(39)

Appendix 1.

PROPOSED PROGRAM OF PROSPECTING AND MINING OPERATIONS:

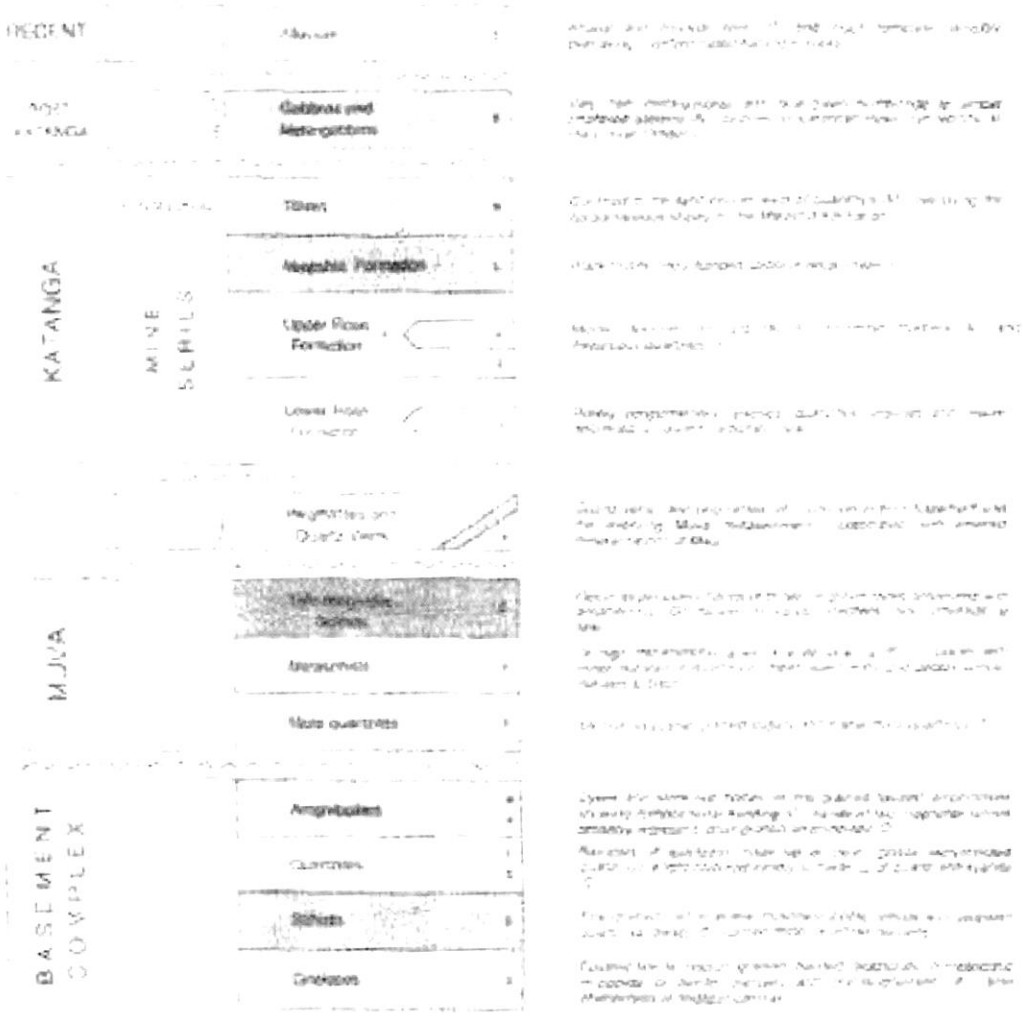
Regional Geological setting:

The emerald mineralization occurs predominantly within the Proterozoic, Muva Super Group, which lies between the granite-gneiss basement complex and metasediments of the upper Proterozoic Katanga Super Group. The Muva Supergroup has been overlain by the Katanga Supergroup comprising mainly of sedimentary rocks, which are the host rocks for the famous Zambian copper deposits.

The basement rock consists of adamellite and biotite-adamallite granite gneisses, with minor sodic - plagioclase phases. We also find quartz muscovite, kyanite schists and quartz-rich pegmatites occurring within the basement complex.

The Muva Supergroup consists of quartzite and quartz mica schist intercalated with talc-chlorite-tremolite-magnetite schist derived from ultramafic flows of sills and tuffs.

The Katangan Supergroup consists of pebbly conglomerates, arkoses, quartzite, argillites, dolomites, quartz-carbonate rocks and carbonaceous shale, locally intruded by gabbro or metagabbro.



The stratigraphic sequences were subjected to deformations by Kibaran and the Lufilian orogeny. The pre-Katangan rocks were extensively sheared and faulted during the Kibaran orogeny where the structures trending NE-SW were superimposed by E-W trending structures of Irumide orogeny, which resulted in large synformal and antiformal structures elongated in E-W direction. According to Hickman, 1973, during the succeeding Lufilian orogeny, at least four folding and metamorphic events were superimposed upon the Muva deposits and the intrusion of tourmaline bearing pegmatites took place.

