EX-SITU STABILISATION OF CONTAMINATED SEDIMENTS IN FINLAND – CASE AURAJOKI

RAMBØLL

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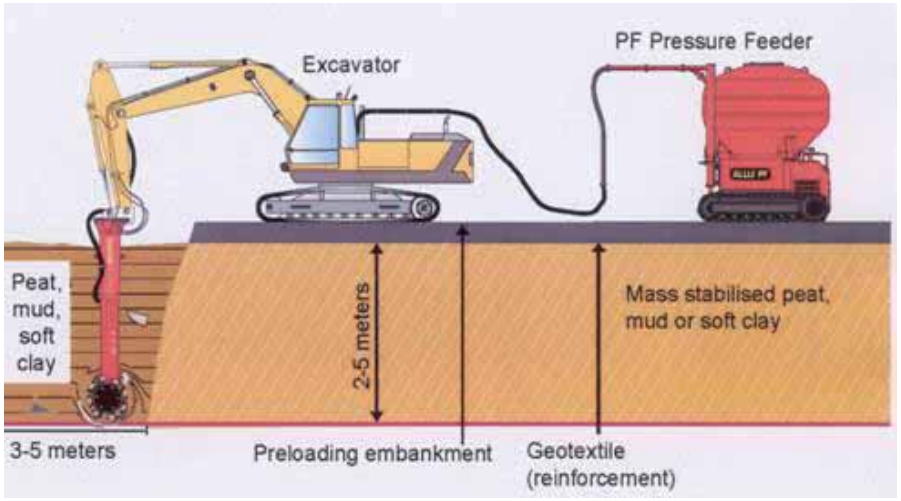
Background

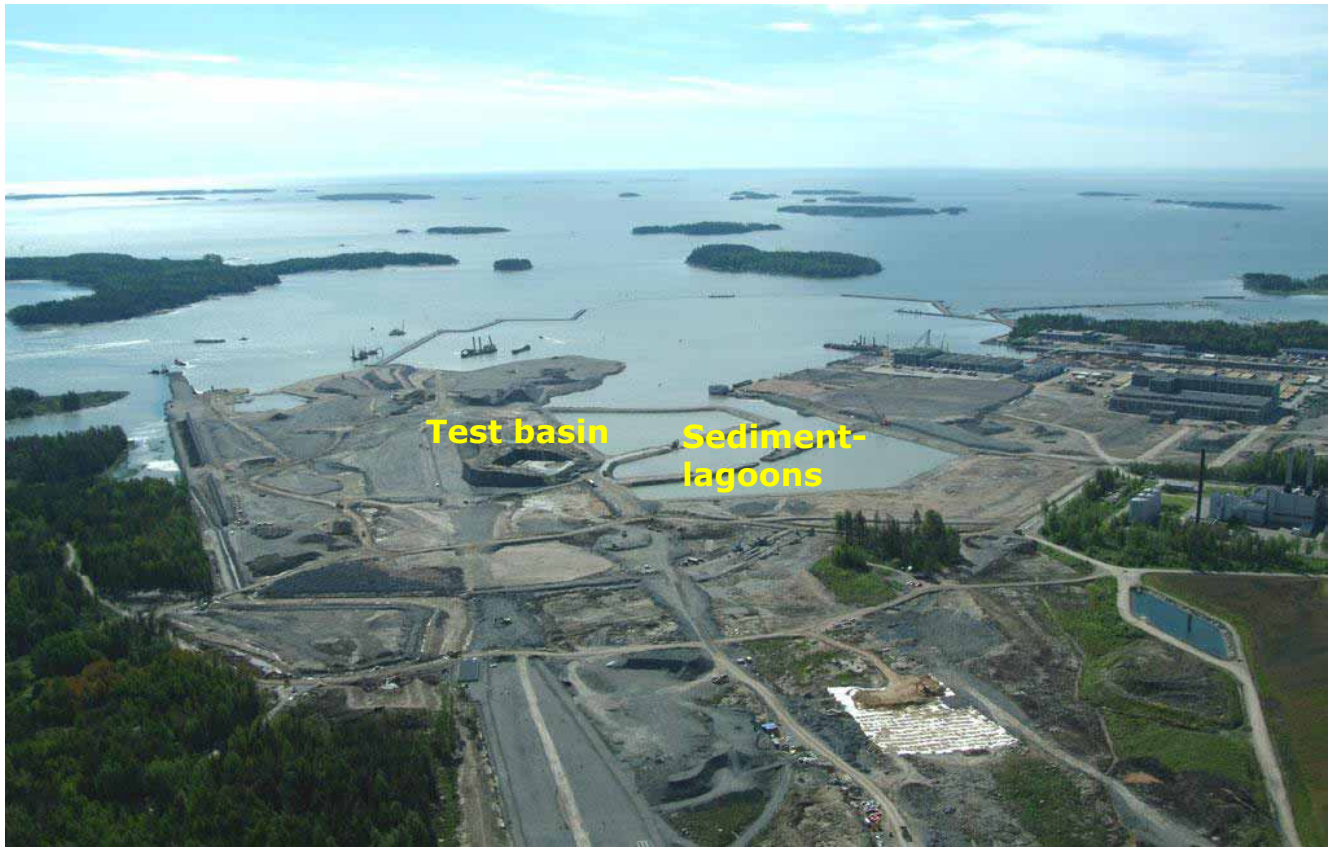
- Contaminated sediments have become a remarkable problem in harbours and waterways everywhere in the world. For example only in Europe roughly 200 million cubic metres of sediments are dredged each year (information: SedNet - European Sediment Research Network). In most cases they contain harmful substances originating from the operations of shipyards, industry etc.
- Economically and environmentally acceptable solutions to this problem have not been found so far.
- For example the maximum content of TBT (tributyltin) in the sediment is strictly regulated regarding the possible treatment alternatives. Contaminated dredged sediments are mostly classified as hazardous waste. The treatment is strictly regulated, expensive and problematic.

