

Basal Reinforced Embankment on Soft Soils - Mine Services Corridor, Cape Preston, WA, Australia



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Overview

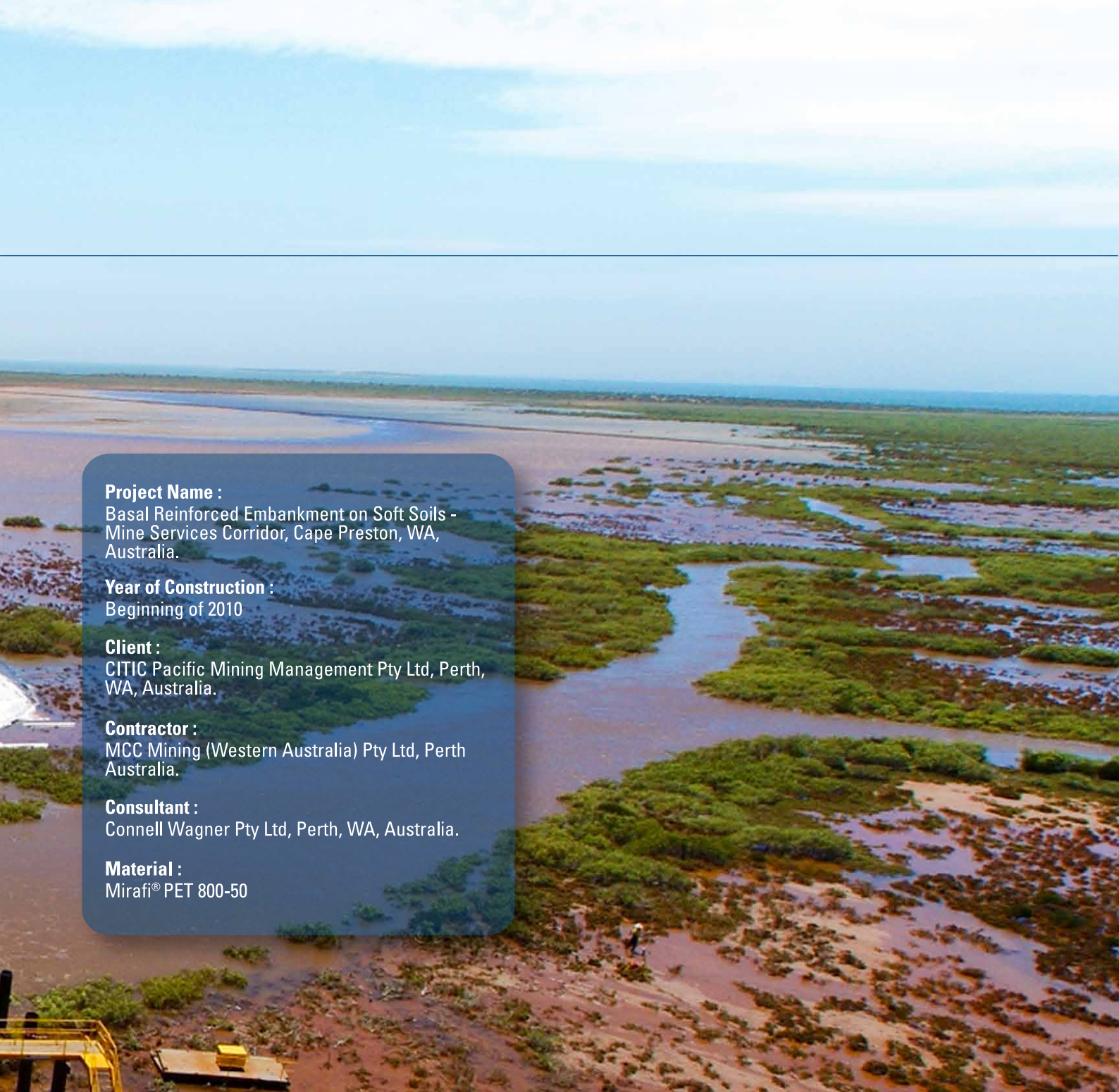
The Sino Iron Project is a world class, large scale magnetite iron ore project located at Cape Preston, 100km south west of Karratha, in Western Australia's Pilbara region. This iron ore project is the largest planned magnetite project in Australia with an estimated 2 billion tonnes of identified magnetite ore. Mine development and infrastructure costs were estimated at USD 3.5 billion.

The project had an extremely tight time schedule, with construction beginning in mid-2008 and was due for completion at the end of 2010.

A crucial component of the overall project was the construction of a 30 km long services corridor connecting the port to the mine site.

Part of this services corridor

consisted of a 2 km long causeway constructed through a river estuary. The foundation conditions within the river estuary consisted estuarine mud which is a very soft to firm silty clay of medium to high plasticity. Investigation by in-situ cone penetration and vane shear tests resulted in a design undrained shear strength of 6 kPa from the surface to 1.5 m depth, increasing thereafter at

**Project Name :**

Basal Reinforced Embankment on Soft Soils -
Mine Services Corridor, Cape Preston, WA,
Australia.

