

# FORESHORE PILOT PROJECT FOR HOUTRIB DIKE - Guidelines for the design and assessment of dike foreshore systems

## Abstract

### Context

The stated aim of the foreshore pilot project for the Houtrib Dike was to establish a firmer basis for faster sandy dike-strengthening operations, in particular in the load conditions in the larger lakes. The results from the project have now been applied in both present and future projects covered by the Flood Protection Programme. One of those projects is the strengthening of the Markermeer dikes between Hoorn and Edam in the Netherlands, which includes a sandy reinforcement approach (the 'shore dike'). The knowledge generated by this pilot project was also used to determine the dimensions for the sandy reinforcement of the western section of the Houtrib Dike and the sandy outer edges of the Marker Wadden.

### Reports

In addition to the more technical basic reports, a number of guidelines were also drafted in the context of the foreshore pilot project for the Houtrib Dike. Guidelines for permits and construction had already been completed at an earlier stage. The final phase of the project involves the production of guidelines for Management and Maintenance, guidelines for the Design and Assessment of dike-foreshore systems and a memorandum covering the Sandy Foreshore Business Case.

### This guideline document

This report contains the guidelines for Design and Assessment of dike foreshore systems and is a first step in the development of concrete computation rules and suggestions for the design and assessment of foreshore solutions, primarily for existing dikes. The sole factor of importance in the assessment of a foreshore solution is the current condition of the actual flood defence (in other words, the dike including the foreshore). The failure probability based on the current strength and load must comply with the applicable standards. The design must take into account the development over time of the load (as a result of sea level rise, higher river discharges, a rise in the level of the lake, etc.) and the strength of the defence (losses due to longitudinal transport, settlement etc.). A responsible approach is required here to uncertainties in long-term development, which can be significant.

### Objective

The report focuses in particular on technical difficulties such as the lack of concrete computation rules and guidance for the integral assessment of the integrity of the flood defence, including the performance and stability of the foreshore. The elimination of these difficulties can open up the way to the proper design of the flood defence. This is distinct from the consideration of how to adapt design boundary conditions in the light of future developments.

### Details

A description is first given of different types of dike foreshore systems. They can be broken down in broad terms into systems that act as sandy barriers and systems that reduce the load. A description is then given of relevant principles for both the assessment of existing flood defences and the design of new flood defences, together with a detailed example. The example includes the calculation of a failure probability for a dike with a sandy foreshore based on the conditions and profile seen in the Houtrib Dijk pilot project. Finally, a number of practical recommendations are made for the inclusion of foreshore systems in a design.

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