Gemeenschappelijk Nautisch Beheer
Scheldegebied

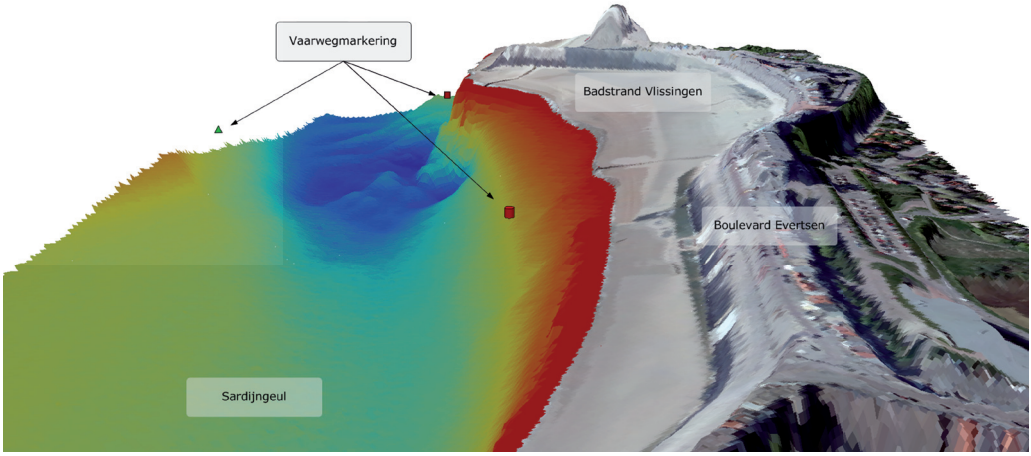
SHIP WAVES AT VLISSINGEN BEACH

Vlissingen boulevard and beach

The boulevard in Vlissingen has traditionally attracted people of all ages – residents and tourists alike. On warm summer days, the recreational beach, which is adjacent to the boulevard, attracts around 2,500 people, and on peak days around twice or three times that number come to enjoy the facilities. At a short distance from the beach, on the Sardijngeul passage, an average of two vessels pass every hour.

Unknown danger?

The residents of Vlissingen have long known that those using the recreational beach must be wary of the waves and flow produced by vessels. The suction of the passing ships can cause the water to sharply subside and cause bothersome waves. As early as 1971, the Provinciale Zeeuwse Courant newspaper reported that the larger and faster vessels could potentially create dangerous situations, and the shipping volume has only increased since then. The beach attracts a growing number of non-local recreational users , who are unaware of this danger, and although there have been alert signs at the entrances to the beach since 2003, a number of incidents occur each year. So far, any serious accidents have been avoided thanks to effective intervention by lifeguards: damage has been limited to a drenched suit, a slight physical injury, and loss of property. For this reason, the traffic control centre in Vlissingen started monitoring the passing vessels more closely in July 2011, an effort in which the Flemish and Dutch Pilotage Services are involved as well.



Aerial photo of recreational beach and depth recording of the passage in question

Incidents reported

The majority of vessels pass by at an appropriate speed, not requiring the intervention of the lifeguards. However, several situations have occurred that caused a nuisance and, in some cases, danger. A dangerous incident is defined as a situation where the lifeguard loses control and children can be rescued only with considerable effort. 'Nuisance' is defined as a situation where the beach is flooded, beach users are no longer able to stand up, and their personal belongings on the dry beach get wet. Personal injuries have been caused on several occasions prompted by these conditions, and off season, too, pedestrians and fishermen have experienced nuisance. The table below shows passages of vessels that resulted in nuisance and/or danger. As the table shows, these situations may vary significantly.

