

## THE PERFECT SLOPE: BEACH PROTECTION MEASURES IN UMDLOTI UMDLOTI, KZN

### SHORELINE AND OFFSHORE PROTECTION

#### Shoreline Protection

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**A soft engineering approach using in-situ materials to rehabilitate Umdlotti Beach has created a structure that blends in perfectly with its environment.**

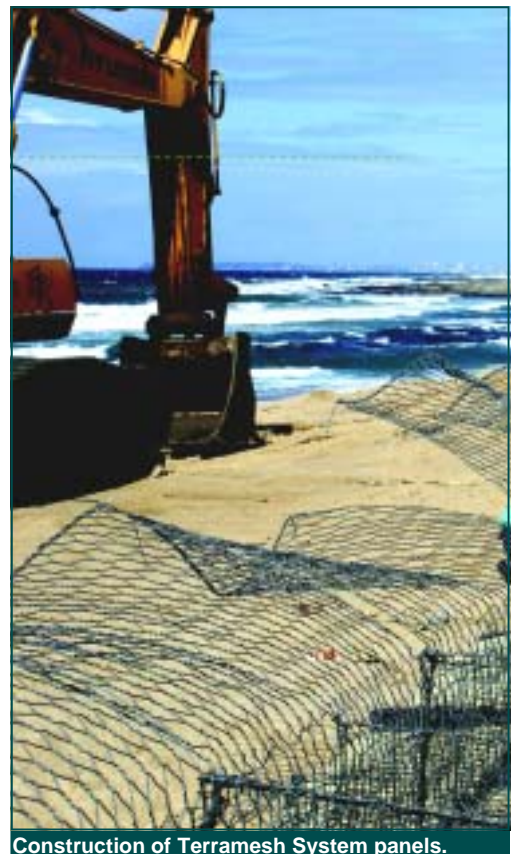
When an unusually savage storm hit the KwaZulu-Natal (KZN) coast in March this year, it left in its wake extensive damage to civil infrastructure and property as waves as high as 5m pounded the beaches, in the process causing severe soil and sand erosion, and threatening to undermine nearby buildings.

For scenic seaside communities like Umdlotti Beach, situated north of Durban, the impact was as much physical as economic given their strong reliance on tourism, with the city's Ethekwini Municipality stepping in to remediate the damage and ensure the implementation of lasting solutions.

For Umdlotti, the storm swept away large sections of the beach, resulting in the near collapse of the soil embankment bordering the roadway, plus the destruction of structures such as storm water drainage systems. Under normal circumstances, waves don't travel above the defined high water mark and reach the road.

However, to prevent a possible recurrence in the future, Godfrey Vella, manager for Ethekwini Municipality's Coastal Engineering Department, says that the in-house design called for the installation of a wave dissipation structure using specialised products supplied by environmental and bio-engineering specialists, Maccaferri Southern Africa. The project has been carried out by KZN based company, Namandla Roads & Civils, one of a number of contractors appointed by the municipality to execute rehabilitation. This soft engineering approach using in-situ materials to rehabilitate Umdlotti Beach, has created a structure that blends in perfectly with its environment, and has also added protection measures along Durban's coastline.

Adriano Gilli, marketing director for Maccaferri Southern Africa (part of the global Italian-owned group), says that the structures installed by Namandla are meant to recreate a stable beach condition, and to dissipate rather than resist the action of the waves.



Construction of Terramesh System panels.



From left to right are Adriano Gilli (marketing director—Maccaferri SA), Eugene Jandles (site agent, Namandla Roads and Civils), and Benny Govindsamy (sales representative—Maccaferri SA)

“The design solution selected makes extensive use of Maccaferri’s Terramesh System, plus the specification of Green Terramesh,” Gilli explains. “Maccaferri’s Terramesh System is a modular system used for soil reinforcement applications, such as mechanically stabilised earth walls and slopes. Each Terramesh System is a completely assembled unit made of double twist heavily galvanised and PVC coated wire mesh, where a continuous double twist wire mesh panel forms the reinforcement, as well as the front and top of a gabion style facing section.”

The back panel, ends and diaphragm of the facing section are connected to the unit during manufacture. This creates rectangular shaped cells used for stone confinement. However, for the Umdlotti project, stone has not been used and for the first time in such an application in KZN, geotextile bags filled with sand have been specified. According to Vella, this approach is in line with government’s environmental legislative policy on new structures of this nature.

