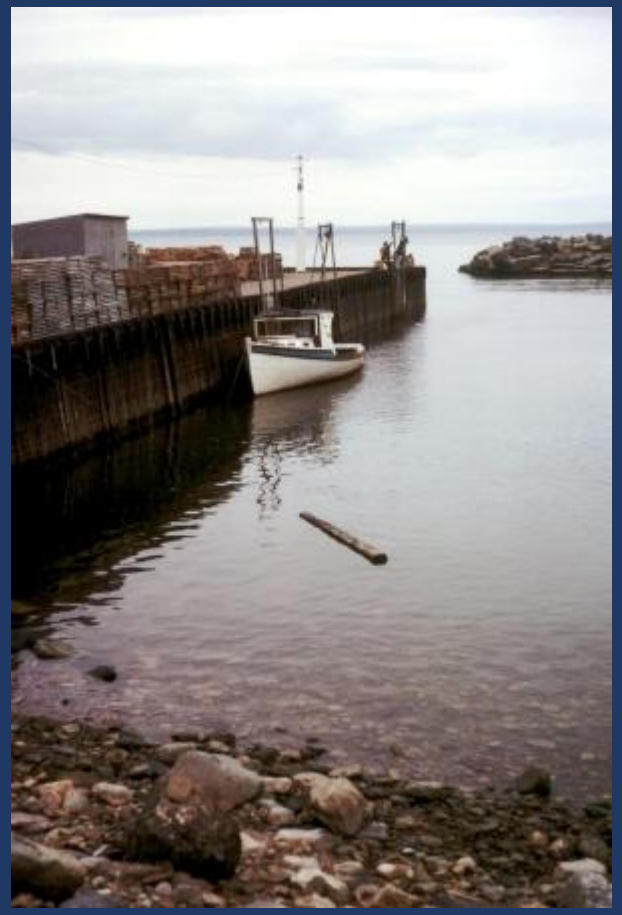
Tides

For lunatics…

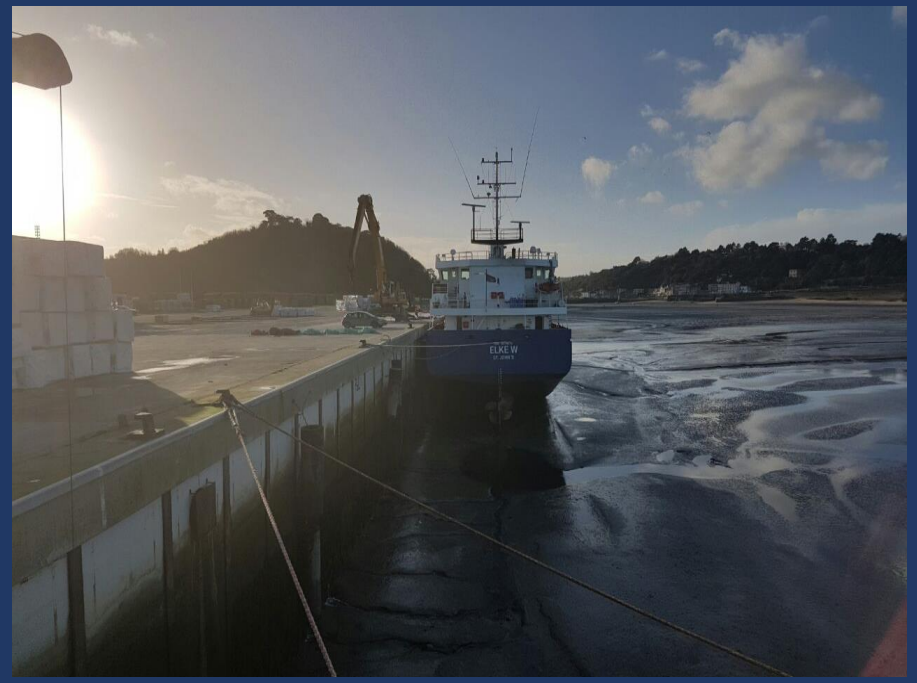
High Tide – Low Tide

The same place can look very different depending on the height of tide.



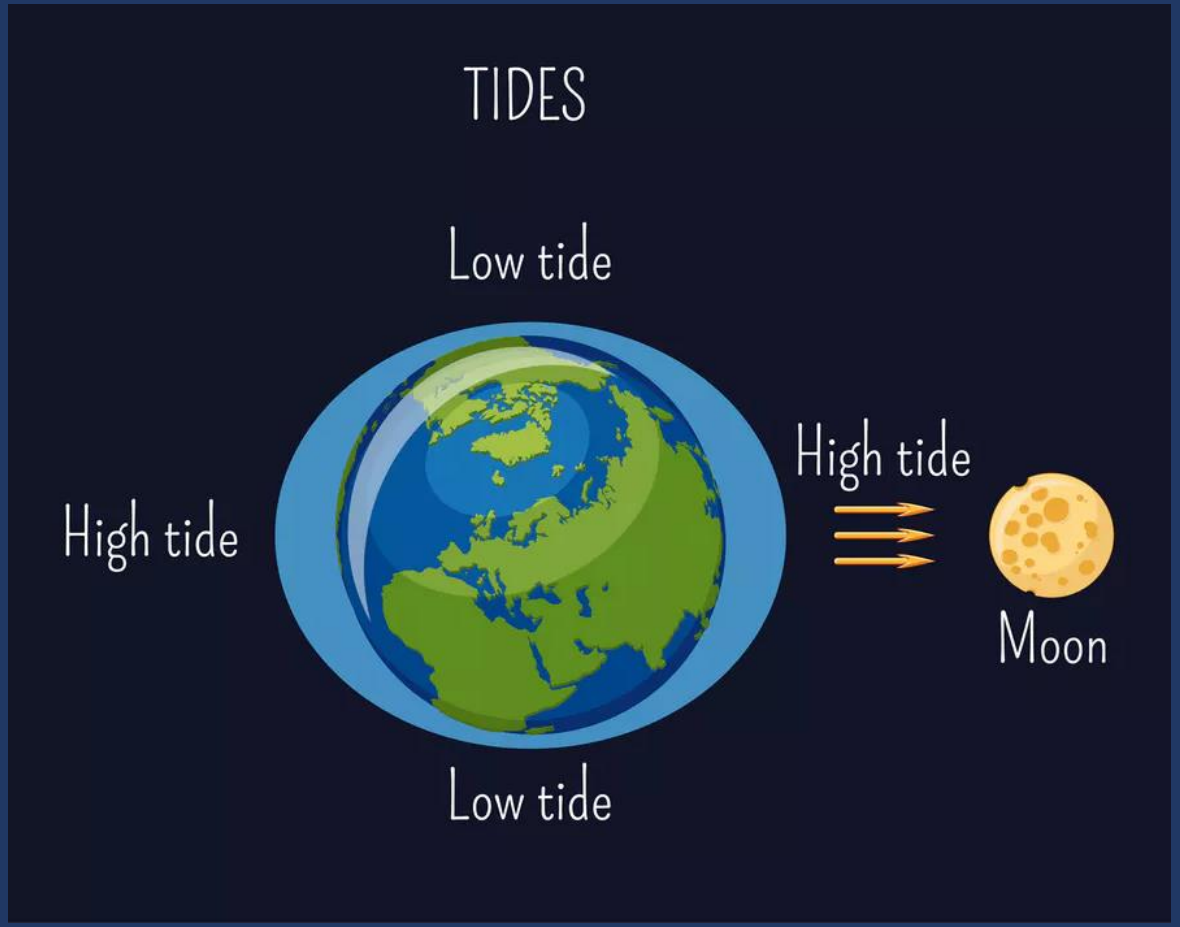
Low Tide

What was a wide river now falls dry completely…



Definition

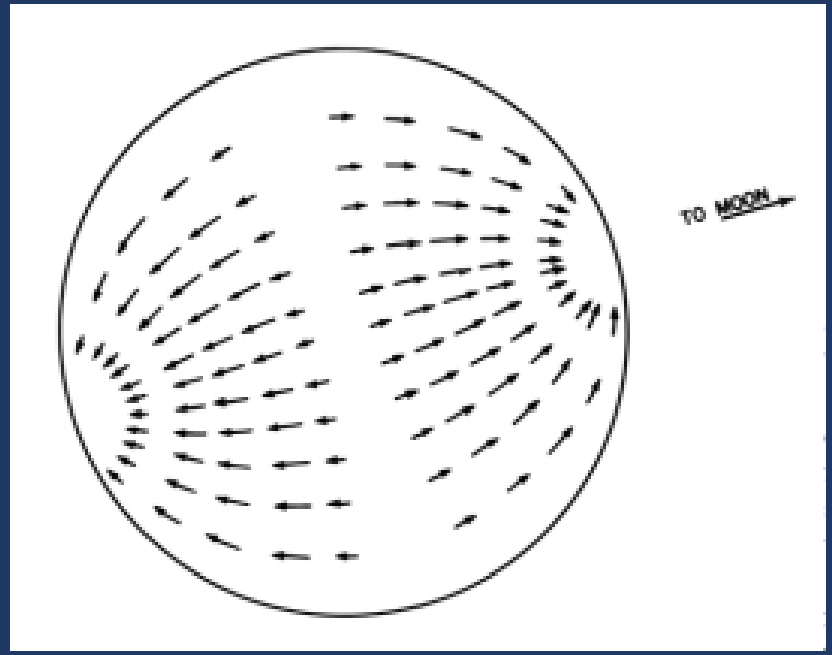
Tide is the vertical rise and fall of the ocean level caused by the gravital forces between the Earth and the Moon, and the Earth and the Sun.

