

History of Helvetia-Rosemont Mining District, Pima County, Arizona

David F. Briggs
Consulting Geologist



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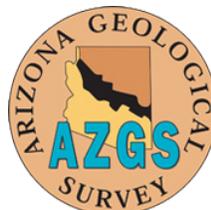


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History of Helvetia-Rosemont Mining District, Pima County, Arizona

David F. Briggs
Consulting Geologist
Email: DavidFBriggs@aol.com

This article presents the history of the Helvetia-Rosemont mining district from 1875 until December 2013. The pre-World War II history of the area deals with the settlers, the early mining camps where they lived, and the mining ventures that developed and worked many of its early mines. The post-World II mining activities lead to the discovery and development of the Rosemont copper deposit.

Prologue

Jesuit missionaries, led by Father Eusebio Francisco Kino arrived in southern Arizona during the early 1690s and established missions along the Santa Cruz River at Guevavi (1691), Tumacacori (1691) and San Xavier del Bac (1692). Presidios were subsequently established at Tubac in 1752 and at Tucson in 1775.



Mission San Xavier del Bac

These settlements served as bases for prospectors, who explored the nearby mountain ranges. While sporadic conflicts between Indian and settlers along with other frontier difficulties hampered early development of mineral resources of the region, small scale mining activities persisted until the beginning of Mexican Revolution in 1810. It is unknown if any discoveries were made in the Helvetia-Rosemont area of the Santa Rita mountains during this early period of mining activity.

An increase in Indian conflicts and outlaw activities in the region resulted from the withdrawal of Spanish protection during the Mexican War of Independence (1810-1821), leading to the gradual abandonment of many mines, settlements and missions in the region by 1830. Following the Mexican-American War (1846-1848), Mexico was forced to cede much of its northern territory to the United States under the terms of the Treaty of Guadalupe Hidalgo. This concession included all of Arizona that was located north of the Gila River. The remainder of Arizona, located south of the Gila River, was acquired by the United States in June 1854 with the ratification of the Gadsden Purchase. U. S. troops arrived in the area in March 1856, allowing limited mining activity to resume. However, this protection was withdrawn in 1861 with the beginning of the American Civil War. With the appeasement of hostilities between the Indians and settlers in 1874, mining activities resumed in many areas of southern Arizona.

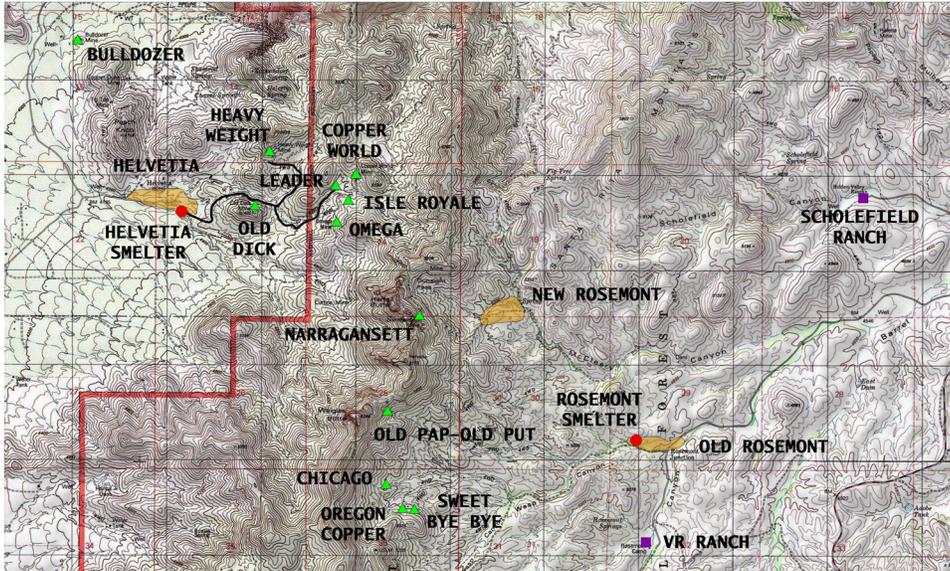
Early Years of the Helvetia-Rosemont Mining District (1875-1893)

The Helvetia sub-district is located along the western flank of the Santa Rita mountains, while the Rosemont sub-district is located on the eastern flank of the range. The boundary separating these two sub-districts is generally placed along the Santa Rita ridgeline.

