

SAXUM MINING & TRADING CC

PO BOX 91362
Auckland Park, 2006
Johannesburg

Office 29, 3rd Floor
Mentone Centre, 1 Park Road,
Richmond, 2092
Johannesburg

Tel: 011 482 1399
Fax: 011 507 5101
Cell: 082 330 3535

Email: saxum@saxumining.co.za
Web: www.saxumining.co.za



07 July 2009

Our ref: MRP 0907-216

MR. TONY RUBIN

MAROPENG a'AFRIKA LEISURE (PTY) LTD
PO BOX 1426
RANT EN DAL, 1751

Dear Tony,

BRIEF ASSESSMENT OF STERKFORTEIN CAVES

At your request, the Sterkfontein Caves were briefly assessed on Monday 06 July 2009 by Saxum Mining. The purpose of the assessment was to check on the geotechnical instrumentation installed in the entrance to the caves as well as investigate the incidence of rock fractures that has recently occurred in the access way between the Elephant Chamber and the Milner Chamber.

Geotechnical Instrumentation

The system has been running uninterrupted now for more than 2½ years. All the units were found to be still in good order and the measurement data was correctly relayed to the readout unit. The surge protection on the system is still in good order.

The data from the system is diligently recorded on a daily basis by the Sterkfontein personnel.

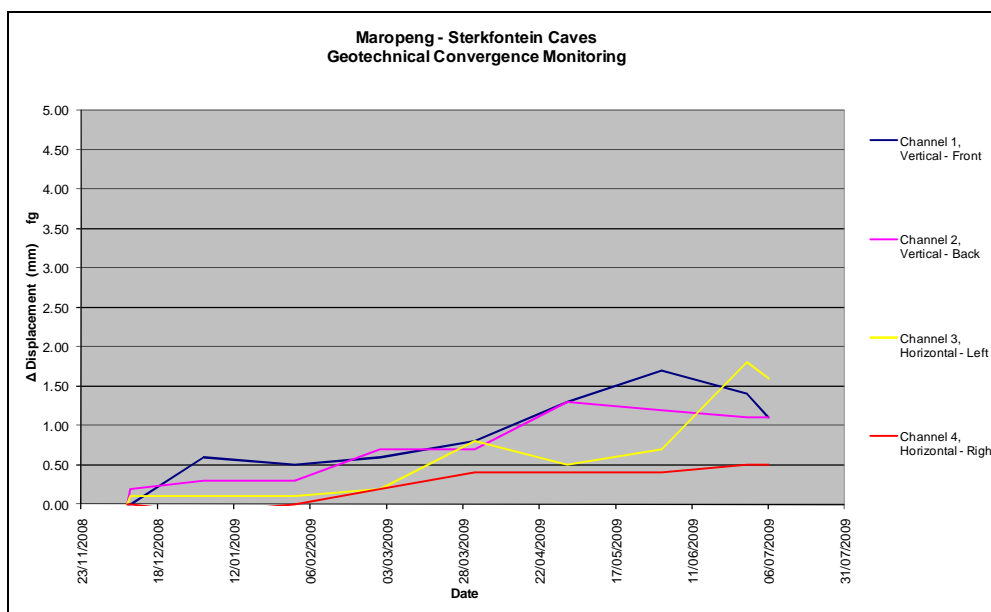


Figure 1 – Relative Displacement of Convergence Monitors

The data was very briefly assessed, specifically to check on the increasing reading for Channel 1. During the previous routine maintenance that was conducted on the system on 08 December 2008, the readings were zeroed. This was used as the starting point and an absolute displacement for each channel was calculated. For channel 1, there was a 1.8mm jump in the readings the day after calibration and this error was corrected for. The plot of the relative displacement readings, from 08 December 2008 to date is shown in Figure 1 and it indicates that there is a gradual increase in the readings up to approximately 1.5mm. This is considered to be within the error limits of the convergence units and mostly related to ambient temperature changes. Most probably as it got colder towards July, the steel wire connecting the footwall and hangingwall, against which the convergence monitor is mounted, has shrunk slightly and therefore showing a slight closure.

Based on these readings there is no cause for concern that there is any movement occurring within the rock overlying the entrance to the caves.

Rock Fractures in Elephant Chamber

Lower down in the caves, in the access way between the Elephant Chamber and the Milner Hall, rock fractures were recently noticed in the rock wall (sidewall) of the access way as shown in Figure 2. This route was subsequently closed to the public. You are concerned that this might be a major rock stability issue that is influencing a larger part of the cave system.



Figure 2 – Rock Wall in Access way between Elephant and Milner Chambers

The first query was to assess if the rock movement detected in the entrance to the cave by the geotechnical monitoring system was related to these fractures occurring in the lower end of the caves.

This is considered to be very unlikely, as was previously mentioned, the movement in the entrance is most probably related to ambient temperature fluctuations rather than any change in the rock mass conditions. Secondly the rock mass between the cave entrance and the bottom of the Elephant Chamber is isolated or disconnected through a series of discontinuities or breaks in-between the two areas and in my opinion, small displacements such as detected in the entrance, should not influence the rock mass as far away as the bottom of the Elephant Chamber.

The area in question consists of a very thin pillar or wall of rock, more or less in the centre of a semi-arch like opening in the rock mass. This is shown in Figure 3. The arch above this pillar consists of relatively competent rock with near vertical joints dissecting it and forms a pseudo-Voussoir arch.



Figure 3 – Pillar of Rock indicating fracturing

The peculiar angle of the rock wall as well as its physical dimensions in relation to the load acting on it, causes a stress concentration at its narrowest point, which is on the Elephant Chamber side and more or less at mid-height of the wall. This is shown in Figure 4.



Figure 4 –Fracturing in rock wall

If one observe the structure from the Milner Hall side where there is an increase in the thickness of the wall, there is no evidence of the stress fracture extending into it. This is shown in Figure 5. Also, the rock mass above the arch was inspected and there is no evidence of any displacement or movement on any of the joint structures above the arch.



Figure 5 – Back of the rock wall on the Milner Hall side



It is considered to be a localised fracturing of the rock, directly related to the physical dimensions of the wall structure and the load acting on it. If this passage is to remain open to the public, it would be suggested to create a safe passage by placing interlinked arches in this section. There are more appropriate measures to support the rock, but this will change the aesthetics of the cave.

The Elephant Chamber was briefly assessed to see if any other tension fractures could be found. There was no evidence to suggest that there is any recent tension fractures that have formed due to any changes in the overall rock mass behaviour.

However, a number of hazardous features were found that could lead to localised rock falls or instability. But, these are inherent to the cave system and if they are made safe or removed, it will change the aesthetics of the cave system.

Please contact me at any time, should you wish to discuss the contents of the report in any way.

Yours sincerely,

Saxum Mining

Jaco J van Vuuren

Per: **Jaco J. van Vuuren**