Year of Construction :

Beginning of 2010

Client :

CITIC Pacific Mining Management Pty Ltd, Perth,
WA, Australia.

Contractor :

MCC Mining (Western Australia) Pty Ltd, Perth
Australia.

Consultant :

Connell Wagner Pty Ltd, Perth, WA, Australia.

Material :

Mirafi® PET 800-50

7 kPa to a maximum of 20 kPa. This layer was unable to support a 7m high rockfill embankment that needed to be constructed.

The causeway embankment ranged in height from 1 m to 7 m, with a crest width of 32 m. The causeway embankment had to be designed to allow for heavy vehicle loadings from

240 tonne haul trucks as well as the safe transportation of 1400 tonne giant grinding mills for the mining operations.

CASE STUDY

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Solution

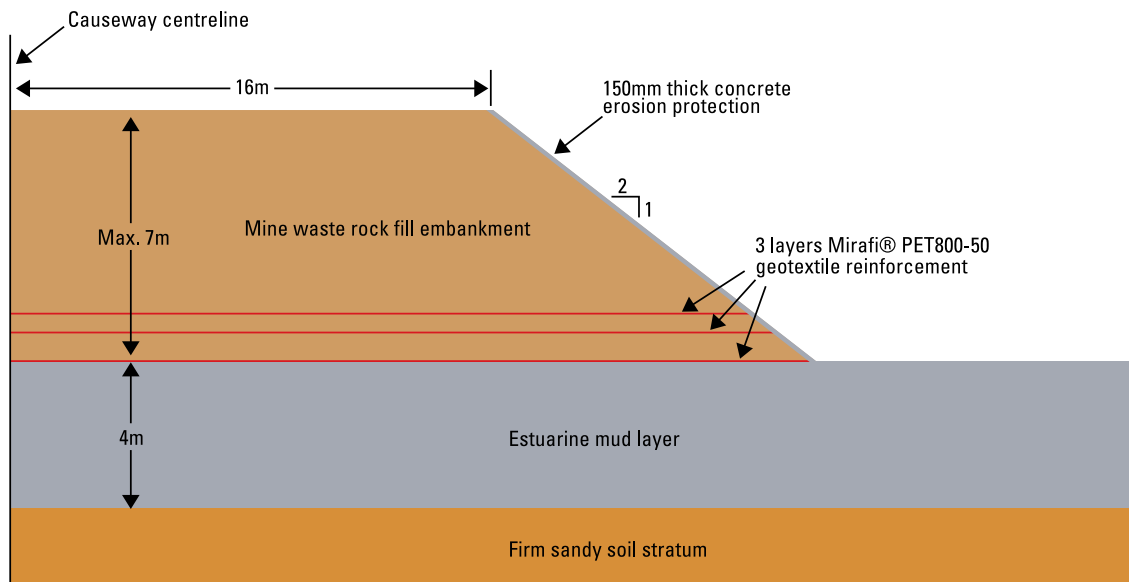
To construct the causeway a number of design and construction options were evaluated. These ranged from stage construction to soft soil replacement. The option must meet the stringent environmental and safety requirements of the project. Most important, the option must meet the tight time construction schedule.

3 layers of Mirafi® PET 800-50 geotextile reinforcement were chosen as the basal reinforcement for its ability to meet all of the requirements. Mirafi® PET 800-50 geotextile reinforcement is a woven polyester geotextile with a tensile strength of 800 kN/m at 10% strain. The high tenacity polyester yarns have high tensile modulus and have an excellent resistance to creep.

Installation

The Mirafi® PET 800-50 geotextile reinforcement was placed directly on the surface of the soft estuarine mud with the rolls of geotextile laid perpendicular to the direction of the causeway embankment. No geotextile joints were allowed in the direction across the full width of the embankment. The first mine waste rockfill was placed on top of the geotextile reinforcement, spread out and compacted to construct an initial fill platform of 0.5 m thickness. On top of this fill platform a second geotextile reinforcement layer was placed and then a 0.3 m thick fill layer placed on top. Finally, a third geotextile layer was placed and then the embankment was constructed to its completed grade alignment.

CASE STUDY Basal Reinforced Embankment on Soft Soils - Mine Services Corridor, Cape Preston, WA, Australia



> Cross Section details of the embankment

Summary

The use of basal reinforcement has enabled the causeway embankment to be constructed quickly, directly on the estuarine mud foundation, without soil replacement. Consequently, environmental impact has been reduced to a minimum. Further, the services corridor has been completed on schedule. The settlement of the embankment was within the predicted value of 250 mm.



> Overall view of the basal reinforced embankment over soft estuarine mud



> Overall view of the completed basal reinforcement embankment causeway

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