



The portal culvert constructed using River mattresses at the Olievenhoutsbos low-cost housing development in Midrand, Gauteng, which is fed by an extensive drainage channel. The slope angle for the drainage channel is around 33 to 35 degrees.

Erosion control through gabion interventions

by Alastair Currie

The design of the stormwater runoff system for a large scale low-cost housing estate at Olievenhoutsbos in Midrand, Gauteng, provides an excellent example of the use of gabion structures to create a sustainable solution. The establishment of the infrastructure services for the site, carried out by civil contractor, Roadcrete, has been split into two phases, each catering for 10 000 residential units. Phase Two is currently in progress.

Louis Cheyne, managing director of Gauteng based concern, Gabion Baskets, says that this development represented the first major order secured by the company since its establishment in June 2006. Specialising in the manufacturing and supply of gabions, River mattresses and geotextiles, Gabion Baskets has established a factory in Gaborone, Botswana, from where all products are produced for distribution via its facility in Kempton Park, Gauteng.

In addition, the company provides services which include on-site training, technical design advice, and a listing of

preferred sub-contractors. All gabion and related products are Class A galvanised or with an additional PVC coating, normally supplied with non-woven geotextile manufactured by a local supplier in the Western Cape. Supply channels outside Johannesburg include Gilbert Synthetics, the appointed distributor for KwaZulu-Natal, with current representation in Swaziland and investigations in progress into other areas.

Turning to the Midrand project, Cheyne says the bulk of the gabions and mattresses were manufactured by hand, with phased delivery to Olievenhoutsbos as the civils programme progressed. "Phase I, now completed, mostly entailed the installation of the mattresses, with Phase II largely entailing gabion installations. The site is characterised by fine dispersal soils, making gabions ideal as an erosion control measure. Work rates on site have been very fast-track with the sub-contracting team achieving around 36m³ per day, requiring daily rock quantities of approximately 61t."

A key element of the environmental engineering programme has been the construction of a channel at the bottom of the site bordering the N14 which is designed to transport the bulk of the surface stormwater run-off into a controlled area of drainage. One of the largest installations of its kind seen by Cheyne in recent years using mattresses, the channel measures in the region of 200 linear metres with a total width of 16m, with relatively steep slope angles of between 33 and 35 degrees. At these angles, extra stabilisation in terms of steel pegs is not required.

In total, Gabion Baskets will be supplying some 3 500m² of River mattress. The mattresses for the first section of the channel are 500mm thick, since extra depth is required to counter possible scour at the point of highest velocity, whilst further down the stream the thickness reduces to 300mm. At the end of the channel, the water feeds into a large portal culvert before reaching the N14, whilst upstream of this channel, the contractor will be constructing approximately 12



A

A-F: Construction sequences showing gabion wall and mattress construction in progress on a river diversion and bridge abutment protection project in Kestell in the Eastern Free State.



B



C

gabion weir structures - each measuring up to 70m in length - to slow down the water velocity and prevent the formation of gullies.

Kestell, Makado

Another recent erosion control programme where Gabion Baskets has been the nominated supplier includes a project in Kestell in the Free State. This entailed extensive construction of new gabion structures to protect the abutments for a road bridge, as well as river diversion measures using gabions and mattresses, with the works carried out by BEE contractor, Da Grill Enterprises. Prior to the commencement of the project, the abutments were almost completely out-flanked, with the road under threat of collapsing. The consulting

engineer for the project was DMV, based in Harrismith.

"The rocks used in the original gabion wall design came from an old bio-reactor at a local municipal wastewater treatment plant," Cheyne explains. "However, their smooth rounded shape made them unsuitable, and contributed to the subsequent failure of the system. For gabion construction the rock should ideally come from a blasted source, as their angular shape creates the optimum interlock. The bulk of the material for this upgrade was imported from a nearby quarry to complete the project."

Another project includes the supply of 30t of gabion baskets, as well as training, for Basil Read's upgrade road project in Makado (Louis Trichardt), Limpopo Prov-

ince, supplied between August and October 2006. Similar to the Midrand project, this entailed the construction of a 300m long mattress channel within an existing floodplain to counter historical flooding of the road, a common problem experienced during heavy rainfall periods.

As a counter-measure, Basil Read constructed an earth berm running along side and next to the road to deflect the water and preventing erosion of the roadway edges, with the facing protected by the river mattresses, measuring some 9m down the slope at an angle of around 35 degrees. In addition to providing a pleasing aesthetic finish, this engineered solution has worked extremely well.

cw



D



Slope stabilisation and flood protection using mattresses on a road rehabilitation project carried out by Basil Read in Makado (Louis Trichardt), Limpopo province.



E



F