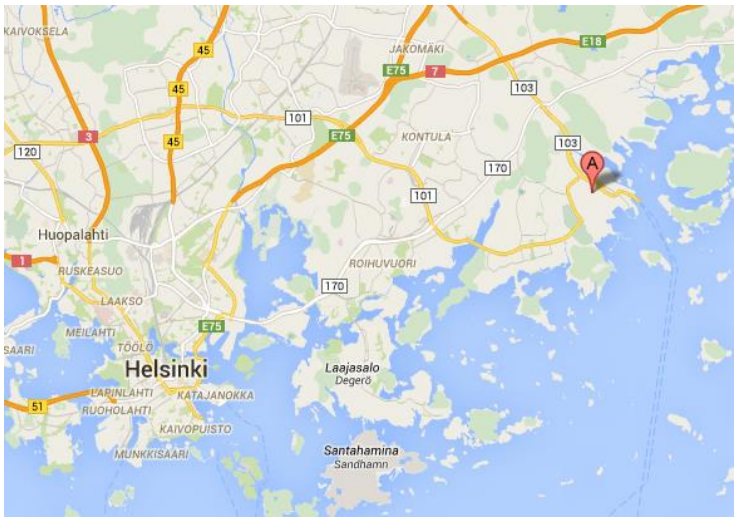
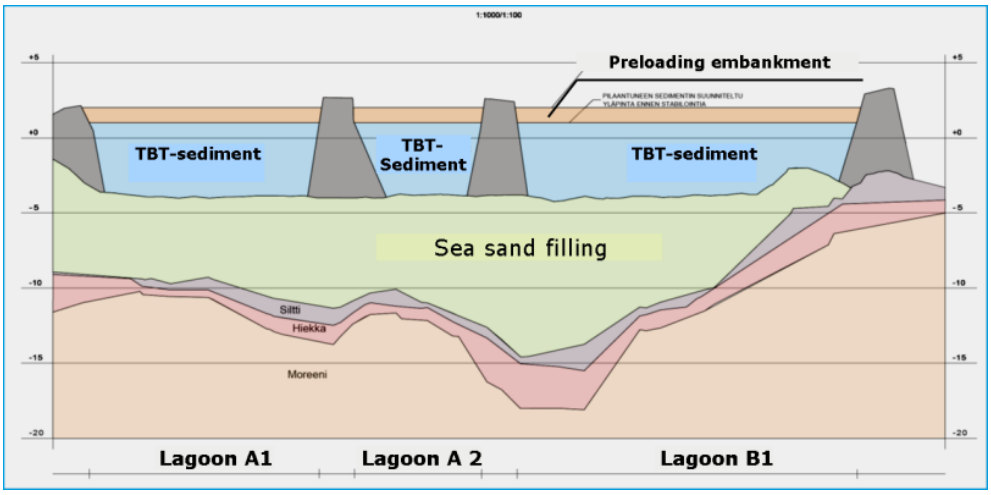
PORT OF VUOSAARI
Helsinki, Finland
Construction of port area using dredged sediments

Key words:
Contaminated sediments,
Port construction, Mass stabilization

General information	During the extension of the Port of Vuosaari, it was necessary to dredge sediments contaminated with TBT (tributyltin) that ended up in the water as a result of old shipyard activities. The sediments were stabilized and the stabilized mass was utilized as a construction material in the port structures. This allowed removing the contaminant from the sea habitat. Stabilization of the sediments enabled considerable saving of natural resources as it radically diminished the needed amount of blasted stone and crushed gravel for construction purposes.
Advantages of stabilization	Considerable savings of the natural resources in comparison to the traditional method of filling construction.
Project timetable	12/2005 – 12/2006
Volumes and dimensions	The overall size of the stabilized area was about 9 ha. The total volume of the stabilized sediments was about 500 000 m^3. Thickness of the layer: 5 m.
Geology and stabilized material	Dredged sediments (Mud/ Clay/ silt)
Target strength of the stabilized material	Planned shear strength > 70 kPa after 90 days Planned water permeability value 5 x 10^{-9} m/s
Binder(s)	CEM II/A-M (S-LL) 42,5 N ; 130 kg/m^3
Laboratory and field tests	Basic geotechnical tests in the laboratory and compressive strength and water permeability tests. Quality assurance concerning the consolidation process during construction included soundings (column and vane auger soundings). Surveillance of settlement of the stabilized fields. The solubility of the organic tin compounds including TBT was tested in laboratory with modified diffusion test NVN7347 and column test CEN/TS 14405 from the stabilized sediment.
Other	Strength targets were achieved. There occurred considerable differences in the achieved strength results. The highest values were at some places more than 2 000 kPa and in general the average value was well above the expectations. The measured solubility of the organic tin compounds from the stabilized sediment in diffusion and column tests were low. The mass stabilization reduced the solubilities significantly.
Long-term follow-up and lessons learned	A port field suitable for heavy traffic was constructed in the mass stabilized area. All the structures over the mass stabilized layer have behaved excellently (no settlement detected, good bearing capacity, etc.). In 2016 quality control soundings were performed to examine the long-term strength development. The strength of the mass stabilization had increased from already high value.
Sources	Havukainen, J. et al. (2011): *Stabilisation of tributyltin sediment in a harbour in Helsinki*. Ground Improvement, Vol. 164 Issue GI1. Maijala, A. et. al. (2009): *Cement stabilization and solidification – STSO*. Review of techniques and methods. Piispanen, P. (2017): *Long-term functionality of mass stabilization*. Master's Thesis. Aalto university.
Stabilization contractor	Biomaa Oy



Stabilization works in progress.



The principle of utilizing sediments in Vuosaari.

Aerial photo of the Port of Vuosaari.