

# PROJECT SHEET

**MUUGA COAL TERMINAL**  
ESTONIA

## GENERAL INFORMATION

The Muuga Coal terminal, sited on a bay, East of the existing port of Muuga, is to handle some five million tons of Siberian coal a year for destinations worldwide. The coal is shipped to Muuga by rail.

Future developments may include container berths and steel facilities.

The main contractor for the development of the Muuga coal terminal was the Estonian project management group A.S. Merko Ehitus. The dredging subcontract was awarded in late May 2003 to Terramare Eesti O.Ü., the Estonian arm of the Finnish-based Boskalis group company Terramare Oy.

## CONTRACT SPECIFICATIONS

The scope of works included the dredging of one million cu m of clay to create Muuga's access channel, plus another 1.5 million m<sup>3</sup> for three large berths. The soil was varying from soft clay to very hard Cambrian clay. There were also areas with a high concentration of boulders. The new coal terminal's access channel had to be dredged to -17.8 m; two berths had to be dredged to -11 m and the third berth to -17.1 m.

Dredged clay was transported to an offshore disposal area close to the island of Aksi. The contract also provided for reclamation of the terminal area, requiring 2.5 million m<sup>3</sup> of sand. Two borrow areas were used. Around 750,000 m<sup>3</sup> was won from a location near Prangli, an island close to Aksi. The balance was sourced from an area near Naissaar, an island to the west, of Tallinn.

## DREDGING ACTIVITIES

The dredging activities began in September 2003, when the backhoe Kuokka Pekka 2 was mobilized from Finland. The backhoe's job was to clear

## FEATURES

Client	Tallinn Port Authority
Location	25 km east of the capital of Estonia, Tallinn
Period	September 2003 - February 2005



- A Location map
- B Heavy ice on deck of TSHD Coastway
- C The completed coal terminal

boulders for the quay wall construction team. The 4,900 m<sup>3</sup> trailer Coastway then arrived at Muuga, having completed a major dredging program to deepen Gothenburg's access channels.

In November 2003 the 13,255 m<sup>3</sup> trailer Seaway arrived. Also on site were a survey vessel (Scheldestroom) and the tug/multicat Afon Goch. The latter to handle floating pipelines and other general support tasks.



The two trailers completed the initial phase of dredging works by early February 2004. At that point, they had finished the reclamation and about 65 per cent of the dredging in the access channel. These operations were completed only six days before the Gulf of Finland became ice-bound. It was then that the Muuga construction effort focused on piling and associated tasks across the reclaimed area.

The dredging of the remainder of the access channel was executed by a medium size trailer and resumed in July 2004. The second phase of dredging was also timed to avoid disturbing the salmon spawning season. A small cutter suction dredger cleared the sand bund around the reclaimed area after the piling had been completed. The big backhoe Nordic Giant, which features a Liebherr P995 excavator, was deployed to deal with top layers of clay during dredging for the berths. Two bucket dredgers were deployed and dredged the deeper clay layers as well as the final channel profile. The major part of all the dredging works was completed by end December 2004.

## SPECIAL FEATURES

Weather and, in particular, winter ice conditions have been a challenge. The water has a low salinity and heavy ice soon built up on deck of the

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dredgers. A thick coating of ice made working conditions very uncomfortable. The project's design also took account of a series of strict environmental parameters. The coastline in this area was out of bounds to the public during Soviet times. For this reason habitats controlled by the military were left undisturbed. They are now recognized as valuable wildlife reserves and, as such, are subject to strict supervision and protection. There was also another challenge: unexploded ordnance. It was estimated that around 80,000 sea mines were sown in the Gulf of Finland. When dredging began the dredgers were always preceded by a minesweeper. Estonian Navy mine experts were in residence on board each trailer. Every hopper of sand brought to the site was checked by military personnel. Some 1,200 items of unexploded ordnance have been recovered and safely disposed of.

## GEOTECHNICAL DESIGN

As the subsoil at the site consists of a number of quite weak soils, a geotechnical design was required. A basic geotechnical design was presented by the client in the tender documents and was based on a soil investigation program which had taken place in the mid nineties. This design was re-evaluated by the in-house engineering department of Boskalis, Hydronomic. The re-evaluation was based on the availability of the results of additional soil investigation which took place in the end of 2002.

The settlements predicted by Hydronomic were much less (less than half) than in the tender reference design. This allowed a significant optimization of the soil improvement which consisted of vertical wick drains. The area to be improved was reduced and the grid spacing for the drains was increased.

Based on Hydronomic's final geotechnical design, vertical drains were installed with a centre-to-centre grid of 2.5 meters (compared to a reference design spacing of 1.5 m and 2 m). The actual settlements were in the order of the values predicted by Hydronomic.



- D** Backhoe Nordic Giant
- E** TSHD Seaway pumping ashore
- F** Reclamation works by TSHD Coastway
- G** Installation of vertical drains

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