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Rib Cutting Resue Stoping, improvement on stoping rates and reduction in waste dilution compared with other known resue stoping methods on a Free State gold mine

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Abstract:

Mining of the Basal Reef at Jeanette Mine, is typically complicated due to an overlaying Khaki Shale (shale) that has unfavourable rock engineering properties. Shale has always been either left underground or mined as part of the orebody. The first approach can only be applied in areas where the quartzite beam (directly above the Basal Reef and below the shale) is of sufficient thickness to support the shale in the hanging wall. This method is known as undercutting. Alternatively, open stoping can be applied in areas where the shale and the Basal Reef is extracted concurrently and sent to the mill as diluted ore.

Alternatively, a resue stoping method can be considered in areas where undercutting cannot be done, due to a thin quartzite middling. Resue stoping involves stowing or packing of the shale into the mined-out area and is not included as part of the hoisted rock. In the past, resue stoping was done by hand packing, which is unsuitable for a modern mine. As such, two mechanised resue stoping methods can be considered, namely; Longhole Resue Stoping and Rib Cutting Resue Stoping.

Rib Cutting Resue Stoping utilises a continuous miner ("CM") to remove the shale in a first pass, extract the reef during a second pass and backfilling the mined-out rib with shale. The use of a CM will significantly improve the extraction/mining rate, sidewall stability, backfill placement, dilution and overall safety.

Longhole Resue Stoping utilises strike drives from where longholes are drilled into the shale and the reef in an up-dip direction moving on retreat. The shale is blasted with sufficient force into the mined-out area behind it, compacting it. The reef will be loaded by Load Haul Dumper ("LHD") or dozer.

It was determined that Rib Cutting Resue Stoping is more effective than Longhole Resue Stoping due to a higher extraction rate, lower dilution, reef loss reduction and improved shale sidewall stability. The operating angles and equipment height limits the application to only 51% of the available reef at Jeanette mine with favourable dip and thickness. Longhole Stoping can navigate hard rock, shale and increased dip angles; it can be applied to 91% of the available ore deposit.

Longhole Resue Stoping and Rib Cutting Resue Stoping should both be considered as suitable stoping methods for Jeanette.

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