+0 31	-1 46	0.4	0.3	0.3	103°	0.2	297°
1091	Winthrop Head, 1.1 n.mi. east of	10	42° 21.30'	70° 55.90'	-0 52	-0 57	-0 14	-0 25	0.8	1.0	0.2	112°	0.2	300°
1096	Lovell Island, 1.3 n.mi. north of	25	42° 21.30'	70° 55.90'	-1 19	-0 59	-0 12	-0 13	0.7	0.6	0.0	—	0.1	135°
	do.													
	BOSTON HARBOR APPROACHES													
1101	The Graves, 0.3 n.mi. SSE of	10	42° 21.60'	70° 52.00'	+0 16	+1 08	+1 21	+0 19	0.5	0.5	0.3	171°	0.1	135°
	do.	45	42° 21.60'	70° 52.00'	-0 37	-0 52	-0 10	-0 58	0.3	0.4	0.1	186°	0.0	—
1106	Thieves Ledge	60	42° 19.28'	70° 50.28'	-0 49	-0 52	-0 16	-1 23	0.2	0.3	0.0	—	0.0	—
1111	Little Brewster Island, 1.5 n.mi. E of	45	42° 19.68'	70° 51.43'	-0 15	-0 06	-0 40	-1 37	0.2	0.2	0.1	030°	0.0	—
	do.	10	42° 19.68'	70° 51.43'	+2 19	+0 41	-0 40	+0 55	0.5	1.0	0.4	028°	0.6	337°
	do.	35	42° 19.68'	70° 51.43'	+0 53	-0 49	+0 03	+1 30	0.3	0.4	0.0	—	0.2	212°
1116	Hypocrite Channel	60	42° 19.68'	70° 51.43'	-1 14	-1 23	+1 31	-0 45	0.3	0.2	0.2	265°	0.0	—
1121	Little Calf Island, 0.4 n.mi. NW of	10	42° 20.95'	70° 53.63'	+0 13	+0 19	+0 49	-0 31	0.8	0.8	0.1	345°	0.1	351°
1126	Boston Light, 0.2 n.mi. south of	10	42° 19.05'	70° 54.00'	+0 23	+0 04	-0 15	-0 18	0.5	0.6	0.0	—	0.0	—
1131	Point Allerton, 0.8 n.mi. NNW of	10	42° 19.52'	70° 53.40'	+0 14	+0 19	+0 41	+0 40	0.9	1.1	0.1	203°	0.0	—
	do.	25	42° 19.28'	70° 53.25'	+0 25	+0 03	+0 46	-0 05	1.0	1.1	0.0	—	0.1	005°
1136	Point Allerton, 0.5 n.mi. NNW of	10	42° 19.05'	70° 53.10'	+0 14	+0 13	+0 55	+0 29	0.9	0.9	0.0	—	0.0	—
	do.	25	42° 19.05'	70° 53.10'	+0 14	+0 26	+0 41	+0 11	0.9	1.0	0.0	—	0.0	—
1141	Point Allerton, 0.4 n.mi. northwest of	10	42° 18.88'	70° 53.23'	-0 09	+0 29	+0 53	+0 25	0.8	0.8	0.0	—	0.0	—
	do.								0.6	0.7	0.0	—	0.2	353°

TABLE 2 – CURRENT DIFFERENCES AND OTHER CONSTANTS

No.	PLACE	Meter Depth	POSITION		TIME DIFFERENCES				SPEED RATIOS		AVERAGE SPEEDS AND DIRECTIONS			
			Latitude	Longitude	Min. before Flood	Flood	h	Min. Ebb	Flood	Ebb	Minimum before Flood	Maximum Flood	Minimum before Ebb	Maximum Ebb
		ft	North	West	h	m	h	m	h	m	knots	Dir.	knots	Dir.