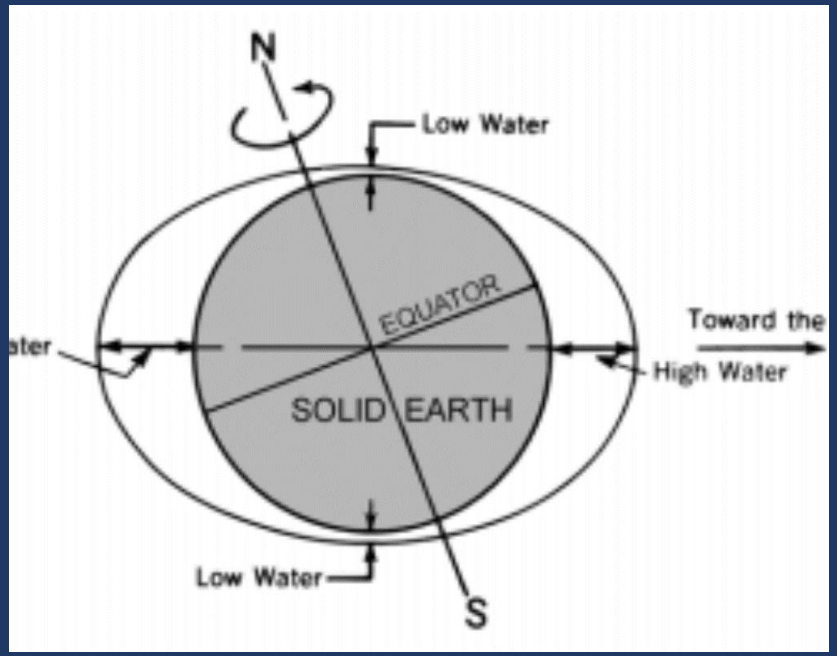


Definition

These interacting forces cause the tides to rise and fall twice a day. This is known as 1 tidal day.

The period of one high and one low is called a tidal circle.





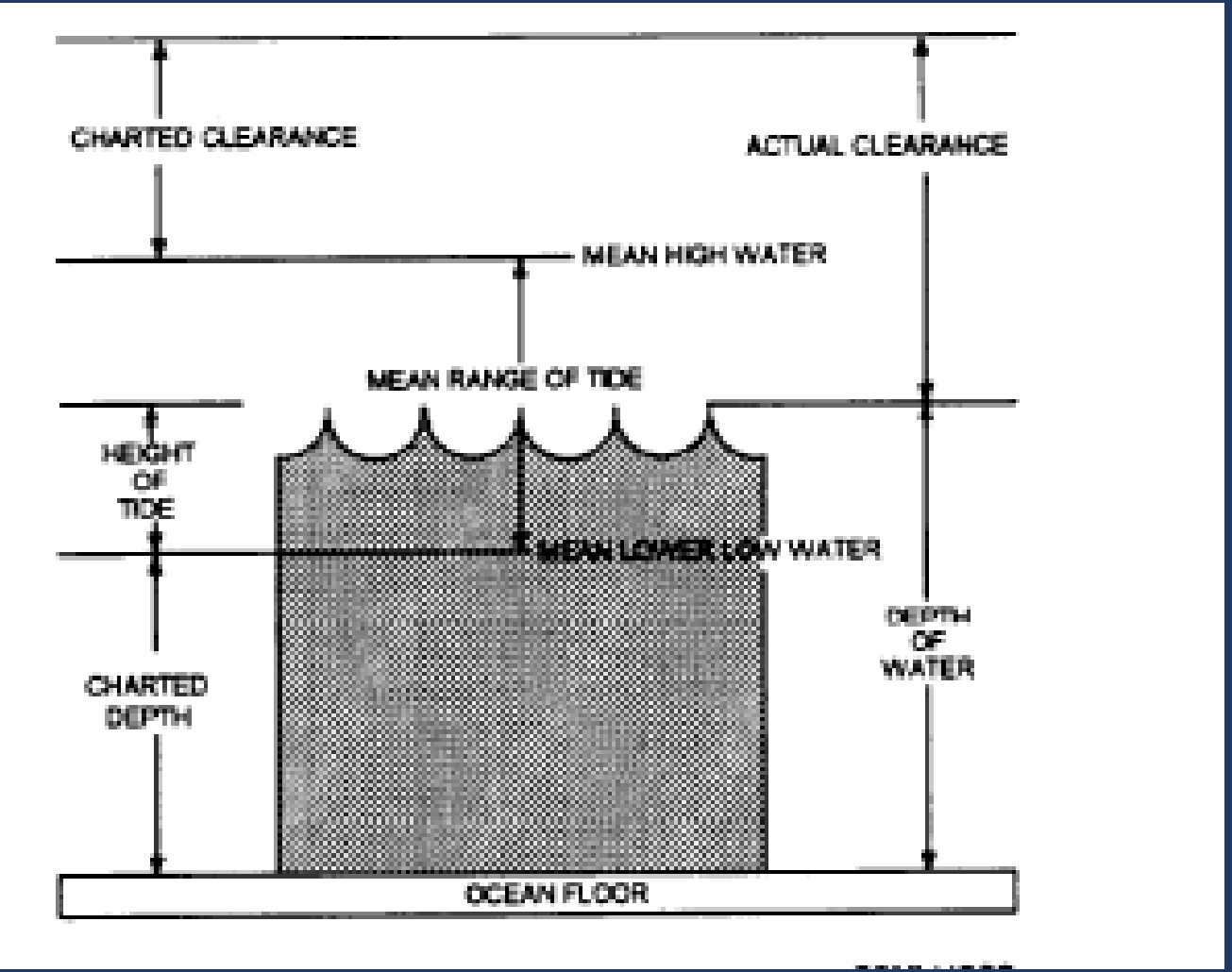
More Definitions

Terms associated with tides

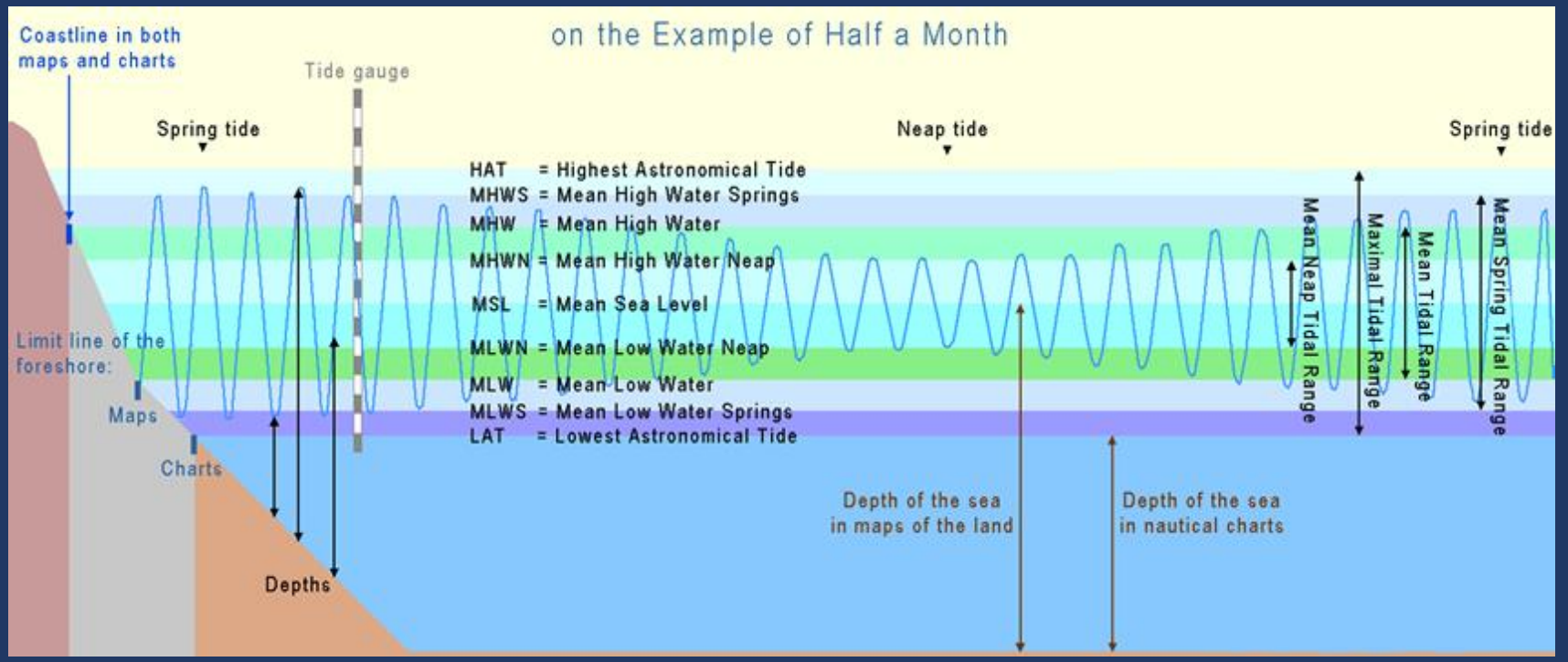
Term	Definition
High tide or high water (HW)	The maximum height of the water resulting from the rising tide.
Low tide or low water (LW)	The minimum height of the water resulting from the outgoing tide.
Duration of rise and fall	The period of time measured in hours and minutes that it takes the tide to go from low water to high water.
Range of tide	The distance between HW and LW.
Stand	A brief period where no rise or fall occurs; this occurs when the tide reaches its maximum or minimum level.
Mean high water (MHW)	The average height of all high-tide water levels, measured over a 19-year period.
Mean low water (MLW)	The average height of all low-tide levels, observed over a 19-year period.
Mean lower low water (MLW)	The average of the lower of the low water levels, observed over a period of 19-years. This is the reference plane currently used on almost all charts covering U.S. waters as the basis of measurement of charted depths and height of tide.