According to Tembo et al (2008), the stratigraphic sequences were deformed by three orogenic events – Ubendian, Irumide and the Lufilian respectively. The first event, which is the oldest (1800 Ma), only affected the foliations which show a predominantly shallow to moderate dip and the second event marks NE-SW to E-W trend which changes to a SE-NW trend in the southern part of the Kafubu area. The regional anticlinal – synclinal fold axes trend E-W. Pegmatite dykes and steep quartz-tourmaline veins trend mainly N-S and NW-SE, while flat lying quartz-tourmaline veins shows variations in strike.

Local Geological setting:

The geology of the Kafubu Emerald Area consist of three major litho-stratigraphic units, namely the Basement Complex, The Muva Supergroup and the Katanga Supergroup. The rocks responsible for emerald mineralizations are talc magnetite schists (TMS), of the Muva Supergroup, and the pegmatitic intrusions, which are post-Muva. The TMS is believed to be a metamorphosed product of the ultrabasic igneous bodies close to dunite / peridotite composition, thereby being richer in Cr^{3+} content which is the source of coloration in emerald. The Cr^{3+} replaces the Fe^{3+} ion in the magnetite, which forms about 2-3% of the total rock, locally getting richer up to 15%. The TMS bodies are both overlain and underlain by mica schists, with concordant and discordant pegmatite intrusions.

There are four main Muva Supergroup age talc –magnetite schist with related pegmatites in the Kafubu area. These are Chantete of the northeastern belt, dipping 60 degree from the Kafubu granite stock, the Miku or the northern belt, dipping 30 degree from the stock, the main belt passing through Kagem mine, dipping 30-45 degree south and the scattered southern belt of various strikes and dip, 10 km further south.

The footwall contact of talc – magnetite schist with mica schist is the most critical in emerald exploration. Emerald mineralization also occurs in the contact zone between the metabasic units and the pegmatites. In these zones, hydrothermal alteration due to pegmatite intrusion has produced biotite-phlogopite schist, which holds emerald – tourmaline mineralization.

Silva and Ngulowe (1984) recognized three phases of pegmatite injections. The first two phases are always discordant to the host rocks whilst the third phase occurs as both concordant and discordant veins. On ths basis, the first two phases were considered to be the feeder to the third phase and most of the emerald mineralization are associated with the third phase. Hickman (1972) noted the local transition of schist into amphibolite and partial transformation of amphibolite to talc and chlorite suggest a metasomatic alteration of amphibolite to talc-chlorite schist which was derived from the ultramafic rock.

Current work to be undertaken:

Exploration is a research activity. First there is the idea, the vision or the intuitive thought. These involve repeated phases of data gathering, data interpretation and concept testing through drilling if necessary. Despite the improving tools of science and technology, exploration may involve years of costly work, with the investment always remaining high risk.

The key to successful exploration is the ability to select at an early stage the highly endowed ground. In Lufwanyama, emerald occurs where chromium-bearing talc magnetite schist (TMS) of the Muva Supergroup is intruded by the beryl-bearing quartz-tourmaline pegmatites. Based on the reconnaissance surveys carried out in the surrounding areas of the emerald producing mines, prospecting has been taken up in the prospecting licenses (PL) granted to Gemfields.

Initially, geomorphological, geological and structural mapping has been carried out by taking traverses along and across the strike of the license area which has led to the production of geological map which has further served as a media for interpretation of geochemical results

Following the geomorphological mapping, geochemical studies have been taken up. A systematic campaign was launched to understand the soil geochemistry throughout the license. A systematic grid of 400m x 200m which was reduced in some location for better data representative. Samples were then sieved to 80 microns and sent to laboratory, for chemical analysis for 10 elements including beryllium. 20 samples of rock were also collected and sent for analysis to laboratory. The results of the soil geochemistry have outlined an encouraging anomalous zone, which Gemfields has planned and proposed to explore the area by destructive surveys using the technique of core drilling.

Most of the sample results are pending analysis and will be summarized after data compilations.

The plot has indication of presence of one layer of TMS (talc-magnetite schist). The TMS layer have to be identified subsurface and the lateral thickness to be determined and measured. The depth of TMS is assumed to be 40-50m for open pit mining. The magnetometer survey has to be taken also. This will help closely identify the TMS. The sampling points should be 5m down to 1m in zones of TMS. Pits should cross the TMS and covering the entire outcrop of TMS. Trenches should cross the TMS zone traversing the plot/area

Pits will help determine the depth of mineralization and rock types whereas the trenches can help define the thickness and extent of the veins or pegmatites. Trenches can equally uncover mineralized zones and will be used to check the geology for better understanding

A number of assumptions in evaluation phase will be used

- The geology and mineralization is assumed to be the same through the whole mineralization area
- The production figures for both emerald and beryl are assumed as hard rock ore
- Drilling positions will be determined later when data is analysed. As at now the locations can be estimated to be temporal and very few up to 60m depth. The data collected from this exercise will help determine the reserves of the plot
- Estimation is assumed to represent both in situ hard rock ore and mineralization persists with depth and gets better

The project will involve:

- Preparation of detailed geological, structural and geochemical mapping of the area
- Undertake specific geophysical survey to understand the subsurface behavior of the outcrops and
- Identification of TMS bands
- Trenching and pitting activity for exposing near surface ore body
- Subsurface sampling by drilling
- Bulk sampling and opening of the exploration pit.
- Commercial mining activity