The first recorded mining activity in the Helvetia-Rosemont mining district occurred in 1875, when Pinckney R. Tully and Estevan Ochoa shipped approximately 5,000 pounds of copper ore to Tucson from the Omega (?) claim, which is located along the western flank of the Santa Rita mountains near Helvetia. Other early claims in the Helvetia area included the Old Dick, Heavy Weight and Tally Ho claims. The Helvetia-Rosemont mining district was officially established on April 16, 1878.

The completion of the Southern Pacific Railroad to Tucson in 1880 and the New Mexico and Arizona Railroad from Benson to Nogales in 1882 spurred

ranching and mining activities throughout southeastern Arizona. Notable ranches in the Rosemont area include the VR Ranch (now known as the Rosemont Ranch), which was



Helvetia-Rosemont Mining District, Pima County, Arizona



Topographic Map Base obtained from U. S. Geological Survey

established by Edward Vail in 1883. The Scholefield Ranch (now known as the Hidden Valley Ranch) was founded by George P. Scholefield in 1884.

Financed with eastern capital, the Omega Copper Company and Columbia Mining and Smelting Company were organized in the Helvetia area during 1881. They set about developing their holdings. The Columbia Mining and Smelting Company commissioned a 30-ton/day blast furnace on the Bulldozer claim in August 1882, while the Omega Copper Company erected a small water-jacketed blast furnace at the Omega property in early 1883. This allowed them to reduce the ores to a high-grade copper matte, which was transported by wagon to the railhead in Tucson.

An overabundance of copper derived from newly developed mines in Arizona and Montana during the early 1880s resulted in a steady decrease of the price of copper, which fell from \$0.191/lb. in 1882 to \$0.165/lb. in 1883. Lower copper prices combined with the Depression of 1882-1885 and generally poor management made these early operations unprofitable. The Columbia Mining and Smelting Company was shut down in April 1883 and its assets were sold at public auction. The



The Rosemont Ranch was Originally Established in 1883 as the VR Ranch (Nov. 2009)

Omega Copper Company was closed in early August 1883, as a result of litigation by its Philadelphia stockholders.

While this ended the first boom in the Helvetia camp, mining activities did not cease in the area. Over the next decade, prospectors continued to comb the hills in search of the next big strike. Among these was William McCleary, who had intermittently explored the eastern flank of the Santa Rita mountains since 1879. In 1885, he and Thomas Deering located the Backbone claim along the crest of the range. It was located adjacent to the Narragansett claim, which had been staked by James K. Brown in March 1879. Other early claims staked in the Rosemont area included the Mohawk Silver claim in 1888, Altamont and Tremont claims in 1892 and Empire claim in 1894.

Old Rosemont (1894-1903)

By the early 1890s, William McCleary and his partner L. J. Rose had acquired thirty claims along the eastern slope of the Santa Rita Mountains and established the settlement of Old Rosemont, which was located at the present day site of Rosemont Junction. They commissioned a 60-ton/day water-jacketed blast furnace in October 1894 and formed the Rosemont Smelting and Mining Company in December 1894. This company experienced major problems from the onset due to lack of high-grade feed for its smelter. Things went from bad to worse in July 1895, when this smelter was damaged by an explosion and closed.

The Lewisohn Brothers of New York purchased the Rosemont Smelting and Mining Company in February 1896 and changed its name to the Rosemont Copper Company. By early 1897, the Lewisohns' employed 40 men to develop their holdings. The water jacket for the smelter was repaired and smelting operations resumed in June 1897. Rosemont Copper Company patented 21 mining claims and seven mill sites in April 1899. Principle producers during this early period included the Oregon Copper, Sweet Bye Bye, Chicago, Old Put and Old Pap mines, located near the head of Wasp Canyon. The ores from these mines were derived from small open cuts and shallow underground workings. They were treated at the Rosemont smelter, which produced a copper matte product that was transported by wagon to the Southern Pacific railhead at Vail (18 miles) or to the New Mexico and Arizona

railhead at Sonoita (14 miles). On their return trip, the wagons would bring coke to fuel the smelter as well as supplies for the settlement.

Early mining operations at Old Rosemont were not sustainable. The smelter was briefly closed in 1899 due to a lack of coke, which required the hand-sorted, high-grade ores to be shipped to the Vail railhead for transport to a smelter in El Paso or Tucson. This significantly increased the costs of production. The smelter was idle again at the end of 1901 and operated intermittently until 1903, when it was permanently closed. Following its closure, the Rosemont Copper Company continued to employ a caretaker at the Old Rosemont town site and intermittently leased their holdings to others until the late 1950s.



