Sulphate Prediction Through Ion Balance

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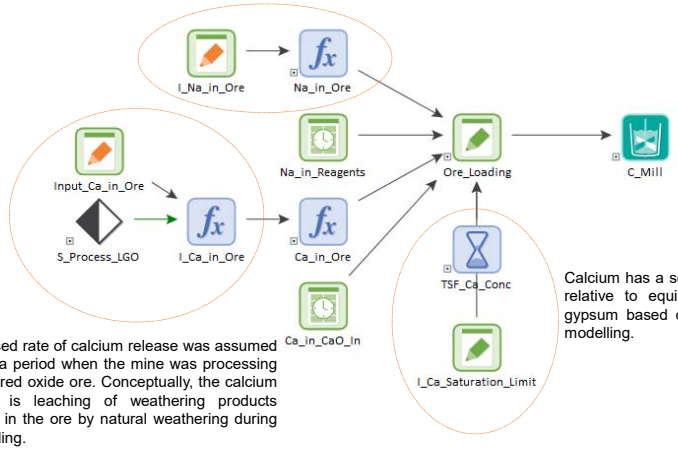
Sodium was assumed to be released at a constant 'per tonne of ore processed' rate. Based on experience elsewhere, SRK has conceptualized that sodium is released by ion exchange between calcium in solution and sodium held in clay minerals.

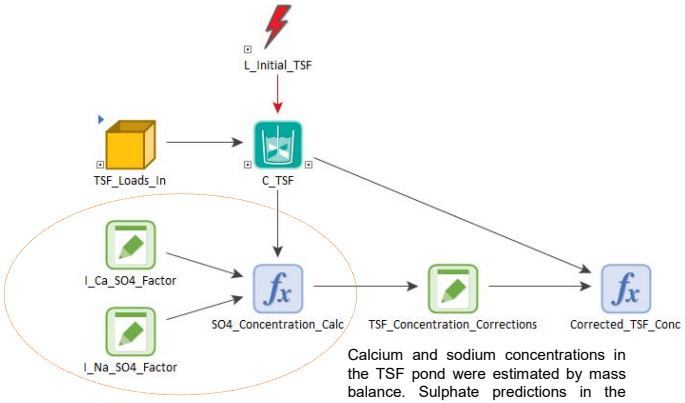


Calcium has a solubility limit relative to equilibrium with gypsum based on PhreeqC modelling.

Increased rate of calcium release was assumed during a period when the mine was processing weathered oxide ore. Conceptually, the calcium source is leaching of weathering products formed in the ore by natural weathering during stockpiling.

Problem: Observed increasing sulphate concentrations in a Tailings Storage Facility pond at an operating mine in BC has implications for compliance with discharge requirements.

