Discussion of Mine Impacts

Table 6 shows that Solwara 1 (based on expectations as of the date of this report) is likely to be more efficient at producing copper with fewer overall key physical inputs and fewer overall undesirable by-products than any of the three comparison terrestrial mines. Of the two terrestrial copper mines in operation and the proposed Intag copper mine, none would be comparable to Solwara 1 in producing a metric ton of copper with the least impact on freshwater usage, energy use, carbon emissions, and metric tons of mineral waste.

As the table shows, lack of comparability is one of the most significant challenges in this analysis. Bingham Canyon data includes impacts for the mine, smelter and refinery; Prominent Hill data includes impacts for the mine and refinery (but not a smelter); Solwara 1 data was based on the mine's impacts (but not refining or smelting); and it is unknown whether Intag would include a refinery or smelter.

Solwara 1 is likely to be more efficient at producing copper with fewer overall key physical inputs and fewer overall undesirable by-products than any of the three comparison terrestrial mines

In addition, while Rio Tinto Kennecott (Bingham Canyon) and OZ Minerals (Prominent Hill) provide relatively detailed environmental reports on their natural capital inputs and impacts compared with other mining companies, their reports do not yet provide sufficient information to separate their mining operation's impacts from the additional processing (refining and smelting). Therefore, in order to make the comparison between Solwara 1 and the three mines more "fair", and to avoid underestimating the impacts of Solwara 1, estimates for impacts of the Tongling Non-Ferrous Metal Group's (TNFM) refinery were added based on reasonable estimates provided by Nautilus Management (specifically, mineral waste and area of disturbance). It should be noted that the figure for Tongling is valid for a processing plant that processes 400,000 tons of copper per annum, and that the Solwara 1 mineralized material will produce only 77,760 tons of copper per annum, so these figures are an overestimate of the area of disturbance that can be attributed to Solwara 1.

Each impact is discussed in more detail below.

Freshwater Use

The process of copper mining and refining consumes large quantities of water, though the amount of usage can vary widely between mines.[106] Most water usage in a terrestrial mine is for flotation, beneficiation, smelting, and electro-refining, though up to 15% of water is also used for dust suppression at the mine site.[107] The Solwara 1 project is expected to consume virtually no terrestrial water during extraction or refining. Freshwater on the production

0 LITRES

SOLWARA 1 WILL CONSUME VIRTUALLY NO FRESHWATER DURING EXTRACTION OR REFINING

support vessel will be provided using a desalinization process.[108] The smelter where refining will occur has a net negative water balance (i.e. does not discharge water), and salt removal will not result in a requirement to treat and discharge water to the environment.[109] The TNFM smelting facility will use wastewater from other processes, not freshwater, to process the Solwara 1 mineralized material.[110] However, it should be noted that if wastewater was not available from these other processes, freshwater would be required.

Energy Use & CO_2 Emissions

All aspects of copper extraction and refining require electricity. Approximately one third of the total energy use in an average open-pit copper mine is comprised of electricity use, with diesel fuel contributing approximately two thirds. Electricity is required for grinding, crushing, smelting and mine support services.[111] Diesel is typically used for drilling, blasting, ore and waste haulage, earthworks and the powering of production support vehicles. CO_2 emissions are produced as a result of both electricity and diesel use. The Solwara 1 project will use diesel to power the production support vessel and its generators, and to both produce and transport mineralized material.[112]

Compared with the three terrestrial comparison mines, Solwara 1 appears to use significantly less energy and produce moderately less CO_2 emissions per ton of copper produced. While estimates are not available for the TNFM refinery for these impact categories, some idea of the level of impact can be understood by looking at the GRI data produced by other companies. The Canadian company Xstrata, for example, reports that its Canadian Copper Refinery and Horne Smelter use a combined total of 4.8 MWh of energy and emit 0.9 tons of CO_2 per ton of copper produced. Even if these impacts were added to the Solwara 1 mine impacts, its energy usage would remain much lower than the comparison mines, and its CO_2 emissions would remain slightly lower per ton of copper produced.

6X LESS MINERAL WASTE

WILL BE PRODUCED BY SOLWARA 1 PER TON OF COPPER THAN THE TERRESTRIAL COMPARISON MINES

Mineral Waste

Mining operations often move large quantities of waste rock (overburden) before reaching valuable ore. In addition, large amounts of mineral waste (tailings) are produced during ore refining.[113] Compared with a typical terrestrial mine site, the Solwara 1 project will remove minimal overburden before reaching copper mineralized material.[114] In addition, because the copper content of the mineralized

material is so high (approximately 7% copper,[115] compared with Prominent Hill, for example, where the ore is 1.1% copper), a smaller quantity of mineral waste will be produced per ton of copper extracted. Even with the TNFM refinery impacts considered, Solwara 1 produces significantly less mineral waste per ton of copper produced.

Area of Disturbance

Terrestrial copper mines impact the landscape significantly in several ways. First, all ecosystems, fertile soils, and human communities in the direct footprint of the mine site are removed. Second, a location near the mine pit must be found for storing waste rock and mine tailings, and unless tailings and waste rock are re-deposited in pits (known as "backfilling"), waste storage will also result in the removal of ecosystems (although these systems may be rehabilitated at the conclusion of mining). Finally, downstream impacts due to spills, such as the 70-square-mile (181 square km) plume of contaminated groundwater from Bingham Canyon operations, can be significant.[116] This analysis appears to show that the area of disturbance for the Solwara 1 mine is on par with that of Bingham Canyon and Intag, but lower than Prominent Hill, per ton of copper produced. This result is the only measure in which Solwara 1 does not appear to outperform its terrestrial counterparts. This may be due to the relative shallowness of the Solwara 1 mine compared with a mine like Bingham Canyon, which has reduced the additional surface area impacted by digging a deeper pit. Finally, it is important to remember that while the Solwara 1 site is demonstrably smaller in size and disturbance impact than any of the other mines, the inclusion of the entire footprint of the Tongling facility increases the attributable footprint of Solwara 1 considerably.

181 KM^2

SIZE OF THE CONTAMINATED GROUNDWATER PLUME DUE TO THE TERRESTRIAL BINGHAM CANYON MINE