Slag Pile from Rosemont Smelter at Old Rosemont (April 2007)

Following the suspension of Rosemont Copper's mining operations in 1903, the citizens of Old Rosemont gradually abandoned the site and its infrastructure was allowed to decay. The Old Rosemont post office was closed in May 1910. By 1927, the Rosemont Hotel had been vacated and was finally dismantled around 1938 for its lumber and brick.

Helvetia's Second Boom (1898-1911)

During the early 1890s, a group of investors with the Paine Weber and Company began to acquire mining claims in the Helvetia area. By March 1898, they had acquired 27 claims and organized the Helvetia Copper

Company in 1899. Over the next year, they invested more than \$1 million establishing the town site of Helvetia, erecting a smelter, assay lab, warehouse and 8,000-foot narrow gauge railroad. Completed in November 1899, the narrow gauge railroad connected the Heavy Weight, Copper World and Isle Royale mines with the smelter. A 200-ton/day water-jacketed blast furnace was commissioned in December 1899.



Foundations of the Helvetia Smelter (Dec. 2013)

On December 6, 1900, the Helvetia Copper smelter was destroyed by fire after molten slag overran the jacket of the furnace and ignited its wooden floor. More than 50% of the workforce was laid off as a result of this mishap. A new 150-ton/day smelter was erected and commissioned on May 1, 1901. However, losses associated with the replacement of the smelter, lost production, an inability to obtain a reliable source of coke to fuel the smelter, and a decline in the price of copper to \$0.122 per pound resulted in a decision to suspend all operations and liquidate the company's assets in January 1902. Helvetia was soon abandoned as many miners left to find jobs elsewhere.

In November 1903, Boston and Michigan shareholders of the defunct Helvetia Copper Company acquired its former holdings and incorporated the Michigan and Arizona Development Company. By January 1904, 40 miners were working at the Isle Royale, Leader and Copper World mines. Over the next year, much of these efforts were aimed

at developing ore reserves at these underground operations. By March 1905, small shipments of hand-sorted, high-grade ores were being transported by wagon to the Vail railhead for shipment to the El Paso smelter. Michigan and Arizona Development Company was reorganized as the Helvetia Copper Company of Arizona in October 1905. The existing smelter was refurbished and commissioned in

early 1906. However, it was permanently closed in 1907 due to operational difficulties, resulting from its poor design. Following the closure of the smelter, high-grade ores were transported by wagon to the Vail railhead (17 miles) for shipment to the Old Dominion smelter in Globe. Although the Helvetia Copper Company of Arizona survived the Panic of 1907 and made their operations more efficient over the next several years, all operations were suspended during the summer of 1911. The principal reasons for this decision were the collapse of the price of copper from \$0.20 in 1907 to \$0.125 in 1911 and the high costs of mining and

transporting the ores to a railhead.

Following the closure of the mines in 1911, some of the former miners found work at neighboring ranches. Stimulated by an increased demand for copper during World War I, Helvetia's mines experienced a brief boom, but never returned to the large scale operations of the pre-war years. The post office closed its doors in December 1921 and Helvetia's school was closed in 1923. Although most of its citizens moved away, marking an end of an era at Helvetia, lessees continued to conduct small-scale mining activities in the area over the next several decades, with a small boom occurring during the mid- to late 1940s.

New Rosemont (1915-1921)

By 1915, the increased demand for copper led to the development of the Narragansett mine, which had been intermittently worked by James K. Brown since 1879. In July 1915, William R. Ramsdell purchased the Narragansett claim for \$60,000 and incorporated the Narragansett Mines Company in September 1915.

Production commenced soon afterward and by 1917, two hundred and fifty miners were working at the site. Most of the mine's employees lived at the mining camp of New Rosemont, which grew up along a low ridge located immediately east of the mine site.

which were subsequently sold to Albert Steinfeld of Tucson. The steady decline of the price of copper following the end of World War I made it unprofitable to ship its low-grade ores to a smelter. By July 1919, Albert Steinfeld recognized his investment was in jeopardy and filed a lawsuit against the Narragansett



Panorama of the Helvetia Town Site (Dec. 2013)

The Narragansett mine was the district's largest producer during World War I. Between 1915 and 1918, this underground mining operation produced 34,300 tons of copper ore, which was transported by wagon or truck to the Southern Pacific railhead at Vail (18 miles) for shipment to a smelter. However,

Copper Company. Steinfeld received a judgment against the defendants in August 1919, and eventually acquired the Narragansett property as part of the settlement. Operations continued under a lessee until 1921, when production ceased and the mining camp of New Rosemont was abandoned.



