

Background

On the 14th of December 2021 the Porewa Stream broke out from its bed and eroded several acres of land. The flood and resulting destruction was unexpected, and exacerbated by the fact that many other locations in the region were also suffering damage, so concrete block groynes could not be acquired or installed in time to mitigate the erosion.



The cliff on the left is four metres high, and the original stream bed can be seen in the extreme right of the photo. This stretch of riverbank has been problematic in the past, but not to this scale.



Once the flood waters had receded, the stream returned to its channel, the scale of the damage became evident. The 2-tonne concrete blocks are dwarfed. The area was filled, bulldozed smooth, topsoiled, and grassed. Trees and vegetation were planted to attempt to reinforce the bank.



Before any vegetation could begin to take hold, a second flood occurred in May 2022, completely destroying the repairs and vegetation, and partially eroding the filled area. Concrete walls, blocks, and groynes placed previously were of some aid, but were levelled within 12 hours. Forty-two 2-tonne concrete blocks are in the image below, invisible beneath the flood waters. Many were rolled 50-100m down the stream.



After spending large amounts of time and capital on what are effectively temporary repairs, we reached out to a company in China to see if we could manufacture a product which would suit our application. 150 two-tonne “Rock Bags” were specified and procured, as they are a well-established, highly effective, and eco-friendly product.



These bags are manufactured with double-layered, 25mm polyester mesh, and can be filled with rocks, riprap, graded metal or even river run (depending on sand content). Several bag weights and mesh sizes are available.

No bed preparation is required, and they are quick and simple to fill and place. Once placed, the bags can be covered with dirt, and plantings utilised to assist their assimilation into the local environment.

Expected lifespan is 30+ years.

Porewa Rock Bag Installation

There are several methods of placement; in the photo below, the bags have been placed on a shallow stop bank using the “pancake” method, which provides the greatest coverage. Once filled, the 2T bags are about 2m in diameter, and 0.6m high.

In the week before Tropical Cyclone Gabrielle struck, the bags were filled and placed, utilising river run from on site.



Although the scale is not comparable with the likes of the Esk Valley, the amount of water in the Porewa Stream was similar to the December 2021 flood, and without the rock bags, the damage incurred would also have been substantial (as evidenced by previous floods).

The photo below shows the water rising, about a day before its peak level.



Of note is that although the stop bank visible here is only a pile of loose river run, the Rock Bags prevented erosion, enabling it to contain the stream during a large flood. Without them, the recently planted willow trees and other vegetation would again have been wiped out.

This photo was taken the day after the peak flood level (the tide mark is evident in the foreground). The water level is around a meter above the ground level visible on the right of the image.



Note that some bags have slid into the stream slightly. This is one of the unique features of Rock Bags; they slide or droop into erosion points, filling the localised damage, and preventing or mitigating further erosion.

Only a single row of Rock Bags was placed at the end of the vulnerable section of riverbank, however even this was still sufficient to prevent any substantial bank erosion from occurring.



Post Flood

Despite this installation being the result of emergency repairs, silt, dirt, and vegetation have already begun to build up around the bags. This will assist and encourage regrowth.

In a planned installation, the Rock Bags can be covered with dirt, and plantings made in, on, and around them.

Post-flood, there were no works, repairs or cleanup required. If required, further Rock Bags can be filled and placed into any gaps or weak points as they appear.

Conclusion

The Porewa installation was a resounding success. After multiple costly floods, causing significant damage, a simple installation of Rock Bags was sufficient to prevent any damage to a vulnerable riverbank during Tropical Cyclone Gabrielle.