Relationship of terms

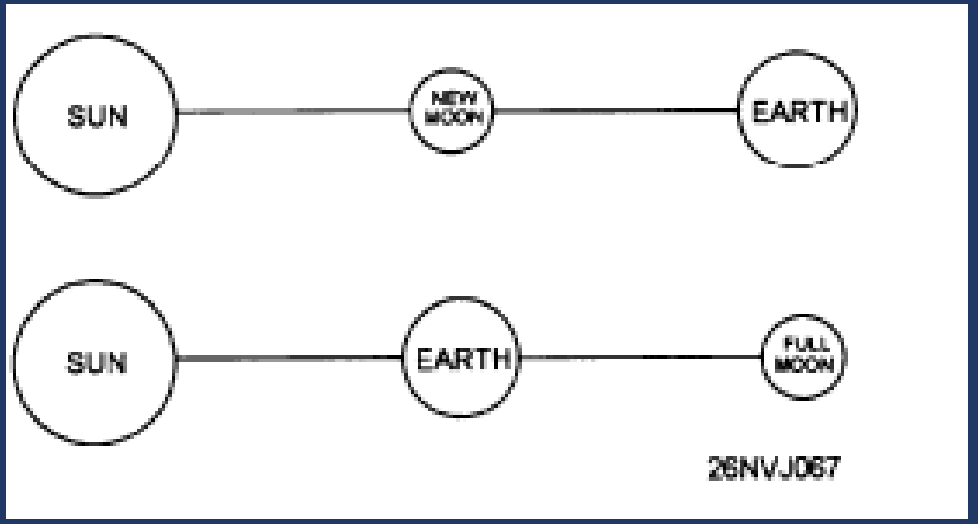
when measuring heights and depths



Relationship of terms



Effects of Sun and Moon on Tides

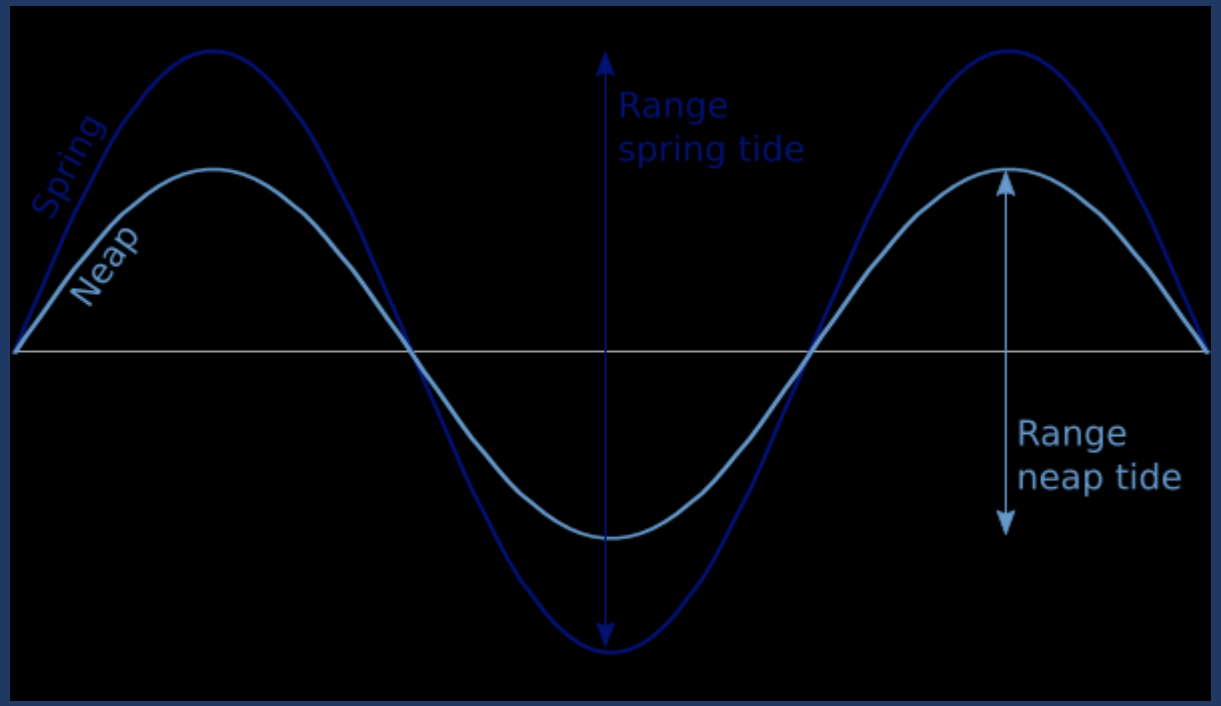


Spring Tides:

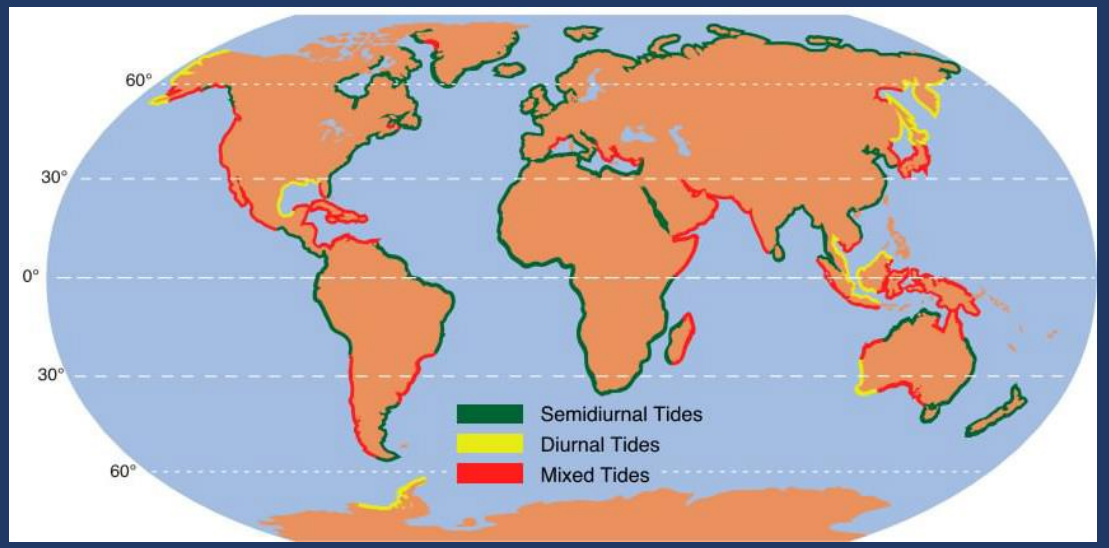
When Sun and Moon are in line with Earth, their combined effects causes high tides to be higher and low tides to be lower than avarage.

Neap Tides:

When the direction of Sun and Moon are 90° apart, as when the Moon is in the 1st and last quarter, both, high and low tides are lower than normal.



Timing



World map showing the location of diurnal, semi-diurnal, and mixed semi-diurnal tides. The European and African west coasts are exclusively semi-diurnal, and North America's West coast is mixed semi-diurnal, but elsewhere the different patterns are highly intermixed.

The same tidal forcing has different results depending on many factors, including coast orientation, continental shelf margin, water body dimensions.

The tidal forces due to the Moon and Sun generate very long waves which travel all around the ocean following the paths shown in co-tidal charts. The time when the crest of the wave reaches a port then gives the time of high water at the port. The time taken for the wave to travel around the ocean also means that there is a delay between the phases of the Moon and their effect on the tide. Springs and neaps in the North Sea, for example, are two days behind the new/full moon and first/third quarter moon. This is called the tide's age.

