

Measurement of geotechnical properties and physical stability of dredged material in a CAD

Tore Kvalstad¹, Kjersti Marie Stensrud², Hans Nilsson³, and Gijs D Breedveld¹.

¹Norwegian Geotechnical Institute, 0806 Oslo, Norway

²Sweco Grøner, Oslo, Norway

³Norwegian Institute for Water Research, Oslo Norway

Deposition and capping of sediments in a confined aqueous disposal facility (CAD) is one of several measures to reduce the problems caused by contaminated sediments. The method is used in Norway as part of the remediation efforts to clean up the contaminated sediments in Oslo Harbour. Dredged sediments can have high water content and are mostly made up from fine grained, cohesive materials. As a result, they have low shear strength. Therefore, consideration of the bearing capacity is important. Moreover the consolidation ratio and the amounts of excess pore pressures that can be expected in the deposited sediments are important factors to be able to estimate the occurring strength in the sediments at any given time.

The purpose of this work has been to investigate the strength properties and the bearing capacity of dredged sediments from laboratory investigations, calculations, a model experiment and in-situ field measurements using innovative approaches. Even though the aim in this project is the investigation of contaminated sediments from Oslo Harbour, the studies, calculation and investigation methods should be applicable for similar remediation projects.

Good correlation between traditional geotechnical methods, rheometer measurements and model experiments were found. Loading of the sediment in the model experiment tank resulted in failure in the same area as had been predicted by bearing capacity calculations both in the modelling tool Plaxis and by hand.

Investigation of the occurring effective stresses and strengths of the sediments in the CAD at the time of capping is therefore necessary before placement of the cap can start. In-situ measurements at 70 m water depth require innovative methods. Sediment profile imaging has been used to document sediment properties. Observations showed good correlation with sampling and on-site measurements.