Date	Type of vessel	Water level	Depth of schip	Length of schip	Width of schip	Shipping speed
25 june 2009	Container	AOD+2.19m	9.8 m	203 m	25 m	11.6 kn
4 august 2009	Container	AOD+0.35m	8.6 m	149 m	22 m	15.6 kn
4 july 2010	Tanker	AOD-1.26m	6.5 m	178 m	28 m	13.0 kn
18 july 2010	Container	AOD-1.20m	7.2 m	185 m	25 m	14.4 kn
20 july 2010	Container	AOD-1.30m	7.5 m	149 m	22 m	12.5 kn
24 march 2011	Tanker	AOD+1.42m	7.5 m	182 m	34 m	10.6 kn
22 may 2011	Container	AOD+1.50m	8.4 m	294 m	32 m	12.5 kn
25 may 2011	Container	AOD-0.33m	7.5 m	198 m	28 m	12.6 kn

The passage of the OOCL St. Petersburg on July 20 2010 caused such nuisance that a formal report was filed against the captain. The tidal wave caused two young children to get dragged between the groins and become injured. One woman sustained a minor injury when she lifted her child out of the water, and lifeguards had to come to rescue several children in the water.

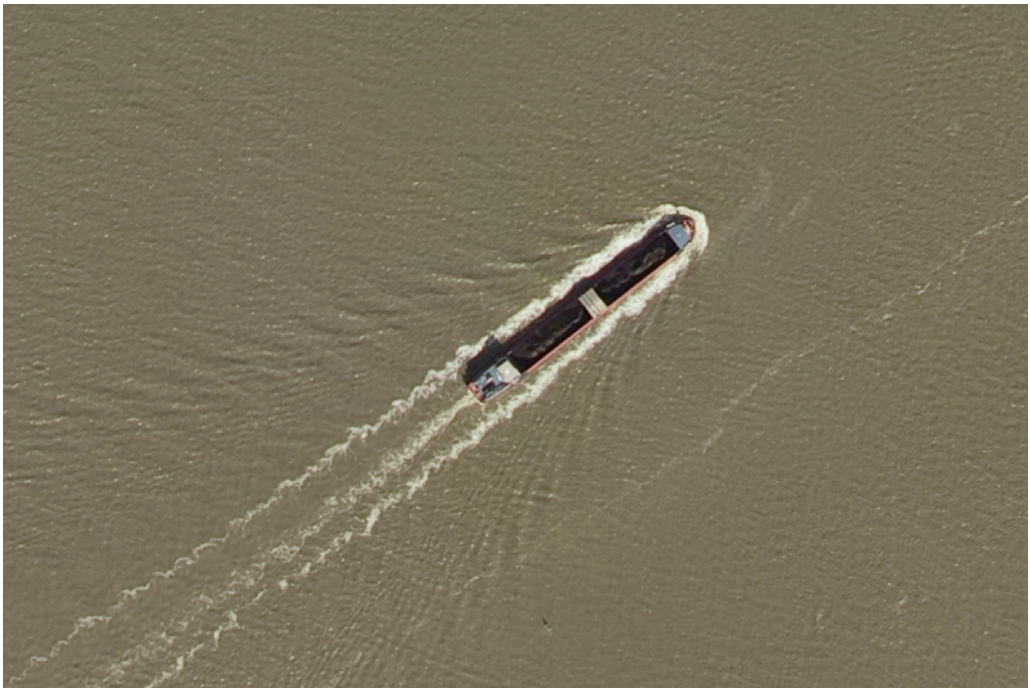
Cause and effects

When a vessel is in motion, the water, which is superseded at the bow, flows to the gate of the ship. This flow causes a backwash in front of the ship, and a return flow beside the ship, coupled with a decline in the water level. At the gate, the return flow ends with the stern wave. Circumfluence increases when the vessel starts sailing faster – this circumfluence is referred to as the 'primary shipping wave'.

A ship in motion also triggers a secondary wave system, consisting of diverging and transversal waves. Interference peaks are created in those areas where diverging and transversal waves strengthen each other.

