Mine Health and Safety Council
Research project name SIM 14-02-04

Project Title:	Integration of the South African National Seismograph Network and Database with Mining Networks as per the recommendation in chapter 1 of the Presidential Mine Health and Safety Audit 2008.Phase 2

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Category:	-	**Applied Research**	-

Summary

Background of the Study

This project stemmed from the recommendations in Chapter 1 of the Presidential Mine Health and Safety Audit where it was recommended that the mining data and the national data be integrated.

The objectives of this study were to:

i) Maintain the existing extended seismograph network within the Klerksdorp-Orkney-Stilfontein-Hartbeesfontein (KOSH) region, and

ii) Calibrate/compare the data from the network in KOSH to the data from the mines within the region, and

iii) Present the results to the stakeholders for inputs.

Methodology

The processes used to undertake the project were:

1) Regular maintenance and state of health checks for the network and procuring of spares for rapid deployment.
2) In depth analysis of the data from the differing networks, looking at spectral parameters.
3) Workshop for stakeholders where the results were presented.

Results of the study

The data from the KOSH network was compared to that from AngloGold Ashanti (AGA). As can be observed from Figure 1 the relationship between the M_w magnitudes from the different networks is very close to one, therefore in the practical application both the M_w magnitudes can be used interchangeably.

The scalar seismic moment obtained by the KOSH network has a tendency to be larger than that obtained from the AGA network, but it is to influence the estimation of the M_w magnitude significantly.

There are significant differences between the corner frequencies obtained by the two networks. The KOSH network estimates the corner frequencies within the range varying from 6 to almost 30Hz, while the AGA network has an almost fixed value of 10 Hz. Another feature is that the AGA network corner frequency is up to 200Hz, while the KOSH maximum corner frequency is around 50Hz. Both differences are caused by instrument limitations. The AGA network distorts the corner frequency below 10 Hz and the KOSH network distorts the corner frequency above 50 Hz.

Conclusions:

The KOSH network is fully operational and has been well received by the stakeholders. The importance of the network was highlighted after the magnitude 5.5 earthquake on 5 August 2014, where the data was available and was merged with other mining data in order to better understand the mechanisms of the earthquake.

When comparing the data with the mining networks, it was very rewarding to notice the similarities between the two sets of data.

The stakeholders were very positive about the project and encouraged similar studies in other mining regions, such as Platinum and Free State.

Recommendation:

In conclusion, Phase 2 was successfully completed and it is highly recommended that the project expands to other mining regions, such as the Platinum and Free State mining areas and include further research into the observed differences between the networks.

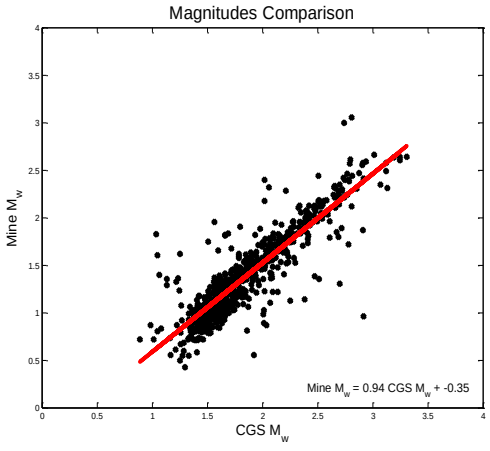

Figure 1. Relationship between M_w magnitude estimation obtained by the two networks in the magnitude range from 0.8 to 3.5.