Tidal Range

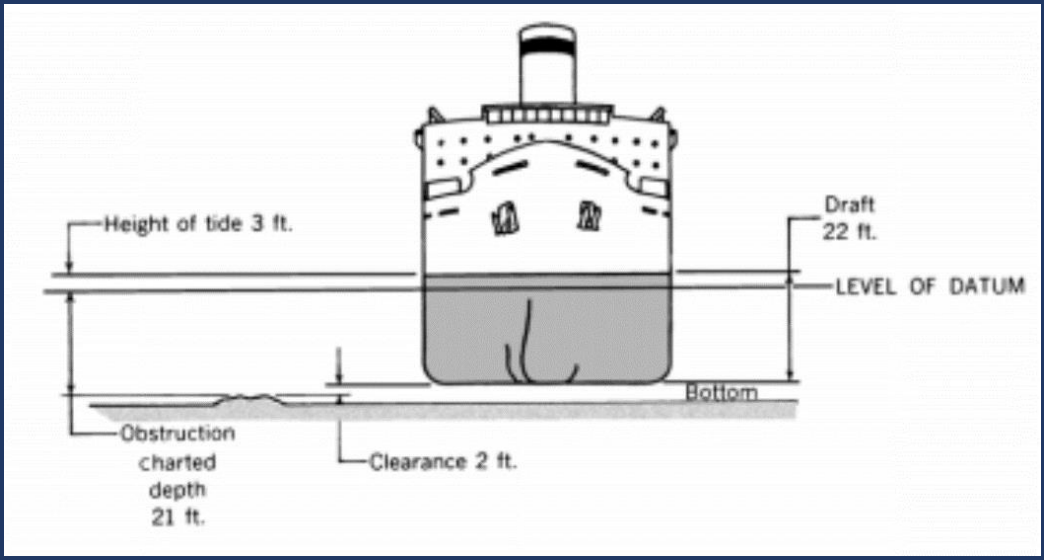
Tidal range is the height difference between high tide and low tide. Tides are the rise and fall of sea levels caused by gravitational forces exerted by the Moon and Sun and the rotation of Earth. Tidal range is not constant but changes depending on the locations of the Moon and Sun.

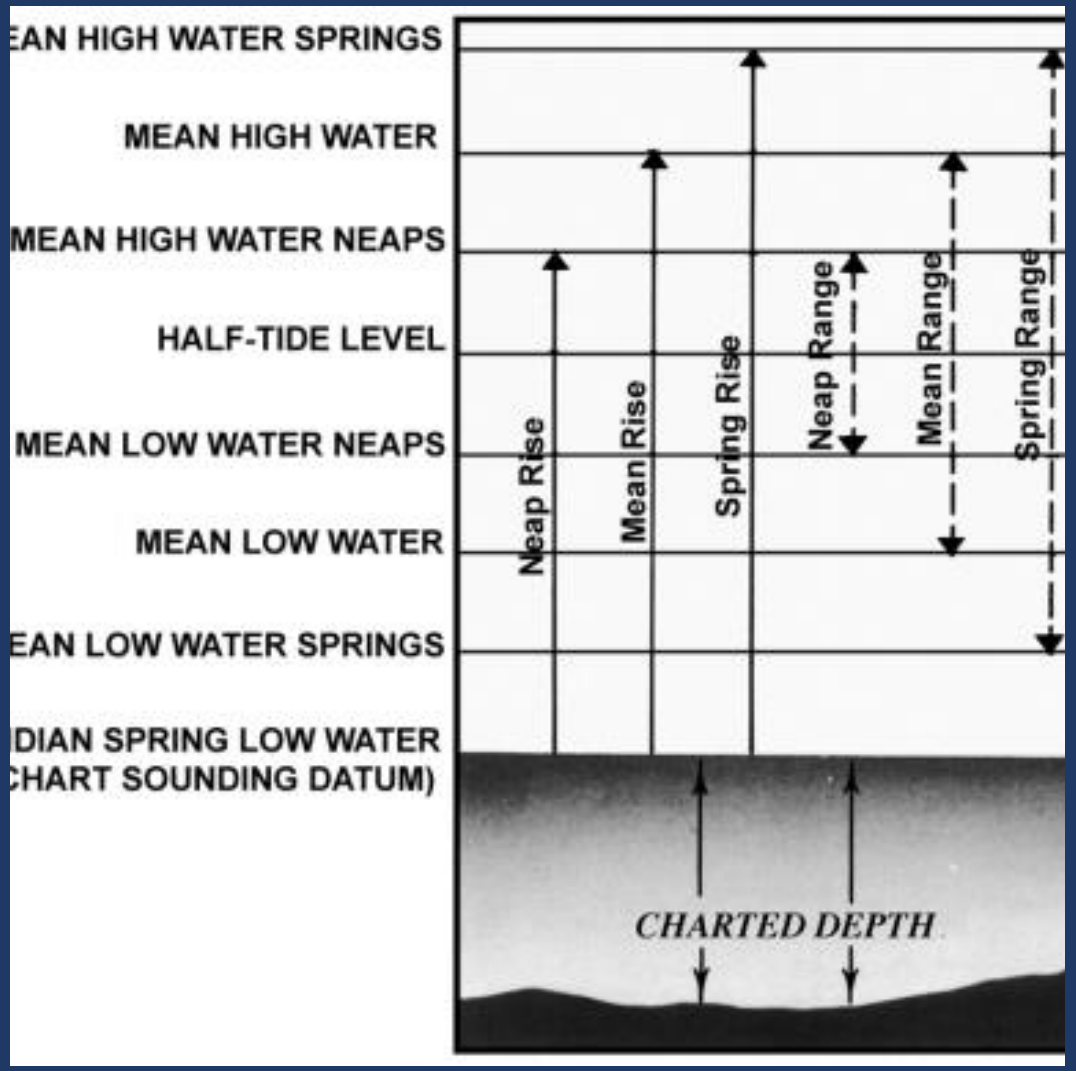
The typical tidal range in the open ocean is about 0.6 metres. Closer to the coast, this range is much greater. Coastal tidal ranges vary globally and can differ anywhere from near zero to over 16 metres.

The world's largest tidal range of 16.3 metres occurs in Bay of Fundy, Canada, and the United Kingdom regularly experiences tidal ranges up to 15 metres between England and Wales in the Severn Estuary.

Tidal Range

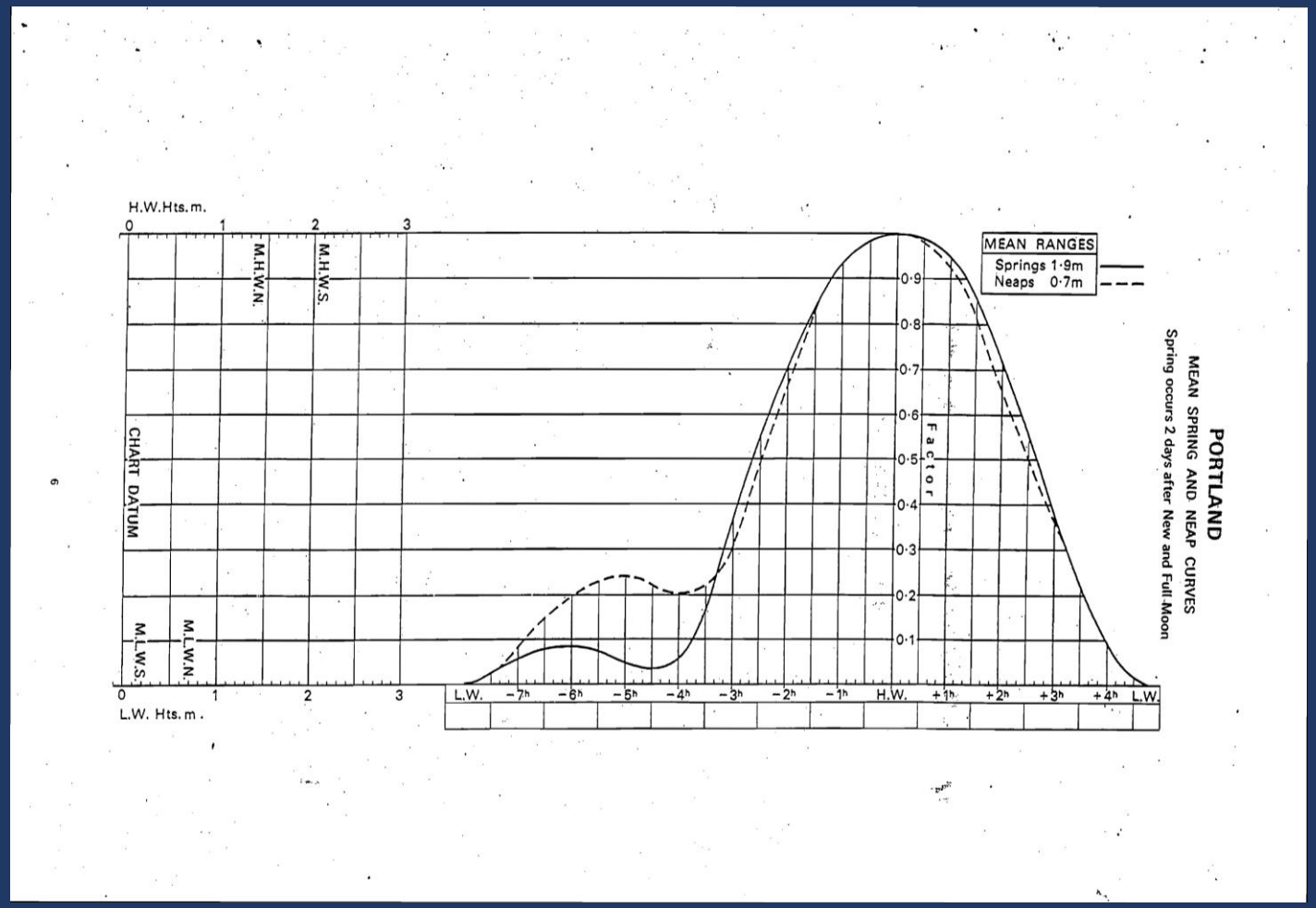
To find out if in a port or coastal passage there is enough water available for our ship, the charted depth and the tidal levels must be added and compared with the draught of the ship.





