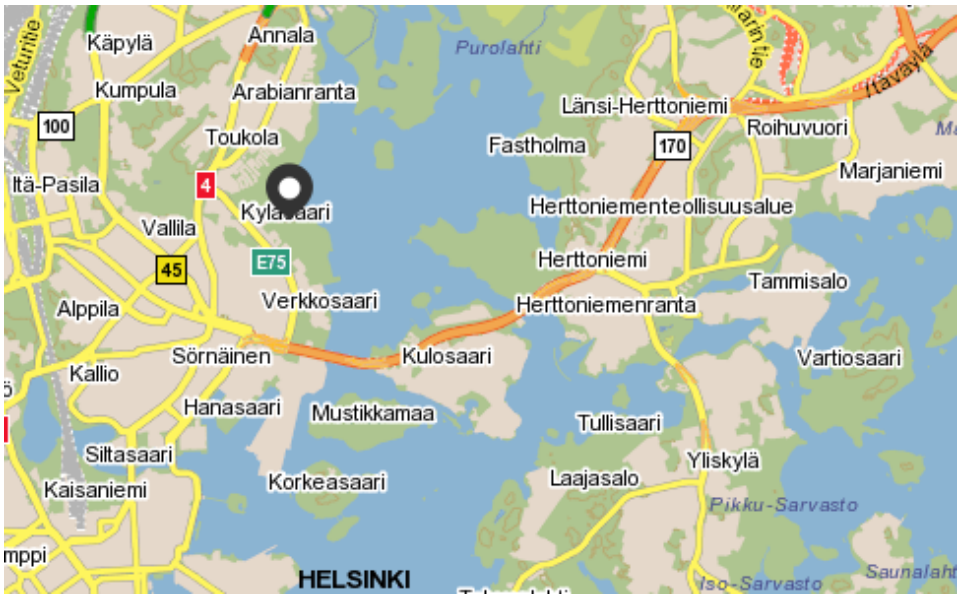
CASE ARCADA II

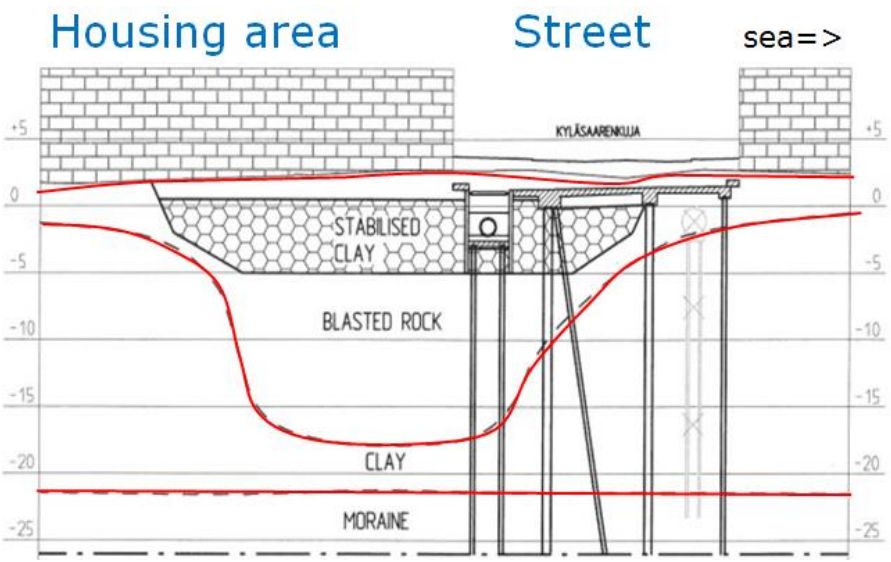
ARCADA II
Kyläsaari, Helsinki, Finland
Street and plot area construction

Key words:
light weight structure utilization of surplus soils

General information	The bottom level of clay in the area is -15 to -30. The area was filled from the sea in the 1960s by filling the area with aggregate contained with an embankment. Subgrade filling failed and the big part of the aggregate filling was floating on top of the clay layer. The largest thickness of the "subgrade filling" is more than 20 m. In the vicinity of the filled area, there are mainly 2-5 m thick filling layers constructed directly on top of compressible soft layers of clay and gyttja. In order to curb the lateral movement, the thick layers of filling were lightened by digging away the original filling to the level of -5 and filling the pit with soft surplus clay which was subsequently stabilized there. Also the lower excavations carried out in order to remove contaminated filling were filled with surplus clay which were stabilized afterwards. Surplus clay was transported from other construction sites.
Advantages of stabilization	The unit weight of the stabilized clay is considerably smaller than the unit weight of the aggregate filling submerged in the groundwater. The replacement of the aggregate with stabilized clay has allowed for considerable lightening of the structure and has decreased the lateral movement. In the same way, it was possible to utilize surplus soft clays which otherwise would have to be transported to soil landfill.
Project timetable	12/2010 - 08/2011 mass stabilization
Volumes and dimensions	The amount of the mass stabilized clay – approximately 32 000 m^3
Geology and stabilized material	The water content of the stabilized surplus clay w ≥ 80-90 %. The unit weight for the water content in question $\gamma_w \leq 15$ kN/m^3 (required). Other requirements concerning stabilized clay: clean (environmental requirements) and no cobbles allowed.
Target strength of the stabilized material	At the depth from ground surface to level -4 $\tau_{targed} \geq 40$ kPa and at level -4 to -5 $\tau_{targed} \geq 80$ kPa
Binder(s)	Cement 100 kg/m^3
Laboratory and field tests	Index and stabilization tests performed in the laboratory, stabilization tests carried out with the use of various binder mixture combinations. Quality control soundings in the basins (column penetrometer) in various stages of the work. During sounding tests, the observed shear strength of mass mass stabilization was mainly 80-300 kPa. In two basins, the shear strength varied between 50-200 kPa.
Other	In the Kyläsaarenkuja street, steel pipe piles of large diameter were driven through the mass stabilized layer. Piling trough the stabilized layer succeeded well.
Long-term follow-up and lessons learned	No long-term follow-up activities in the site
Sources	Articles: NGM 2012, Wascon 2012, Rostock 2012, *Arcada II, Report on the implementation of mass stabilization* 5.9.2011, Biomaa, V. Niutanen.
Stabilization contractor	



A cross section of the embankment in Arcada II and Kyläsaarenkuja illustrating the method applied. The aggregate removed from the area was replaced with stabilized clay which constitute a light weight structure.



Contaminated aggregate filling made in the 1960's was dug out to the level -5. Ground water in the area is on the level of the sea which is next to the site. After removal of the aggregate, the excavation was filled with surplus clay.

Stabilization of the surplus soft clay placed in the pit. In the back, a loading embankment is constructed. This functions as a working platform for the stabilization equipment, and allows for the compaction of the stabilized soil layer during the curing time.