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Bremer Focal catchment – modelled loads reduction

(Confidential briefing note 2)

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This report

This report is part of the Healthy Country Project. The Healthy Country project is a Queensland Government funded 'proof of concept' initiative to demonstrate that bringing together the best science, planning and on ground implementation can significantly reduce non-urban diffuse source pollutants entering the waterways. It started in January 2008 with an $8 million investment. Project partners include the SEQ Healthy Waterways Partnership (SEQ HWP), SEQ Catchments Ltd, Queensland Primary Industries and Fisheries (QPIF) Dept of Employment and Economic Development and the SEQ Traditional Owners Alliance (SEQTOA). The project aims to develop methods for reducing sediment loads to Moreton Bay by 50%. This report documents the distribution of catchment works in the Bremer Focal Area and estimates the likely effects of those works on sediment supply at the whole of catchment scale.

Sediment Loads in Bremer Focal Area

The Phase 2a report: Rehabilitation priorities Bremer Focal Area – Final Report (December June 2010) showed that sediment supply to the catchment outlet is dominated by gully and stream bank erosion. Gully and stream bank erosion are predicted to supply ~4685 t of fine sediment to the stream network each year, and hillslope erosion is predicted to contribute ~990t/yr. Cropping areas account for most of this (760t/yr). This is a maximum as cropping areas were modeled as bare ground. About 290 t/yr is deposited on floodplains in the lower catchment. The net export from the catchment is ~5400 t/yr.

Modelling assumptions

Note: The modelling assumptions below are made on the basis of catchment works being at or close to maximum efficiency.

Sediment control structures: Where erosion control structures have been placed across drainage lines it has been assumed that they have similar sediment trap efficiency to small farm dams. For similar sized farm dams in the SE region of Australia Neil and Fogarty (1991) predicted the sediment trap efficiency to range from 24% to 91%, with a mean value of 64% (also see Verstraeten and Prosser, 2008). No figures are yet available for similar semi-tropical regions and a more conservative estimate of 50% trap efficiency is used here. Where the structures have been placed in sequence it has been assumed that each structure has the same trapping efficient such that two structures in sequence will reduce the sediment supply from the upstream catchment area by 1 – (0.5 x 0.5) = 0.75 or 75%, and so forth.

Riparian Fencing: Fencing along stream-lines has been assumed to improve riparian cover to 100% effectively decreasing bank erosion to 0.

Re-vegetation: Improve vegetative cover to 100% - effectively stopping hillslope erosion

