



Arizona Department of Mines and Mineral Resources

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Arizona 2003 Mining Review Nyal Niemuth, Mining Engineer

At year's end the sun was once again shining brightly over Arizona as copper prices rose to levels not seen for nearly a decade. Preliminary data released by the USGS ranked Arizona third nationally in the value of mineral production, an improvement from fifth in 2002. Total value of non-fuel production was up \$2 billion to \$2.1. Although production fell slightly copper prices improved resulting in an increase in total value. The tonnage of sand and gravel (construction) produced ranked fourth in the U.S. Cement (portland) and molybdenum are the other top commodities by value. Arizona continues to rank first in value of mined gemstones.

Value Arizona of Mineral Production¹ (value in \$ 000)

Commodity	2001	2002 ⁴	2003 ⁴
Copper	1,490,000	1,260,000	1,390,000
Gemstone	1,610	1,640	na
Gold	W	1,270	na
S&G construction	288,000	294,000	319,000
Stone crushed	49,600	49,900	na
Combined values ²	343,000	321,000	na
Subtotal from USGS	\$2,170,000	\$1,928,000	\$2,100,000
Coal ³	322,000	307,000	na
Total	\$2,492,000	\$2,235,000	na

1. US Geological Survey (USGS) data except as noted; totals rounded to nearest million

2. Includes cement, clay, lime, gypsum, gold (in 01 and 03), molybdenum, perlite, salt, silver, dimension stone, zeolites, and iron oxides

3. Arizona Department of Mines and Mineral Resources value for coal

4. Unpublished USGS data, subject to change; official preliminary 2003 and final 2002 data will be published by the USGS in the Mineral Industry Survey, Arizona 2003 Annual Estimate.

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Copper

Arizona continued to be the number one copper state, accounting for 67% of U.S. production. 1.6 billion pounds were produced, a 3% drop. This eighth year of decline pushed output down to an amount last seen in 1984. Phelps Dodge's production in Arizona was up slightly while Asarco's Ray and Mission operations experienced significant declines.

There was strong evidence that the bearish copper cycle was ending. The U.S. producer cathode price averaged \$.85/lb. for the year, a 12% improvement over 2002. Copper prices reached a 2-year high by July and a 6-year high in November. At year's end prices exceeded a dollar and that trend continued strongly into 2004. Inventories fell sharply in response to production problems in Indonesia and elsewhere, along with strong economic activity in China. Use of copper there, a combination of internal consumption and export in manufactured goods, has made China the world's largest copper market, surpassing the U.S. for the first time. The weakening U.S. dollar also contributed to higher copper prices.

US and Arizona Copper Production and Prices

Year	US (metric ton)	Arizona (metric ton)	Arizona (billion lbs)	Change	Price ¹ cents/lb	Change
1999	1,600,000	1,050,000	2.314		75.9	
2000	1,440,000	963,000	2.123	-8%	88.1	16.1%
2001	1,340,000	885,000	1.951	-8%	77.0	-12.6%
2002	1,140,000	767,000	1.691	-13.3%	75.8	-1.6%

2003	1,110,000	741,000	1.634	-3.3%	85.25	12.4%
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Source: USGS production data

1. Metals Week US Copper Cathode Producer

Phelps Dodge produced over 75% of Arizona's copper in 2003. Improved copper prices were largely responsible for returning PD to profitability for the year and justified plans announced, in early 2004, to return two Arizona mines to full production. The company had more good news in December with the release of the Final EIS for the Safford project.

Morenci continued to be Arizona's largest copper mine and for the first time produced over half of the state's total. The all-leach operation recovered 842 million pounds in 2003. This was despite a fire during October that damaged the Metcalf solvent extraction plant, one of the mine's four SX plants.

In the first quarter the company successfully commissioned the first-of-its-kind high-temperature and pressure concentrate leach plant at Bagdad. The \$40 million plant and EW expansion quickly achieved design capacity. The leach vessel demonstrated copper recovery exceeding 98.5% and averaged 85% availability during the year. The plant has an annual capacity to produce 35 million pounds of copper turning 15% of Bagdad's chalcopyrite concentrate production into copper cathodes. The plant also recovers 140 tons of sulfuric acid per day that is beneficially used in the oxide leach.

At year's end Bagdad was operating at about 75% of capacity but by the second quarter 2004 would return to full capacity. Sierrita is targeting to do the same by the fourth quarter. Both mines had seen output cut to half capacity since 2002. Bagdad had been adding workers in 2003 and Sierrita is expected to add 100 miners during 2004. Although the doubling in molybdenum oxide prices over the last two years is helping Sierrita, its molybdenum grade is forecast to fall in 2005.

