Remembering the Smelter
The Magma Copper Company Smelter at Superior, Arizona

WestLand Resources
Detail from the 1902 U.S. Geological Survey topographic map of the Florence 30-minute quadrangle, showing places in the Pinal Mountains and the vicinity of the Superior townsit e, just before it was platted. Its location is added here in red.
Superior and Its Smelter

Every community has a history it calls its own and landmarks that embody that history in special ways. For the Town of Superior, Arizona, local history has long centered on the Magma Copper Company, organized at Superior in 1910 to mine the copper ore in the adjacent mountains. For almost 50 years, Magma’s connection to Superior was embodied by the copper smelter built by the company on the edge of town. Construction of the smelter began in 1922, and the first batch of ore from the Magma mine was processed there in March 1924. The smelter then stayed in almost continuous operation until July 1971.

A decade or so after the smelter closed, many of its largest steel-frame structures were taken down and the steel was sold as scrap. Nearly all of the industrial machinery in the complex was removed and sold, or taken to be used elsewhere. However, a group of large brick buildings at the center of the original smelter complex was left in place, as was the original 300-foot-high brick smelter chimney, known simply as the Stack to the people of Superior. Together the chimney and the buildings near its base would stand for 47 more years as the most prominent landmark in Superior, a monument to the community’s historic connection with the copper industry.

In 2004, the new owner of the property, Resolution Copper, embarked on a property-wide reclamation effort in advance of new mining activities nearby. The reclamation effort included the closure of several ponds, the covering and seeding of tailings facilities, and the removal of a layer of soil adjacent to the buildings impacted by the smelter. Resolution Copper evaluated the stability of the smelter chimney and the buildings near its base and determined that full reclamation could not be completed until these unstable structures were removed. In 2018, the company made the difficult decision to remove the Stack and the last of the smelter buildings.
Before Copper Came Silver

Copper put Superior on the map, but it was silver that first drew miners to the Pinal Mountains. The first known discovery of silver in the region occurred in 1870, the year that General George Stoneman, head of the U.S. Army Department of Arizona, ordered the construction of a military road over the mountains between the future site of Superior and the future site of Globe. The Stoneman Grade, as it was called, opened the Pinal Mountains to prospecting and ranching, but the road’s biggest impact on mining history came from an incidental discovery made while it was still under construction. A soldier laboring on its western end, just below Kings Crown Peak, noticed a prominent outcrop of silver ore and vowed to return and mine it.

While different versions of the story exist, all agree that the soldier never got the chance to return to his discovery before he died. In 1875, however, a group of men he had informed of the outcrop rediscovered it. They eventually opened a mine there, naming it the Silver King. The Silver King mine, a few miles north of the future site of Superior, was soon producing a high-grade silver ore, and a busy town, also known as Silver King, had begun to grow up around it. The Silver King was the earliest and most successful silver mine in the area, but other mines quickly opened on adjacent ground, creating a patchwork of claims around the original discovery. All of the claims, successful or not, were encompassed by the

Ore wagons waiting to be filled at the Silver King mine, 1880s. Courtesy of the Superior Historical Society (Superior).
Pioneer Mining District, which was formally established in 1875. The success of the Silver King mine also led to the creation of Pinal City, a town along Queen Creek about 5 miles south of the mine, near the foot of Picketpost Mountain. The ore from the Silver King mine was hauled by wagons to Pinal City, where a stamp mill was built to process the ore.

The Silver King mine and the town of Silver King flourished until the late 1880s when the price of silver dropped dramatically. The mine soon closed, along with most of the other silver mines in the Pioneer district, and the town of Silver King was largely abandoned. Pinal City hung on a little longer, but by the turn of the twentieth century, it too was mostly abandoned. The silver boom, as promising as it seemed in the 1880s, was over by 1900.

During the silver boom in the Pinal Mountains, copper was mostly an incidental discovery in the local mines. It didn't become a focus of mining until its value greatly increased with the advent of electrical power in the 1890s. As more and more of the United States was electrified, the demand for copper soared because it was the most suitable metal for making electrical wire. By 1900, the potential of copper mining in the Pioneer district was clear, and many of the old silver mines in the district were being reopened as copper mines.
William Boyce Thompson (1869–1930) founded the Magma Copper Company in 1910. Courtesy of the Boyce Thompson Arboretum (Superior).

