



# SOIL RETENTION PRODUCTS INC.

## ENVIROFLEX® Project Case Study - Permeable and Plantable Scour Protection Product -

**Project Location:** Forester Creek Channel Improvement Project, City of Santee, California

**Project Funding:** City of Santee, San Diego Regional Water Quality Board and Caltrans

**Background:** The \$36M Forester Creek Channel Improvement Project is the City of Santee's largest capital improvement project to date, which has received multiple awards for concept and design as a pinnacle for creek restoration to improve urban water quality. The project involved the widening and realignment of the creek in order to withstand a 100-year flood level while facilitating the restoration of riparian and wetlands habitat.

Mission Gorge Road, which is designated as a safety route out of the city in case of regional catastrophe.

Forester Creek flows northwest from the City of El Cajon, through the City of Santee (skirting along the downtown area), where it outlets to the San Diego River and eventually drains to the coastal waters of Mission Bay, which adjoins with the Pacific Ocean. The Forster Creek is concrete lined through the City of El Cajon and was un-lined for a 1.2 mile segment within the southwestern portion of Santee prior to adjoining the San Diego River on the western side of the Mission Gorge Road bridge.

Prior to improvements, The Santee segment of the Forester Creek was under capacity for the 10-year storm event and threatened to overtop its banks during almost every significant storm. This condition threatened adjacent inhabited areas (evacuations were needed in 1995), created erosion conditions requiring continued maintenance, threatened bridge abutment and pier foundations, and also flooded the major thoroughfare,



Fig. 1 – Project Notice for Community



Fig. 2 – Closed Crossing



Fig. 3 – Mission Gorge Road Bridge



Fig. 4 – Near Overtopping of Banks

**Design:** Under review of the San Diego Regional Water Quality Board and the Federal highway Administration (FHWA), the entire 1.2-mile channel was elected to be widened (by up to three times - approximately 200 feet wide) in order to handle a peak capacity of 13,000 ft<sup>3</sup>/sec at initial channel velocities of 20 ft/sec and re-vegetated to improve regional water quality. To accommodate this design, a large energy dissipater was necessary at the head of the earthen channel to reduce discharge velocities from the upstream concrete channel. In addition, new bridges for the widened earthen channel were needed. Hard armored surfaces were necessary for a maintenance access road through the energy dissipater and as scour protection for bridge pier areas and narrowed sections of the channel. The project engineer for the site was Earth Tech and construction management was performed by PBS&J.



Fig. 5 – Concrete/ Earthen Interface



Fig. 6 – New Olive Lane Bridge

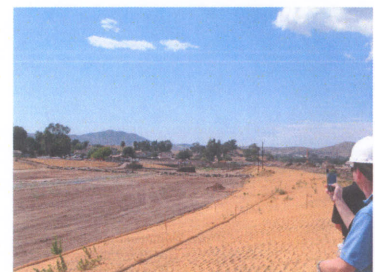


Fig. 7 – Widened Channel

**Applications:** The *Enviroflex*<sup>®</sup> product was utilized in three areas along the channel alignment: 1) within the energy dissipater as an access road for rip-rap maintenance; 2) as scour protection for the 2:1 slopes and bridge pier foundations under the Olive Lane bridge; and, 3) again as scour protection, upstream and downstream, of the Mission Gorge Bridge.

**Energy Dissipater:** *Enviroflex*<sup>®</sup> was used as a permeable, plantable, drive-able access road through a rip-rap energy dissipater at the earthen and concrete channel interface. *Enviroflex*<sup>®</sup> was laid over an earthen berm to create an access road through the rip-rap dissipater area. 6"-thick *Enviroflex*<sup>®</sup> mats were installed over 4" of 3/4" clean gravel over Mirafi Filter Weave 500 fabric over a compacted subgrade for a sturdy drive-able section. The angle points of the corners and turns of the berm were locked into place by a cable-tied concrete closure-pour. The ends of the access road were tied into the upstream concrete channel and downstream cut-off-wall with eyebolts and cables tied to blocks with a concrete closure-pour. Rip-rap was placed on either side of the trapezoidal access road to create the energy dissipater.



Fig. 8 – Concrete/ Earthen Interface



Fig. 9 – *Enviroflex*<sup>®</sup> Access Road



Fig. 10 – Rip Rap Placement

**Olive Lane Bridge:** *Enviroflex*<sup>®</sup> was also placed under the Olive Lane Bridge to protect the piers from scour and erosion. Adjacent 2:1 side slopes at abutment locations were also outfitted with *Enviroflex*<sup>®</sup> scour protection blocks. The structural section consisted of 4" *Enviroflex*<sup>®</sup> blocks placed over 4" of 3/4" clean gravel over Mirafi Filter Weave 500 fabric. *Enviroflex*<sup>®</sup> was tied into bridge piers and abutments with dowels and a cable-tied concrete closure-pour. Scour protection on the slopes was achieved without anchoring of the face. *Enviroflex*<sup>®</sup> solely relies upon the lateral confinement of the perimeter closure pour for the 16-foot high application.



Fig. 11 – Olive Lane Bridge



Fig. 12 – *Enviroflex*<sup>®</sup> Installed under Olive Lane



Fig. 13 – 2:1 Slope at Olive Lane

**Mission Gorge Road Bridge:** *Enviroflex*<sup>®</sup> was also utilized on the upstream and downstream sides of the Mission Gorge Road Bridge just before the outlet of the Forester Creek into the San Diego River. The structural section consisted of 4" *Enviroflex*<sup>®</sup> blocks placed over 4" of 3/4" clean gravel over Mirafi Filter Weave 500 fabric. The perimeter conditions and a hinge point for a turn in the alignment were all enclosed within a cable-tied concrete closure-pour.



Fig. 14 – *Enviroflex*<sup>®</sup> Installation



Fig. 15 – Upstream of Mission Gorge



Fig. 16 – Downstream of Mission Gorge

**Construction:** Archer Western was the general contractor for the project, while Soil Retention Systems, Inc. was the installer of the **Enviroflex**® scour protection system. Approximately 75,000 square feet were installed within 25 days, which accelerated the construction schedule for Archer Western. Construction of the overall channel and associated improvements began in January 2006 and was completed by November 2007. The **Enviroflex**® construction occurred in three phases during June, July and September of 2007.

The following construction details show the miscellaneous benefits of the **Enviroflex**® scour protection system. The product is palletized and can be staked and stored close to the work area. The product can be transported and installed with light-weight equipment.



Fig. 17 – Product Delivered and Stored



Fig. 18 – Fabric and Gravel Placement



Fig. 19 - **Enviroflex**® Installation



Fig. 20 - **Enviroflex**® Installation



Fig. 21 - **Enviroflex**® Installation



Fig. 22 – **Enviroflex**® Easily Transported



Fig. 23 – Saw-Cut Corners and Joints



Fig. 24 - Eyebolt and Cable Tie-In



Fig. 25 - Concrete Closure Pour



Fig. 26 – Top of Slope Anchor



Fig. 27 - **Enviroflex**® Installed Needs Closure Pour



Fig. 28 – Concrete Closure Pour