	BUZZARDS BAY <7>-cont. Time meridian, 75° W													
2056	Penikese Island, 0.2 mile south of		41° 26.6'	70° 55.5'	-1 43	-0 15	-1 30	-2 39	0.4	0.5	0.0	0.7 093°	0.0	0.9 287°
2061	Gull I. and Nashawena I., between		41° 26.2'	70° 54.2'	-2 15	-0 57	-2 01	-2 41	0.5	0.6	0.0	0.9 091°	0.0	1.1 247°
2066	Weepecket Island, south of		41° 30.4'	70° 44.3'	-3 16	-1 07	-1 28	-2 27	0.4	0.4	0.0	0.8 069°	0.0	0.6 255°
2071	Quamisset Harbor entrance		41° 32.4'	70° 39.8'							0.0	0.4	0.0	0.3
2076	West Falmouth Harbor entrance		41° 36.5'	70° 39.3'										
2081	Megansett Harbor		41° 38.8'	70° 39.2'										
2086	Abie's Ledge, 0.4 mile south of		41° 41.1'	70° 40.4'	+0 26	-0 36	-0 06	-0 23	0.4	0.6	0.0	0.8 035°	0.0	1.0 216°
2091	Dumpling Rocks, 0.2 mile southeast of		41° 32.0'	70° 55.1'	-1 43	-1 03	-1 32	-2 09	0.4	0.6	0.0	0.8 066°	0.0	1.1 190°
2096	Apponaugset Bay		41° 35'	70° 57'										
2101	Clarks Cove		41° 36'	70° 55'										
2106	New Bedford Harbor and approaches		41° 35.6'	70° 50.4'							0.0	0.3	0.0	0.4
2111	West Island and Long Island, between		41° 34.0'	70° 48.6'							0.0	0.7 079°	0.0	0.8 203°
2116	West Island, 1 mile southeast of		41° 37.1'	70° 50.2'	-0 43	-0 43	-1 28	-1 42	0.4	0.5	0.0	0.3	0.0	0.3
2121	Nasketucket Bay		41° 38'	70° 47'										
2126	Mattapoisett Harbor		41° 41'	70° 44'							0.0	0.3	0.0	0.4
2131	Sippican Harbor		41° 44.0'	70° 43.0'	-1 41	-0 31	-1 22	-1 23	0.3	0.4	0.0	0.6 022°	0.0	0.6 202°
2136	Wareham River, off Long Beach Point		41° 44.7'	70° 42.4'	-1 49	-0 27	-1 22	-1 31	0.4	0.4	0.0	0.7 010°	0.0	0.6 185°
2141	Wareham River, off Barneys Point													
	on Cape Cod Canal, p.16													
2146	Onset Bay, south of Onset Island		41° 43.9'	70° 38.7'										
2151	Onset Bay, south of Wickets Island		41° 44.1'	70° 39.3'										
	CAPE COD CANAL													
2156	CAPE COD CANAL, railroad bridge		41° 44.5'	70° 36.8'							0.0	4.0 070°	0.0	4.5 250°
2161	Bourne Highway bridge		41° 45'	70° 35'	-0 03	-0 01	-0 03	-0 04	0.8	0.9	0.0	3.3 065°	0.0	4.0 245°
2166	Bourne Bridge		41° 46'	70° 34'	-0 07	-0 03	-0 09	-0 10	0.8	0.8	0.0	3.4 030°	0.0	3.6 210°
2171	Sagamore Bridge		41° 46'	70° 33'	-0 09	-0 04	-0 11	-0 13	0.7	0.6	0.0	2.8 095°	0.0	2.5 275°
2176	Cape Cod Canal, east end	15	41° 46.5'	70° 30.0'	-0 13	-0 06	-0 17	-0 19	0.6	0.6	0.0	2.4 065°	0.0	2.6 245°
	NARRAGANSETT BAY <8>													
2181	Sakonnet River (except Narrows)													
2186	Black Point, SW of Sakonnet River	15	41° 30.4'	71° 13.2'	-2 54	-1 55	-2 13	-2 26	0.2	0.2	0.0	0.4 012°	0.0	0.4 194°