“This soft engineering approach makes perfect sense since the use of the in-situ sand passes on cost savings. The installation of the Terramesh System also means that the bulk of the stepped back structure established isn’t visible, and lies concealed below the sand. All that’s visible to the casual observer is a gentle 30 degree slope running back from the beach and level with the road, creating an aesthetically pleasing result,” Gilli explains.

As an added benefit when used in conjunction with the Terramesh System and allied gabion approaches, Maccaferri supplies its AG range of non-woven geotextiles which are manufactured from double needle punched continuous polyester filaments.

“This makes the product more resistant to detangling of the filaments, particularly in severe hydraulic conditions, for example through constant wave action, or in Scenarios where high water velocity in one direction is typically experienced,” Gilli continues.

Meanwhile, Maccaferri’s Green Terramesh is an environmentally friendly modular system used for soil reinforcement, such as mechanically stabilised embankments. Green Terramesh is a completely assembled unit made of double twist heavily galvanised and PVC coated wire mesh lined with Maccaferri’s BioMac and strengthened with a welded steel panel. (BioMac is a biodegradable erosion control blanket manufactured from randomly arranged coconut husk fibres layered between photosensitive polypropylene netting to produce a coir mat.) Two pre-formed steel brackets incline the front face at an angle of 70 degrees to the horizontal. The angled front face and the BioMac facilitate the establishment of natural vegetation of the units.

Eugene Jandles, site agent for Namandla Roads & Civils, says that work began with the excavation of a trench to around 1,8m below natural beach profile and some 5m back from the road level and running parallel. “We would have preferred to go down to bedrock. However, this wasn’t practical in most cases as this would only have been reached at between 5 and 10m,” he explains.



**Green Terramesh panels lined with Maccaferri’s BioMac biodegradable erosion control blanket. The Terramesh System used to construct the Umdlotti wave dissipation structure is concealed below the sand. The area behind will be backfilled to form the final slope profile.**



**Sandbags ready for use in constructing the Terramesh System units. Their adoption instead of using rocks is a first time application in KZN.**

The next step was to install in sections a 2m wide mattress, 0,3m high and 6m in length followed by the first 1m wide Terramesh System front-faced unit, which was then backfilled to create the platform for the next Terramesh unit, using a stepped back approach to create the slope. In total, Namandla will have established some 1km of protective measures using this approach.

Comments Vella: "During construction we revised the design of the slope by 0,5m to make it flatter as the initial approach proved to be too steep. We also switched to smaller sandbags, as the initial 1x1m<sup>3</sup> bag bulged quite substantially. However, the final result has worked very well."

Finishing off the structure are two rows of stacked Green Terramesh units (each 0,6m in height) rising to 1,2m above the Terramesh System installation. Meanwhile, the Green Terramesh is being vegetated with Hottentot Fig, a succulent creeper that will also grow on the slopes of the newly installed coastal protection structure, with access for beach goers via wooden staircases - the end result being an environmentally sound solution in harmony with the tides.



Green Terramesh construction in progress. On the right are rocks that were temporarily dumped to protect the roadway to prevent it from being undermined following severe storm damage.

**Maccaferri SA (Pty) Ltd**

**HEAD OFFICE - DURBAN, SOUTH AFRICA**

P O Box 15777, Westmead, 3608 Tel: +27-31-700 8456 Fax: +27-31-700 8469 e-mail: dbnsales@maccaferri.co.za

**JOHANNESBURG, SOUTH AFRICA**

P O Box 2285, North Riding, 2162 Tel: +27-11-704 0160 Fax: +27-11-704 0159 e-mail: jhbsales@maccaferri.co.za

**CAPE TOWN, SOUTH AFRICA**

P O Box 22150, Fish Hoek, 7974 Tel: +27-21-702 1416 Fax: +27-21-702 2977 e-mail: cptsales@maccaferri.co.za

**MADAGASCAR**

BP 168 Antananarivo 101, Madagascar Tel: +261-20-22-231 02 Fax: +261-20-22-553 90 e-mail: maccaferri@moov.mg

[www.maccaferri.co.za](http://www.maccaferri.co.za)