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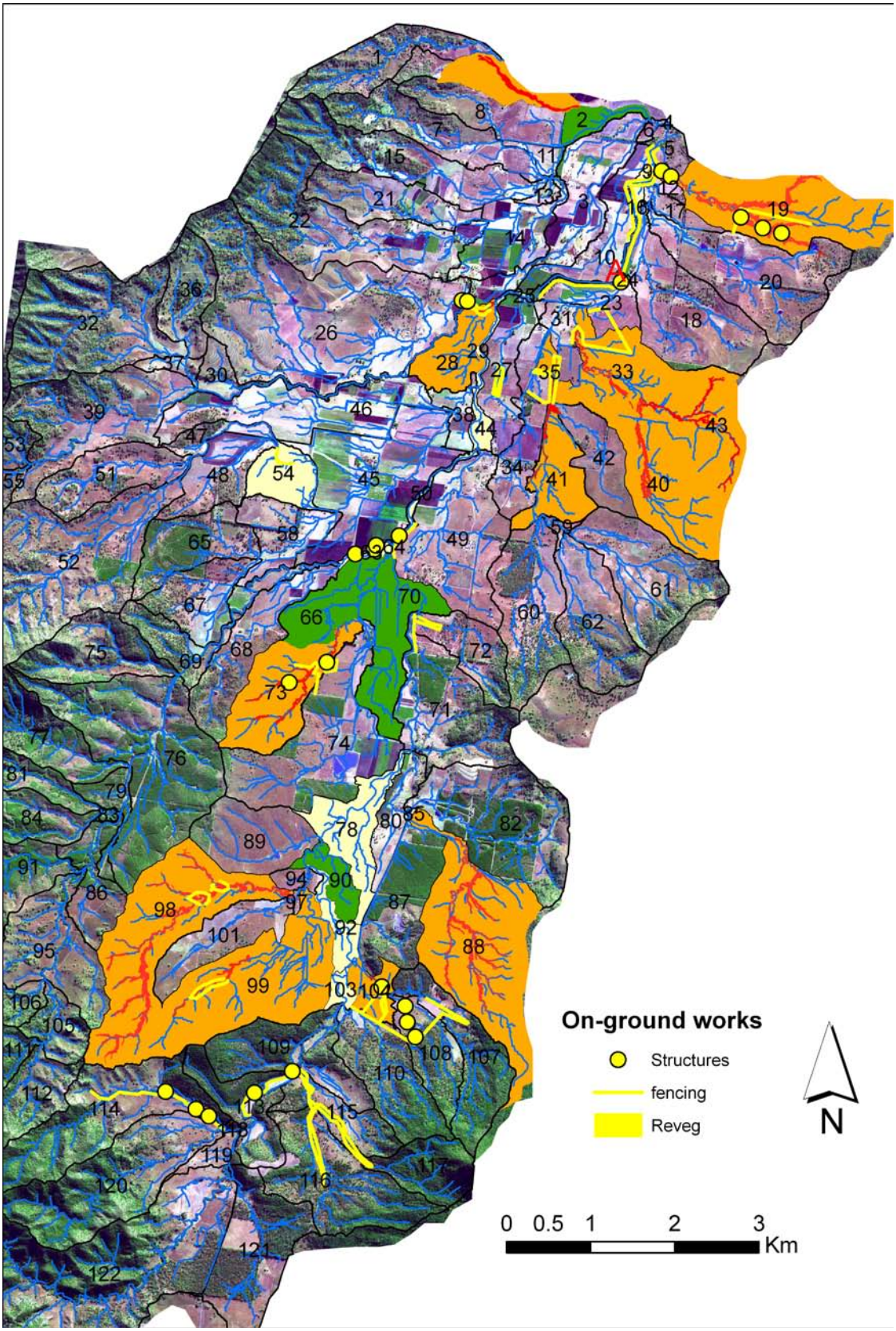

Figure 1: Map of the Bremer Focal Area showing the location of the on-ground works (yellow) and the 30 highest yielding (t/km^2/yr) sub-catchments, gully extent (red) and the dominant erosion process in each priority subcatchment (orange =gully, cream = channel, green = hillslope).

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Modelled sediment reduction

The type and distribution of catchment works is shown in Figure 1. This data was provided by SEQ-catchments as JPEG image and excel spreadsheet.

Whole of catchment scale: As Figure 1 shows most of the works are located in identified priority areas as indicated by the colored areas. The net effect of the on-ground works on the overall sediment budget for the catchment, according to our sediment modeling, is predicted to be a reduction of ~2000 t/y, about ~35 % of the total sediment yield (~5400 t/yr). The structure located at the site marked A on the map is particularly noteworth. It effectively diverts flow from the gullied subcatchment 33, 35, 41, 42, and 43 parallel to the main channel and along a set of wetlands which run parallel to the channel along the floodplain margin. This structure is predicted to produce a sediment reduction of ~770 t/y more than a third of the total sediment reduction. This illustrates the fact that our modelling shows that well placed structures can significantly reduce the sediment loads. Additional structures if located on the lower sections of gullied subcatchments 88 and 98, 99 would also be predicted to produce significant sediment reduction.

Summary

- Most of the rehabilitation works in Bremer Focal Area were in areas identified as high priority subcatchments by our initial sediment budget modeling.
- At the whole of catchment scale the modelled the works are predicted to decrease sediment export by ~35 %.
- If additional funds were available additional structures if located on the lower sections of gullied subcatchments 88 and 98, 99 would produce significant sediment reduction.
- Note that the above results rely heavily on sediment budget modelling and expert opinion to determine the effectiveness of catchment works. There is little data with which to calibrate the current models or to determine the effectiveness of the catchment works. This highlights the need for a properly designed and resourced monitoring, evaluation and learning program to accompany future works.

Neil, D.T., Fogarty, P., 1991. Land-use and sediment yield on the Southern Tablelands of New South Wales. Australian Journal of Soil and Water Conservation 4, 33–39.

Verstraeten, G., Prosser, I., 2008. Modelling the impact of land-use change and farm dam construction on hillslope sediment delivery to rivers at the regional scale Geomorphology 98 199–212