Development of mass stabilisation technology

- The mixing drum of ALLU Stabilization System
- The mass stabilization system of ALLU



Vuosaari Harbour, Mass stabilization of TBT-sediment, 2005-2006



LIFE06 ENV/FIN/000195 = STABLE

- ” Controlled Treatment of TBT-Contaminated Dredged Sediments for the Beneficial Use in Infrastructure Applications. Case: Aurajoki – Turku, Finland ” is a project funded by LIFE Environment (acronym STABLE).
- One of the objectives has been to demonstrate a new environmentally friendly and cost effective method for the treatment of contaminated sediments.
- The pilot demonstration was carried out in Port of Turku, where dredged sediments from river Aura were stabilised and used for the filling of Pansio harbour lagoon.

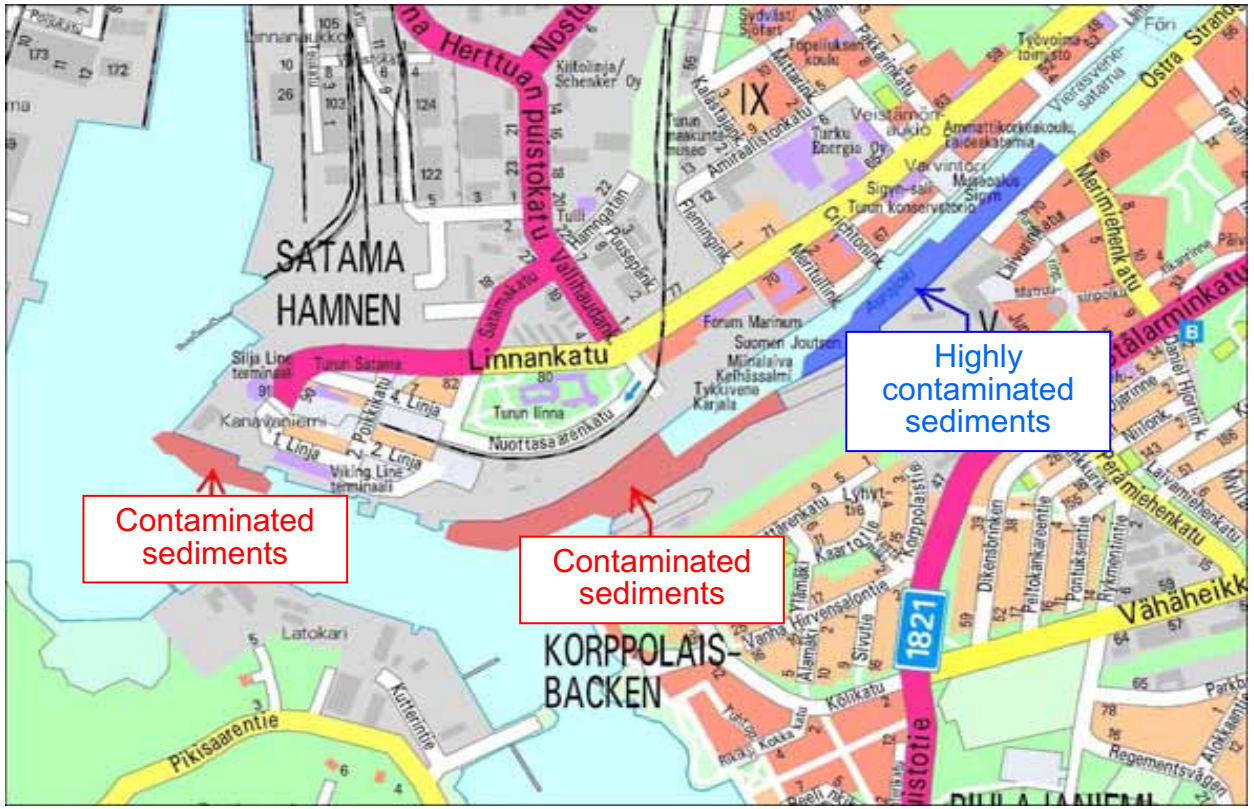
STABLE-project shortly

- The demonstration project has been funded by EU LIFE-Environment and Port of Turku as well as the consortium for the project: Terramare Oy, Biomaa Oy, Fortum Power and Heat Oyj and the Regional Council of Southwest Finland
- Planning, binder mixture recipe and quality control have been made by Ramboll Finland Oy.
