Sandgate Rail Grade Separation – Lime Cement Dry Soil Mixing to improve very soft Estuarine Clay

The first use of the Lime Cement Dry Soil Mixing system in Australia facilitated the construction of new rail lines over deep deposits of very soft clay.

AUSTRALIA
NEW ZEALAND
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Enquiries to:
PO Box 7974
Baulkham Hills NSW 1755

Level 1, 4 Burbank Place
Baulkham Hills NSW 2153
Australia
t: (02) 8866 1155
f: (02) 8866 1151
e: info@kellerge.com.au

KELLER GROUND ENGINEERING

Project

In order to improve the efficiency of rail traffic in the Hunter region a rail crossover and new section of track was required to be built at the intersection of two lines. The new section of track consisting of twin 450m long lines was to be located between the existing tracks and an environmentally sensitive swamp.

Soil Conditions

The soil conditions onsite comprised very soft silty clay to depths of between 6m and 30m. The moisture content of the clay was generally between 60% and 80% and the undrained shear strength was between 10kPa and 16kPa.

Solution

The construction challenges associated with the proposed geo-textile raft lead the design team to consider alternative techniques. Working together, Keller, John Holland and Arup developed a ground improvement scheme using Lime Cement Dry Soil Mixing. The technique involves insitu mixing to form columns of improved soil with increased shear strength and stiffness. The mixed columns work together to improve the embankments lateral stability and limit settlement. The design incorporated 800mm diameter soil mix columns installed in a grid arrangement to depths of between 5m and 8m.

Construction

Following laboratory trials with binder types and proportions a site verification section was installed to confirm that the design parameters could be achieved. Working to the highest environmental and safety standards required in the location, Keller completed the work using one mixing unit operating around the clock to meet tight deadlines dictated by rail possessions.

Performance

The measured performance of the works six months following opening of the new lines has exceeded expectations in terms of lateral stability and settlement performance.

Specialist Geotechnical Contractor:

Keller Ground Engineering Pty Ltd

Client:

ARTC

Principle Contractor:

John Holland Pty Ltd

Designer:

Arup Geotechnics