

## CASE STUDY:

# SLOPES & WALLS

## Dashwood Rail Overpass

SH1, 12KM EAST OF SEDDON,  
MARLBOROUGH  
JUNE 2014 - FEB 2018  
CLIENT: NZTA



## KEYSTONE TW3

### CONCRETE MODULAR WALL SYSTEM

Keystone TW3 Wall System is a proven, practical engineered solution for bridge abutments and retaining walls. The Keystone TW3 Wall System can be a cost-effective alternative to traditional retaining walls offering both versatility and substantial savings in cost and construction time.

Keystone TW3 Wall System uses a unique high strength positive connection system which securely locks the Tensar uniaxial geogrid to the modular block face. This positive connection satisfies the design requirements for use in road infrastructure projects in areas subject to seismic events and has been proven in projects worldwide. Our team of experienced engineers can help you find the complete solution using our sophisticated TensorSoil software from free application suggestions to helping you develop a full design solution.

The existing Dashwood Bridge on SH1 over the railway line was a pinch point and quite dangerous with the high number of trucks using it. There were sharp corners on entry and exit, compounded by the narrow width (6.2m). The bridge was built in 1932 in a continuous 4 span concrete beam, and no longer met the NZTA seismic standards. It was decided due to the strategic route strategy risk, a new structure with improved alignment across the railway was required. This was critical since there are limited options for alternative routes, and this bridge has a record of accidents.

A main design consideration was seismic (acceleration specified was 0.6g), this region is located only 12km from a large earthquake of 6.5 on 21st August 2013 (17km depth, and 20km east of Seddon).

Designs for the block sections to provide support for the slope sides at the end of the 54m CSP Steel Culverts was redesigned in Keystone TW3 modular blocks and Tensar RE uniaxial geogrids by Opus Napier with the assistance of Geofabrics New Zealand Ltd (formerly Maccaferri NZ Ltd). Technical support was offered with our software, and regular site visits during construction were also part of the package.

Keystone TW3 had a lot of advantages for this site listed as follows:

- Positive Connection into the block for seismic factors
- High strength 30MPa concrete – meet AASHTO & BS8006
- Face batter 0.4 degrees (near vertical)
- Proven Tensar RE primary geogrid
- Dry laid
- 120 year design life



> Keystone Segmental Block Wall Case Study – Continued.

- Testing at Vyborg with Keystone TW1 (2mm residual movement with 0.63g)

Laying of the Keystone TW3 block required a concrete foundation pad to be installed first.

The 70 week project was started by Higgins in January 2014, the Keystone wall was started the end of June due to wet weather, and took approx. 1 month from start to complete the two TW3 walls (2730 blocks). Other products included Enkadrain, Megaflo 450, Gabions, Enkamat and Bidim.

Tensar RE geogrids are not affected by hydrolysis and therefore can be used with the concrete TW3 blocks.

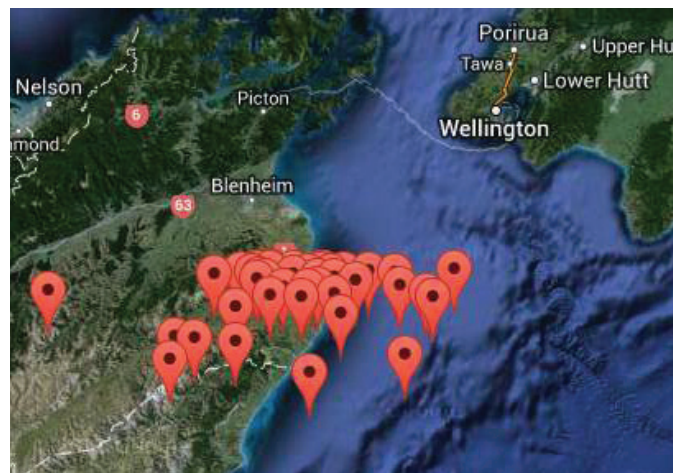
The new site route in green shown below:



On 14th November 2016 a magnitude 7.8 (Mw) earthquake occurred in the upper South Island with its epicentre near Kaikoura. This was a major event that resulted in widespread damage. The Keystone TW3 modular block wall at Dashwood is located about 7km north of Seddon up SH1 and around 16km south east of Blenheim. Seddon recorded a PGA = 0.76g and Blenheim a PGA = 0.27g as a result of the Kaikoura earthquake. A linear interpolation from these locations implies that the Dashwood wall experienced a PGA = 0.60g which matches the peak ground acceleration (PGA) used in the design. Visual inspections of the wall, subsequent to the Kaikoura earthquake showed no signs of damage or wall movement. This provided a good validation of the Keystone TW3 wall system and design approach.



EXISTING BRIDGE AND NORTHERN END



EARTHQUAKE LOCATIONS 2013



CONCRETE FOUNDATION FOR KEYSTONE TW3

**CONTRACTOR:** HIGGINS CONTRACTORS NELSON/BLENHEIM  
**CONSULTANT:** OPUS CONSULTANTS

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