In 1902, a new townsite was platted along Queen Creek near the base of Apache Leap. It was named Superior after the Lake Superior and Arizona Mining Company, one of the largest copper-mining businesses that took an early interest in the area. During its first eight years, Superior grew slowly but steadily as people moved to the area to work in the copper mines that were opening nearby.

In 1910, things began to change more quickly in Superior. That year, William Boyce Thompson, a mining financier from Montana who had developed successful mines elsewhere in Arizona, decided to buy the Silver Queen mine. The Silver Queen was just upslope from Superior and had ceased to be a profitable silver mine in the 1890s, but Thompson and his engineers were confident it would be a steady producer of copper. When Thompson bought the mine, he changed its name to Magma and founded the Magma Copper Company. The headquarters of the new company would be in New York City, but Magma would focus exclusively on its mine at Superior. Over the next four years, Magma deepened the old Silver Queen shaft and renamed it Magma No. 1, erecting an ore-concentration mill adjacent to the mine and building a railroad to connect the mill with an existing rail line near Florence, about 30 miles away.

The Magma Smelter

Thompson first came up with the idea of building a smelter at Superior in November 1917 while he was on a diplomatic mission to Russia. World War I was raging, the Russian Revolution had reached a pivotal moment, and Thompson and his team were trying to promote American business interests. Despite the dramatic circumstances, Thompson was also thinking about how to make the most of his mining operation thousands of miles away at Superior. After examining a new set of maps of his mine, he declared to a fellow mining man on the mission, “If the Magma is what I think she is, I’m going to put up the finest smelter in the world there—not the greatest, mind you, but the finest.”

Building a smelter at Superior was just one part of a major expansion of the Magma operation envisioned by Thompson. From 1922 through 1924, Magma undertook three major projects at the same time. First, the existing mill (or concentrator) was rebuilt and greatly expanded. Second, the railroad built by the company in 1914 was upgraded from narrow gauge to standard gauge. And third, a state-of-the-art smelter was built on Magma property at the northwest edge of Superior. Together the expanded mill, the upgraded railroad, and the new smelter cost Magma more than four million dollars, a huge sum at the time. When the work was complete, the investment would triple Magma’s production of copper, and the Magma work force would increase to almost 700 men.

True to Thompson’s pledge to build the finest smelter in the world, Magma hired some of the most prominent names in the construction business for the project. The design of the smelter was the work of Bradley, Bruff and Labarthe, an engineering firm based in San Francisco that specialized in the design of mining operations around the West. The firm’s youngest partner, Jules Labarthe, was an expert in smelter design and was chiefly responsible for the Magma project. Labarthe had worked previously for Thompson on the design of a copper smelter at Mason Valley, Nevada, and he seems to have based his design of the Magma smelter partly on that earlier project.

For the earthmoving, site preparation, and concrete foundations of the smelter project, Magma hired Twohy Brothers of Portland, Oregon—the same firm that was already busy upgrading the narrow-gauge railroad. For the massive structural steel of the various smelter buildings, Magma contracted with the Kansas City Structural Steel Company of Kansas City, Missouri. For the 300-foot-
high Stack, Magma turned to the Alphons Custodis Chimney Construction Company of Chicago. The Custodis company was the leader in industrial chimney construction at the time and had already built hundreds of similar smokestacks at smelters around the world. The company used a design developed in the 1870s in Düsseldorf, Germany, by the company founder, Alphons Custodis. The characteristic feature of a Custodis chimney was the use of “perforated radial bricks” made especially for each chimney depending on its height, diameter, and requirements for heat resistance. For the Stack at Superior, Custodis used bricks made at a brick plant built by Magma next to the smelter site. The plant used clay from a quarry adjacent to the plant, and the same clay was used to make conventional bricks for the many brick buildings in the smelter complex. The plant also produced bricks for a range of new buildings going up in Superior, including residences, businesses, and schools. The same bricks were also used for a large winter home being built by Thompson at the same time as the smelter at Picketpost Mountain.

