Copper & Diamonds
4700 Daybreak Parkway
South Jordan, Utah 84095
T 801 243 5063

# Technical memorandum

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| From | Matt Wickham, Principal Advisor, Geochemistry |
| Department | Copper & Diamonds |
| To | Victoria Peacey, Resolution Copper |
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Resolution Copper will conduct routine sampling and analysis of the tailings produced by the mining operation in Superior, AZ. The monitoring will be conducted to support concentrator and tailings operations, inform embankment design and construction, and to meet various permit requirements. This technical memorandum summarizes conceptual level sampling locations, sampling frequency, and laboratory testing to be conducted on tailings and the associated decant pond. The program is informed by the Rio Tinto mineral waste management standards[1] and the sampling program conducted at Rio Tinto Kennecott Copper at the Bingham Canyon Mine, in South Jordan, Utah. The plan described here will be adapted to final designs, permit requirements, and operations and incorporated into detailed standard operating procedures at the appropriate facilities.

## Background

The milling and floatation processes to be used by the Resolution Copper project will generate two different tailings types, a scavenger tailings and a pyrite tailings. The process design will preferentially deport sulfides to the pyrite tailings, thereby producing a scavenger tailings with a low sulfide content that can be used with cycloning to produce a material suitable for embankment construction. Due to the high sulfide content of the pyrite tailings and the potential to produce poor quality water when exposed to oxygen, the pyrite tailings will be managed subaqueously under a cover of water during operations.

The embankment will be raised annually to maintain storage capacity for the tailings, the decant pond, and required freeboard. A centreline raise method will be employed. Cyclones will be used to process the scavenger tailings to produce a coarse underflow sand and a finer overflow tailings during active embankment construction. The underflow sands will be thickened and then hydraulically deposited into mechanically constructed cells on top of the embankment and the overflow tailings will be thickened and spigotted into the interior of the impoundment in thin lifts. The underflow cells will gravity drain and then the tailings will be mechanically compacted as required to specification. The final placed tailings in the cells will be sampled and tested to confirm that they are geochemically suitable for the outermost surface layer of tailings on the

[1] Rio Tinto Health, Safety, and Environment E13 Standard for Chemically Reactive Mineral Waste Control and associated guidance.

embankment slope or if amendments are needed (i.e. limestone). This outermost slope will then be progressively reclaimed.

The impoundment interior will receive scavenger tailings as whole scavenger tailings (without cycloning) and cyclone overflow tailings using a perimeter spigot system or, if required, single point discharge pipelines that report to the interior. In order to minimize exposure to atmospheric oxygen, the pyrite tailings will be deposited subaqueously and kept saturated during operations in low permeability pyrite cells contained by independent downstream raised compacted cyclone-sand embankments. The pyrite cells will also act as the decant pond, from which water will be reclaimed for reuse in processing. Slurry bleed water and precipitation runoff from the scavenger tailings beach will be collected in low spots and pumped into the active pyrite cell, such that no permanent pond will be maintained on the scavenger beach.

**Concentrator**

Routine sampling and analysis at the concentrator will be intensive to ensure maximum recovery of metals during processing of the ore and maximum deportation of sulfides to the pyrite tailings. Sampling and analysis of the final tailings solids (scavenger and pyrite) will likely include X-Ray fluorescence (XRF) for rapid elemental analysis for elements such as Cu, Fe, MoS and full elemental analysis using a 2 or 4 acid digest with inductively coupled plasma mass spectrometry (ICP MS) or equivalent. Total sulfur and carbon will be analyzed by LECO

Frequencies are dictated by variability in the ore feed and various operational requirements, but elemental analyses would be routinely conducted as frequently as every 12 hours for both scavenger tailings and pyrite tailings. Full elemental and C and S by LECO would be conducted on a monthly composite for both tailings streams.

**Tailings Impoundment**

Routine monitoring of tailings entering the pipelines, from specific locations within the pipeline, and at the impoundment would include sampling and analysis of the whole scavenger tailings, the cyclone underflow and overflow at the cyclones, overflow placed in the cells, and final overflow placed on the final slopes.

Laboratory analyses would be conducted on both the tailings solids and on the liquid fraction. The water fraction of the tailings would be analyzed for pH, electrical conductivity, total dissolved solids, and a full suite of major ion chemistry and trace metals and metalloids by ICP MS or an equivalent method.

The tailings solids would be subjected to the following laboratory static tests:

- Acid base accounting using Modified Sobek, including both sulfur and carbon speciation, paste pH, paste electrical conductivity
- Total metals analysis consistent with EPA SW846 Method 6010 or 6020
- Synthetic Precipitation Leaching Procedure according to EPA SW846 Method 1312

The sampling and analysis frequency would depend on the location, whether cyclones are operating and intended use of the data. Regardless, routine frequencies would likely be no less than monthly for tailings solids and waters for whole scavenger tailings, cyclone overflow and underflow, and pyrite tailings. Sampling of the cyclone underflow placed in cells would coincide with the final materials placed in each completed cell with analysis for acid base accounting.

In addition to the static tests on tailings solids, a net acid generating tests (NAG) would be conducted on a subset of scavenger tailings subjected to the static tests. The NAG test involves the addition of a strong oxidizing agent, hydrogen peroxide, to the tailings sample. The hydrogen peroxide oxidizes the available sulfide in the sample at a rapid rate, mimicking years or decades of surface weathering in a matter of hours. The NAG tests would be completed each year to

represent materials with a broad range of characteristics but with an emphasis placed on samples where the acidification potential is typically uncertain.

Sampling and analysis of final embankment outslopes after regrading will also be conducted prior to progressive reclamation. The analyses will include at a minimum the acid base accounting and NAG testing. The number of samples per unit area will depend on material variability, but may target between 1 and 5 acres per sample and include a randomized transect sampling approach to assess spatial variability.

**Decant pond and water cover**

The decant pond water chemistry will be sampled at the barge pumps or as delivered to the concentrator on a routine basis as necessary to inform pond management and concentrator operations. The analyses will include pH, electrical conductivity, total dissolved solids, and a full suite of major ion chemistry and trace metals and metalloids by ICP MS or an equivalent method.

The frequency will be weekly for pH and electrical conductivity and then no less than monthly, for the analytical suite.