



History of the Florence Copper Deposit, Pinal County, Arizona

by David F. Briggs

Prologue

During the post war period of 1946-1973, enormous strides were made in the knowledge of the hydrothermal processes that result in the formation of mineral deposits and the development of a porphyry copper model that could be used to evaluate the exploration potential of these large mineralized systems. These advances lead to the discovery of many large copper deposits in southeastern Arizona, including Mission (1951), Sierrita (1955), Twin Buttes (1956), Sacaton (1961), Rosemont (1961), Lakeshore (1967) and Red Mountain (1970).

Discovery

Interest in the mineral potential of area near the town of Florence began during the early 1960s, when geologists working for ASARCO noted the presence of abundant iron oxides replacing pyrite (i.e. leached cap) in the Precambrian granite located at the base of Poston Butte along the Hunt Highway north-northwest of Florence. They acquired a land position and drilled three holes in the area around Poston Butte. After this short-lived exploration effort failed to encounter significant mineralization, ASARCO lost interest in the area, dropped most of their holdings and focused their exploration activities elsewhere.

Continental Oil Company (Conoco) geologists were drawn to the Florence area during late 1969, when a regional reconnaissance program focused on this region as a good site to explore for copper. Like ASARCO's effort nearly a decade earlier, they were also intrigued by the presence of leached cap in a outcrop located at the base of Poston Butte. With much of the area overlain by younger alluvial cover that would conceal any potential mineralization, the site offered an attractive exploration target for a major copper deposit.

After solidifying a property position in the area, Conoco began a diamond drilling program along the southwestern flank of Poston Butte in March 1970. The first hole of this effort encountered significant oxide copper mineralization and the presence of a major copper deposit at Florence had been confirmed by August 1970. Between December 1974 and December 1975, Conoco sank two 700-foot shafts at the site and developed a small underground operation, which recovered approximately 31,700 tons of oxide material and 16,900 tons of sulfide material for metallurgical testing at a pilot plant.

Conoco had initially envisioned developing this resource as a large open pit copper operation. However, following the issuance of the phase III feasibility study in December 1976, Conoco decided to shelve the project due to economic factors related to the depth of overburden, low tenor of the mineralization and potential impacts dewatering would have on the water table beneath neighboring lands that had been set aside for the San Carlos Indian Irrigation project.

Over its seven year examination of the Florence copper deposit, Conoco invested approximately \$27 million in project studies, drilling, engineering design and construction of a pilot plant and underground mine. The project was briefly revived during the spring of 1981, when Conoco considered using in-situ leaching methods to recover the copper contained in the oxide zone of the deposit.

Magma Copper/BHP Copper

After remaining idle for nearly two decades, the Magma Copper Company purchased the Florence copper property from Conoco for \$9 million in July 1992. They initiated a pre-feasibility study in January 1993, which verified Conoco's earlier work and focused on identifying the most appropriate mining method to use to develop the oxide portion of the Florence deposit. Both open pit and in-situ mining methods were examined during this study. Completed in January 1995, Magma Copper's \$2.2 million pre-feasibility study concluded that in-situ leaching and solvent extraction-electrowinning (SX-EW) would be the best method to recover copper from this deposit. Low acid-consumption, the presence of acid-soluble chrysocolla along fractures and intense fracturing of the copper-bearing host rocks all favored this mining method. Magma Copper proceeded with a feasibility study that would secure environmental permits and advance this project to the construction stage.

Broken Hill Proprietary Company Ltd. of Australia (BHP Copper) acquired the Florence project through its merger with the Magma Copper Company in January 1996. They continued the feasibility study that had been started by Magma Copper. The Arizona Department of Environmental Quality (ADEQ) issued BHP Copper an Aquifer Protection Permit in June 1997, which allowed BHP Copper to conduct a 90-day hydraulic control test. This test was successfully completed in early 1998, confirming the ability to maintain full "hydraulic control" of the solutions in the ground. The results of this test were reported to ADEQ in April 1998. ADEQ subsequently removed the hydraulic control test stipulation from Florence's Aquifer Protection Permit, effectively giving BHP Copper permission to proceed with commercial development of the project.

However, declining copper prices resulted in BHP Copper's decision to defer construction of the Florence project until it elected to sell the property to real estate interests in December 2001.

Curis Resources

In the wake of the turmoil in the real estate markets that resulted from the Great Recession of 2008, Hunter Dickinson, Inc., purchased the surface and mineral rights of the Florence property in December 2009 and acquired mineral leases to adjoining state-owned lands in February 2010. Hunter Dickinson established Curis Resources (Arizona), Inc. to manage its Arizona assets in April 2010.



**In-situ Leach Well Field at Florence Copper Project, Pinal County, Arizona
(Photo taken by Jan Rasmussen, April 2012)**

Since its acquisition of the Florence property, Curis Resources has worked to bring its mineral resource estimates into compliance with NI43-101 standards. Additional drilling and metallurgical testing were also performed at the site. M3 Engineering completed a pre-feasibility study on the Florence copper project in March 2013.

The Florence Copper project will consist of two phases. The initial phase will consist of a 12 to 14 month small-scale production test, which will be followed by a 10 to 12 month rinse down period. The main goals of Phase 1 include: 1) optimization and confirmation of engineering designs, capital and operating costs; 2) evaluation of design improvements to ensure compliance with permitting requirements and demonstration of the safety and reliability of the in-situ copper recovery process; 3) demonstration and enhancement of best water practices and optimization of new treatment technologies; and 4) demonstration and enhancement of technical considerations with key regulatory agencies.

To date, all of the required permits to proceed with Phase 1 of the Florence Copper project have been obtained except for the EPA's Underground Injection Control Permit and a Memorandum of Agreement with the Arizona State Historic Preservation Office and the Advisory Council on Historical Preservation. Construction of Phase 1 is expected to commence during the second quarter of 2014 with initial cathode production beginning in November 2014.

The final phase of the Florence Copper project will consist of commercial production from the site, which is estimated to take approximately 25 years. Upon receipt of additional regulatory approvals, the commercial production phase is projected to recover 55 million pounds of copper annually during its initial six years of operation and 85 million pounds of copper annually for the final fifteen years of the project. Commercial production is scheduled to commence during the first quarter of 2018.

Epilogue

By its very nature, exploration and development of natural resources is a repetitive process in which a mineral deposit may be examined many times before a decision is made to place it in production. Since its discovery in 1970, the copper deposit at Florence has been examined by four different companies. The knowledge gained from each of these efforts combined with favorable commodity markets and advances in science, engineering and technology will ultimately determine how this copper resource is responsibly developed.

Disclaimer: David F. Briggs is a resident of Pima county and a geologist, who has worked in the mining industry for thirty-five years.

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