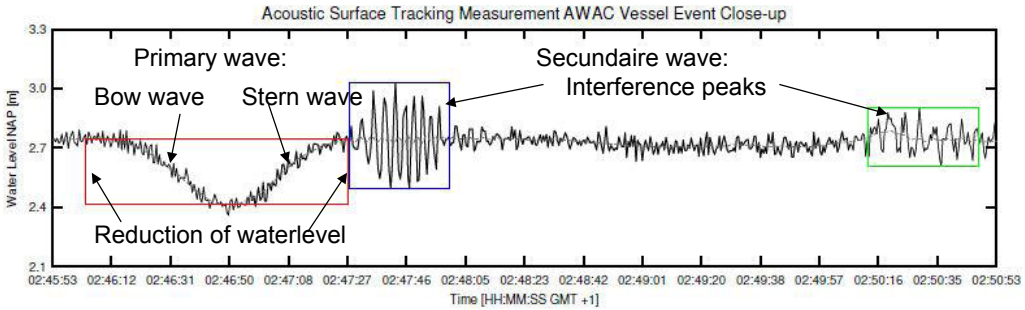
The Sardijngeul passage is very narrow west of the recreational beach. From the Rede van Vlissingen (Vlissingen Roadstead), vessels often accelerate in order to safely pass this section of the passage. The effect of the contraction and acceleration results in long waves, which flow away from the bow of a ship, causing elevation of the ship and abatement beside the ship. This abatement increases the decline in water level.

Flooding of the beach by a stern wave on May 22 2011



The circumfluence of a vessel and the secondary waves this produces (aerial photo courtesy of the Province of Zeeland, 2011)

On the beach, we first see how the water retreats due to the distorted decline in water level beside the ship. Due to the increased resistance in shallow water, this water-level decline reaches the beach far behind a vessel. The water-level decline changes into a stern wave and a wake current. Due to the distortion, the stern wave is higher on the beach than in the fairway. The first major stern wave might be followed by several other stern waves.

