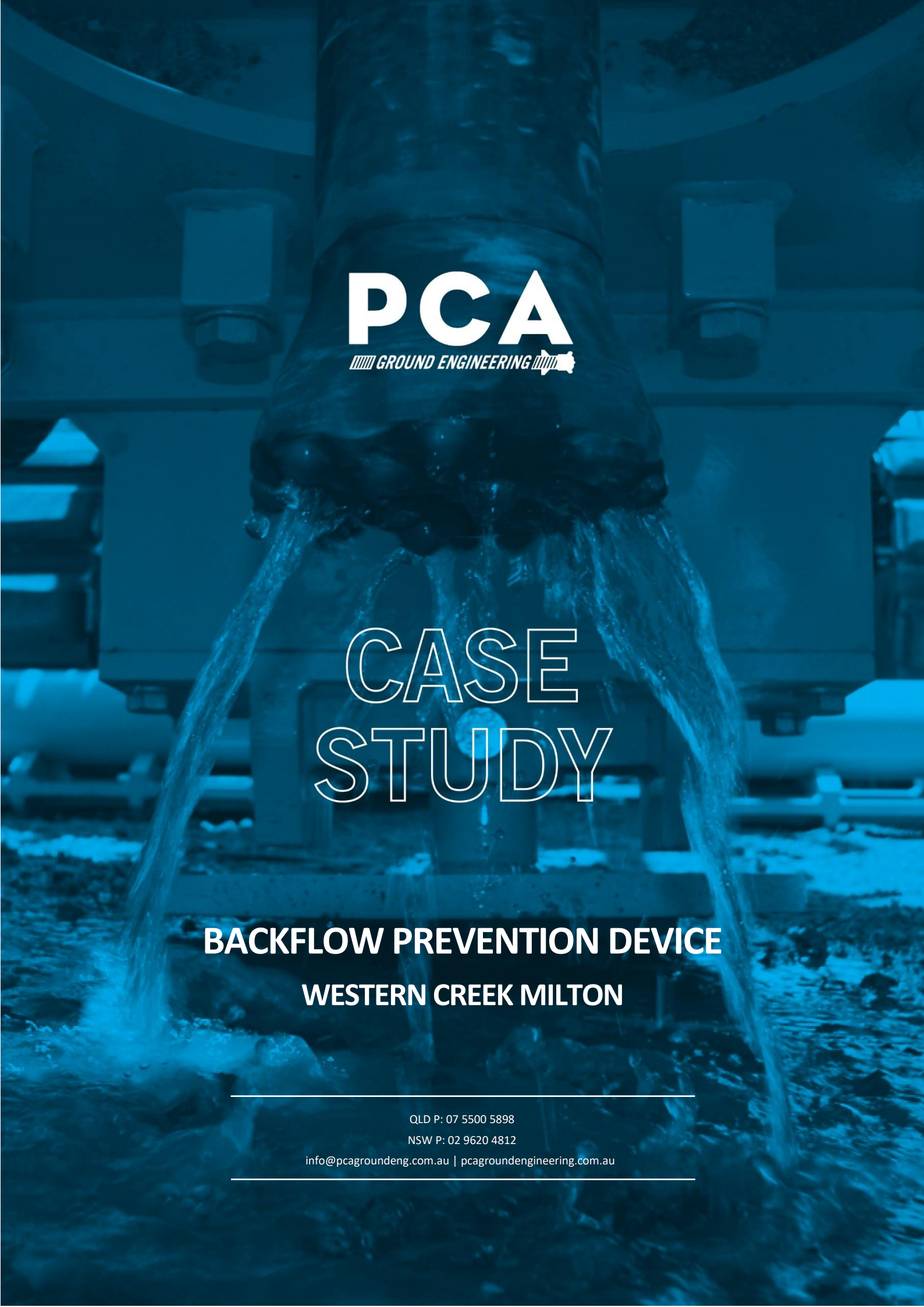

PCA GROUND ENGINEERING

CASE STUDY

BACKFLOW PREVENTION DEVICE

WESTERN CREEK MILTON

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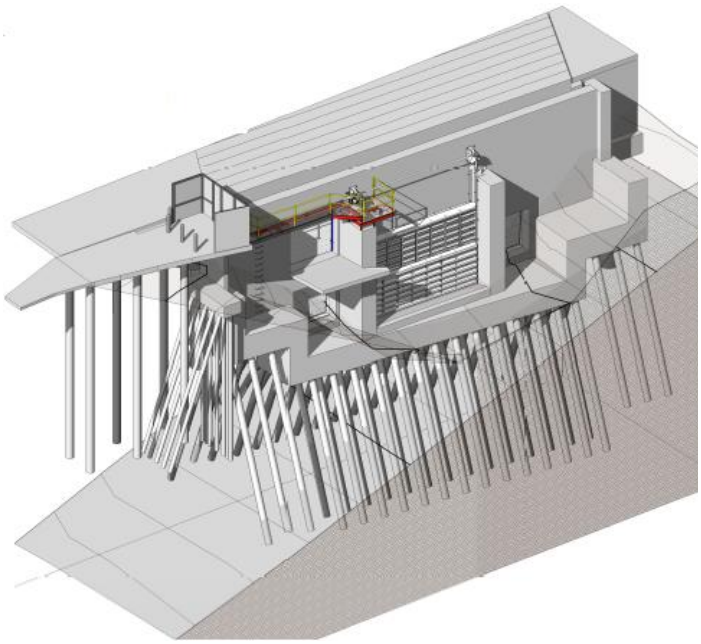
CASE STUDY

