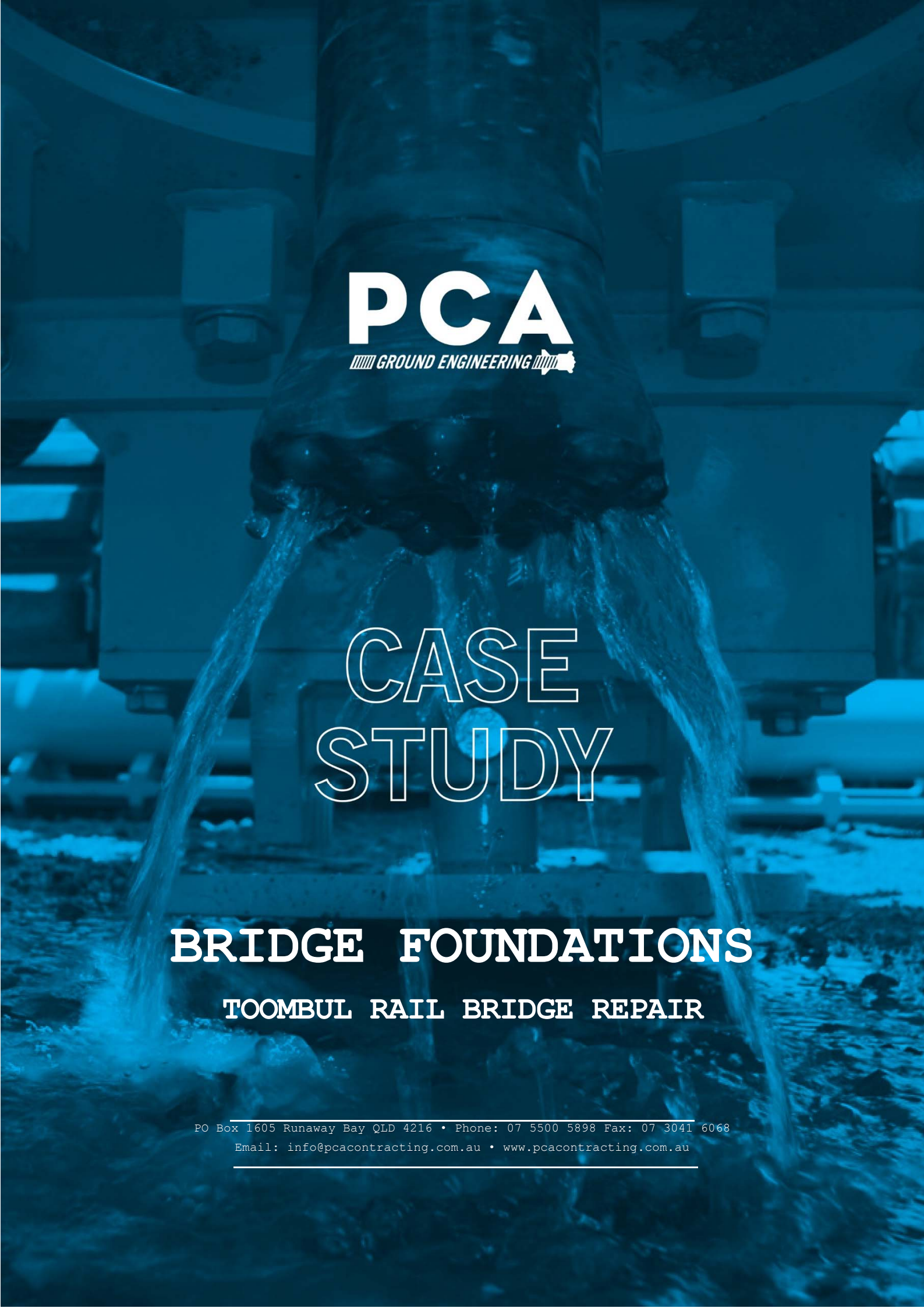

PCA

GROUND ENGINEERING

CASE STUDY

BRIDGE FOUNDATIONS

TOOMBUL RAIL BRIDGE REPAIR

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CASE STUDY

PCA GROUND ENGINEERING

EARTH RETENTION | PILING | GROUTING | ENGINEERING GROUND IMPROVEMENT | CIVIL CONSTRUCTION

PROJECT TYPE: MICROPILE FOUNDATION REPLACEMENT

CLIENT: QUEENSLAND RAIL

MAIN CONTRACTORS: ARK CONSTRUCTION GROUP

PROJECT ENGINEERS: ARUP

PROJECT DESCRIPTION AND CHALLENGES

Built in the early part of the 20th century on a foundation of timber piles, the Toombul rail bridge at Kedron Brook is a vital link for all passenger and freight trains entering Brisbane from a northerly direction. It is a major artery traversing the Kedron Brook waterway across Shultz canal which is subject to flash flooding during significant rain events.

An inspection of the foundations in early 2012 after the wet season revealed that a number of the old timber piles under one of the centre caissons had rotted away and were no longer in contact with the concrete foundation. Due to the high cost of replacing the bridge, a decision was made by QR for an urgent repair of the foundation.

Due to the critical nature of the bridge, the design brief required the foundations to be repaired without closing the bridge. The Kedron Brook waterway is also an environmentally sensitive creek that flows out into the Brisbane River and Moreton Bay. As such, strict environmental controls were required to maintain the quality of the water in the creek during construction.

THE SOLUTION

Grout injected hollow bar micropiles were designed and installed by PCA and connected via concrete beams that were dowelled into either side of the caisson. The micropiles were drilled through the upper 10m of marine clays and gravels using a high pressure grouting technique to provide an effective pile diameter of 300mm. Once through the upper soft soil layers, the micropiles piles were drilled 10m into the underlying coal shale to develop the design loads through skin friction. The micropiles were statically load tested in both tension and compression to verify the design assumptions in accordance with *AS2159 – 2009 Pile Design and Construction*.

Due to the marine conditions, a double corrosion protection hollow bar was selected which is specially manufactured to include both a hot dip galvanised layer coated with a durable outer layer of epoxy to provide the required 100 year design life.

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CASE STUDY

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Completed foundation repair

High pressure grouting was used to increase micropile diameters in upper soil layers

Micropile reinforcement elements installed prior to construction of edge beams.

THE MICROPILE ADVANTAGE

Traditional piling methods would have prevented this project from going ahead due to the limited access for piling equipment and the need to keep the bridge in operation during construction.

The micropile foundation has significantly extended the life of the bridge asset providing benefits to commuters and the general community for significantly less cost than replacing the bridge.

Micropiles have been proven to perform from the static load testing on this project for both tension and compression loads of up to 350kN ULS which is an impressive result due to the upper 10m of saturated soft marine clay above the underlying coal shale.

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