

August 14, 2017

Ms. Mary Rasmussen
US Forest Service
Supervisor's Office
2324 East McDowell Road
Phoenix, AZ 85006-2496

Subject: Resolution Copper Mining, LLC – Mine Plan of Operations and Land Exchange – Follow-up Alternatives Information

Dear Ms. Rasmussen,

As a follow-up to the e-mail and informational submittal on May 10, 2017 Resolution Copper is providing some additional information related to the nature and characteristics of underground hard rock mineral deposits and how the characteristics of the deposits define the mining methods that are used with a particular focus on selective methods such as cut and fill and unselective methods such as block caving as the two methods that have been used by mines in and around the Copper Triangle for the last century.

Underground mining methods are typically applied to deposits that are relatively deep, relatively steep and have high enough grades to exceed the costs, yet typically cannot be economically mined using open pit extraction. The most technically feasible and safe underground mining method used, will largely depend on the characteristics of the deposit, particularly thickness, orientation, rock strength and competency of the surrounding host rock. Underground methods used historically in the Superior area for Magma Copper include selective (cut and fill) and the proposed method for the Resolution Copper deposit is unselective (caving). A technical comparison of the methods as it relates to deposit characteristics is presented below.

Cut and Fill

Selective methods, such as cut and fill, are typically used in narrow (vein-type) deposits. These are generally characterized with high grades, stable rock mass surrounding the host rock and a low to moderate production rate. The Magma Copper deposit fit these characteristics and as such was mined using cut and fill. Mineralization occurred as high-grade veins and replacement deposits (mantos) and due to that style of mineralization, Magma was much smaller and much higher grade, producing approximately 25 million tons at an average grade of 5% Cu with appreciable gold, silver and zinc byproducts. In addition to challenges associated with technical characteristics of the deposit (Table 1), mining via selective methods is not recommended for Resolution for safety reasons as a result of constant exposure of all miners to the mine face and the anticipated heat/climatic conditions expected (~180 degrees Fahrenheit).

Block Caving

Unselective underground mining methods such as block caving maximize ore recovery and so as little ore as possible is left behind. This method is technically feasible for massive, deposits with substantial vertical relief and where the strength of the ore and surrounding rock is weak to moderate, such that it is not self-supporting when material is extracted beneath it. Thus, block cave mining is generally reserved for large, low grade deposits with high friability. An added benefit to cave mines is that they generally require less services, such as equipment (air emissions), ventilation (air emissions/direct greenhouse gas), power (indirect greenhouse gas) and water per ton of ore mined than cut and fill, therefore having a lower relative impact on the environment per ton of ore. Additionally, during caving the ore is mined on a dedicated level that is engineered to segregate miners from the caved area. As such, cave mining is generally more favorable from a safety perspective since exposure to the mine face is limited relative to cut and fill (a larger percentage of miners are directly involved in activities that deal with maintaining services and ore flow rather than exposure to the mine face).

The Resolution Copper deposit fits these characteristics and as such, the proposed mining method is caving. There are many examples where this mining method has been applied in and around the Copper Triangle (i.e. San Manuel) and both Ray and Miami where the initial mining method started as a block cave and then transitioned to open pit as ore grade declined and the deposit became more shallow. A general comparison of technical and safety characteristics for selective mining methods such as cut and fill and unselective methods such as caving is listed below in Table 1 and compared to the characteristics of the Resolution Copper deposit.

Ore Deposit Characteristics	Cut and Fill	Block Caving	Resolution Copper Deposit	Technical Applicability of Underground Mining Method to Resolution Copper Deposit
Typical Ore Strength	Moderate to Strong	Weak to Moderate	Weak to Moderate	Block Cave
Host Rock Strength	Weak	Weak to Moderate	Weak to Moderate	Block Cave
Deposit Shape	Tabular / Irregular	Massive and Thick	Massive and Thick	Block Cave
Deposit Dip	Steep	Steep	Steep	Cut and Fill or Block Cave
Deposit Size	Thin to Moderate Thickness	Very Thick	Very Thick	Block Cave
Ore Grade	High	Low	Low	Block Cave
Uniformity of Ore	Variable	Uniform	Uniform	Block Cave

Depth	Moderate to Deep	Moderate to Deep	Moderate to Deep	Cut and Fill or Block Cave
Ventilation required per ton of ore mined	High	Low	Low	Block Cave
Services (power and water) required per ton of ore mined	High	Low	Low	Block Cave
Worker exposure to working Face	High	Low	Low	Block Cave
Sterilization of Ore (ore left unmined)	High	Low	Low	Block Cave

Table 1. Technical Characteristics and Feasibility of Selective (Cut and Fill) and Unselective (Block Cave) Underground Mining Methods Compared to the Resolution Copper Deposit

Resolution is a porphyry copper deposit with disseminated relatively low-grade Cu mineralization. The Resolution Copper deposit characteristics match the technical criteria associated with block cave mining. Also, this method presents an avenue for high-tech applications and jobs that most importantly benefit worker health and safety as unmanned working equipment at 7,000 feet underground can be controlled from the surface. Although cut and fill is applicable to steeply dipping and moderate to deep ore bodies, the remaining deposit characteristics and technical criteria do not match and the method puts worker health and safety at a higher risk and as such the method would not be technically feasible or practicable.

Should you have any questions or require further information please do not hesitate to contact me.

Sincerely,



Vicky Peacey,
Senior Manager, Permitting and Approvals; Resolution Copper Company, as Manager of Resolution Copper Mining, LLC

Cc: Ms. Mary Morissette, Senior Environmental Specialist; Resolution Copper Company
Mr. Jacques Tshisens, Principal Geotechnical Engineer; Rio Tinto