

PROJECT SHEET

PORT OF MOMBASA, KENYA
PORT DEVELOPMENT ON SOFT SUBSOIL

INTRODUCTION

The Port of Mombasa is currently the biggest port on the coast of East Africa north of Durban, and the only international port in Kenya. It is now in the throes of a huge expansion drive to both increase cargo handling capacity and accommodate Panamax and Post Panamax vessels.

The port is a transit route for, mainly, Uganda, Rwanda, South Sudan and Northern Tanzania. The current container terminal has an installed capacity of 250,000 TEU but handled more than 770,000 TEU in 2011. The port will raise its profile as a regional hub by building a second container terminal with a capacity of 1.2 million TEU. The port authority decided to construct the container terminal in phases.

CHALLENGES

The main challenge on the project was the fact that Boskalis had to work with weak subsoil with a low bearing capacity. There were also environmental challenges because the sand borrow area was situated between marine reserve parks.

WORK METHOD

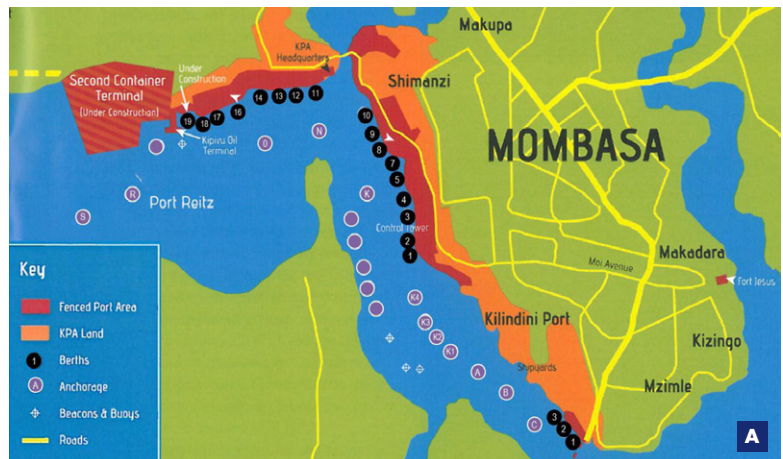
On 1 August 2012, Boskalis International B.V. signed the sub-contract for the dredging and reclamation works for the first construction phase for the second container terminal.

Before construction of the quay walls, three deep trenches were dredged by TSHDs Argonaut and Willem van Oranje to remove the weak subsoil and replace it with sand.

Boskalis soil specialists invested large amounts of time and energy in sourcing suitable sand in the immediate vicinity of the project.

FEATURES

Client	Kenya Ports Authority
Location	Mombasa, Kenya
Period	August 2012 – August 2013
Contractor	Toyo Construction Co. Ltd
Sub-contractor	Boskalis International B.V.



- A** Location map
- B** Spraying in layers with spray pontoon SP10
- C** TSHD's Willem van Oranje and in the background Argonaut removing the soft subsoil

After the removal of 1 million m³ of soil, the soil improvement area was filled with offshore sand by TSHD Willem van Oranje and a spray pontoon. Reclamation had to take place very carefully to avoid mud slides and circular slip. During reclamation to +1 m CD, the spray pontoon SP10, positioned on six anchors, was used to apply layers of 75 cm; that part of the work was completed successfully on 11 March 2013.

The remaining sand was applied in layers up to +5.5 m CD using land pipelines. Boskalis successfully met some challenges with extreme local



settlements. The +5,5 m CD level was completed on 7 May 2013. This activity was followed by a surcharge fill to a maximum of +11 m CD to reduce settlement time.

The total hopper volume of sand harvested for the project was 7.5 million m³ in 685 trips. All the sand had been delivered to the project area by 15 June 2013.

ACCELERATING SOIL SETTLEMENT

Soil settlement was accelerated by using prefabricated vertical and horizontal drains installed by the Boskalis specialist subsidiary Cofra. Cofra used four installation machines and dedicated teams for the horizontal drains. Cofra installed 6 million m of preformed vertical drains and 150,000 m of horizontal drains in record time before the surcharge fill was positioned. The Boskalis specialist subsidiary Boskalis Environmental used cone penetration testing at 350 different locations to determine the thickness of the sand in place.

ENVIRONMENTAL CHALLENGES

The main challenge was the location of the sand borrow area between marine reserve parks. An EIA (Environmental Impact Assessment) and EMMP

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(Environmental Monitoring Management Plan) were prepared and local environmental regulations and restrictions were met throughout the project.

SAFETY PERFORMANCE

Safety performance was highly satisfactory. More than 85% of the employees on site completed NINA training. Boskalis worked almost 450,000 man hours without any personal injury.

CONCLUSION

The client was fully satisfied with our performance. The project was completed well within budget and on time.



- D** Aerial view of the completed reclamation
- E** Cofra installing vertical and horizontal drains
- F** Reclamation +5,5m by TSHD Willem van Oranje, using land pipelines

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