Workings of the Narragansett Mine along the Ridge overlooking the New Rosemont Town Site in the foreground (Mar. 2007)

this operation was plagued with financial problems throughout much of its life. In an effort to raise funds to keep the mine operating, the principals of the Narragansett Mines Company formed the Narragansett Copper Company in January 1917. This company gave the Narragansett Mines Company four notes, totaling \$300,000, in return for a mortgage on fifteen unpatented mining claims, including the Narragansett,

Albert Steinfeld patented the Narragansett and six other claims in February 1926. The next recorded activity in the area was in 1938, when R. Hughes and Earl Peterson leased the Narragansett holdings from the Steinfeld estate. It was intermittently operated over the next two decades, with the last recorded production occurring in February 1961.

Post World War II Years (1945-1973)

During the period from 1945 to 1973, enormous strides were made in the understanding of the hydrothermal processes involved in ore formation. A conceptual model for porphyry copper deposits was also developed during this period. These advances proved to be very useful in evaluating the mineral

potential of these large mineralized systems and resulted in the discovery of many large copper deposits in southeastern Arizona, including Mission (1951), Sierrita (1955), Twin Buttes (1956), Sacaton (1961), Florence (1970) and Red Mountain (1970).

Although the widespread distribution of copper in the Helvetia-Rosemont mining district interested many geologists during the late 1940s and 1950s, exploration efforts were challenged by the area's highly complex structural setting. Mining companies eventually took up the challenge of evaluating the Helvetia-Rosemont mining district's mineral potential. One of the first efforts was a churn drilling program conducted by the Lewisohn Copper Company in 1955-1956. It identified a large area of low-grade disseminated copper mineralization known as the Peach-Elgin deposit, which is located immediately northwest of the historic town site of Helvetia. The American Exploration and Mining Company explored the Ingersoll breccia pipe, located southeast Broad Top Butte during 1956, but failed to find economic mineralization.



Exploration Drill Roads at the Peach-Elgin Copper Deposit (Dec.2013)

Having intermittently visited the Helvetia-Rosemont mining district over a period of more than a decade, Allan Bowman of the Banner Mining Company decided it was time to explore the area. In April 1961, they acquired a large land package through four basic agreements, which included the extensive holdings of the Lewisohn estate. Exploration drilling commenced soon afterward, resulting in the discovery of the Rosemont deposit in drill hole G-33, which contained a 1,000-foot intercept, assaying more than 0.90% copper. Banner Mining Company acquired the Narragansett property in July 1963. By the end of

1963, this exploration effort had completed 16,541 feet of diamond and rotary drilling in the Helvetia-Rosemont mining district, including three diamond drill holes, totaling 4,300 feet at their Rosemont discovery.

The Anaconda Company acquired an option to lease Banner's Arizona holdings in March 1963, which included the Helvetia-Rosemont property. Anaconda exercised its option in April 1964, initiating a 60-year lease. Over the next ten years, Anaconda geologists prepared detailed geological maps of the area and carried out extensive diamond drilling programs on the Peach-Elgin and Rosemont deposits. These studies included 113 diamond drill holes, totaling 136,838 feet in the Rosemont deposit.

Anamax Mining Company (1973-1986)

In January 1973, a 50/50 partnership, known as the Anamax Mining Company was formed by the Anaconda Company and Amax, Inc. to manage their holdings in southern Arizona. Amax, Inc. subsequently acquired the underlying ownership interest in these properties through its merger with the Banner Mining Company in June 1973.

Anamax developed plans to place Rosemont in production during the mid- to late 1970s. Their efforts included Anamax's purchase of the 47,000-acre Empire Ranch in December 1974 and the Cienega Ranch in 1977 for the water rights. State-owned lands along North Canyon were also leased for use as a conventional tailings pond. Anamax also initiated the process to acquire title to 5,544 acres of public lands through a land exchange with the Coronado National Forest. Geological evaluation of its Rosemont-Helvetia properties included the completion of 52 diamond drill holes in the Rosemont deposit, totaling 54,350 feet by 1986.

