

## KOOLAN ISLAND SEAWALL

**O**n Western Australia's Koolan Island, Douglas Partners has been involved in an unusual geotechnical project, advising on the safe construction of a seawall and the stabilisation of an iron-ore crusher for Mt Gibson Iron Limited.



Preparations made for the construction of a Seawall, Koolan Island, WA

Mt Gibson Iron operates in the junior iron ore industry, with three haematite iron-ore mines in Western Australia. At its Koolan Island mine the company is in the process of building a seawall across Arbitration Cove on deep alluvial sediments.

The seawall which separates the sea from the main iron ore pit will allow a deepening of the pit to at least 140 metres below sea level and

to 20 metres of soft, lagoonal silty sediments beneath the proposed seawall, and a tidal range of 8 to 10 metres, made for challenging construction conditions and associated methodologies'.

He also noted that Koolan Island conditions required a buttress wall be built in front of the steep coralline drop-off prior to building the seawall on the lagoonal sediments behind.

equipment could safely approach the advancing faces.

In developing the alternative construction methods, various types of stability analyses were carried out including the use of innovative particle flow computer codes, which allow modelling of very large strains.

Mt Gibson Iron chose to use a mud-waving technique whereby underlying sediments are displaced from beneath the filling as a result of overloading on the advancing construction front.

In addition to the seawall, DP is also consulting on an iron ore crusher constructed on top of a 60 metre high rock fill bench.

With the crusher experiencing signs of fatigue, DPs Fred Verheyde developed a methodology to form a grout plug beneath the existing crusher, with grouting intended to stiffen up the foundations and to reduce or prevent localised future subsidence of the ground beneath the crusher. ☐

// UP TO 20 METRES OF SOFT, LAGOONAL, SILTY SEDIMENTS BENEATH THE PROPOSED SEAWALL AND A TIDAL RANGE OF 8 TO 10 METRES MADE FOR CHALLENGING CONSTRUCTION CONDITIONS //

widening that will cut well into the existing foreshore.

DP was approached by Mt Gibson Iron to develop a number of alternative safe work methods that could be used while blocking off an existing channel into the open-cut and constructing the seawall. DP was also requested to provide an overview of the GHD seawall design and of the proposed construction materials.

Principal Engineering Geologist, John Braybrooke, commented that 'up

This buttress wall entailed building a rock-fill embankment in water of approximately 20 metres in depth, also over soft sediments.

Drawing on experience in the construction of offshore fills on mangrove muds and other soft sediments in the Darwin region, and experience in dam construction, DP was able to develop a number of alternative safe construction methods with associated limitations placed on the distances that various pieces of

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Client: Mt Gibson Iron Limited*

## WA DP BRANCH BECOMES ACLCA MEMBER

The Western Australia division of Douglas Partners joined its New South Wales and Victorian counterparts by successfully securing membership with the Australian Contaminated Land Consultants Association (ACLCA), the consulting industry's peak representative group on contaminated land issues.

ACLCA promotes the responsible management of contaminated lands and seeks to develop public awareness on the professional skills involved in contaminated land management.

Adopting a stringent code of practice, ACLCA reinforces the professional, ethical and quality standing of its members, ensuring a commitment to honest, impartial and reliable consulting services.

Asked regarding the importance of membership, DPs Glyn Eade stated "this no doubt acts as a further testament to both the quality of our specialised consultancy services and the credibility of our staff". Through shared knowledge and collaboration DP endeavours to make a positive contribution to the conservation and rehabilitation of our environmental resources and hence the quality of life for all Australians. ☞

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# TUNNELLING BENEATH BOGGO ROAD GAOL

*In the vibrant city of Brisbane, DP engineers have recently consulted on a major Boggo Road Busway Alliance project that promises many benefits. Encompassing a diverse range of geotechnical conditions, DP has been involved in a wide scope of on-site testing, interpretative reporting, analysis and, construction supervision.*

As a Queensland Government initiative, the \$364 million Boggo Road Busway and first stage of Eastern Busway extend over 1.5km from the South East Busway to the University of Queensland via the Eleanor Schonell Bridge.

