KAYTECH CASE STUDY

CONCRETE CANVAS® SOLUTION FOR KWANDENGEZI RAILWAY EMBANKMENT REHABILITATION

GEOSYNTHETICS USED

Concrete Canvas®: Geosynthetic Cementitious Composite Mats (GCCMs).

CCX® consists of two interconnected layers of geotextile that encapsulate a specially formulated dry concrete mix.

CCX-MAT® (**CCX-M®**) is a variant of CCX® with an LLDPE geomembrane backing which ensures the material has very low permeability.

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PROJECT DESCRIPTION

The KwaNdengezi Natural Stream, situated along Transnet Freight Rail's mainline between Johannesburg and Durban, required urgent rehabilitation. Heavy rainfall and flooding, had caused severe erosion, destabilising the stream's banks and threatening the integrity of the railway embankment.

To prevent further erosion and safeguard the line, Transnet Freight Rail proposed lining and protecting the existing Mechanically Stabilised Earth Wall (MSEW) within the stream channel. This structure, a PVC-coated gabion wall, was reinforced with Concrete Canvas® CCX-M®, a high-performance cement-impregnated geosynthetic.

A BETTER SOLUTION

The embankment was previously stabilised using a retaining system, however recent extreme weather events exceeded its design capacity. Prolonged rainfall increased the risk of slippage, raising safety concerns for the rail line.

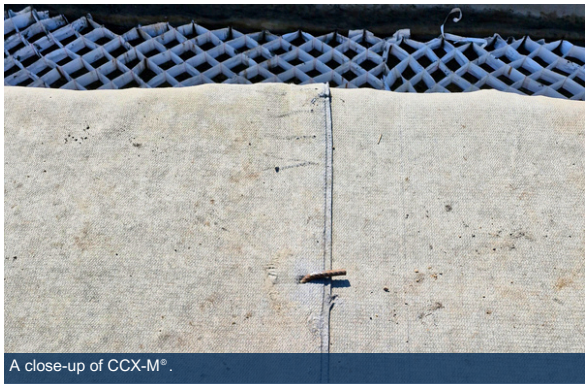
To mitigate this, Concrete Canvas® CCX-M® was selected to line and protect the MSEW. This flexible material, backed with a polyethylene geomembrane, provides low permeability, excellent UV resistance, and superior erosion control. It directs runoff safely into the stream, shielding the gabion wall from water ingress and surface damage.

A total of six rolls, 570 m², were installed in just three days, minimising disruption to operations. The system now provides a durable, low-maintenance solution that withstands harsh environmental conditions.

Compared to conventional methods such as soil nailing or revetments, concrete-based geosynthetics like CCX-M® offer improved durability, faster installation, and long-term cost efficiency (Berg *et al*., 2021; Smith *et al*., 2019).

CCX-M® installed over geogrid with adjacent gabion wall support.

Deploying CCX-M®.



A close-up of CCX-M®.

CCX-M® installation secured with temporary nails for alignment.

Did you know?

Workforce

More than 70% of the workforce consisted of women, showcasing a commitment to inclusive labour practices.

Enviromental Impact

An Environmental Impact Assessment (EIA) was successfully completed, ensuring no harm to the natural stream during construction.

Post-Installation Monitoring

A site inspection one month post-installation showed the MSEW in excellent condition, with plans for further monitoring after January 2025 to assess the effects of anticipated rainfall.