PCA GROUND ENGINEERING

SHOTCRETING I EARTH RETENTION I PILING I GROUTING I ENGINEERING GROUND IMPROVEMENT I CIVIL CONSTRUCTION

PROJECT TYPE:	**MICROPILED FOUNDATION WITH LIMITED ACCESS IN MARINE CONDITIONS**
CLIENT:	**BRISBANE CITY COUNCIL**
MAIN CONTRACTORS:	**MCILWAIN CIVIL ENIGNEERING**
PROJECT ENGINEERS:	**OPUS (BACKFLOW STRUCTURE) PCA (MICROPILE DESIGN)**



Micropile layout beneath the backflow preventer

Completed works on right demonstrating the tight access conditions of the project

PROJECT DESCRIPTION AND CHALLENGES

Western Creek drains into the Brisbane River at the John Oxley Centre after meandering through the flood prone Brisbane riverside suburbs of Milton and Paddington. Much of the flooding in the suburbs is due to backflows of water from the Brisbane River along Western Creek causing millions of dollars in damage during major flood events. After the 2011 flood event, the Brisbane City Council identified Western Creek as one of several creeks and drains to have backflow prevention devices fitted as part of the "flood proofing" of inner-city Brisbane.

The Western Creek backflow device was designed to fit in the narrow space between the busy Coronation Drive and John Oxley Centre. Access to this small space was limited and the geotechnical profile indicated the structure would need a piled foundation due to a profile of marine mud overlying a rock that was dipping steeply away across the site. The piled foundation was required to handle both compression and tension loads from the overturning forces associated with the varying water levels on each side of the backflow valve and needed to be installed without closing down Coronation Drive which is a major distributer road within the Brisbane transport network.

The site was prone to flooding from tidal and rain events with the added complexity of the environmental sensitivities that exist when carrying out earthworks in a creek that feeds directly into the Brisbane River.

THE SOLUTION

Prior to releasing the project to tender, Brisbane City Council engineers contacted PCA to assess the feasibility of a micropiled foundation for the backflow prevention device. Their main concerns were in relation to access and the ability of micropiles to handle the loads under such a critical piece of infrastructure in a marine environment for the required 100 year design life.

After visiting site and solving the access problems, PCA's engineers carried out some preliminary design calculations and determined that a system of hollow bar micropiles could be arranged to resist the various compression, tension and lateral loads from the structure. Ischebeck Titan Duplex coated hollow bars were selected for the project due to their durability performance in marine conditions which allow the micropiles to resist the corrosive marine environment for the life of the structure

CASE STUDY

PCA GROUND ENGINEERING

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

Micropiles installed in the foundation at opposing rake angles to handle the compression, tension and lateral forces

PCA's excavator mounted drill rig reaching down to install micropiles from the pedestrian lane adjacent Coronation Drive

THE MICROPILE ADVANTAGE

Conventional bored or driven piles were not an option for this project due to access restraints and the close proximity of adjacent structure. Grout injected micropiles are able to work efficiently in both tension and compression and were easily load tested to prove the design assumptions. Although the micropiles are slender elements and have minimal resistance to bending forces, the lateral loads on the structure were able to be handled by the microppile group through a clever design layout with opposing piles raked at up to 20 degrees from vertical.

The zero swing excavator mounted drill rig enabled the project to proceed with minimal disruption to traffic along the busy Coronation Drive. The project was carried out during night works with a brief lane closure to allow for deliveries before piling could commence with the rig situated 6m on the pedestrian path above the foundation on the bridge that crosses Western Creek.

During construction, the 3m high city end excavation of the foundation required stabilising. Access restrictions, adjacent structures and program restraints ruled out most conventional forms of temporary stabilisation and PCA's design engineers provided a solution using a micropile A Frame structure between the John Oxley Centre and the bridge. The ability of the existing machinery to install the temporary structure saved significant time on the sensitive project and enabled work to continue with minimal disruption.

Several flooding events inundated the site during construction forcing temporary delays to the micropile installation. However, the grout injection process used to install the micropiles ensured that the micropiles were completed in a single operation which enabled them to handle the temporary inundations without the need for costly reworking.