- The budget of the project was 4 million euros.
- STABLE-project started 1.4.2006 and it was finished 31.3.2009.

STABLE-project had five main tasks

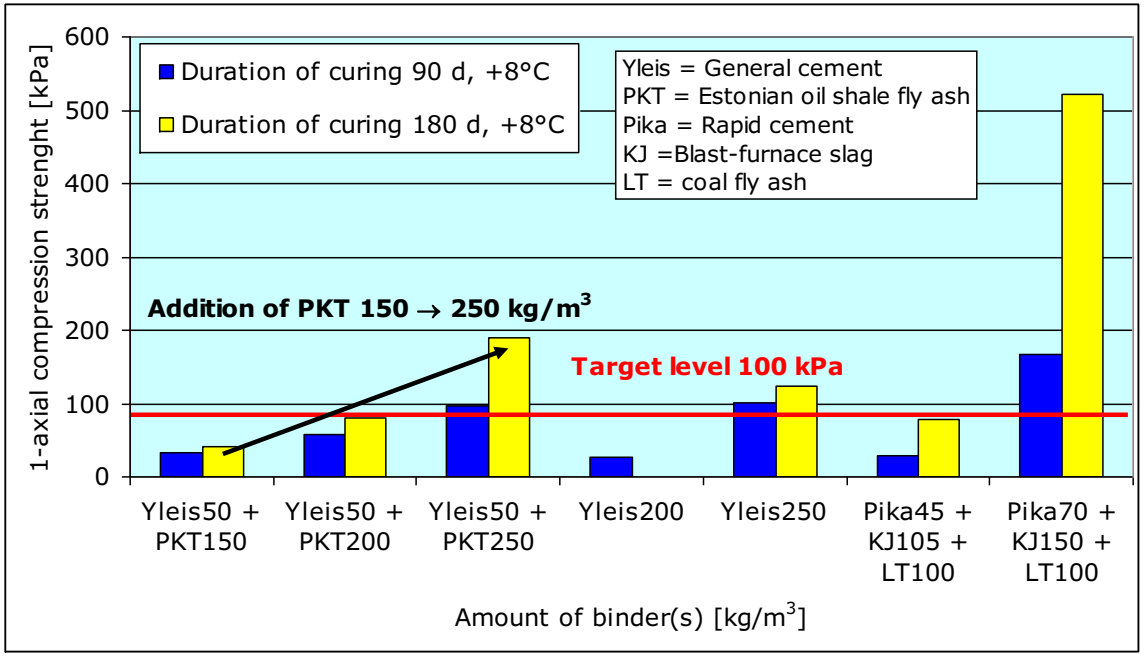
- **Binder mixture development**. The contaminants in the dredged sediments, especially TBT, should be bound to a low-leaching state. The stabilised dredged material should also have technically appropriate quality for the harbour field structure.
- **Testing and supervision of environmental grab technique.**
- **Testing and supervision of the process stabilisation** from dredging to stabilisation. The quality assurance of process stabilisation included e.g. sampling and testing of: the water from the stabilisation lagoon, stabilised dredged mass and bottom sediment outside the stabilisation lagoon.
- **Life-cycle** studies on the environmental impacts and costs of the stabilisation methods and their alternatives
- **Dissemination** to spread the information and knowledge in Europe. The project produced web-page, DVD presentation, power point presentation, conference presentations, articles, reports, press conferences and releases for media and other professionals etc.

