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Sentinel Copper Mine, Zambia

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Sentinel copper mine is located approximately 150km west of Solwezi in north-west Zambia. The mine is being developed by First Quantum Minerals, through its subsidiary KALUMBILA Minerals Limited (KML), as part of its Trident project.

Construction works at the Sentinel mine commenced shortly after approval for construction was granted in May 2012. Commercial production is expected to commence in mid-2014.

The mine is expected to produce approximately 270,000t-300,000t of copper each year. The mine life is expected to be more than 15 years, with the potential to extend it further. The project has an estimated capital cost of \$2bn, which also includes the cost of adding a nickel processing plant at the Enterprise mine. The project is expected to generate around 2,000 jobs.

Trident project

The Trident project comprises the Sentinel copper mine, Enterprise nickel mine and other mining deposits. It is situated approximately 140km west of the town of Solwezi and 150km from the Kansanshi mine in northern Zambia, and features five



First Quantum, through its subsidiary KALUMBILA Minerals Limited (KML), is developing the Sentinel copper mine in Zambia.



Kansanshi and Sentinel mines will use the same smelter, which is currently under construction.



Konecranes will supply cranes for the Sentinel copper project.

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from the Kansanshi mine in northern Zambia, and features five large prospecting licenses covering approximately 2,300km². First Quantum acquired the project through the purchase of Kiwara in January 2010 for approximately \$279m.

Mining licenses for the Trident project were granted in April 2011. The Enterprise mine is expected to be commissioned in 2015. It is estimated to contain resources of 40.1 million tonnes graded at 1.07% Ni and reserves of 32.7 million tonnes graded at 1.10% Ni.

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Sentinel mine geology and mineralisation

The Sentinel copper mine is situated on the southern portion of the Trident copper project area. The Sentinel prospect is a stratabound, sediment hosted copper-nickel-cobalt deposit with more than 11km of strike length.

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Base metal mineralisation is hosted in a carbonaceous phyllite, a sericite-quartz rock. The Sentinel phyllite hosts the mineralisation and is structurally bound by a large recumbent fold. The copper mineralisation occurs principally as chalcopyrite hosted in a metasedimentary carbonaceous phyllite.

Kansanshi Copper Mine, Zambia

The Kansanshi mine in Zambia is the eighth largest copper mine in the world, with two open pits.

Sentinel mine reserves and resources

The Sentinel mine, as of December 2012, was estimated to hold 475.8 million tonnes of ore (grading 0.52g/t Cu) in proven reserves and 298.4 million tonnes of ore (grading 0.47g/t Cu) in probable reserves.

The measured and indicated resources were estimated to be 1,027.3 million tonnes graded at 0.51g/t Cu, while the inferred resources were estimated to be 165.6 million tonnes graded at 0.42g/t Cu.

Mining and processing

Conventional mining and shovel method will be employed to extract the ore from the Sentinel copper mine. The copper treatment plant will have a throughput capacity of 55 million tonnes per annum of ore at an average grade of 0.5%.

The ore will be crushed in-pit using three ThyssenKrupp KB 63-89 semi-mobile crushers and delivered to a crushed ore stockpile with a capacity of 80,000t. It will be loaded into excavators and hauled by trucks, for milling at two process trains, each comprising a 28MW SAG mill and a 22MW ball mill, to produce a final grind of 80%.

A secondary crushing circuit, comprising two large cone crushers and a pebble crusher to crush the pebbles ejected from the SAG mills, will also be installed.

The crushed ore will go through four rougher-scavenger flotation circuits followed by three stages of cleaning to recover 90% of the concentrate containing approximately 24% copper. Tailings will be thickened before discharge to the tailings storage facility (TSF), located approximately 10km north of the copper mine.

The produced concentrates will be further treated at a common smelter being constructed near the Kansanshi mine for both Sentinel and Kansanshi ores.

Infrastructure at Sentinel

Five substations will be constructed at the processing plant. Power will be supplied by Zambia Electricity Supply Corporation (ZESCO) through 330kV power transmission lines from Lumwana-Kalumbila-Lusaka West.

"A 30km-long main access road connecting the mine with Solwezi road is being constructed."

Water supply for the processing plant will come from the Chisola River dam. The 30m-high Musangezi dam will protect the mining operations from ingress, as the pit is located on the river bed.

A 30km-long main access road connecting the mine with Solwezi

road is being constructed. Access roads to the TSF, Chisola dam and other maintenance roads will also be constructed.

The mining fleet will comprise Caterpillar Bucyrus 7495HR 57m³ rope shovels, three PCX5500 loaders, 36 trucks of the 325t class and electric hydraulic excavators, as well as other backup and ancillary equipment.

Contractors

FLSmith was awarded a \$50m contract, in June 2011, for supplying two SAG mills and two ball mills for the Sentinel mine.

Konecranes will supply a SMT SMARTON crane and two CXTD cranes for the project.

ACTOM Power Transformers was awarded a R17m (\$1.7m approximately) contract in April 2013, to supply six 20/25 MVA and two 10 MVA customised transformers for the copper mine project.

CSA Global (UK) was commissioned to undertake a mineral resource estimate for the Sentinel copper deposit in 2012.

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