Calculating the Height of Tide

Graphics are given for Standard Ports and can be used for assigned Secondary Ports.

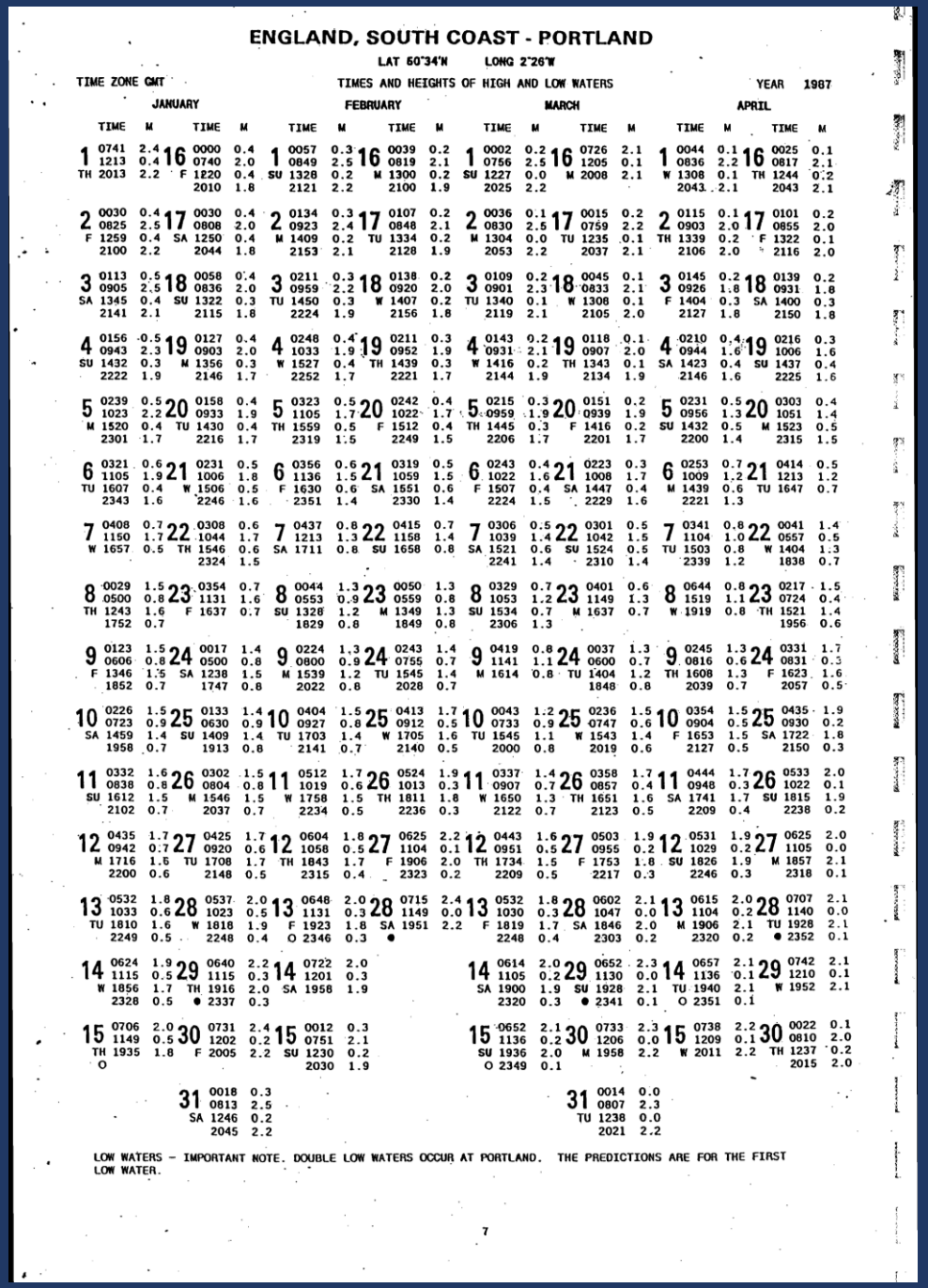


Standard Ports

For the most important British Ports and some French Ports the tide tables for every day of the year can be found in the Admiralty Tide Tables Vol. 1.

Other volumes include important ports in other parts of the world.

The times are always given in local time.



ENGLAND, SOUTH COAST - PORTLAND

LAT 50°34'N LONG 2°26'W

TIME ZONE GMT — TIMES AND HEIGHTS OF HIGH AND LOW WATERS — YEAR 1987

JANUARY

	TIME	M		TIME	M
1	0741	2.4	16	0000	0.4
TH	1213	0.4	F	0740	2.0
	2013	2.2		1220	0.4
				2010	1.8
2	0030	0.4	17	0030	0.4
F	0825	2.5	SA	0808	2.0
	1259	0.4		1250	0.4
	2100	2.2		2044	1.8
3	0113	0.5	18	0058	0.4
SA	0905	2.5	SU	0836	2.0
	1345	0.4		1322	0.3
	2141	2.1		2115	1.8
4	0156	0.5	19	0127	0.4
SU	0943	2.3	M	0903	2.0
	1432	0.3		1356	0.3
	2222	1.9		2146	1.7
5	0239	0.5	20	0158	0.4
M	1023	2.2	TU	0933	1.9
	1520	0.4		1430	0.4
	2301	1.7		2216	1.7
6	0321	0.6	21	0231	0.5
TU	1105	1.9	W	1006	1.8
	1607	0.4		1506	0.5
	2343	1.6		2246	1.6
7	0408	0.7	22	0308	0.6
W	1150	1.7	TH	1044	1.7
	1657	0.5		1546	0.6
				2324	1.5
8	0029	1.5	23	0354	0.7
TH	0500	0.8	F	1131	1.6
	1243	1.6		1637	0.7
	1752	0.7			
9	0123	1.5	24	0017	1.4
F	0606	0.8	SA	0500	0.8
	1346	1.5		1238	1.5
	1852	0.7		1747	0.8
10	0226	1.5	25	0133	1.4
SA	0723	0.9	SU	0630	0.9
	1459	1.4		1409	1.4
	1958	0.7		1913	0.8
11	0332	1.6	26	0302	1.5
SU	0838	0.8	M	0804	0.8
	1612	1.5		1546	1.5
	2102	0.7		2037	0.7
12	0435	1.7	27	0425	1.7
M	0942	0.7	TU	0920	0.6
	1716	1.6		1708	1.7
	2200	0.6		2148	0.5
13	0532	1.8	28	0537	2.0
TU	1033	0.6	W	1023	0.5
	1810	1.6		1818	1.9
	2249	0.5		2248	0.4
14	0624	1.9	29	0640	2.2
W	1115	0.5	TH	1115	0.3
	1856	1.7		1916	2.0
	2328	0.5	●	2337	0.3
15	0706	2.0	30	0731	2.4
TH	1149	0.5	F	1202	0.2
	1935	1.8		2005	2.2
O					