As part of the tunnel construction review panel, DP engineers have participated in this project through a series of geotechnical investigations and an onsite construction supervision role. The investigations were carried out in phases, with Stage 1 extending from Ipswich Road to Annerley Road, Stage 2 from Boggo Road Gaol to Dutton Park, and Stage 3 covering Ipswich Road to the South East Freeway.

Investigation reports have provided: extensive information on subsurface conditions, comments on excavation requirements, advice on tunnelling conditions and recommendations in relation to open cut and underground retention

systems (both soil nails and ground anchors), slope stability analysis and footing selection.

Chris Bell noted that "when you take into consideration that elements of this project involve tunnelling beneath an existing major rail corridor and the heritage listed Boggo Road Gaol, it makes for a very interesting but also a very high responsibility job where precision becomes really important".

He added, "By having engineers on site during the construction phase, DP has been able to provide integrated support to the construction team and to offer practical and cost effective solutions as queries arose."

DP's onsite construction supervision included pile inspections, soil nail and rock anchor installation and temporary excavation stability assessment. All efforts have been made to minimise disruption to existing structures and community facilities throughout the construction phase.

The Busway is expected to be completed in late 2009 and is to be used by 600 buses, carrying up to 13 000 passengers a day. When completed, this public transport initiative will reduce traffic congestion and improve commuter accessibility in South East Brisbane. ☞

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Alliance/Queensland Transport

# THE ROCK MECHANICS GROUP

**D**P has recently formed, and is proud to officially introduce, their Rock Mechanics Group. Consisting of three engineering geologists, one geotechnical engineer and one mining engineer, the group combines over 100 years of professional experience to form a special team focused on rock related geotechnical issues.

Mainly catering for the civil and mining industry, and with capabilities to perform two and three dimensional computer modelling, DP's Rock Mechanics Group applies the science surrounding the mechanical behaviour and response of rock, rock masses and other geological materials including soil,

to assist in the design and/or implementation of complex projects.

The Rock Mechanics group is currently working on a range of impressive projects around Australia and Papua New Guinea. These projects involve the design of drifts, shafts and on-seam works for coal mines in Queensland, the design of tunnel support in low strength rock for a new gold/copper mine in South Australia, and the design of TBM tunnel support for a gold/copper mine in PNG. An extended scoping study for the infrastructure for a new gold/copper mine in PNG is also underway.

Specialising in advice in relation to deep basements, retaining walls, underpinning, rock slope stabilisation, work in close proximity to rail



Major rock support & underpinning project

tunnels, and having worked on a number of legal cases, DP's Rock Mechanics Group offers its clients invaluable advice, practical insight and alternative solutions to rock mechanic problems. ☑

## DP ROCK MECHANICS GROUP DEVELOPS ROCK TRAJECTORY ANALYSIS FOR F3 FREEWAY

DP's newly formed Rock Mechanics Group conducted test trials to determine fly rock trajectories for design of a suitable barrier to prevent damage to passing traffic during widening of the F3 Freeway between Sydney and Newcastle, NSW.

A 12 km section of the F3 is being widened, by reducing the central sandstone barrier ('mohawk'). This will increase the number of traffic lanes from four to six and will improve traffic flow and road safety for the 75,000 motorists using the freeway each day. The \$59 million project is being jointly funded by the NSW and Australian Federal Government.

DP engineers, commissioned by BMD Constructions, proposed using a suitable catch screen during excavation to allow continuous usage of rock hammers, without traffic disruption, thus:-

- halving excavation time
- saving millions of dollars
- providing safe traffic flow past the excavation zone
- ensuring workers safety

DP's David McLintock stated "Numerous test trials using a rock hammer attachment to an excavator were used to determine fly rock trajectories on medium to high strength sandstone boulders. By using digital video footage it was possible to estimate both the initial velocities and final trajectories. Computer analysis then enabled estimation of rock velocities and trajectories for site conditions. It was found that fly rock was heavily influenced by



Safe excavation continues without road closure, F3 Freeway, NSW

hammer wear, tip geometry, hammering energy absorption and rock strength.

Based on DP's trials and modelling, the positions and heights of suitable traffic safety screens was thus determined maximising the available storage volume for the boulders produced from excavations, whilst maintaining traffic safety. This resulted in significant cost savings for BMD Constructions".

The project is expected to be completed in 2009. ☑

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