

PROJECT SHEET

NOVA SCOTIA, CANADA

DESIGN AND CONSTRUCTION OF RECLAMATION AREA AND SHORE PROTECTION, SYDNEY HARBOR CHANNEL DREDGING PROJECT

INTRODUCTION

The 'Sydney Harbor Channel Dredging Project' in Nova Scotia, Canada, involved dredging and reclamation work as part of the construction of the new Sydney Port container terminal located on the northeast coast of Canada. Once operational, Sydney Port will be the most northerly deepwater container terminal on the North American east coast.

The project required the creation of a 12km access channel, for which approximately 4 million m³ of sand and silt was dredged. This material was then taken to a confined disposal facility (CDF) forming the foundation of the future terminal. The CDF was constructed by Boskalis and engineered by Hydronamic, the Boskalis engineering consultancy.

PROJECT SPECIFICATION

- Detailed design of CDF
- Debris and wreck removal in access channel, Construction of CDF, including the installation of 80,000t of filter material (10 - 100kg rocks) and 130,000t of armor rock (0.1 - 3t rocks)
- Deepening of existing natural harbor: dredging 3.3 million m³ of sand and gravel and 0.9 million m³ of mud
- Disposal of dredged material in CDF
- Execution of environmental monitoring and other environmental control measures.

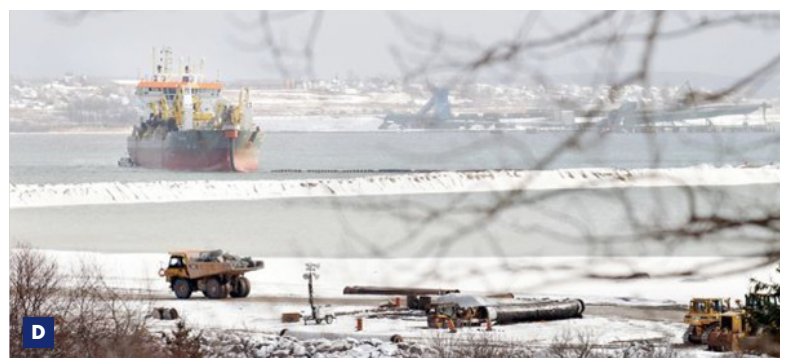
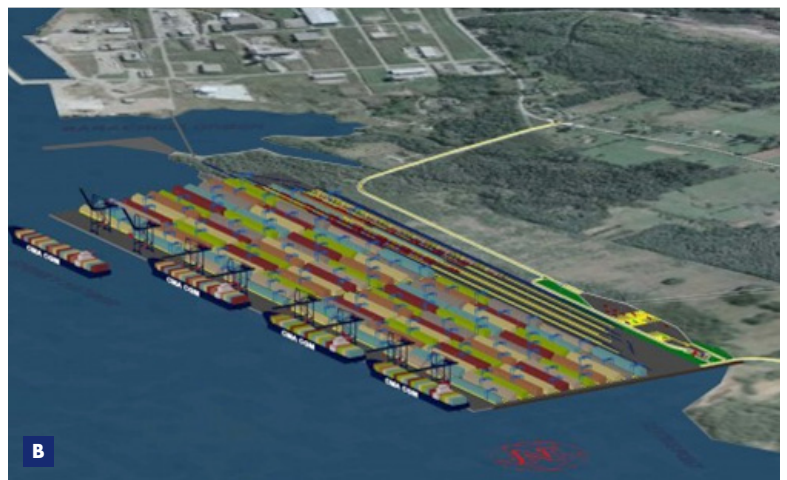
DESIGN AND CONSTRUCTION OF THE CDF

The detailed design of the CDF mainly involved the perimeter cell dikes, including slope protection.

- A** Overview of the natural harbor of Sydney in Nova Scotia, on the northeast coast of Canada
- B** Artist's impression of the future Sydney Port container terminal
- C** Photograph indicating the locations of the access channel (yellow-bordered area) and reclamation area (green-bordered area) in Sydney harbor
- D** TSHD Oranje in Sydney harbor during winter

FEATURES

Client	Sydney Ports Corporation Inc.
Location	Sydney, Nova Scotia, Canada
Period	2011
Performed by	Boskalis International B.V.



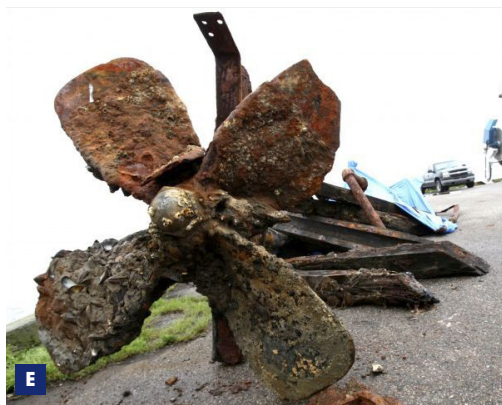
The north and south dikes perpendicular to the coastline were designed with a permanent revetment. This design followed from stability analyses for both wave and ice loading conditions. Geotechnical simulations ensured the stability of the perimeter dikes during both the construction and post-construction phase.

The shore protection along the 1,600m eastern dike of the CDF parallel to the shoreline is a temporary construction, as it will be replaced with a quay wall as part of the future container terminal. Initially, the eastern dike was to be protected by armor rock like the southern and northern dikes. However, this implied the removal of armor rock and the underlying filter layer in the 2nd phase of the terminal construction. Furthermore, no new purpose for these rocks was foreseen, resulting in a considerable loss in terms of effort and cost. Boskalis therefore proposed a temporary 'soft' sea defense on the eastern side of the CDF. The engineering study executed by Hydronic and the significant cost benefit convinced the client to approve this alternative design.

OPERATIONAL WORK METHOD AND EQUIPMENT

Wreck removal

As well as piles of rock and subsea cables, an archaeological shipwreck had to be removed from the footprint of the approach channel to allow the Trailing Suction Hopper Dredger (TSHD) to operate. A floating crane was deployed to remove the wreck, which was a wooden, partly decomposed, ship with a propeller and engine. A barge and tug were employed to transport all objects to a lay-down area west of the CDF.



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Dredging and reclamation works

The large Boskalis TSHD, Oranje, executed the dredging operations. Dredged material was pumped ashore by means of a pipeline system to the reclamation area. Granular sediments from the northern part of the channel were stored in one part of the reclamation area, as well as along the eastern cell dike to construct the 'soft' sea defense. Fine sediments from the southern part of the channel were stored in the other part of the reclamation area.

Rock works

The cores of the cell dikes were built using the coarse fraction of the dredged material. After profiling of the outer slopes of the northern and southern cell dikes with an excavator, a geotextile was put in place to prevent the migration of dredged material into the future revetment. Rock material was delivered to the site by truck from a quarry in the Sydney area; cranes subsequently placed the rock.

ENVIRONMENTAL CHALLENGES

An environmental management plan was established to ensure compliance with the environmental limits and regulations during the execution of the project. The plan aimed to protect typical sensitive receivers in the Sydney Port Area like lobsters, fish and marine mammals. Preventive environmental measures controlled and limited the dispersion of fines and subsequent potential negative effects due to the dredging and disposal operations. Full compliance was demonstrated by, for example, turbidity monitoring.



- E** Propeller of the archaeological wreck removed from Sydney Port
- F** TSHD Oranje pumping dredged material into the reclamation area
- G** Overview of the CDF with shore protection works along the southern cell dike and silt screens
- H** Detailed view of the CDF showing the northern cell dike during construction

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