Map of the contaminated areas in the river Aura.



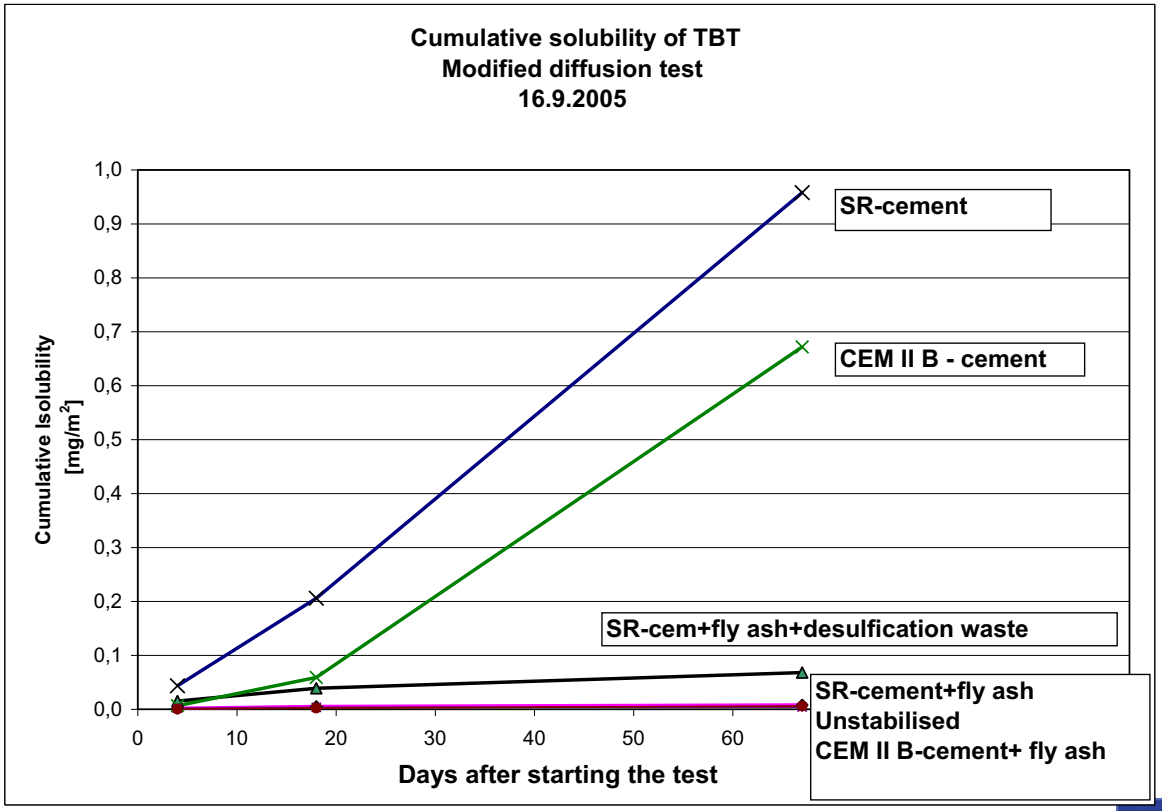
Binder receptation

- It is very effective and economical to use industrial by-products. In the case of the river Aura the most effective by-products combined with cement are coal fly ash, blast-furnace slag and oil shale ash.