2191	Almy Point Bridge, south of Sakonnet River	15	41° 37.3'	71° 13.2'	-3 00	-2 10	-2 30	-3 13	0.2	0.8	0.0	0.4 034°	0.0	1.5 180°
2196	Tiverton, Stone bridge, Sakonnet R. <9>		41° 37.5'	71° 13.0'	-2 58	-5 02	-2 26	-3 06	1.4	1.6	0.0	2.7 010°	0.0	2.7 190°
	on Pollock Rip Channel, p.20													
2201	Tiverton, RR. bridge, Sakonnet R. <10>		41° 38.3'	71° 12.9'	-3 26	-5 06	-2 48	-3 41	1.3	1.4	0.0	2.5 010°	0.0	2.4 180°
	on Pollock Rip Channel, p.20													
2206	Common Fence Point, northeast of	10	41° 39.5'	71° 12.5'	-2 38	-4 50	-2 32	-2 41	0.8	0.1	0.0	1.5 000°	0.0	0.3 210°
2211	Brenton Point, 1.4 n.mi. southwest of	7	41° 25.9'	71° 22.6'	-1 03	-0 38	-1 20	-1 04	0.1	0.4	0.0	0.1 046°	0.0	0.6 170°
2216	Castle Hill, west of East Passage	15	41° 27.4'	71° 22.7'	-0 06	-0 42	-1 07	-0 29	0.4	0.7	0.0	0.4 347°	0.0	1.2 237°
2221	Bull Point, east of	10	41° 28.8'	71° 21.0'	-1 10	-0 47	-1 10	-1 33	0.6	0.8	0.0	1.2 001°	0.0	1.5 206°
2226	Mackereel Cove		41° 28.5'	71° 22.8'										
2231	Newport Harbor, S and E of Goat Island		41° 29'	71° 20'										
2236	Rose Island, northeast of	15	41° 30.2'	71° 19.9'	-1 57	-0 07	-1 17	-2 08	0.4	0.5	0.0	0.8 310°	0.0	1.0 124°
2241	Rose Island, northwest of	15	41° 30.4'	71° 21.1'	-1 38	-0 26	-1 30	-1 39	0.4	0.5	0.1	0.7 007°	0.1	1.0 190°
2246	Rose Island, west of		41° 29.8'	71° 21.0'	-1 40	-0 34	-1 20	-1 28	0.4	0.6	0.0	0.7 001°	0.0	1.0 172°
2251	Gould Island, southeast of	7	41° 31.5'	71° 20.2'	-1 40	-1 28	-1 14	-1 16	0.3	0.4	0.0	0.5 033°	0.0	0.7 217°
2256	Gould Island, west of	15	41° 31.9'	71° 21.5'	-0 16	-0 32	-1 13	-1 07	0.3	0.4	0.0	0.6 351°	0.1	0.8 193°

Boston Harbor (Deer Island Light), Massachusetts, 1997

F—Flood, Dir. 254° True E—Ebb, Dir. 111° True

January				February				March			
Slack	Maximum	Slack	Maximum	Slack	Maximum	Slack	Maximum	Slack	Maximum	Slack	Maximum
h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
1 W	0342 0824 1.1F 1029 1233 1.0F 1603 2045 0.9E 2250	16 Th	0156 0156 1.1F 0421 0855 1.3E 1107 1430 1.0F 1651 2123 1.2E 2330	1 Sa	0109 0109 1.2F 0442 0739 1.1E 1136 1340 1.1F 1711 2003 1.0E 2354	16 Su	0003 0331 1.0F 0554 1026 1.3E 1243 1605 1.0F 1834 2253 1.2E	1 Sa	0314 0600 1.2E 1008 1211 1.2F 1541 1821 1.0E 2226	16 Su	0159 0159 1.1F 0424 0900 1.3E 1112 1436 1.0F 1703 2130 1.1E 2334
2 Th	0100 0100 1.1F 0433 0914 1.0E 1121 1329 1.0F 1657 2136 0.9E 2340	17 F	0258 0258 1.1F 0521 0953 1.3E 1209 1532 1.0F 1753 2221 1.2E	2 Su	0204 0204 1.2F 0538 0848 1.1E 1230 1439 1.1F 1809 2117 1.0E	17 M	0103 0429 1.1F 0655 1121 1.4E 1342 1701 1.1F 1941 2347 1.3E	2 Su	0034 0034 1.3F 0406 0656 1.1E 1101 1304 1.2F 1637 1921 1.0E 2321	17 M	0301 0301 1.0F 0524 0959 1.3E 1213 1536 1.0F 1806 2227 1.2E
