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# Environmental monitoring of mines in Namibia by the Geological Survey of Namibia, Division of Engineering and Environmental Geology

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The mining industry is one of the biggest contributors to the Namibian economy. Developing the mining industry should however be done with due regard to the environment. The Government of Namibia has taken up the responsibility and introduced environmental friendly legislations and policies after independence and has implemented regulatory bodies with in itself. The Division of Engineering and Environmental Geology (DEEG) with in the Ministry of Mines and Energy and other line ministries has established several monitoring programs to ensure sustainable land use systems. One of the projects at DEEG is to actively monitor the environment of active mines and exploration activities. Negative aspects associated with mining such as excessive water use, dust emission and pollution of the surface as well as groundwater causes impacts to the geo-ecosystem. The division therefore conducts independent monitoring programs by sampling soil, stream sediments and water. Over the years DEEG has conducted a number of environmental monitoring surveys on the various mines in Namibia. One mine being the Otjihase Copper Mine that has been active since the early 1970's. The environmental monitoring campaign that was conducted in 2010, when the mine was in temporal care and maintenance, revealed that since at least July 2009 the seepage water collection system at the Otjihase tailings dump was not operational. Therefore, highly acidic and heavy metal loaded seepage, containing deleterious metals such as copper and cadmium in high concentrations, was being disposed into the nearby Kuruma River at a rate of several cubic meters per hour. This lead to uncontrollable contamination of the surface water and groundwater in the area which are water sources for many farms downstream. The contamination eventually reached the Windhoek valley at Okapuka farm. The mine management was urged to impose mitigation measures with immediate effect. More recently the division visited Navachab Gold Mine and Tschudi Copper Mine. In 2006 and 2012, the Division of Engineering and Environmental Geology (DEEG) undertook groundwater monitoring surveys at Navachab Mine and again in 2015. A total of six (6) boreholes and one (1) tailing seepage pond where sampled in 2015. The results for all cyanide test are <0.01 mg/l for all the sampled boreholes and 0.12mg/l for the tailings seepage pond/stream. They reveal that the cyanide content in the ground water of the boreholes is well below the World Health Organization effluent standard of 1.0mg/L and also below the Namibian limit of 0.2mg/L for Class a drinking water. This could mean that there may not be any leakage of cyanide into the groundwater system or it could because cyanide breaks down in the environment quite quickly. Cyanide can naturally degrade rapidly in the environment by volatilizing to hydrogen cyanide gas (HCN). Tschudi Mine is a new operation and thus presented the division with an opportunity to collect base line data identify environmental risks and assess potential impacts. The baseline data was collected in order to establish existing conditions. For mining and the environment to co-exist, continuous environmental monitoring needs to take place. This allows the regulatory bodies in the government to keep track of the activities of the mining companies and to impose mitigation measures if need be.

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