EMERGENCY ADVICE FOR A TEMPORARY DAM NEAR GRAVE

Left: The damage to the weir near Grave, right: Temporary dam structure

On the evening of 29 December 2016, a ship collided with the weir at Grave in the Netherlands. In darkness and thick fog, the inland vessel Maria Valentina missed the entrance to the lock, and collided with the operational weir, which suffered extensive damage, making it impossible to maintain water levels upstream. This made navigation impossible for day-to-day shipping, not only on the River Meuse but also on the connected Meuse-Waal canal.

Several months would be needed to repair the weir, which was originally built in 1929. It was therefore proposed to build a temporary dam blocking half of the river Meuse. However, the dam would result in a situation in which high river discharges would lead to higher waterlevels upstream of the weir and an increased risk of flooding. In order to decide about the installation of this temporary structure, Rijkswaterstaat needed more information to make an assessment and decide

whether the increased risk was acceptable. Deltares has an agreement with Rijkswaterstaat to provide advice on a 24/7 basis in case of emergencies. The emergency advice procedure is trained regularly using scenarios. On 6 January 2017, the procedure was activated for the damaged weir near Grave with the aim of assessing the impact of the temporary dam. During the course of a weekend, a plan was drawn up for this assessment, discussed with Rijkswaterstaat and implemented, and a team of experts reported on the outcomes. Normally, this process would have taken weeks or months. With the intensive deployment of experts and the full use of Deltares computational facilities, the work was completed within three days. This type of advice is only possible with an excellent knowledge base and model infrastructure.

Computations were completed for multiple discharge intensities and multiple design options for the proposed temporary structure. Hundreds of simulations were made using 1D (SOBEK3) and 2D modelling (WAQUA). The results showed that, in bank-full conditions, water levels would rise half a metre by comparison with the reference situation. However, at higher discharges, the effect of the dam was reduced: increases in the water level were smaller. The effect of the dam on the occurrence of threshold water levels ("code orange" or "code red") was limited.

Rijkswaterstaat used the results in their decision about the acceptance of the risks associated with the temporary dam. Building work on the dam began on Tuesday, 10 January. Within two weeks, the operational level of the weir was restored and shipping traffic on the Meuse and the Meuse-Waal canal resumed.

This concluded the emergency advice procedure. However, the reduced width of the Maas at the weir also resulted in increased flow velocities. Additional research was requested in a longer project to evaluate the flow velocities near the river bed, for which the CDF modelling in STARCCM+ was used. Given the results of this longer study, grouting was applied to the river bed and rock was placed in the river to prevent the scouring of the bed.

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Further reading:

Jurjen de Jong et al. (2017). Definitief memo Spoedadvies Stuw Grave. Available on https://www.deltares.nl/en/publications/