



Results of a Monitoring Program at a Sediment Trap in the Elbe Estuary near Wedel

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In June 2008 a sediment trap was built in the *Tidal Elbe River* near *Wedel*. The trap is about 2 km long, 2 m deep in average and spans the whole roughly 300 meter width of the navigation channel. The geometry of the trap is aligned to the zones with maximum sedimentation in the past. Therefore it has a triangular geometry on the western side. The dimensions of the sediment traps were restricted due to more or less legal circumstances. A longer and deeper sediment trap requires a planning approval as the used dimensions were evaluated as supporting maintenance works.

Hamburg Port Authority (HPA) and the *Waterway and Shipping Administration of the Federal Government (WSV)* want jointly further improve the management of sediments and dredging activities by means of this measure. Until end of 2010 a total amount of about 4 Mio. m³ of fine sediments has been removed from the basin in 4 maintenance campaigns and was relocated about 50 km downstream to the relocation area at *Elbe-km 690*.

The main function of the sediment trap is to reduce the residual transport of marine sediments from the *North Sea* in direction of *Hamburg* by trapping minor polluted sediments before they reach the port area. In this area these sediments mix-up with higher polluted sediments. The three specific objectives of the sediment trap are:

1. to reduce the dredging amounts in the area of the *Hamburg port*;
2. to be able to relocate minor polluted sediments further downstream to areas where the ebb-tidal current dominates the flow regime;
3. to economically optimize maintenance dredging activities within the sediment trap.

Beside these qualitative advantages the sediment trap has additional advantages in regard to maintenance works of the fairway due to a higher flexibility. Since sediments are collected in one defined place they can be dredged more efficiently through the use of optimized equipment, e.g. larger hopper dredgers can be used resulting in a cost-benefit. Another optimisation possibility can be found in the higher densities that can be dredged through a longer period of consolidation, resulting in higher hopper densities. In contrast to these advantages, a cost increase through preparation of the sediment trap in the first place needs to be considered.

In order to report stakeholders, *HPA* runs a monitoring programme on how this sediment trap affects hydrology, morphology and ecological issues. Besides that, *HPA* carries out further monitoring activities tailored to system analysis and to study morphological processes in detail. The *Federal Institute of Hydrology (BfG)* analyses the data and carries out further investigations on the measuring data (refer to *BfG*, 2009 and *BfG*, 2010).

Hydrological and morphological parameters are being constantly recorded at four monitoring stations which are located up- and downstream to the sediment trap. The current velocities were analysed by ADCP campaigns on several profiles. In order to study the near-bed morphological processes a steel-frame-platform – equipped with measurement devices and traps for suspended material – was installed directly on the bottom of the sediment trap. A pump sampler collects water samples from a survey vessel to obtain suspended matter (SPM) content.

Furthermore, *HPA* uses a multibeam echo sounder to observe the resulting sedimentation patterns in the trap. Surface grab samples are used to collect data about grain size distributions. Echo soundings with two frequencies and sediment echo sounders were used to get a picture of the density and consolidation of the settled sediments within the trap.

In this paper short results of the mentioned monitoring program should be presented.

References:

BfG (2009): Monitoring der morphologischen, ökologischen und naturschutzfachlichen Auswirkungen eines Sedimentfangs vor Wedel – Bericht 2008; *Bundesanstalt für Gewässerkunde, Koblenz; BfG-1655*, 2009

BfG (2010): Monitoring der morphologischen, ökologischen und naturschutzfachlichen Auswirkungen eines Sedimentfangs vor Wedel – Zwischenbericht 2009; *Bundesanstalt für Gewässerkunde, Koblenz; BfG-1692*, 2010