Building of a subgrade road layer based on marine sediment with experimental monitoring

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Introduction: The results presented here are within the framework of the European research project SETARMS. The aim of this project is to use innovative and sustainable solutions of management of marine dredged sediments in the Channel (France-England). Indeed, in France, 50 Mm^3 of sediments are dredged every year in ports and rivers for the development and maintenance of waterways. The aim of this research was to determine the feasibility of using sediment as a material for subgrade road layer. This required preliminary work in laboratory in order to define optimised treatments [1].

Methods: During the SETARMS (Sustainable, Environmental Treatment and Reuse of Marine Sediment) project, thirteen sediments were dredged from different ports of each side of the Channel. Out of these, four representative sediments were chosen to build an experimental subgrade road layer (Fig. 1). In order to meet necessary mechanical criteria, optimal treatment mix design was studied in laboratory and applied in the field. Experimental sections were built with the usual equipment used for road construction. During one year monitoring, different in-situ tests were performed such as plate load test, Westergaard Test and cone penetration test. Additionally, unconfined compressive and indirect tensile tests were carried in the laboratory on samples collected by core boring.

Fig. 1: Subgrade road layer manufacture

Results: Results from plate load test (EV2) show that, at 7 days, treated sediments satisfy the minimum value. Core specimens show a better mechanical behaviour than lab samples (twice to seven times) (Fig. 2). However, it has been noticed that results obtained from plate load test and core specimens seem to depend on the spot tested. For instance, standard deviation of unconfined compressive strength results from core samples reached 40%. These observations were confirmed by cone penetration test results (Fig. 3). It shows that, according to the tested area, there is strength heterogeneity in the material.

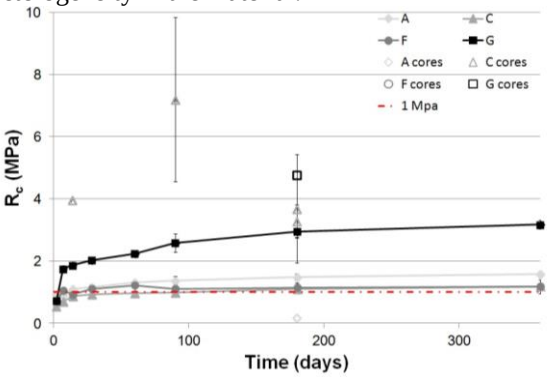

Fig. 2: Unconfined compressive strength of lab samples and core samples

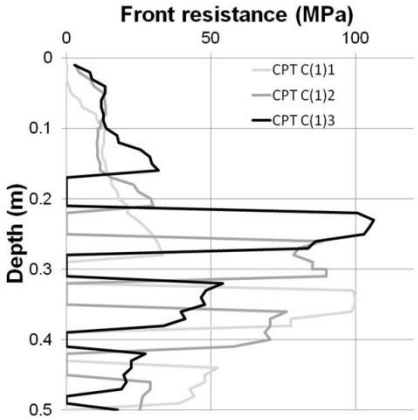

Fig. 3: CPT diagrams of experimental block C(1)

Discussion: This study shows that, using an adapted treatment formulation, sediment can be used as an alternative material for subgrade road layer. However, these results show that the manufacture process for road subgrade layer with sediment needs adapted method of execution and a close follow-up of the treatment process.

References: [1] Le Guern et al. (2014) *Dredgedikes conference*