In December the BLM released the Final EIS for the Safford copper project. It covers two open pit mines, Dos Pobres and San Juan, and one giant heap leach the project that is expected to produce 250 million pounds annually by SX-EW when built. The two deposits are reported to contain over 500 million tons of oxide ore averaging nearly 0.4% copper. The operation plans to place mined material in a retreat-stacking method, unlike the advance stacking in use at Morenci, to avoid compaction. The single-lined leach pad will be the largest in the world at about 900 acres – nearly 1.5 square miles. The world's longest stackers, 100 yards, will be used to load it.

Construction is planned for 2005 – 2007 and production will hopefully begin sometime in 2007 – 2009. An average of 450 construction workers will be needed on the 18-month construction period and the mine will employ 350 people for approximately 16 years. When completed it will be an economic boon to Graham County as well as the State. The mine will generate an estimated \$151 million in state and local taxes and \$213.1 million in wages to employees.

The FEIS' preferred alternative includes a land exchange where Phelps Dodge receives land near the operation and BLM receives lands with other significant resource values including: Tasasci Marsh adjacent to Tuzigoot National Monument, and private in holdings in the Gila Box Riparian and Las Cienegas National Conservation areas and parcels that provide access to the Dos Cabezas wilderness. Safford became home to Phelps Dodge Mining Company offices during the year, joining the company's process technology center already in operation there.

In January Asarco and the Department of Justice reached agreement allowing the sale of Asarco's 54% share of Southern Peru Copper Corp. to Grupo Mexico's Americas Mining Corp. for \$765 million on March 31. The sale strengthened Asarco's financial situation by cutting Asarco's net debt to \$226 million, a 77% reduction of overall debt and canceled 100% of short-term debt. The agreement also calls for Asarco to fund a \$100 million trust for environmental cleanup in Arizona and other states.

Asarco operations withstood a tough economic year amid a further production drop of 27%. Mission mine production declined due to the closure of the underground portion of the mine and a temporary closure of the open pit. These cutbacks dropped output to 25% the level of 5 years ago. The company considered closing the mine in the late fall but rising copper prices made that choice unnecessary. Ray's output was off over 100 million pounds, a 29% drop from last year's record level. Both operations continued to suffer from the low copper prices and deferred investment. Asarco's Silver Bell was an exception to this trend, seeing an increase of over 6 million pounds to 48.6, its largest since being reborn

as an SX-EW producer in 1997. In the first quarter of 2004 Grupo Mexico announced plans to increase production from 70% to 100% at Ray and also increase output at Mission. To do so his will require a reduction of the stripping backlog that makes it difficult to increase production rapidly.

Early in 2004 Rio Tinto announced it had earned a 55% interest in the Resolution copper project near Superior by spending the required \$25 million. BHP-Billiton retains a 45% stake. Estimated reserves of at least 1 billion tons at 1.5% were reported, making it one of richest and largest copper discoveries in Arizona. Preliminary plans are to develop the deposit by block caving.

Unfortunately, the axe had fallen too swiftly on BHP-Billiton's San Manuel mine. With headframes gone, shafts backfilled and the pumps off, the mine was precluded from a restart and participating in the copper price recovery. The San Manuel smelter, the largest and most modern in the U.S. and once thought to be the best part of the Magma purchase, has failed to attract any buyers at the purported asking price of \$500 million. Lack of nearby concentrates is possibly to blame. Late in the year the permanent closure of the concentrator, smelter and refinery complex was announced. Baring any last minute sale, reclamation will begin in 2004 and continue during for 5-7 years at a cost likely to exceed \$100 million. All of the site's approximately 500 buildings including the two 300-foot tall smelter stacks will be removed.

Arizona Copper Production – 1999-2003

Cu (million lb.)

Mine, Company	2003	2002	2001	2000	1999
Morenci, Phelps Dodge and Sumitomo	842.4	825.4	783.2	834	960
Ray, Asarco	272.0	382.1	352.5	304	318
Bagdad, PD (Cyprus pre 2000) ¹	214.0	168.0	257.2	247	211.2
Sierrita, PD (Cyprus pre 2000) ¹	151.2	152.4	241.8	245	204.5
Mission, Asarco	51.6	80.7	138.9	189	200
Silver Bell, Asarco and Mitsui	48.6	45.0	41.9	40	46
Miami, PD (Cyprus pre 2000) ¹	35.6	21.0	88.2	137	124.2
Pinto Valley, BHP	22.0	25.1	32.0	38	na
Mineral Park, Mercator ^{2,3}	2.9	3.1	3.6	5.0	na
San Manuel, BHP	0	4.0	20.5	23	na
Total	1,640.3	1,706.8	1,959.8	2,062	~2,300

Data from company annual reports, form 10-ks, etc.

