Sustainability aspects of the Brotherson Dock Life Extension Project

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Summary
In 2015 NSW Ports commenced a program of investigations to be able to establish the current condition of one of the key revenue generating assets within the asset portfolio. The investigations were to form the basis for the next stage of the project aimed at developing any required life extension solutions to the assets which was nearing 40 years of ongoing operations. The resultant life extension solutions were developed and designed and then contractors were procured for delivery of the designed solutions. This presentation will outline the sustainability aspects of the project and the innovative solutions implemented.

Keywords: Corrosion Protection, Sustainability, Concrete Structures, Quay Walls

Introduction
This paper covers the life extension of wharf structures from investigation through design to installation and commissioning. Life extension of structures is in itself a sustainable approach to asset management, but this project included additional innovative approaches to the design and installation of corrosion protection systems that resulted in further sustainability gains. The paper covers the sustainable steps taken to reduce the required power supply to run the system.

Investigations
At the time of taking over the responsibility for the ongoing maintenance of key port assets in Port Botany, NSW Ports initiated a program of work to establish the condition of these critical port assets. Investigations covered a wider range of investigations from half cell potential testing to chloride penetration testing as well as delamination testing.

The investigations revealed that the nearly 40 year old maritime structures were in good condition, however localised chloride penetration has reached or was about to reach the reinforcement steel in the concrete structures.

NSW Ports' objective with the project was to extend the useful life of the Brotherson Dock assets recognising that the structures was nearing their intended design life.

Design
Having established the condition of the assets a comprehensive review of design solutions was undertaken to derive the optimum life extension solution for these assets.

In developing solutions for the localised onset of corrosion, the project team consider all available solutions that could be practically implemented within the constraints of the site.

The final selected technical solutions were then subjected to peer review by specialist corrosion designers to ensure that the selected solution would provide the benefits set out for the project at the onset.

Procurement
Competitive procurement of contractors for installation of the designed systems were undertaken and contractors were encouraged to propose alternative solutions that would lead to a better value for money solution. No alternative solutions were proposed by the invited contractors.

Construction
The main challenge to be overcome through the construction period was the requirement to work around existing port operations. This proved to be a significant challenge which required daily consultation between key project stakeholders.

Working collaboratively with the container stevedores of the quay structures, the project team was able to work through this key challenge and deliver the project within the project budget even though the project timeline was extended to accommodate container operations.

A number of innovative constructability measures were implemented throughout the project to accelerate the project delivery and improve safety. These included development of a bespoke working platform, a solution to install water anodes with brackets and a special coring rig.

Sustainability
NSW Ports applied to have the project accredited under the Infrastructure Sustainability Council of Australia's ratings scheme. , NSW Ports incorporated substantial sustainable measures in the project delivery. This was done through minimising waste for disposal, recycling everything that could be recycled, harvest rainwater for use in the project. Hybrid corrosion protection was implemented above the saturated zone instead of

impressed current cathodic protection systems, which reduces the overall power demand for the life of the asset. The final step will be to develop solar photovoltaic solutions to offset the power consumption of the impressed current cathodic protection system.