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**REVIEW OF STABILITY ANALYSIS**
**SWAN REACH WASTE DISPOSAL STATION - RIVER MURRAY**

Dear Dan

## Introduction

As requested by the South Australian Department of Water Land and Biodiversity Conservation (DWLBC) Golder Associates Pty Ltd (Golder Associates) has completed a peer review of geotechnical analysis carried out by Sinclair Knight Merz (SKM) into riverbank collapses at Swan Reach Waste Disposal Station in the Lower Reaches of the River Murray. Golder Associates were commissioned for this work by email (Sartoretto/Sanders) on 1 April 2010

Sinclair Knight Merz (SKM) previously undertook studies of river bank collapses which are described in *Geotechnical Investigation Report* dated January 2010. The studies included intrusive investigations at the Swan Reach Waste Disposal Station. The SKM report indicates the following for the Swan Reach site

> *"The results of our investigation indicate that this is a LOW RISK site. Slope stability analyses in the vicinity of the river side property, based on observed existing static conditions, indicate that the FoS against slope failure, is above the FoS that would normally be considered acceptable, for permanent areas used by the public. It is considered likely that further reductions in water level will not affect the stability of the properties.*
>
> *We recommend that the operator of these riverside properties to be advised to monitor the cracks or accelerating ground movements. No fencing is required at this location."*

### Slope Stability Analysis

Golder Associates has carried out additional slope stability analyses at the Swan Reach site using the computer software SlopeW.

The cross section used for the slope stability analysis that documented in the SKM report, and included a tension crack to a depth of 4 m which was placed 5 m behind the crest of bank.

Soil parameters for the slope stability analysis were chosen based the data presented in the SKM report. Four sets of soil parameters were analysed. The table below presents the soil parameters used in the analysis.

**Table 1: Soil Parameters**

| | FILL | | CLAY 1 | | CLAY 2 | | CLAY 3 | | CLAY 4 | | SAND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c (kPa) | φ | c (kPa) | φ | c (kPa) | φ | c (kPa) | φ | c (kPa) | φ | c (kPa) | φ |
| CASE A | - | 32° | 300 | - | 100 - 300 | - | 20-100 | - | 10 | - | - | 32° |
| | γ = 20 kN/m³ | | γ = 19 kN/m³ | | γ = 19 kN/m³ | | γ = 18 kN/m³ | | γ = 17 kN/m³ | | γ = 19 kN/m³ | |
| CASE B | - | 30° | 250 | - | 75 – 250 | - | 10 – 75 | - | 10 | - | - | 32° |
| | γ = 19 kN/m³ | | γ = 19 kN/m³ | | γ = 19 kN/m³ | | γ = 18 kN/m³ | | γ = 17 kN/m³ | | γ = 19 kN/m³ | |
| CASE C | - | 30° | 250 | - | 60 – 200 | - | 10 – 55 | - | 7.5 | - | - | 32° |
| | γ = 20 kN/m³ | | γ = 19 kN/m³ | | γ = 19 kN/m³ | | γ = 18 kN/m³ | | γ = 17 kN/m³ | | γ = 19 kN/m³ | |
| CASE D | - | 30° | 200 | - | 60 – 200 | - | 5 – 50 | - | 5 | - | - | 32° |
| | γ = 20 kN/m³ | | γ = 19 kN/m³ | | γ = 19 kN/m³ | | γ = 18 kN/m³ | | γ = 17 kN/m³ | | γ = 19 kN/m³ | |

Case A represents what Golder considers to be a reasonable interpretation of the data. Case D represents what we consider to be a 'lowest credible' interpretation of the data. Case B and C are intermediates between these.

Two analysis were completed for each case, one with the tension crack dry and one with the tension crack full of water.

## Recommendations

Our analyses indicate that SKM's assessment of stability at Swan Reach Waste Disposal Station is reliable and that SKM's conclusions and recommendations for the site are reasonable.

The analyses predict a decrease in the Factor of Safety if water is present the tension cracks. While these analyses would not, in our opinion, invalidate SKM's conclusions and recommendations, they do indicate that it would be prudent to manage stormwater flows to prevent the water entering the cracks and maintain the stability of the site.

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## Closure

Thankyou for the opportunity to work on this project which has presented some interesting challenges. We look forward to contributing further. If you have any questions about this letter please call Lyndon Sanders on 0414 575 071.

**GOLDER ASSOCIATES PTY LTD**

Lyndon Sanders
Principal Geoetchnical Engineer

AFS/LJS/nd

Attachments: Limitations (LEG04, RL1)
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