Achieving more with less
Lessons learned by the Oslo harbor case study, Norway

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Introduction: One of the largest sediment remediation project in Norway so far has been conducted in the harbor of Oslo. Remediation consisted of dredging the inner harbor with subsequent deposition in a confined aqueous disposal site (CAD). Additional capping was used to achieve the environmental goals. Important drivers for the project were harbor development and construction of a submerged road tunnel (fig. 1). Beneficial use of dredged material improved the remedial effect. This presentation will focus on the increased environmental benefit achieved by the remedial activities.

Methods: To ensure minimum negative impact under construction, and optimum environmental effect for the remedial action, the contractor used special adopted methods like an excavator with protective lid during dredging, trimmed pipe during deposition and rotating cutter knifes during clay capping, and reversed hopper dredging during sand capping. Efforts to document potential negative impacts during remediation were extensive, and involved various methods like turbidity sensors, sediment traps and passive samplers. Based on these measurements, it was possible to estimate contaminant release. After completion of the construction works, the environmental effect was documented., Focus was on reduced sediment concentrations as well as transport of metals and organic pollutants from seabed to the water column. Recolonization studies of benthic organisms, focused on abundance and diversity. Physical performance of the cap on the CAD was documented, using ROV technology and measuring rods.

Results: After completion of the CAD, it was found that the concentration of pollutants in the area decreased since the CAD site had been historically polluted. Along with a decrease in total sediment concentration a decrease in diffusive contaminant transport was observed (fig. 2).
Biological analyses have shown a clear change in benthic community evolving from mainly pollution tolerant into colonization type organisms resulting in a higher diversity during the last two years.

Fig. 1: Oslo Harbor. development of the new FjordCity including remediation of contaminated sediments.

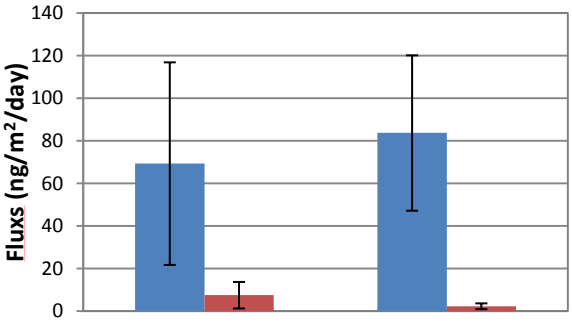

Fig. 2: PCB release rates from sediments before (blue) and after (red) construction of the CAD, measured using passive samplers in special benthic landers.

Discussion: Environmental dredging has successfully removed contaminated sediments from the harbor of Oslo. Increased environmental benefit was achieved by using dredged clay for capping the inner harbor area. By using an heavily contaminated site for construction of a CAD, significant environmental improvement was obtained. Two years after completion of the CAD the site can be described as a "clean sandy island" in an area dominated by historically contaminated sediments.

References: http://www.renoslofjord.no/in-english/