Anamax's mine plan of operation called for a 33,000 short ton/day conventional sulfide concentrator to treat the sulfide ores and a 4,100 short ton/day oxide treatment plant, which was similar to their existing facility at Twin Buttes. Total estimated water usage by this operation was 19,000 acre feet per year. The copper concentrate product was planned to be hauled by truck to a rail loading facility near Vail and shipped to the Hayden smelter.



Panorama of the Future Site of the Rosemont Copper Mine (Aug. 2008)

In November 1985, Anamax ceased operations and permanently closed its Twin Buttes operation at Green Valley. This resulted in the liquidation of its assets, including its Helvetia-Rosemont property. Its Empire and Cienega ranch properties were acquired by real estate interests, who subsequently entered into a series of land exchanges, which transferred these properties to the Bureau of Land Management in June 1988. They ultimately became part of the Las Cienegas National Conservation Area in December 2000.

ASARCO, Inc. (1988-2004)

ASARCO, Inc. purchased the patented and unpatented mining claims in the Helvetia-Rosemont mining district from real estate interests in August 1988.

Over the next several years, ASARCO evaluated their mineral holdings in the Helvetia-Rosemont mining district and began drawing up plans for future mining operations at Rosemont. By 1995, they initiated a process to acquire title to the Forest Service lands required to facilitate the potential development of this mineral resource. This effort involved exchanging 2,222 acres of privately owned parcels within national forests of Arizona with an appraised value of \$5.3 million for 13,272 acres of Forest Service lands in the Rosemont area, which had an appraised value of \$5.1 million. In February 1998, ASARCO suspended its efforts to get a land exchange in response to the falling price of copper, which had declined from \$1.395/lb. in July 1995 to \$0.755/lb. in February 1998.

Grupo Mexico acquired the Helvetia-Rosemont property in November 1999 through its merger with ASARCO, Inc. They continued to hold this property until June 2004, when it was sold to Triangle Ventures LLC. Over the 16-year period, the Helvetia-Rosemont property was held by ASARCO and its successor, Grupo Mexico, eleven diamond drill holes, totaling 14,695 feet were completed at Rosemont. Although ASARCO failed to complete their proposed land exchange, they did succeed in acquiring patents on 21 mining claims in the Rosemont area in December 1995.

Augusta Resource (2005-Present)

Soon after Triangle Ventures LLC purchased the Helvetia-Rosemont property, they offered to sell it Pima County, so it could be preserved as open space. After Pima County declined this offer, Triangle Ventures sold it to Augusta Resource Corporation in April 2005. Augusta Resource (Arizona) Corporation (renamed Rosemont Copper Company in July 2007) was incorporated under Arizona law to manage these assets.

After purchasing the Rosemont-Helvetia property, Augusta Resource commenced an in-fill drilling program to bring the resource estimate at Rosemont into compliance with National Instrument 43-101 standards set forth by Canadian securities regulations. Between mid-2005 and January 2007, 55 diamond drill holes, totaling 96,129 feet were completed. This program was designed to better define the geology and distribution of copper mineralization at Rosemont, as well as gather geotechnical data required to design a

proposed pit. It also included a re-examination of all the drill core from previous studies at the site.

In June 2006, Washington Group International completed a preliminary assessment and economic evaluation of the Rosemont copper project. Augusta



Diamond Drill Rig at Rosemont (Jan. 2007)

Resource submitted a plan of operation to the U. S. Forest Service in July 2006. However, this plan was subsequently deemed incomplete and returned for further work. Augusta Resource resubmitted a revised plan of operation to the Forest Service in July 2007. M3 Engineering completed a positive feasibility study on the Rosemont copper project in August 2007. The Forest Service accepted Augusta Resource’s revised plan in March 2008 and commenced the process of evaluating this proposal under guidelines set forth in the National Environmental Protection Act of 1969.

