

THE COAST AND THE NORTH SEA

Map IV.4 shows the mouth of the Scheldt, the coastal region and the sea bed adjacent to the Belgian coast. Besides the off-shore relief it portrays the navigation routes and gives a brief view of the essential characteristics of the tides. The map has been prepared on the basis of the most recent Belgian, Dutch, French and English soundings. The mouth of the Scheldt is defined as the part of the estuary of the river situated approximately between the line Westkapelle -Wenduine and the transverse line in the vicinity of Flushing (Vlissingen).

NAVIGATION

The principal route followed in the mouth of the Scheldt is the sea passage from Westhinder via the pilot vessel near the Akkaertbank and the navigable Scheur as far as Flushing. This route now has a secondary line towards the port of Zeebrugge departing from the Scheur-Zand buoy (situated to the north-east of the Wandelaar bank): this consists of the dredged channel formed by the Ribzand and the Zand passage.

The navigation route Westhinder-Flushing via the Scheur, which still attains depths of 25 to 30 metres in the proximity of the Westhinder bank, gradually becomes shallower as it approaches the coast near Flushing. The Scheur has minimum depths of 13,5m; similarly, further east, south of the Sluische Hompels bank, there are also shoals of 13m which here constitute the last traces of the small Kadzand bank. The depths are expressed in decimetres on the map and are reduced to the lowest mean sea level of spring tides. The Scheur channel has been open to navigation since 1963 and, in the course of intensive dredging work along its total length, has acquired greater depth.

The Wielingen route, which extends south of the Wandelaar and the Bol van Heist banks - formerly the principal navigation route of the mouth of the Western Scheldt - is only used today by shallow draught boats; it has a minimum depth of 8 metres south of the Bol van Heist bank.

The navigation route from the Scheur-Zand buoy towards Zeebrugge at the present time reaches depths of about 12 metres (relative to local lowest mean sea level of spring tides) in the Ribzand and of 13 metres (idem) in the Zand passage, at the further end of the new moles.

In front of the access to the port of Ostend (Grote Rede) the minimum depth is about 6 metres. This port has three approaches by sea; from the north from the pilot-boat via the Ravelingen and the Grote Rede and then by two coastal routes (coming from Nieuport (Nieuwpoort) via the Westdiep and the Kleine Rede and coming from Zeebrugge via the southern side of the Wenduine bank).

The port of Nieuport, which is only accessible to boats with a very limited draught, is essentially only used for fishing and yachting. The port of Blankenberge today has only the function of a pleasure port.

For further details concerning the depths and the beaconing of the navigation routes it is necessary to refer to the Belgian nautical charts produced by the Coastal Hydrographic Service at Ostend.

PHYSICAL CHARACTERISTICS

As a result of the combined forces of attraction of the moon and the sun (Newton's Law of Gravity), the watermasses of the sea are subject to periodic oscillations (flowing or rising and ebbing or sinking). The horizontal movements of water which result are sometimes given the name "tides" (see later) but it is better to call them "tidal currents" and reserve the term "tide" only for vertical movements.

The attraction exerted by the moon is 2,18 times stronger than that of the sun; this is because, although the sun's mass is greater than that of the moon, the distance moon to earth is 386 times smaller than the distance sun to earth. The preponderance of the moon's influence is marked in our regions by the tidal period: during a time interval of 24 hours 50 minutes (a "lunar day") water levels reach a maximum and minimum level each twice over.

The amplitudes of the tides are strongly influenced during a fortnightly cycle, by the positions of the moon and the sun relative to the earth. At the time of neaptides (about two days after the first quarter of the moon and two days after the last quarter) the amplitude is reduced at the most. It increases to a maximum at the time of spring tides (about two days after the new moon and two days after full moon). This delay of the tide of at least two days (around 52 hours in the southern part of the North Sea) is called "the age of the tide" and is a result of disturbances produced in the tidal forces by the distribution of the continents in the northern hemisphere. In the southern hemisphere the tidal patterns are closer to the ideal picture because of the absence of large continental masses.

At the equinoxes (21st March and 21st September) the sun and the moon are over the celestial equator and at their mean distance. At this time their influences combine and are at their greatest.

The tidal regime of the Belgian coast is integrated with the amphidromy (water circulation system) which exists in the southern part of the North Sea. The rather strong tidal movement in the North Sea is the product of free tidal movements. These open water movements originate in the region of oceanic tides and they are under the direct influence of the forces engendering them. The free tide of the Atlantic Ocean penetrates from the north and is transformed into a stationary wave type as a result of its rebounding against the different coasts.

An amphidromy is generally born from a transverse action (Coriolis acceleration or some other tidal force) on a stationary wave, which in fact reduces the nodal lines to a certain number of nodal points, called also amphidromic points: here the tidal range is nil. In the southern North Sea such a nodal point exists at ca 51° 41'N and 3° 13'E (between IJmuiden and Lowestoft). In the eastern part of the North Sea a similar point is equally found at ca 55° 31'N and 5° 42'E. A tidal force turns around these points in an anti-clockwise direction.

The theory we have just summarised is at the base of the tidal movements along the Belgian coast. The tidal range increases with remoteness from the amphidromic point. One can thus delimit zones of equal tidal range by closed curves around the amphidromic point.

Tidal rises and falls can be produced under the influence of meteorological factors; on the Belgian coast rises can generally be observed by winds from the north, north-west or west, and falls by winds from the east and south-east. A barometric high pressure lowers the sea level, low pressure allows it to rise.

The forces of attraction of the moon and the sun which determine the vertical movements of water masses (tides in the strict sense) also engender horizontal movements of water. These are tidal currents. Of course, besides the influence of the moon and the sun, the force and the direction of the wind equally exercise an action which cannot be underestimated.

As a general rule one can say that the flood tide (or the ebb tide) starts ca 2 hours before high tide (or low tide) and persists for about 3 hours after high tide (low tide). On the other hand, the tidal current, which along the Belgian coast turns anti-clockwise, gradually takes different directions. Tidal currents are sometimes represented in the form of a current rose; in that way the characteristics of a particular current are brought out more clearly.

For details of the tidal currents along the Belgian coast and in the estuary of the Scheldt, we refer to the Atlas of the Flemish Banks and the tables of currents of the Belgian maritime maps published by the Coastal Hydrographic Service at Ostend.

Under extreme meteorological circumstances, wind can produce some very high waves, up to 5 metres near Westhinder; near Zeebrugge their height can reach 4,5 metres.