BMRG Case Study

Gully rehabilitation saves dam by-wash

Background

In 2013 Ex-tropical Cyclone Oswald dumped torrential rain on catchments throughout the Wide Bay Burnett. This event produced run off rates which were estimated to be in excess of a one in one hundred year flood. This event followed on the heels of similar but slightly smaller events in 2010 and 2011.

The South Burnett had been in the grip of an extended dry period prior to these flood years so many catchments were in a state of reduced vegetation cover. The resulting erosion across the region was the worst seen for decades and affected cropping and grazing land alike. Particularly hard hit were contour banks, waterways, dams and dam by-wash areas. Many of these structures had not been maintained adequately for some time due to the extended years of low rain and run off.

The Site and the Challenges

Peter and Romaine Undery are landholders in the Findowie Road district of the South Burnett who were faced with the prospect of damage to a key stock water dam through an actively eroding by-wash. The catchment supplying the dam has an estimated area of 134 hectares of cleared grazing land with some contoured areas which had been farmed many years ago. Water flowing to the dam was calculated at approximately 7.5 cubic meters per second in a one in fifty year storm event. This is a significant water flow through the system and is much less than would be flowing in a one in one hundred year event such as the recent record 2013 floods. The by-wash of the dam was approximately 7 meters wide and was running at least 1 meter in depth.
Erosion in the by-wash had been gradual up until the extreme events when it increased dramatically leaving a gully head 1.7 meters deep and 7 meters wide marching towards the dam. Alarming progress of the gully necessitated a quick response and Mr Undery sought the advice of the Burnett Mary Regional Group’s Soil Conservation Officer to help develop a rehabilitation strategy to stop the advancing erosion near the dam.

The Goal and the Methods for Rehabilitation

After discussion on the possible options to repair the erosion site the planning team decided on a rock chute design with the added strength of a netting mat construction method.

This method was favoured to ensure that the rock placed on the chute could not be easily moved regardless of the velocity of the flows that could be expected from the catchment. This method was also cost effective due to the proximity of a suitable rock quarry business near the property.

The rock available was a good mix ranging in size from 100mm to 600mm which aligned with the design velocities for the structure. The catchment peak flow for a one in ten and a one in fifty year flood event was calculated. From these peak flows a weir crest length was designed which necessitated a longer crest than the existing by-wash width.

The rock chute was designed to deliver the expected flows from ground level above the erosion to the modified, much flatter sloping ground level below the erosion at a depth of approximately 1.7 metres with a slope no less than 3:1. Total chute length is approximately 12 metres (See Diagram 1). The rock chute crest length was built to the design specification of 15 metres long with a 300mm level rock lip above ground level to encourage silt drop at the top of the chute.

The by-wash was widened and levelled to deliver the water from the dam to the chute crest at low velocity and shallow depth.

The chute crest was constructed in a lopsided horseshoe shape to accommodate the existing gully below the actively eroding section. The by-wash bank was retained at approximately 1 metre.
The area below the rock chute has remained basically untouched as a resilient rock surface had been naturally reached. Topsoil and hay mulch was added to the levelled area above the chute and to the banks around the structure. Winter and summer active grass and crop seed was spread on the area prior to mulching to assist in the rapid establishment of vegetative cover.

The construction consisted of the following steps:

- Top soil removed and stored.
- Excavation, shaping and compacting the chute slope and surrounding waterway.
- Cut off trenches excavated at top and bottom.
- Texel Geofabric placed over the compacted soil on the chute slope and into the cut off trenches.
- Netting strips placed in the cut off trenches to attach to the netting over the rock fill.
- Mixed rock fill and granite gravel placed to a depth of approximately 400mm on the chute and in the cut off trenches, securing the Texel Geofabric and netting strips.
- More netting was secured over the rock and laced together with strong plain wire and tensioned to ensure a complete mat with firm contact to hold the rock in place. Steel pickets were used at the bottom of the structure to aid tensioning of the plain wire and netting.
- Top soil was replaced over the area above and around the chute and
- Grass seed and mulch spread over the by-wash and banks above the structure.

The Results

The project developed with inputs from a combination of technical soil conservation experience, local landholder experience and the knowledge and skills of the earth moving contractor and gravel and rock supplier. This combination along with many hours of hard work and planning by Mr Undery and his family has produced a very strong and functional rock chute structure which should secure the safety and
Perversely the 2014 winter season has been a continuation of dry conditions with the whole shire still drought declared. Construction is finished and grasses have been planted however there is yet to be a useful fall of rain to germinate the grass planting. The area has been fenced and can be managed to maximise the grass vigour when it emerges. The project will be monitored and regular maintenance will be carried out to ensure the structure performs and provides the ongoing protection for the farm dam.

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Photos by John Day and Sarah Undery.

The Queensland Government is committed to the productive and responsible use of the State’s natural resources and has supported these projects as part of BMRG’s Sustainable grazing management and on-ground works: conserving soils in the Burnett Mary Region project.