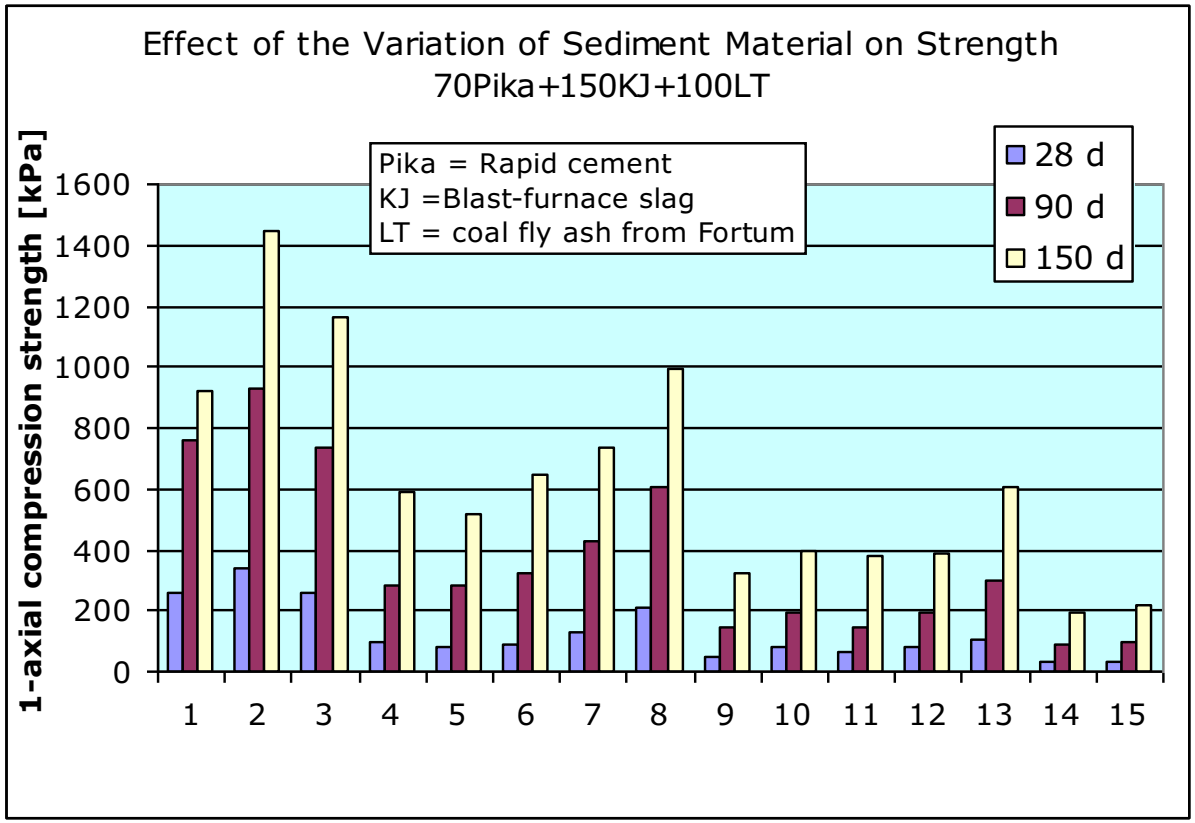


Binder receptation

- Results of a leaching test



Effect of the variation of sediment material on strength



EU-Life STABLE LIFE06 ENV/FIN/000195

Controlled Treatment of TBT-Contaminated Dredged Sediments for the Beneficial Use in Infrastructure Applications. Case: Aurajoki (river Aura)– Turku, Finland

