

Risk assessment & management of polluted sediments in areas with a nautical necessity - A Case study from the Port of Antwerp, Belgium

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Introduction: To meet up with the demands of an expanding harbour, the authorities of the Port of Antwerp need to perform maintenance and nautical dredging works in the proximity of the Hansa Dock. An estimated volume of 700.000 m³ sediment needs to be dredged.

Due to historical industrial activities (e.g. shipyards, oil refineries, tank storage), sediments in the Hansa Dock are heavily polluted with mineral oils and the biocide tributyltin (TBT). For decades TBT was used in the shipyards as an antifouling paint additive on ship and boat hulls.

The planned dredging works provide the Port authorities with an opportunity to coordinate a risk assessment of the present contamination, to investigate the possible increased exposure to pollutants during the works and to study the feasibility of possible remediation techniques.

Methods: After evaluation of the results of previous surveys, sediments were collected at additional locations using a vibrocorer sampler. Further data analysis with GIS software allowed to determine the degree and the extend of the pollution.

A conceptual risk assessment model was developed to identify the present routes of exposure and the associated risks, both during and after the dredging works. With regards to the scope of the future dredging works, risks concerning the dispersion of pollution were investigated.

Results: In contrast to the original assumptions made by the Port, the size of the pollution exceeded the scope of the dredging works by 200%. The pollution is mainly situated in the upper 2m of the sediments in the wet docks of the shipyard. After GIS extrapolation, it was estimated that only 25% (1.940 kg TBT) of the total amount of pollution will be dredged during the nautical works, leaving behind an residual pollution.

Present pathways and receptors during and after the dredging works were identified in a site-specific risk assessment model.



Polluted sediments map, Hansa Dock, Antwerp

Because the Hansa Dock is intensively used as a transportation route, the strong affinity of TBT to clay minerals and organic matter makes the dispersion of TBT-bounded sediment by increased turbidity/suspension the main pathway in the conceptual risk model.

Because the hotspot of the residual pollution is located near the shipping route, additional analytical testing of the sediment load in and around the Hansa Dock (e.g. by monitoring of turbidity levels, sampling and analysis of dispersed sediments) is needed to estimate the actual risk of dispersal of pollutants.

Results of an intensive monitoring campaign on turbidity before, during and after the dredging activities will be presented. As well as an evaluation of the various remediation alternatives for this zone.

In the near future: With present knowledge of the risks concerning the dispersion of pollution, the Port plans to elaborate a risk assessment with the university of Antwerp concerning the ecological risks. The study will be based on the results of monitoring campaigns and ecotox analyses, both being carried out at this moment.

This information will help the Port to decide which will be the best way to deal with the residual pollution.