3 F	0155 0155 1.1F 0525 1003 1.1E 1213 1431 1.1F 1751 2225 1.0E	18 Sa	0357 0357 1.1F 0621 1050 1.4E 1309 1630 1.1F 1856 2316 1.3E	3 M	0303 0303 1.2F 0634 1049 1.2E 1325 1545 1.2F 1907 2322 1.1E	18 Tu	0201 0523 1.1F 0754 1213 1.5E 1436 1753 1.1F 2048	3 M	0129 0129 1.2F 0502 0801 1.1E 1159 1402 1.2F 1737 2033 1.0E	18 Tu	0400 0400 1.0F 0624 1054 1.3E 1312 1633 1.0F 1911 2321 1.2E
4 Sa	0254 0254 1.2F 0618 1050 1.1E 1306 1605 1.1F 1846 2311 1.1E	19 Su	0453 0453 1.1F 0720 1143 1.5E 1405 1724 1.1F 1958	4 Tu	0407 0407 1.3F 0730 1145 1.3E 1419 1717 1.3F 2004	19 W	0038 0038 1.3E 0253 0614 1.1F 0847 1302 1.5E 1523 1842 1.2F 2132	4 Tu	0228 0228 1.2F 0601 0923 1.2E 1256 1507 1.2F 1838 2300 1.1E	19 W	0456 0456 1.0F 0724 1147 1.4E 1407 1726 1.1F 2023
5 Su	0359 0359 1.3F 0711 1135 1.2E 1357 1700 1.2F 1940 2354 1.1E	20 M	0009 0009 1.4E 0222 0546 1.2F 0815 1234 1.5E 1457 1815 1.2F 2054	5 W	0014 0014 1.2E 0239 0522 1.4F 0825 1233 1.4E 1510 1817 1.4F 2059	20 Th	0126 0126 1.4E 0341 0701 1.2F 0932 1348 1.5E 1607 1926 1.3F 2206	5 W	0333 0333 1.2F 0701 1123 1.3E 1351 1652 1.2F 1938 2356 1.2E	20 Th	0013 0013 1.3E 0228 0547 1.1F 0819 1236 1.4E 1455 1814 1.2F 2105
6 M	0501 0501 1.3F 0802 1214 1.3E 1447 1749 1.3F 2032	21 Tu	0059 0059 1.4E 0312 0635 1.2F 0906 1323 1.5E 1544 1903 1.3F 2142	6 Th	0102 0102 1.3E 0331 0629 1.5F 0919 1319 1.5E 1601 1908 1.5F 2151	21 F	0211 0211 1.4E 0424 0745 1.2F 1013 1432 1.4E 1647 2008 1.3F 2241	6 Th	0509 0509 1.3F 0800 1217 1.4E 1446 1758 1.4F 2035	21 F	0101 0101 1.3E 0316 0635 1.1F 0906 1323 1.4E 1539 1859 1.2F 2139
7 Tu	0031 0031 1.2E 0304 0550 1.4F 0852 1248 1.4E 1536 1835 1.4F 2122	22 W	0147 0147 1.4E 0400 0721 1.3F 0951 1409 1.5E 1629 1948 1.3F 2223	7 F	0148 0148 1.4E 0422 0723 1.5F 1011 1405 1.6E 1651 1957 1.6F 2242	22 Sa	0255 0255 1.3E 0505 0826 1.2F 1050 1513 1.4E 1725 2047 1.3F 2315	7 F	0047 0047 1.4E 0309 0619 1.4F 0857 1307 1.5E 1538 1852 1.5F 2129	22 Sa	0146 0146 1.4E 0359 0719 1.2F 0947 1406 1.4E 1619 1940 1.3F 2213
8 W	0106 0106 1.3E 0353 0636 1.5F 0942 1324 1.5E 1624 1918 1.5F 2212	23 Th	0233 0233 1.4E 0444 0806 1.3F 1033 1454 1.5E 1710 2031 1.3F 2302	8 Sa	0235 0235 1.5E 0513 0813 1.6F 1102 1451 1.6E 1740 2045 1.6F 2332	23 Su	0335 0335 1.3E 0544 0903 1.2F 1127 1551 1.3E 1802 2121 1.3F 2350	8 Sa	0136 0136 1.5E 0402 0714 1.5F 0950 1355 1.6E 1628 1942 1.6F 2221	23 Su	0229 0229 1.3E 0440 0759 1.2F 1024 1447 1.3E 1657 2019 1.3F 2247