FEBRUARY

	TIME	M		TIME	M
1	0057	0.3	16	0039	0.2
SU	0849	2.5	M	0819	2.1
	1328	0.2		1300	0.2
	2121	2.2		2100	1.9
2	0134	0.3	17	0107	0.2
M	0923	2.4	TU	0848	2.1
	1409	0.2		1334	0.2
	2153	2.1		2128	1.9
3	0211	0.3	18	0138	0.2
TU	0959	2.2	W	0920	2.0
	1450	0.3		1407	0.2
	2224	1.9		2156	1.8
4	0248	0.4	19	0211	0.3
W	1033	1.9	TH	0952	1.9
	1527	0.4		1439	0.3
	2252	1.7		2221	1.7
5	0323	0.5	20	0242	0.4
TH	1105	1.7	F	1022	1.7
	1559	0.5		1512	0.4
	2319	1.5		2249	1.5
6	0356	0.6	21	0319	0.5
F	1136	1.5	SA	1059	1.5
	1630	0.6		1551	0.6
	2351	1.4		2330	1.4
7	0437	0.8	22	0415	0.7
SA	1213	1.3	SU	1158	1.4
	1711	0.8		1658	0.8
8	0044	1.3	23	0050	1.3
SU	0553	0.9	M	0559	0.8
	1328	1.2		1349	1.3
	1829	0.8		1849	0.8
9	0224	1.3	24	0243	1.4
M	0800	0.9	TU	0755	0.7
	1539	1.2		1545	1.4
	2022	0.8		2028	0.7
10	0404	1.5	25	0413	1.7
TU	0927	0.8	W	0912	0.5
	1703	1.4		1705	1.6
	2141	0.7		2140	0.5
11	0512	1.7	26	0524	1.9
W	1019	0.6	TH	1013	0.3
	1758	1.5		1811	1.8
	2234	0.5		2236	0.3
12	0604	1.8	27	0625	2.2
TH	1058	0.5	F	1104	0.1
	1843	1.7		1906	2.0
	2315	0.4		2323	0.2
13	0648	2.0	28	0715	2.4
F	1131	0.3	SA	1149	0.0
	1923	1.8		1951	2.2
O	2346	0.3	●		
14	0722	2.0			
SA	1201	0.3			
	1958	1.9			
15	0012	0.3			
SU	0751	2.1			
	1230	0.2			
	2030	1.9			

MARCH

	TIME	M		TIME	M
1	0002	0.2	16	0726	2.1
SU	0756	2.5	M	1205	0.1
	1227	0.0		2008	2.1
	2025	2.2			
2	0036	0.1	17	0015	0.2
M	0830	2.5	TU	0759	2.2
	1304	0.0		1235	0.1
	2053	2.2		2037	2.1
3	0109	0.2	18	0045	0.1
TU	0901	2.3	W	0833	2.1
	1340	0.1		1308	0.1
	2119	2.1		2105	2.0
4	0143	0.2	19	0118	0.1
W	0931	2.1	TH	0907	2.0
	1416	0.2		1343	0.1
	2144	1.9		2134	1.9
5	0215	0.3	20	0151	0.2
TH	0959	1.9	F	0939	1.9
	1445	0.3		1416	0.2
	2206	1.7		2201	1.7
6	0243	0.4	21	0223	0.3
F	1022	1.6	SA	1008	1.7
	1507	0.4		1447	0.4
	2224	1.5		2229	1.6
7	0306	0.5	22	0301	0.5
SA	1039	1.4	SU	1042	1.5
	1521	0.6		1524	0.5
	2241	1.4		2310	1.4
8	0329	0.7	23	0401	0.6
SU	1053	1.2	M	1149	1.3
	1534	0.7		1637	0.7
	2306	1.3			
9	0419	0.8	24	0037	1.3
M	1141	1.1	TU	0600	0.7
	1614	0.8		1404	1.2
				1848	0.8
10	0043	1.2	25	0236	1.5
TU	0733	0.9	W	0747	0.6
	1545	1.1		1543	1.4
	2000	0.8		2019	0.6
11	0337	1.4	26	0358	1.7
W	0907	0.7	TH	0857	0.4
	1650	1.3		1651	1.6
	2122	0.7		2123	0.5
12	0443	1.6	27	0503	1.9
TH	0951	0.5	F	0955	0.2
	1734	1.5		1753	1.8
	2209	0.5		2217	0.3
13	0532	1.8	28	0602	2.1
F	1030	0.3	SA	1047	0.0
	1819	1.7		1846	2.0
	2248	0.4		2303	0.2
14	0614	2.0	29	0652	2.3
SA	1105	0.2	SU	1130	0.0
	1900	1.9		1928	2.1
	2320	0.3	●	2341	0.1
15	0652	2.1	30	0733	2.3
SU	1136	0.2	M	1206	0.0
	1936	2.0		1958	2.2
O	2349	0.1			
31	0014	0.0			
TU	0807	2.3			
	1238	0.0			
	2021	2.2			