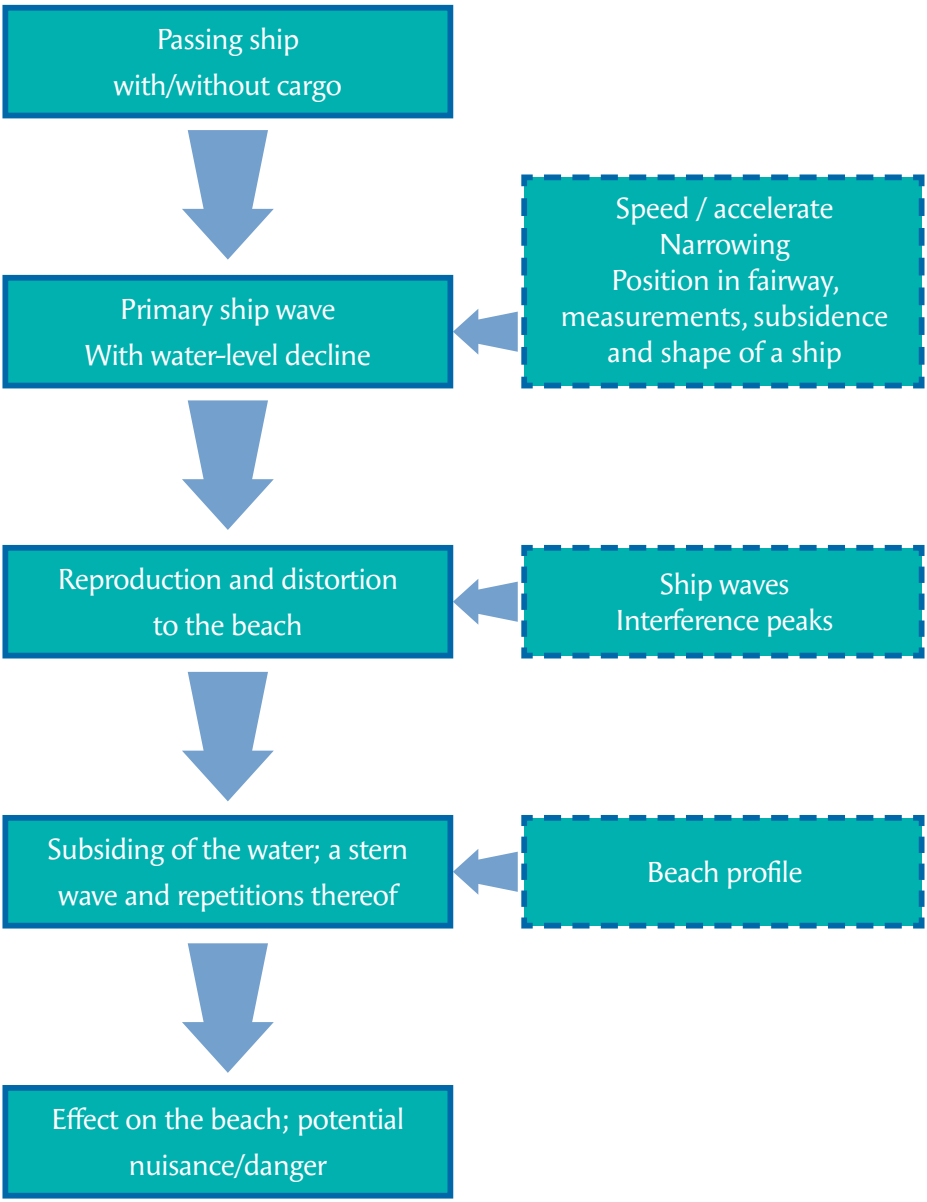


Full wave signal of vessel, including the water-level decline and secondary waves

Depending on the ship and the ship's position in the fairway, the interference peaks may coincide with the stern wave, thereby further increasing the force of this stern wave. In the Sardijngeul passage, these effects are extra strong because the passage for vessels is narrow and shallow in that area.

The combination of the water flowing away followed by a stern wave is the cause of the nuisance on the beach. This is because the stern wave reproduces itself along the beach with the speed of the ship. This can easily catch swimmers unawares, as shown in the flowchart below.

The front of the stern wave becomes distorted and fills the dried-out, shallow passage (photo by Maarten van der Wal, Deltares)


Passing ship
with/without cargo
Primary ship wave
With water-level decline
Speed / accelerate
Narrowing
Position in fairway,
measurements, subsidence
and shape of a ship
Reproduction and distortion
to the beach
Ship waves
Interference peaks
Subsiding of the water; a stern
wave and repetitions thereof
Beach profile
Effect on the beach; potential
nuisance/danger

Deltares' findings, enabling Delta Life

The nuisance at the recreational beach can be diminished by sailing at an appropriate speed at a sufficient distance from the beach. This measure was successfully implemented at Zoutelande beach in 2009. However, the problem is that the Sardijngeul passage lacks the space to implement this measure. Research conducted by Deltares on the Sardijngeul passage indicates that ship waves on the recreational beach can cause flows of 1 to 2 m/s, which can present a danger to beach users. A flow of less than 0.5 m/s is advisable on the beach for children and the elderly. Above the beach, flow caused by the tide is nearly always less than 0.5 m/s. Immediately after high tide, a highest peak value of 0.7 m/s was measured at two meters of water above the beach.

Sailing through a bend, the eccentric position of the vessel in the fairway and the squat of a ship do not significantly affect the water-level decline and the stern wave. It is not possible to provide a general value for the speed of a vessel below which no more nuisance is caused on the beach, as the stern wave depends on too many different factors. It is a question of good seamanship to prevent nuisance from occurring.

On a slightly undulating beach, the stern wave can enter the beach much faster than on a beach with a steeper slope. If the slope is flatter than approximately 2.5%, nuisance will soon increase; if the slope is steeper than 2.5%, nuisance will decrease.