9 Th	0145 0145 1.4E 0443 0721 1.5F 1031 1405 1.5E 1713 2001 1.5F 2301	24 F	0317 0317 1.3E 0527 0847 1.2F 1112 1537 1.4E 1750 2111 1.3F 2340	9 Su	0324 0324 1.5E 0605 0903 1.5F 1152 1541 1.5E 1830 2133 1.6F	24 M	0411 0411 1.2E 0623 0934 1.2F 1203 1621 1.2E 1840 2137 1.3F	9 Su	0224 0224 1.6E 0453 0805 1.6F 1042 1443 1.6E 1718 2030 1.7F 2311	24 M	0308 0308 1.3E 0519 0837 1.2F 1101 1523 1.2E 1733 2053 1.3F 2322
10 F	0230 0230 1.4E 0532 0806 1.5E 1120 1450 1.5E 1802 2043 1.5F 2351	25 Sa	0359 0359 1.3E 0608 0926 1.2F 1151 1617 1.3E 1830 2148 1.2F	10 M	0418 0418 1.5E 0657 0954 1.5F 1243 1638 1.5E 1920 2223 1.5F	25 Tu	0435 0435 1.1E 0703 0923 1.2F 1241 1548 1.1E 1919 2136 1.3F	10 M	0312 0312 1.6E 0545 0854 1.6F 1133 1532 1.6E 1807 2118 1.6F	25 Tu	0342 0342 1.2E 0557 0908 1.2F 1137 1546 1.1E 1811 2102 1.3F 2357
11 Sa	0319 0319 1.4E 0624 0854 1.5F 1210 1539 1.4E 1851 2129 1.5F	26 Su	0440 0440 1.2E 0617 0958 1.2F 1229 1656 1.2E 1910 2213 1.2F	11 Tu	0519 0519 1.4E 0749 1051 1.4F 1335 1746 1.3E 2012 2320 1.4F	26 W	0404 0404 1.1E 0745 0954 1.3F 1320 1610 1.1E 2000 2213 1.4F	11 Tu	0403 0403 1.6E 0636 0944 1.5F 1223 1625 1.5E 1857 2206 1.6F	26 W	0332 0332 1.2E 0637 0900 1.3F 1215 1518 1.1E 1849 2109 1.4F
12 Su	0417 0417 1.3E 0717 0943 1.4F 1301 1639 1.4E 1943 2221 1.4F	27 M	0518 0518 1.1E 0731 0948 1.2F 1309 1632 1.1E 1951 2206 1.2F	12 W	0624 0624 1.4E 0843 1154 1.3F 1429 1853 1.2E 2107	27 Th	0433 0433 1.2E 0829 1036 1.3F 1403 1645 1.1E 2045 2257 1.4F	12 W	0457 0457 1.5E 0727 1036 1.4F 1314 1724 1.4E 1948 2258 1.5F	27 Th	0335 0335 1.2E 0718 0929 1.3F 1254 1543 1.1E 1930 2146 1.4F
13 M	0540 0540 1.3E 0810 1040 1.3F 1354 1809 1.3E 2038 2336 1.3F	28 Tu	0444 0444 1.0E 0816 1023 1.2F 1350 1647 1.0E 2034 2244 1.2F	13 Th	0023 0023 1.3F 0258 0727 1.3E 0941 1259 1.1F 1526 1957 1.2E 2203	28 F	0512 0512 1.2E 0917 1122 1.2F 1450 1729 1.1E 2133 2344 1.3F	13 Th	0557 0557 1.4E 0820 1132 1.3F 1407 1827 1.3E 2040 2355 1.3F	28 F	0405 0405 1.2E 0800 1010 1.3F 1337 1618 1.1E 2016 2229 1.4F
14 Tu	0650 0650 1.2E 0908 1214 1.2F 1450 1919 1.2E 2132	29 W	0510 0510 1.0E 0901 1106 1.2F 1435 1722 1.0E 2120 2329 1.2F	14 F	0127 0127 1.1F 0354 0829 1.3E 1041 1403 1.0F 1627 2058 1.2E 2302			14 F	0659 0659 1.4E 0915 1232 1.2F 1502 1930 1.2E 2136	29 Sa	0445 0445 1.2E 0849 1055 1.3F 1423 1702 1.1E 2104 2316 1.4F
15 W	0050 0050 1.2F 0322 0754 1.2E 1007 1326 1.1F 1549 2023 1.2E 2231	30 Th	0551 0551 1.1E 0950 1153 1.1F 1523 1807 1.0E 2209	15 Sa	0230 0230 1.1F 0454 0928 1.3E 1142 1506 1.0F 1731 2157 1.2E			15 Sa	0056 0056 1.2F 0326 0800 1.3E 1012 1334 1.1F 1601 2031 1.1E 2233	30 Su	0532 0532 1.2E 0939 1144 1.3F 1514 1753 1.1E 2158