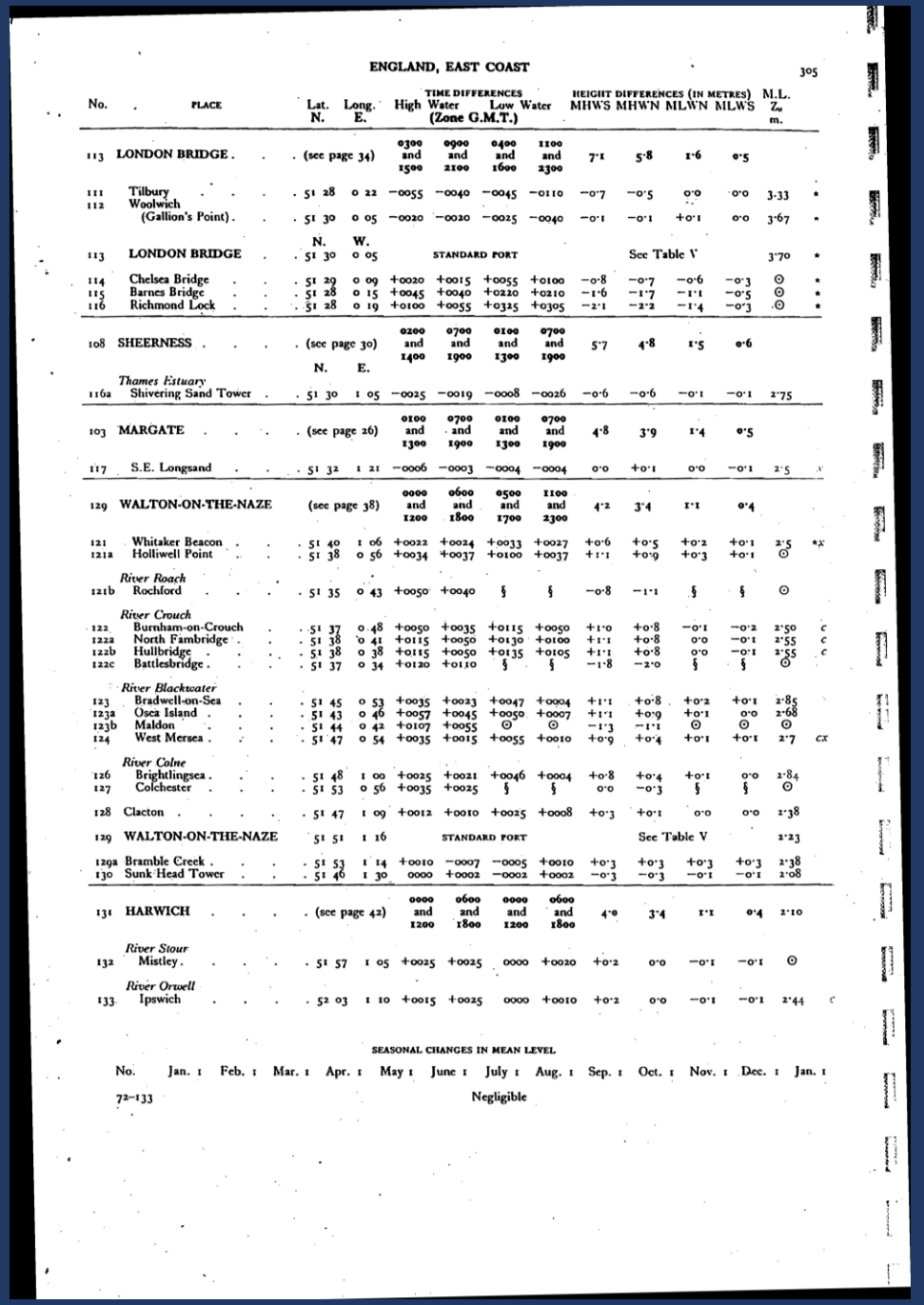
APRIL

	TIME	M		TIME	M
1	0044	0.1	16	0025	0.1
W	0836	2.2	TH	0817	2.1
	1308	0.1		1244	0.2
	2043	2.1		2043	2.1
2	0115	0.1	17	0101	0.2
TH	0903	2.0	F	0855	2.0
	1339	0.2		1322	0.1
	2106	2.0		2116	2.0
3	0145	0.2	18	0139	0.2
F	0926	1.8	SA	0931	1.8
	1404	0.3		1400	0.3
	2127	1.8		2150	1.8
4	0210	0.4	19	0216	0.3
SA	0944	1.6	SU	1006	1.6
	1423	0.4		1437	0.4
	2146	1.6		2225	1.6
5	0231	0.5	20	0303	0.4
SU	0956	1.3	M	1051	1.4
	1432	0.5		1523	0.5
	2200	1.4		2315	1.5
6	0253	0.7	21	0414	0.5
M	1009	1.2	TU	1213	1.2
	1439	0.6		1647	0.7
	2221	1.3			
7	0341	0.8	22	0041	1.4
TU	1104	1.0	W	0557	0.5
	1503	0.8		1404	1.3
	2339	1.2		1838	0.7
8	0644	0.8	23	0217	1.5
W	1519	1.1	TH	0724	0.4
	1919	0.8		1521	1.4
				1956	0.6
9	0245	1.3	24	0331	1.7
TH	0816	0.6	F	0831	0.3
	1608	1.3		1623	1.6
	2039	0.7		2057	0.5
10	0354	1.5	25	0435	1.9
F	0904	0.5	SA	0930	0.2
	1653	1.5		1722	1.8
	2127	0.5		2150	0.3
11	0444	1.7	26	0533	2.0
SA	0948	0.3	SU	1022	0.1
	1741	1.7		1815	1.9
	2209	0.4		2238	0.2
12	0531	1.9	27	0625	2.0
SU	1029	0.2	M	1105	0.0
	1826	1.9		1857	2.1
	2246	0.3		2318	0.1
13	0615	2.0	28	0707	2.1
M	1104	0.2	TU	1140	0.0
	1906	2.1		1928	2.1
	2320	0.2	●	2352	0.1
14	0657	2.1	29	0742	2.1
TU	1136	0.1	W	1210	0.1
	1940	2.1		1952	2.1
O	2351	0.1			
15	0738	2.2	30	0022	0.1
W	1209	0.1	TH	0810	2.0
	2011	2.2		1237	0.2
				2015	2.0

LOW WATERS – IMPORTANT NOTE. DOUBLE LOW WATERS OCCUR AT PORTLAND. THE PREDICTIONS ARE FOR THE FIRST LOW WATER.

Secondary Ports

Each standard port refers to various secondary ports for which the differences between them and the standard port are give in part II of the Tide Tables.



No.	PLACE	Lat. N.	Long. E.	TIME DIFFERENCES (Zone G.M.T.) High Water		Low Water		HEIGHT DIFFERENCES (IN METRES) MHWS	MHWN	MLWN	MLWS	M.L. Z_o m.	
113	**LONDON BRIDGE**	(see page 34)		0300 and 1500	0900 and 2100	0400 and 1600	1100 and 2300	7·1	5·8	1·6	0·5		
111	Tilbury	51 28	0 22	−0055	−0040	−0045	−0110	−0·7	−0·5	0·0	0·0	3·33	*
112	Woolwich (Gallion's Point)	51 30	0 05	−0020	−0020	−0025	−0040	−0·1	−0·1	+0·1	0·0	3·67	*
		N.	W.										
113	**LONDON BRIDGE**	51 30	0 05	STANDARD PORT				See Table V				3·70	*
114	Chelsea Bridge	51 29	0 09	+0020	+0015	+0055	+0100	−0·8	−0·7	−0·6	−0·3	⊙	*
115	Barnes Bridge	51 28	0 15	+0045	+0040	+0220	+0210	−1·6	−1·7	−1·1	−0·5	⊙	*
116	Richmond Lock	51 28	0 19	+0100	+0055	+0325	+0305	−2·1	−2·2	−1·4	−0·3	⊙	*
108	**SHEERNESS**	(see page 30)		0200 and 1400	0700 and 1900	0100 and 1300	0700 and 1900	5·7	4·8	1·5	0·6		
		N.	E.										
	Thames Estuary												
116a	Shivering Sand Tower	51 30	1 05	−0025	−0019	−0008	−0026	−0·6	−0·6	−0·1	−0·1	2·75	
103	**MARGATE**	(see page 26)		0100 and 1300	0700 and 1900	0100 and 1300	0700 and 1900	4·8	3·9	1·4	0·5		
117	S.E. Longsand	51 32	1 21	−0006	−0003	−0004	−0004	0·0	+0·1	0·0	−0·1	2·5	x
129	**WALTON-ON-THE-NAZE**	(see page 38)		0000 and 1200	0600 and 1800	0500 and 1700	1100 and 2300	4·2	3·4	1·1	0·4		
121	Whitaker Beacon	51 40	1 06	+0022	+0024	+0033	+0027	+0·6	+0·5	+0·2	+0·1	2·5	*x
121a	Holliwell Point	51 38	0 56	+0034	+0037	+0100	+0037	+1·1	+0·9	+0·3	+0·1	⊙	
	River Roach												
121b	Rochford	51 35	0 43	+0050	+0040	§	§	−0·8	−1·1	§	§	⊙	
	River Crouch												
122	Burnham-on-Crouch	51 37	0 48	+0050	+0035	+0115	+0050	+1·0	+0·8	−0·1	−0·2	2·50	c
122a	North Fambridge	51 38	0 41	+0115	+0050	+0130	+0100	+1·1	+0·8	0·0	−0·1	2·55	c
122b	Hullbridge	51 38	0 38	+0115	+0050	+0135	+0105	+1·1	+0·8	0·0	−0·1	2·55	c
122c	Battlesbridge	51 37	0 34	+0120	+0110	§	§	−1·8	−2·0	§	§	⊙	
	River Blackwater												
123	Bradwell-on-Sea	51 45	0 53	+0035	+0023	+0047	+0004	+1·1	+0·8	+0·2	+0·1	2·85	
123a	Osea Island	51 43	0 46	+0057	+0045	+0050	+0007	+1·1	+0·9	+0·1	0·0	2·68	
123b	Maldon	51 44	0 42	+0107	+0055	⊙	⊙	−1·3	−1·1	⊙	⊙	⊙	
124	West Mersea	51 47	0 54	+0035	+0015	+0055	+0010	+0·9	+0·4	+0·1	+0·1	2·7	cx
	River Colne												
126	Brightlingsea	51 48	1 00	+0025	+0021	+0046	+0004	+0·8	+0·4	+0·1	0·0	2·84	
127	Colchester	51 53	0 56	+0035	+0025	§	§	0·0	−0·3	§	§	⊙	
128	Clacton	51 47	1 09	+0012	+0010	+0025	+0008	+0·3	+0·1	0·0	0·0	2·38	
129	**WALTON-ON-THE-NAZE**	51 51	1 16		STANDARD PORT				See Table V			2·23	
129a	Bramble Creek	51 53	1 14	+0010	−0007	−0005	+0010	+0·3	+0·3	+0·3	+0·3	2·38	
130	Sunk Head Tower	51 46	1 30	0000	+0002	−0002	+0002	−0·3	−0·3	−0·1	−0·1	2·08	
131	**HARWICH**	(see page 42)		0000 and 1200	0600 and 1800	0000 and 1200	0600 and 1800	4·0	3·4	1·1	0·4	2·10	
	River Stour												
132	Mistley	51 57	1 05	+0025	+0025	0000	+0020	+0·2	0·0	−0·1	−0·1	⊙	
	River Orwell												
133	Ipswich	52 03	1 10	+0015	+0025	0000	+0010	+0·2	0·0	−0·1	−0·1	2·44	c

SEASONAL CHANGES IN MEAN LEVEL

No.	Jan. 1	Feb. 1	Mar. 1	Apr. 1	May 1	June 1	July 1	Aug. 1	Sep. 1	Oct. 1	Nov. 1	Dec. 1	Jan. 1
72–133	Negligible												

Secondary Ports

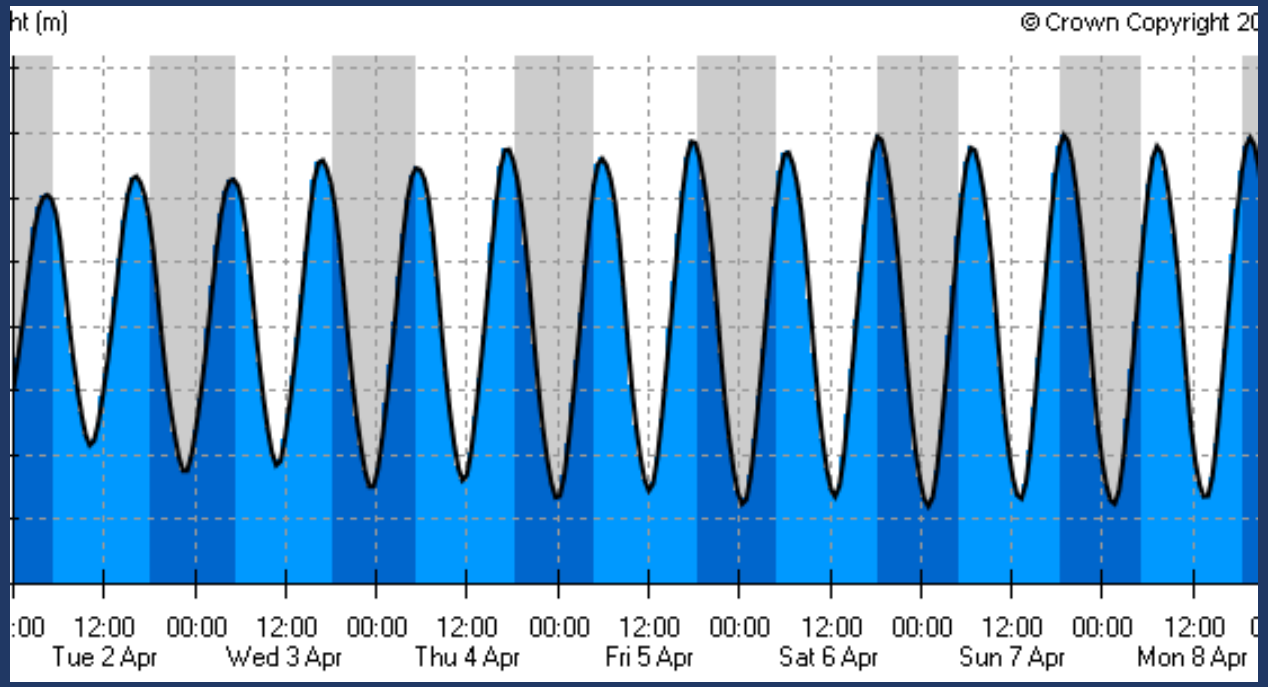
To find out the times and heights of a secondary port the figures must be added.

