

27 September 2011

Document No. 107662007-021-L-Rev0

Mr Richard Brown
Department for Water
25 Grenfell Street
ADELAIDE SA 5000

RIVERBANK COLLAPSE HAZARD, LOWER REACHES RIVER MURRAY STABILITY RISK MANAGEMENT, CALOOTE LANDING

Dear Richard

Introduction

The South Australian Department for Water (DfW) has requested that Golder Associates Pty Ltd (Golder Associates) review data from survey monitoring at the foreshore of Caloote Landing in the Lower Reaches of the River Murray. The aim of the monitoring is to detect movement of the ground that might indicate instability of the River Murray bank at this location. Our review was requested to assess whether riverbank instability is indicated by the measurements available to date. We understand that consideration is being given to temporary reopening of the Caloote Landing foreshore area in early October 2011.

Background information

The stability of the river banks at Caloote Landing has been addressed by Sinclair Knight Merz (SKM) in its report *Stability Risk Assessment for Caloote Landing* dated 11 November 2010. This report includes calculations of the Factor of Safety for various zones within Caloote Landing foreshore at various assumed river water levels. The report indicates a calculated Factor of Safety of 1.42 for the boat ramp area with the water at or above pool level (approximately +0.7 m AHD). A Factor of Safety of 1.5 or more would have been acceptable compared to commonly adopted criteria. On the basis of its studies SKM concluded that the risk of slope failure at the boat ramp was 'nearly tolerable' with the river water at or above normal pool level.

At the time that report was in preparation, the river water level was rising from the depressed level it had experienced for several years. Subsequently the water level has generally been above or close to the nominal pool level. We understand from recent discussions at a meeting with DfW (O'Toole/Brown/Sanders, 27 July 2011) that the level in the Lower Reaches is predicted to remain at or above normal pool level for the next year.

Golder Associates' report (Reference 107662007-018-L-Rev0, dated 29 July 2011) suggested that a decision to reopen the foreshore area and boat ramp in Caloote Landing while water levels remained close to pool level could be made on the basis of survey monitoring. We recommended monitoring of the whole of the Caloote Landing foreshore with survey measurements of all points being taken at fortnightly or closer intervals.



Our report stated:

If the measurements are indicating negligible movement over 4 or more measurement cycles it may be possible for Mid-Murray Council to reopen the boat ramp. The criteria for assessing what is negligible will depend on the repeatability and accuracy of the measurements, but might (for instance) include no detectable trend of movement and successive measurements at a point or group of points not differing by more than (say) 5 mm.

Monitoring data.

The monitoring at Caloote Landing involves measurement by survey of the position and level of 77 targets placed securely into the ground in the foreshore area. The points were installed and their positions and levels were measured on 3 August 2011 by Alexander Symonds Pty Ltd (AS). DfW has provided Golder Associates with the results of position and level surveys of those points conducted by AS on 17 August 2011, 30 August 2011, 12 September 2011 and 23 September 2011. These include vector plots of the monitoring data produced by AS. AS documents indicate that the design coordinate accuracy is ± 3 mm and the design level accuracy is ± 2 mm.

Review of data

The measurement data indicates measured changes in level and position up to about 8 mm:-

- between any two successive surveys (17 August, 30 August, 12 September, 23 September)
- between the baseline survey on 3 August and the survey on 17 August
- between the baseline survey on 3 August and the survey on 30 August
- between the baseline survey on 3 August and the survey on 12 September and.
- between the baseline survey on 3 August and the survey on 23 September.

The average change in position and level across all points surveyed between the baseline survey and each of the other surveys was zero.

The vector plots indicate that the measured movements are not generally consistent between nearby points: in some places in some surveys vectors on adjoining points are in opposite directions. Commonly the vectors from successive surveys differ in size and direction although the measured differences in size are less than 9 mm.

The monitoring data and the vectors suggest that there may be a small trend to southerly and/or easterly movements (ie towards the water) in the southern part of the survey area. The average change in position in east-west position and in level across the surveyed points in the southern area is not zero, by contrast with the zero average change in position for the measurements in the rest of Caloote Landing. However, the inferred movements are all less than 9 mm.

Discussion and Recommendations

In each survey the average change in position and level between the baseline and the particular survey across all points surveyed was zero. Similarly the average change in position and level across all points between successive surveys was zero. From that, we infer that the individual differences measured between baseline and survey and between successive surveys (with a maximum of 8 mm) represent the ordinary 'noise' present in all sets of measured data. On the basis of the data available to date we judge that the repeatability and reliability of the survey measurements is probably around ± 8 mm.

That judgement suggests that 'negligible' movement might be defined (consistently with our previous report) as:

- no detectable trend of movement, and
- successive measurements at a point or group of points not differing by more than 8 mm.

Under that definition the measured movements to date would be considered negligible.

On the basis of the monitoring measurements made between 3 August 2011 and 23 September 2011 we see no impediment to Caloote Landing (except the southern area) being temporarily reopened while the river level remains at pool level subject to continued monitoring demonstrating that ground movements remain negligible.

The measurements suggest that there is a possibility that ongoing movement is occurring in the southern area of Caloote Landing. The data presently available does not reliably demonstrate a trend of ongoing movement – the movements suggested by the data are smaller than what we consider is probably the ordinary amount of 'noise' in the measurements. However, the averages of these measurements are not zero, suggesting that the 'noise' may not be randomly orientated as is suggested by the data for the whole site, or for the whole site excluding the southern area data.

We suggest that it might be prudent to manage access to the southern area until the data allows more reliable conclusions to be drawn. We understand that controls are in place to prevent public access to the southern area of Caloote Landing.

Any decision to reopen the Caloote Landing foreshore and boat ramp can only be taken by the landowner which we understand to be the Mid-Murray Council.

If Mid-Murray Council reopens the boat ramp, we recommend that it implement the recommendations regarding access restrictions to the boat ramp that are included in SKM's report – single lane access to the ramp etc.

If the foreshore and boat ramp are reopened we recommend ongoing survey monitoring. Review of the data may allow measurements to be taken at longer intervals, although we would expect that substantially more data than is currently available would be necessary to confirm that. We recommend a review of the monitoring in June 2012 so that the scope of future monitoring can be assessed.

If the river water level is predicted at any time to fall below +0.2 m AHD we recommend that consideration be given to closing the foreshore and boat ramp. That decision is likely to be illuminated by the data gained from survey monitoring.

Limitations

Your attention is drawn to the document – "Limitations", which is attached to this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Closure

We would be pleased to discuss the matters presented in this report. Should you require clarification please call Lyndon Sanders on 8213 2100.

GOLDER ASSOCIATES PTY LTD



Lyndon Sanders
Principal Geotechnical Engineer

LJS/THH/ljs:rr

Attachments: Limitations (LEG04 RL1).

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