		31 F	0017 0017 1.2F 0350 0640 1.1E 1041 1244 1.1F 1616 1900 1.0E 2300							31 M	0006 0006 1.3F 0337 0627 1.2E 1033 1237 1.2F 1609 1854 1.0E 2255

Pollock Rip Channel, Massachusetts, 1997

F—Flood, Dir. 035° True E—Ebb, Dir. 225° True

January						February						March											
Slack			Maximum			Slack			Maximum			Slack			Maximum			Slack			Maximum		
	h	m	knots		h	m	knots		h	m	knots		h	m	knots		h	m	knots		h	m	knots
1 W O	0229	0505	1.7E	16 Th	0259	0543	1.8E	1 Sa	0326	0603	1.6E	16 Su	0434	0731	1.6E	1 Sa	0156	0434	1.7E	16 Su	0303	0550	1.6E
	0819	1135	1.7F		0857	1228	2.0F		0915	1231	1.7F		1037	1419	2.0F		0741	1053	1.9F		0901	1243	1.9F
	1451	1724	1.6E		1530	1814	1.7E		1600	1831	1.5E		1717	2014	1.5E		1428	1701	1.6E		1545	1834	1.5E
	2033	2356	1.8E		2124				2139				2313				2008	2317	1.7F		2140		
2 Th	0319	0555	1.6E	17 F	0400	0650	1.7E	2 Su	0420	0657	1.8E	17 M	0535	0838	1.6E	2 Su	0248	0525	1.7E	17 M	0405	0659	1.5E
	0910	1229	1.7F		1001	1338	2.0F		1011	1332	1.8F		1139	1520	2.1F		0834	1149	1.8F		1005	1349	1.9F
	1545	1817	1.5E		1637	1926	1.6E		1658	1929	1.5E		1818	2119	1.5E		1525	1757	1.5E		1648	1944	1.4E
	2126				2231				2238								2105				2245		
3 F	0409	0647	1.6E	18 Sa	0501	0759	1.7E	3 M	0515	0753	1.6E	18 Tu	0632	0938	1.6E	3 M	0344	0621	1.6E	18 Tu	0506	0806	1.5E
	1002	1325	1.7F		1105	1444	2.0F		1107	1433	1.8F		1236	1614	2.2F		0932	1253	1.8F		1107	1449	2.0F
	1640	1912	1.5E		1741	2037	1.5E		1755	2027	1.5E		1913	2214	1.6E		1626	1857	1.5E		1747	2047	1.5E
	2221				2336				2337								2208				2345		
4 Sa	0500	0739	1.6E	19 Su	0601	0903	1.7E	4 Tu	0609	0850	1.7E	19 W	0724	1028	1.7E	4 Tu	0443	0721	1.6E	19 W	0604	0906	1.6E
	1054	1420	1.8E		1206	1544	2.1E		1203	1532	2.0F		1326	1703	2.2F		1034	1401	1.8F		1204	1543	2.1F
	1734	2007	1.5E		1842	2141	1.6E		1850	2125	1.6E		2001	2301	1.7E		1726	1959	1.5E		1840	2142	1.6E
	2315																2311						
5 Su	0551	0831	1.7E	20 M	0656	1001	1.7E	5 W	0702	0945	1.8E	20 Th	0810	1112	1.8E	5 W	0543	0823	1.7E	20 Th	0656	0958	1.6E
	1145	1512	1.9E		1301	1638	2.2F		1257	1626	2.1F		1410	1746	2.3F		1136	1507	2.0F		1255	1632	2.2F
	1827	2101	1.6E		1937	2237	1.6E		1942	2220	1.8E		2043	2340	1.7E		1825	2101	1.6E		1928	2228	1.7E
6 M	0009	0330	1.8F	21 Tu	0132	0500	2.0F	6 Th	0129	0446	1.9F	21 F	0238	0604	2.0F	6 Th	0012	0334	1.8F	21 F	0125	0454	2.0F
	0640	0921	1.8E		0747	1051	1.8E		0753	1037	2.0E		0852	1149	1.8E		0640	0923	1.8E		0742	1041	1.7E
	1234	1601	2.0F		1350	1727	2.3F		1349	1717	2.3F												