STANDARD PORT--TRINCOMALLE--- TIME/HT RQD----------

SECONDARY PORT--Jaffna---------- DATE 03 Nov -TIME ZONE----

	TIME		HEIGHT	
	HW	LW	HW	LW
STD PORT	1 0100 1341	2 1721/02 0751	3 0.7 0.5	4 0.3 0.4
Seasonal Changes	Std Port __		6 +0.1	6 +0.1
DIFFERENCES	7 +0654	8 +0654	9 -0.1 0.0	10 0.0 - 0.05
Seasonal Changes	Sec. Port		11 +0.1	11 +0.1
SEC PORT	12 0754 2035 16	13 0015 1445	14 0.6 0.5	15 0.3 0.35

British Admiralty Total Tide



Tue 2 Apr

HW	LW	HW	LW
04:24	10:12	16:05	22:41
6.0 m	2.2 m	6.3 m	1.7 m

Wed 3 Apr

HW	LW	HW	LW
04:56	10:53	16:41	23:19
6.3 m	1.8 m	6.6 m	1.5 m

Thu 4 Apr

HW	LW	HW	LW
05:21	11:30	17:15	23:55
6.5 m	1.6 m	6.8 m	1.3 m

Fri 5 Apr

HW	LW	HW
05:47	12:05	17:49
6.6 m	1.5 m	6.9 m

Sat 6 Apr

LW	HW	LW	HW
00:27	06:15	12:36	18:24
1.2 m	6.7 m	1.4 m	7.0 m

Sun 7 Apr

LW	HW	LW	HW
00:57	06:45	13:07	18:5
1.2 m	6.8 m	1.3 m	7.0 m

Mon 8 Apr

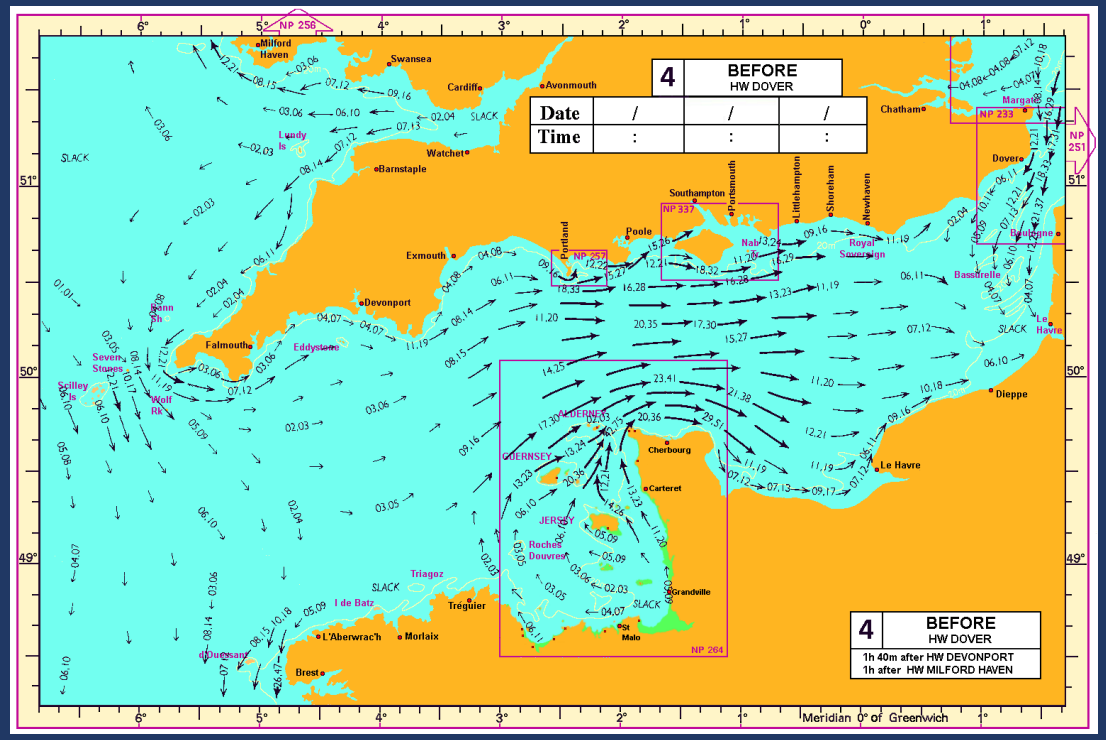
LW	HW	LW	HW
01:27	07:17	13:38	19:32
1.2 m	6.8 m	1.3 m	6.9 m

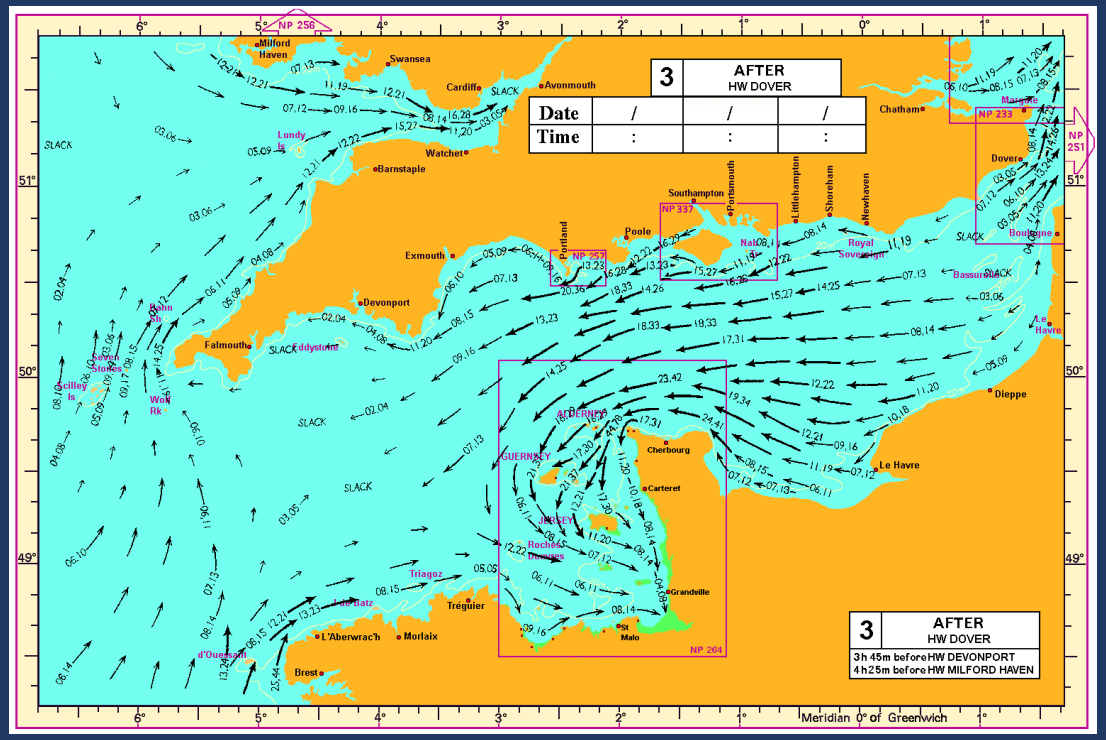
Tidal Currents

Flood and Ebb Current can have high influences on our navigation

Term	Definition
Flood Current	When the horizontal movement of water is toward shore or up a tidal river or estuary, the current is said to be flooding.
Ebb Current	When the horizontal movement of water is away from shore or down a tidal river or estuary, the current is said to be ebbing.
Slack Water	The period of time where there is little or no current is called the minimum before flood or ebb.
Duration of Flood	The interval of time in which a tidal current is flooding.
Duration of Ebb	The interval in which the current is ebbing. In a normal semidiurnal tidal current, the duration of flood and duration of ebb will each be approximately 6 hours, but can vary.
Set	The direction of the current is called SET, and is expressed in the direction *TOWARD* which the current flows.
Speed of Current or Drift	The velocity of the current is called **speed of current** and is sometimes referred to as **drift.**

Tidal Streams





Thank you for your attention