Construction of the smelter began in December 1922 and continued without interruption for 16 months. Once the concrete foundations were poured and the tracks were laid to connect the site to the company railroad, the steel frameworks of the largest smelter buildings were erected.
The core area of the Magma smelter on May 1, 1923 (top), and February 1, 1924 (bottom) (portions of two large panoramic photographs). Courtesy of the Superior Historical Society (Superior).
The progress of the project was followed closely in local and regional newspapers, and a professional photographer hired by Magma took panoramic views of the project on the first day of each month. The 300-foot-high Stack was the very last structure to be built.

In March 1924, the smelter was complete. The first charge of ore from the newly expanded mill was loaded into the reverberatory furnace. The first ingots of smelted copper were poured, cooled, and loaded onto railroad cars for the long trip to a refinery in Texas.

**Converting Ore to Copper**

The smelting process used by Magma at Superior was state of the art when the smelter began operation in 1924. By the time the smelter closed for good in 1971, it was an antiquated curiosity. Some of the men who worked at Magma’s Superior smelter when it closed transferred to jobs at the company’s smelter at San Manuel, Arizona, built in the 1950s. Today the men talk about the many differences between the two smelters—differences in work flow, mechanization, emissions control, and safety.

One of the most memorable of the many smelter processes at Superior, both for the men who worked at the smelter and the people who lived in the larger community, was the conversion process. It was the final stage at the smelter, when the molten copper drained from the reverberatory furnace was placed in large steel vats called converters, then blasted for hours with oxygen to burn off the remaining impurities. The resulting copper, which was 98 to 99 percent pure, was poured into a casting machine to make uniform slabs of copper called ingots or bullion. The ingots, each weighing about 300 pounds and cooled by sprayed water, dropped from the casting machine onto the loading dock at the far end of the converter building. The ingots were then carted by hand trucks onto a waiting rail car, to be shipped to a refinery in El Paso, Texas.

According to longtime Superior residents, the Magma operation as a whole, and the smelter in particular, produced a constant din of whistles, alarms, and machinery sounds. One sound in particular, often described as similar to the ringing of an enormous gong, would echo periodically from the converter building. It
The Magma Arizona Railroad

For the first five years of the Magma Copper Company, 1910 to 1914, the copper ore mined and milled at Superior was hauled by mule-drawn wagons to the Arizona Eastern Railroad at Florence, about 30 miles away. There the ore was loaded onto rail cars and hauled by train 50 miles up the Gila River valley to a smelter at Hayden. It was the expense of hauling by wagon that prompted Magma to build its own railroad to connect its mill directly with the Arizona Eastern. The narrow-gauge Magma Arizona Railroad was completed in 1914 and ran 28 miles from Superior to newly created Magma Junction on the Arizona Eastern, about 10 miles west of Florence.

The narrow-gauge Magma Arizona was a boon for Superior, both for the mine and for the growing town, but Magma quickly outgrew it, requiring even more rail capacity. In 1922, the same year that Magma rebuilt its ore mill and began construction of the smelter, the Magma Arizona Railroad was upgraded from narrow to standard gauge. The upgrade, which along much of the original line amounted to building an entirely new railroad, not only increased how much
ore the Magma trains could carry, it also eliminated many of the tight curves of the narrow-gauge line. This made it possible for the railroad to bring in the oversized structural steel needed for the largest smelter buildings.

During its first 55 years, the Magma Arizona Railroad used steam locomotives exclusively. It was one of the last commercial railroads in the United States to use steam power, and the change to diesel locomotives was not made until 1968. The old steam locomotives, which were featured in several Hollywood movies—most notably How the West Was Won (1962)—were sold as museum pieces or for use in park settings. The diesel engines of the Magma Arizona continued to haul copper ingots to the Arizona Eastern until 1971 when the smelter closed. After that, the railroad hauled concentrate from Superior to the Magma smelter at San Manuel, 60 miles away.

The Smelter Landscape

In addition to the major change that the Magma smelter brought to the mining operation, it also quickly became a symbol of Superior itself, viewed with pride by the community at large. The industrial-scale buildings and structures that stood at the northwest edge of town were a visual reminder of why Superior existed and the reason for its success. The 300-foot-high Stack could be seen from miles away, and its nearly constant emissions were long viewed by the people of Superior more with affection than concern.

