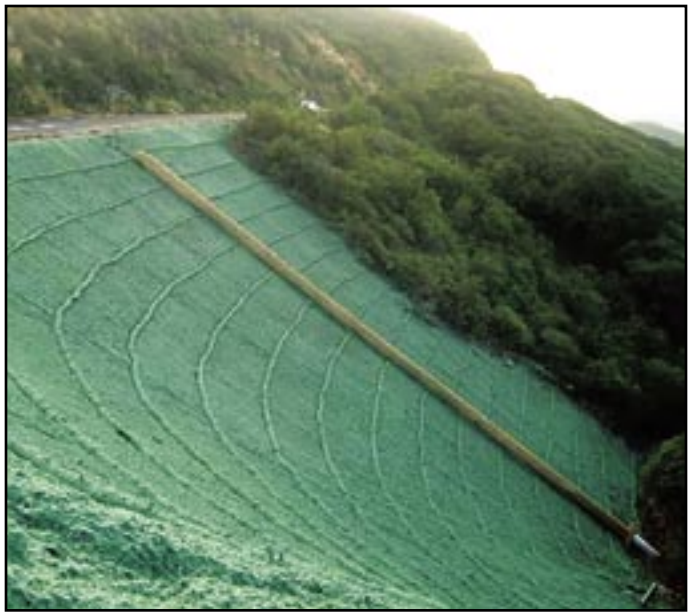
Flexterra® FGM Case Study:
Highway 154, California Roadway Project

Restoring California's Highway 154 from damaging rains



Situation

Highway 154 is a gently curving two-lane mountain pass that takes drivers through canyons, grasslands, orchards and the foothills of the San Marcos Mountains in Santa Barbara County. Forty-five miles in length, Highway 154 is one of two main arteries going north from Santa Barbara, California.

In early January 2005, the skies opened up and Southern California and Santa Barbara County received three solid days of rain. In this short period, Santa Barbara County received 23.7 inches of rain in addition to the 30 inches of rain that had already fallen in the three prior months, wrecking havoc on the slopes supporting Highway 154. One section in particular, known as Painted Cave, was located on top a steep, mountain wall on a 1.5H:1V slope. This section was undermined by trapped water that had built up on the uphill side, which then blew a hole beneath the highway, taking several sections of asphalt with it down the mountainside. One entire lane of the two lane highway was washed away.

Problem

With so much damage, much of the road had to be closed with no thru traffic allowed, inconveniencing many Santa Barbara residents and other travelers needing quick access north.

Over $4,000,000 in emergency funds were appropriated to CalTrans to provide emergency repairs to this popular highway. Faced with a number of different options, CalTrans officials knew they needed to rebuild the slopes and determine how to establish vegetation as quickly as possible.

"With the forecast calling for rain in the near future, our construction staff asked for erosion control solutions to be implemented immediately," said Peter New, landscape architect for CalTrans' District 5.

Flexterra® FGM

Alternatives

New said various conventional erosion control products, such as seed, straw with tack, bonded fiber matrix and fiber rolls, were considered to repair the damage. While some of these products could be used to repair some of the damage incurred on Highway 154's more stable ground, the Painted Cave and other highway sections adjacent to unstable, steep mountain grades posed greater challenges because of the precipitous slopes directly above and below the roadway.

For Painted Cave, CalTrans officials' first priority was to avoid another landslide blow-out. To accomplish this, contractors installed a pipe underneath the road that extended down the four-acre mountain slope to the ravine below to drain rainwater coming from the uphill side of the road. Once the slope was rebuilt and the pipe installed, CalTrans officials needed a product that would provide protective vegetation to the rebuilt slope and could be applied quickly and safely on the steep mountain slopes.

Solution

Bruce Berlin, erosion control product manager with S & S Seeds based in Carpinteria, California, offered such a product. CalTrans accepted Berlin's proposal to use Profile Product's Flexterra® FGM for the project. Flexterra is a hydraulically applied, flexible growth medium made of Thermally Refined™ wood fibers, crimped, interlocking fibers and performance enhancing additives that are engineered to perform under extreme conditions.

Berlin recommended Flexterra based on its proven performance in providing erosion protection and seed germination on steep slopes. Another added benefit of using Flexterra, Berlin explained, was that it was the only FGM that required no cure time to be effective. Upon application, Flexterra creates an intimate bond with the soil surface to form a continuous, porous, absorbent and erosion resistant blanket that allowed for rapid germination and accelerated plant growth.

"With no curing time, Flexterra was an attractive solution because it could be applied with threat of rain in the near future," said New. "Flexterra's soil bonding characteristic and longevity of up to one year provided reassurance that it could perform in the short term and, in the longer term, provide protection if adequate germination didn't occur."

Additionally, Berlin informed CalTrans officials that Flexterra would be compatible with the native plants that grew naturally on the slopes by allowing them to grow, unimpeded, through the FGM.

To reduce the slope length and prevent rilling, fiber wattles were installed at pre-determined intervals transverse to the mountain slope. Workers were also able to use the wattles to gain footing while rappelling down the mountain. In March, KCI Environmental hydraulically applied six tons of Flexterra with a native seed mix onto the mountain slope to ensure soil stabilization and to provide a medium for vegetative establishment.

The Results

CalTrans has reported that, with the application of Flexterra to Painted Cave's steep mountain slope, the slope has remained stable with some outcropping of growth occurring. The vegetation that has grown through the Flexterra has also not "tented" or lifted the material—as so often occurs with vegetation lifting erosion control blankets.

"So far the Flexterra has performed adequately," said New. "It has remained well-knitted together and the soil bonding is evident. We haven't seen a high percentage of germination, which we suspect is due to inadequate rainfall following application. However, we'll continue to evaluate the success of Flexterra into this winter when we have more rain."

Berlin was optimistic that Flexterra would provide the slopes with the stability and germination necessary to prevent further damage to the roads in future rain events.

"We're banking that Flexterra will give CalTrans the protection they need to get through the coming fall rain season," said Berlin. "On challenging situations, such as steep slopes, Flexterra is effective and will save CalTrans money over the long term."

Berlin continued, "Because it also provides erosion control effectiveness on saturated soils and compatibility with native vegetation, Flexterra was good match for this project."

Key Product Properties

Flexterra® FGM Flexible Growth Medium

Extensive documentation from independent laboratory tests combined with jobsite reports show that Flexterra can be more efficient and cost effective in situations where:

- A stronger mechanical and chemical bond is needed to withstand greater surface flow and/or severe slopes.
- The soil needs extended erosion protection for periods up to one year.
- Immediate erosion protection is required to eliminate risk from impending weather conditions.
- Faster, more complete germination is needed. Tests show Flexterra can provide up to 20 percent better germination when compared with excelsior blankets and straw blankets.

Flexterra's patented technology provides an engineered medium with superior erosion control properties.

- Chemical and mechanical bonding techniques are used to lock the growth medium in place.
- Crimped man-made and wood fibers combine with performance-enhancing additives to form a lofty, interlocking matrix.
- The Flexterra matrix creates air space and water absorbing cavities which improve germination, reduce the impact of raindrop energy and minimize soil loss.

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