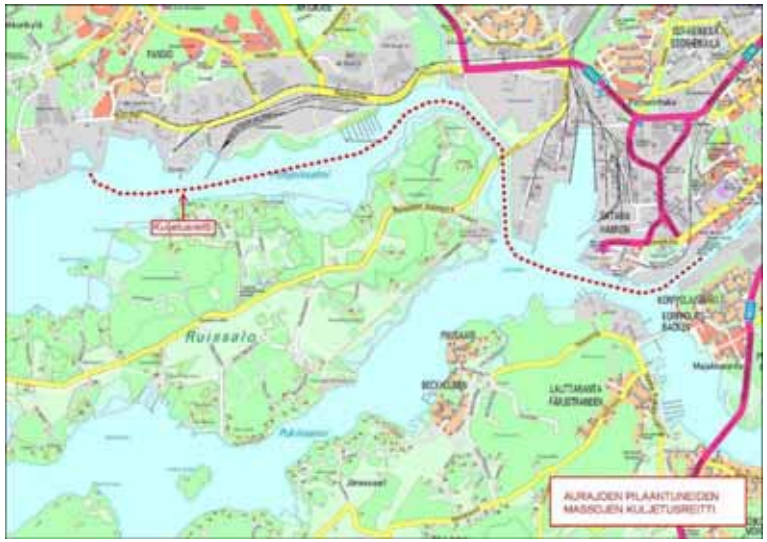
Dredging with environmental grab

Transportation

Process stabilisation

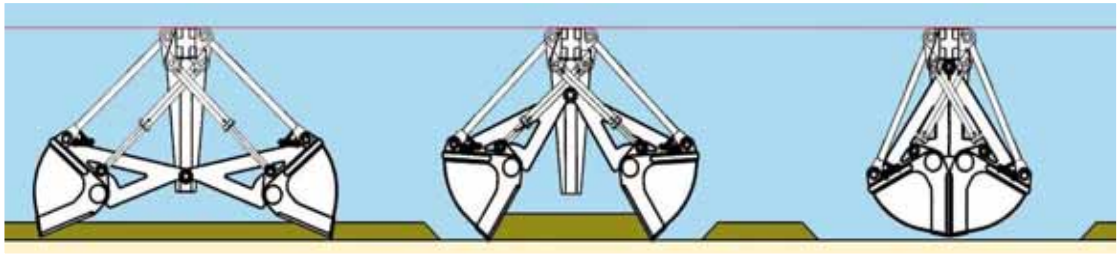
Utilisation in harbour fillings

Transportation route of the sediments, Pansio lagoon



Environmental dredging

- Environmental grab



The principle of process stabilisation

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SUSTAINABLE MANAGEMENT OF CONTAMINATED SEDIMENTS

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ORGANISATION

- 10 Partners
- Associated partner
  - Lenmoriniproekt / Port of St. Petersburg
  - Swedish Maritime Organisation
  - Geological Survey of Sweden
- Supporting organisations e.g.
  - Helcom
  - Finnish Maritime Organisation
  - Baltic Ports Organisation
  - Ministry of Environment in Finland
  - Finnish Environment Institute (SYKE)
  - Swedish Environment Centre (NVV)

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Objectives

- Guideline for management of contaminated sediments including handling alternatives
- Tool-box of treatment technologies, tools for assessment of sustainablity, decision support tools
- Field tests to validate, demonstrate and communicate emerging treatment methods under various conditions
- Permanent network for the management of contaminated sediments of BSR

Conclusions

- Industrial by-products like slag and fly ash make stabilisation of contaminated sediments economical.
- Blast furnace slag and fly ash are technically appropriate and they bind better chemical pollutants than commercial binders like cement.
- When compensating cement by fly ash and slag we can decrease the CO_2 emission dramatically – in this case about 17 000 tons.
- Totally new process stabilisation technology has been tested in full scale and the results were very good.
- It is possible to increase the capacity of the process stabilisation to even 150-200 m^3/h.
- The quality of process stabilisation is very good. Environmentally and technically appropriate quality can be obtained with a relatively small amount of binder material, which means remarkable saving in the costs of the treatment.

Conclusions

- Different transportation techniques have been tested and new technical opportunities were found to transport the stabilised sediment to the lagoon.
- The environmental grab in the dredging worked up to expectations. The water content in the dredged sediment was low, which meant that it could be stabilised with relatively small amount of binder. Consequently, significant cost savings were obtained.
- The strength development of the stabilised sediment has been observed in the field. The strength has increased like expected on the basis of the laboratory results.
- The filling area will be part of the new harbour area. About 100.000 cubic metres of natural filling materials (gravel, blast rock) could be saved by using stabilised sediment.

THANK YOU

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