Because of its size and its central role in the Magma operation, the presence of the smelter could be felt in almost every aspect of daily life in Superior. As one example, soon after the smelter was put into service, Superior High School began playing its football games on a field near the smelter, just north of the Harding Elementary School. The field was on Magma property and just south of the main slag area. It was a bare-bones facility: slightly off-level, without grass, without a grandstand or bleachers, and with the occasional cloud of emissions from the Stack. But the high school football team was the pride of Superior, and most local people considered the shortcomings of the field an important advantage for the home team.

By the 1960s, a different football field was being used, but it was also on Magma property and also close to the smelter. Some Superior residents today still remember watching Friday night games at the field and seeing hot slag from the reverberatory furnace being

Magma Arizona Railroad Engine No. 6 (steam), 1940s. Courtesy of the Superior Historical Society (Superior).
emptied onto the slag dump, glowing brightly in the darkness.

The landscape of Superior was the most visible evidence of how the economic fate of the town was tied to the Magma Copper Company. The mine shafts and their diverse equipment decorated the slopes above and east of town; an extensive area just below and west of the mines held the mill, tailings ponds, and administrative buildings; and the most prominent feature—the smelter—stood on the lowest and westernmost part of Magma property.

The smelter was taken out of service in 1971, when Magma decided that the cost of making needed upgrades to the complex, almost 50 years old by then, was too high. Magma continued to operate its mine and mill at Superior, but the milled ore was hauled 60 miles by rail to the smelter built by Magma in 1956 at San Manuel. Many of the buildings and structures of the original smelter complex were removed over the years, but the Stack and a group of large brick buildings at its base remained standing until 2018.
The Magma Copper Company smelter, 1940s. The smelter was the most prominent part of the built environment of Superior from its completion in 1924 until removal of its last buildings in 2018. The shorter 200-foot-high steel-pipe smokestack, shown here, was for an additional boiler built in 1929. Courtesy of the Superior Historical Society (Superior).

Preserving Smelter History

In 2018, Resolution Copper hired WestLand Resources to document the remaining buildings and structures of the Magma smelter as part of a larger effort to preserve its history. Environmental hazards, structural instability, and other safety concerns meant that the remaining components of the smelter complex could not be preserved. WestLand’s task was to record each building and structure in detail, taking photographs and preparing measured drawings, all to the standards of the Historic American Buildings Survey and the Historic American Engineering Record. WestLand’s work also included aerial drone still and video photography of the complex and the preparation of three-dimensional models of selected smelter buildings. Because some parts of the smelter complex were too hazardous to access directly, WestLand used the drone to take photographs of features that otherwise would have been left unexamined. The project also included archival research and oral-history interviews with

The mouth of the Stack viewed by aerial drone, February 2018. Photograph by WestLand Resources.
individuals who once worked at the smelter or lived in Superior when it was still in operation.

The architectural style of most of the smelter buildings still standing in 2018 was remarkably consistent. The designers were clearly concerned not only with building a functional smelting operation but also with creating an ensemble of brick buildings with an agreeable appearance, rather than being strictly utilitarian. Corbelled brick, on the outer walls of large buildings like the Power House, was also found on small buildings like the Engine House Restroom.

WestLand prepared a report on all aspects of the architectural documentation project, including the archival research and the oral-history interviews. The report is available for examination at the Superior Historical Society, where many of the early photographs, maps, and documents consulted for the project are housed. Although the Magma Copper Company smelter is no longer physically present, its many buildings and structures, as well as the sights and sounds associated with them, live on in the hearts and minds of the people of Superior.
Former smelter workers Albert Valenzuela, Virgil Zavala, and David Lira (left to right) gathered at the Superior Historical Society for interviews about smelter history, August 2018. Photograph by Jan Howard.

**Suggested Readings**


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*Front cover:* The Magma Copper Company smelter, 1940s. Courtesy of the Arizona Geological Survey (Tucson).

*Back cover:* The Stack, as seen from a footbridge in Superior, year uncertain. Courtesy of the Superior Historical Society (Superior).