Rosemont Copper’s initial plan of operation included a single conventional open pit that was supported by processing facilities that were designed to treat both oxide and sulfide-bearing ores. It was designed to minimize the proposed operation’s impacts through the use of proven technologies and innovative mining and reclamation practices. The sulfide ores would be processed by a 75,000-stpd flotation concentrator, while the oxide ores would be treated by a conventional heap leach facility that used existing SX-EW technology to produce a final copper cathode product. Estimated water consumption would be drastically cut through the use of a dry stack tailings disposal system, which enables much of the water that normally remains in a conventional tailings impoundment to be recycled by the ore treatment facility. A side benefit of using this system eliminated the need for a large tailings impoundment,

which significantly reduced the size of the proposed operation’s areal footprint. Incorporation of innovative mining practices allowed reclamation to commence at startup and continue throughout the life of the project. Laboratory and on-site studies were also conducted to determine the best methods to reclaim the waste dumps and tailings disposal site.

Over the next several years, Rosemont Copper continued to evaluate the mineral potential at Rosemont and refine the economics of developing this resource. A 20-hole diamond drilling program (17,522 feet) was conducted from December 2007 through July 2008. Data from these studies were incorporated into an updated feasibility study completed by M3 Engineering in March 2009. This was followed by a twelve-hole diamond drilling program (18,874 feet), which was completed in February 2012.

TABLE 1. Proven and Probable Ore Reserves (August 2012)

Ore Reserves			
Short Tons	Cu %	Mo%	Ag Oz./Ton
667,206,000	0.44	0.015	0.12

Note: Ore reserves are based on \$4.90/ton net smelter return (NSR) cut-off. NSR values used to make this assessment were based on metal prices of \$2.50/lb. Cu, \$15.00/lb. Mo and \$20.00/oz. Ag.

In September 2010, Augusta Resource entered into a joint venture agreement with a Korean consortium, composed of the Korea Resources Corporation and LG International Corporation. This agreement allowed Augusta Resource to reduce its risks in this undertaking by allowing its joint venture partners to earn a 20% interest in the Rosemont property through the partial funding of the project expenses.

Permitting

After three and half years of study, the Coronado National Forest released a Draft Environmental Impact Statement on the Rosemont Copper project in October 2011 and commenced public hearings in November 2011. The public comment period ended in January 2012. Rosemont Copper received its Aquifer Protection permit from the Arizona Department of Environmental Quality in April 2012.

The feasibility study was updated again in August 2012, to incorporate updated resources and engineering information, as well as form a mine plan in line with the Forest Service's preferred alternative that resulted from the Draft Environmental Impact Statement. Modifications to the mine plan

as were many of Arizona's early mining camps. The major challenges faced in exploring, developing, mining and processing of the ores and providing the basic infrastructure required to support these remote communities significantly increased the economic risks of these early mining ventures. Access to



Reclamation Test Plot at Hidden Valley Ranch (Photo by Jan Rasmussen, Sept. 2012)

of operation included a reconfiguration of mine site and the elimination of the oxide ore treatment circuit. Rosemont Copper received its Air Quality permit from the Arizona Department of Environmental Quality in January 2013.

After nearly two years of additional study, the Coronado National Forest published the Final Environmental Impact Statement on the Rosemont copper project on November 29, 2013. The Draft Record of Decision was officially released on December 13, 2013.

Epilogue

The short-lived nature of the early mining ventures in the Helvetia-Rosemont mining district is not unique. Many of Arizona's early mining camps experienced similar boom-and-bust histories. Reasons for this include the heavy dependence on a single industry

regional transportation networks provided by the railroads was crucial for the transport of supplies to these remote mining camps and the shipment of their mineral products to distant markets. All of these activities were labor intensive and costly, making the viability of many of Arizona's early mining operations uncertain and especially vulnerable to fluctuations in the commodity markets.

The nature of the low-grade disseminated copper mineralization that characterizes some porphyry copper deposits, like the one found in the Helvetia-Rosemont mining district offer few opportunities to develop the large, high-grade ore bodies that were required to sustain these early mining operations. In short, the technology and mining practices employed by these early mining ventures were poorly suited for the majority of mineralization they encountered at these deposits.

However, despite all of the challenges experienced

by these early mining ventures, investors have continued to support efforts to explore and develop mineral deposits throughout Arizona. The knowledge gained from these early efforts, improvements in infrastructure and advances in science, engineering and technology have significantly reduced the risks involved in developing and mining low-grade disseminated copper ores, such as those that are now known at Rosemont. However, mining projects continue to be subject to risks associated with boom-and-bust cycles in our economy. The future of the Helvetia-Rosemont mining district depends on the final outcome of the on-going permitting process and successfully dealing with the risks that are faced by all businesses.

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Note: All photographs by David Briggs unless otherwise noted.