The groins complicate the flow pattern due to the partial reflections of the wave. On Nolledijk, the stern wave can rise high up the dike, which can be treacherous to visitors sunbathing on top of the dike.

What measures can the captain and pilots take to prevent this?

- Adjusting the vessel's speed, thereby preventing a major water-level decline and stern wave
- Accelerate as little as possible
- Vessels should keep a distance as large from the beach as possible
- Do not mount or cross in the Sardijngeul passage
- Select the 'west round' route if the vessel cannot prevent nuisance

What measures can the beach operator take?

- Install new sand replenishments between low tide -0.5 m and high tide and create a slope of 2.5% or steeper
- If interim maintenance is performed, reshape/re-groove as with new replenishments

What measures can the fairway operator take?

- Dredging the fairway in order to ensure sufficient depth and correct shape
- Alerting vessels to the possible effects of sailing too fast, and providing the best possible advice
- Informing the lifeguard about passing ships

What measures can the lifeguard at the recreational beach take?

- Staying alert
- Improving information to beach users by means of signs, leaflets and means of communication
- Providing instructions to lifeguards and ensuring that communications between lifeguards and the Vlissingen traffic control centre are up-to-date

If all the parties involved take the appropriate measures, the nuisance will be kept to a minimum and will be manageable.

Monitoring by Rijkswaterstaat/Vlissingen Traffic Control Centre

In the nautical field, Flanders and the Netherlands are working together in the Scheldt region in order to facilitate fast and safe shipping traffic. 'Safe' refers to the environment as well: from the Vessel Traffic Services (VTS) Scheldegebied , shipping traffic is supervised and monitored through the Sardijngeul passage and the Oostgat.

Since 7 July 2011, mutual announcements are made in Bass 06-2011 regarding the adjustment of the shipping speed in the Oostgat/Sardijngeul waters. Bass 06-2011 is a more detailed version of Bass 065/10, aimed at exercising good seamanship.

If any ships arrive that could potentially cause annoying waves on the recreational beach, it is important to immediately contact the lifeguard of the municipality of Vlissingen. The Vessel Traffic Services (VTS) Scheldegebied cannot see on a radar picture whether a ship will cause a large ship wave. In issuing alerts, the centre works on the basis of experiences with specific types of ships.

Alert Pilots

The pilot services are available on the floor of the Vessel Traffic Services (VTS) Scheldegebied, and are in direct contact with the Joint Nautical Authority.

Following the incidents that occurred in July 2010, the management of the two pilot services alerted the pilots to the situation that can potentially arise on the recreational beach. They have been requested through an internal instruction to pass the beaches at an appropriate speed. A single, identical compulsory pilotage regulation applies to the Scheldt region. On board of the ships, the pilots advise the captain. In front of the Oostgat, ships with a length of up to 80 meters and a depth of up to 5.5 meters are not required to have a pilot on board, unless they are carrying hazardous substances.

The good news is that, since the new announcement, Bass 06-11 vessels pass the Sardijngeul passage in a highly disciplined way, keeping nuisance to a limit and making it manageable.

Alert lifeguards

During beach season, the lifeguard of the municipality of Vlissingen will keep an eye on the recreational beach between 10 a.m. and 6 p.m. A great deal of practical experience has been gained over the years, so that it can be reasonably estimated when potentially dangerous situations might arise. In addition, there is a direct link to the Vessel Traffic Services (VTS) Scheldegebied . As soon as a vessel that might produce a ship wave is on the way, the Centre issues an alert in time to the beach centre at the recreational beach. This provides the lifeguards with sufficient opportunity to warn the beach users. In the event of danger, swimmers are alerted with whistle sounds. Warning signs are posted near the stairs and entrances to the recreational beach.

Alert sign on the beach

Publication

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Information about the Joint Nautical Authority is to be found on
www.vts-scheldt.net.