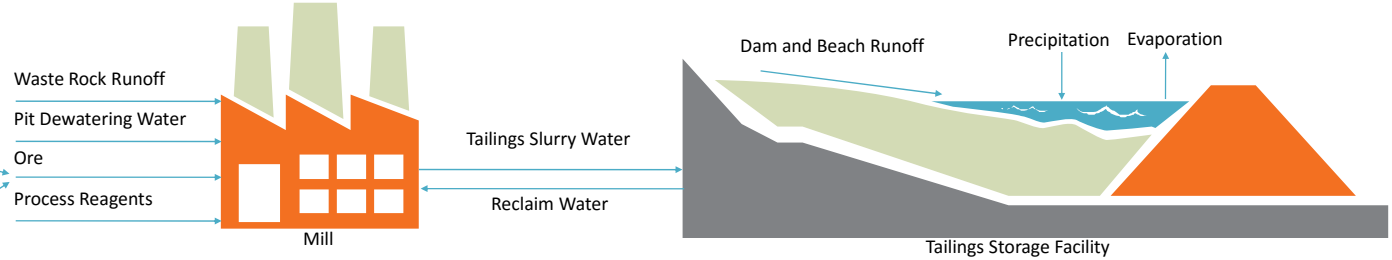
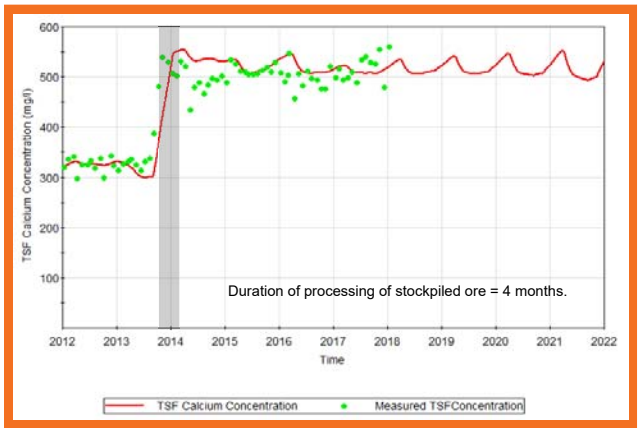
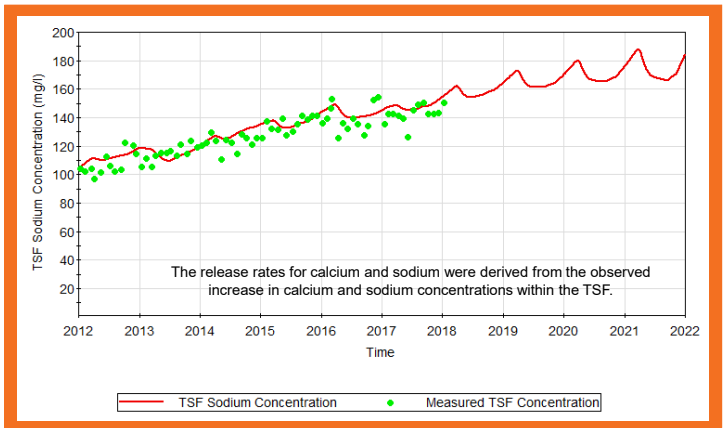
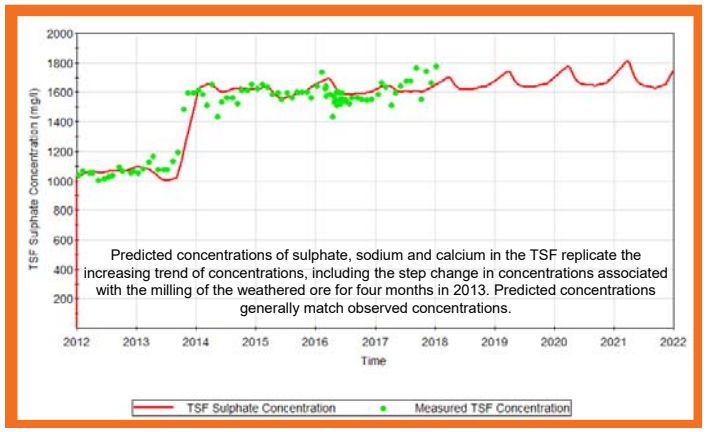
Conclusion: Sulphate concentrations are expected to stabilize when sodium and calcium loads added to the pond are balanced by removal processes such as entrainment of process water in the tailings voids. Prior to steady state, estimates of sodium and calcium loading rates to the TSF provide input on the long term sulphate trends, and into decisions about management of the TSF pond.



Calcium and sodium concentrations in the TSF pond were estimated by mass balance. Sulphate predictions in the model are calculated based on an ion balance with sodium and calcium.

Stockpiled ore undergoes oxidation (eg: $CuFeS_2 + 4O_2 \rightarrow Cu^{2+} + Fe^{2+} + 2SO_4^{2-}$) and is neutralized by carbonates ($CaCO_3$), releasing calcium to solution

Stockpiled Ore

Fresh ore remains unoxidized

Fresh Ore