1. Production data for Oct. 1-15, 1999 is unreported.

2. Equatorial prior to June 2003.

3. ADMMR 2003 production estimate based on quarters 1-3.

Mercator Minerals Ltd. acquired the Mineral Park mine in June from Equatorial. It plans to expand production to an 11 million pounds annual rate from the current 3 by mining new material for the leach operation. In a rare win-win situation, Red Mountain Mining is quarrying and selling crushed stone from Mineral Park that otherwise would have to be removed as waste.

No construction announcements have been made but it was reported that Cambior and BHP-Billiton have discussed use of Pinto Valley's SX-EW plant and other facilities as a possible means to save time and reduce capital expenditures for the Carlota mine.

There was renewed exploration interest shown by majors Kennecott and Teck-Cominco along with number of juniors companies. CastleRock Resources optioned the Dover property adjacent to the Morenci mine from Dover Copper Mining Company. Nord Resources announced plans to raise \$20 million to restart Johnson Camp and also acquired the Coyote Springs prospect in the Safford district. General Minerals was active east of Ray with a porphyry copper target at the Monitor mine.

Other metals

Rising gold prices and the availability of funding contributed to the renewal of precious metal exploration in Arizona. American Bonanza continued exploration work at Copperstone. It completed drifting to the "D" zone in early 2003 and reporting multi-ounce gold grades in underground samples

taken there. Throughout the year the company intersected significant gold zones from a 9,000' drill program to develop reserves. Abington Ventures reported positive intercepts from a 6-hole surface core drilling program confirming a high-grade gold vein at the Verdstone's 3 West zone in northern Yuma County. The property was last operated in the mid-1990's. Other junior companies were also active. Odessa Gold conducted 3,000' of drilling north of Kingman near the Golconda mine. Patriot Gold reported signing a letter of intent to purchase the Moss property 5 miles northwest of Oatman. The mine received 36,000' of drilling in late 1980s and early 1990s as well as pre-feasibility study.

North Star Steel closed its Kingman steel plant in March. The 5 year old plant, with a 650,000 ton capacity, made reinforcing bars and other products. Nucor, the nation's largest steel producer, purchased it for \$35 million, but reopening the plant will require finding a low-cost source of electricity.

Industrial minerals

The residential construction market in Arizona continued very strong helped by record-low interest rates. Growth and construction in the northwest portion of metro Phoenix has led to numerous new sand and gravels operations. These include five operators in the Calderwood Butte area along the Agua Fria River north of Sun City: Rinker, Chandler RediMix, Nu West Materials; South West Sand and Gravel and Cemex.

Rinker Materials reported buying two operations during 2003 from Superstition Crushing. The properties were sand and gravel operations located at 59th and Southern Avenues in Phoenix and at 339th Avenue and the Hassayampa River west of Buckeye. An innovative expansion was accomplished by Rinker Materials purchasing a golf course adjacent to their Cortaro plant and pit north of Tucson in Marana. Creating a new 9-hole golf course in the depleted pit area allowed the sand and gravel resource to be increased by 100 acres while continuing to provide the public with an 18-hole golf course.

In the spring of 2003 Rockland Materials filed for reorganization under Chapter 7 of the Federal Bankruptcy laws. For the prior year Rockland's revenue was in the \$40 million range and had 200 employees. The assets and operations of Rockland Materials were put up for auction in December of 2003 and sold to Arizona Materials, LLC on February 18, 2004 for \$8 million. The sale included what had been known as Rockland's Main Plant #1, Salt River Pit and Buckeye State Route 85 Plant #4. Rockland's leases on aggregate deposits in Chino Valley reverted to their owners.

Rockland's plans for a new cement plant were also affected. ARPL Tecnologia Industrial, S.A. (parent of Peruvian Cementos Lima) purchased Stirling Bridge Cement, LLC in the spring of 2003 and formed a new Arizona company, Drake Cement, LLC. The Yavapai-Apache Nation holds a small investment position in the new company. Stirling Bridge had acquired land and mining claims north of Prescott near Drake, and was in the design and permitting stage to develop the Cedar Glade limestone quarry and construct a 350,000-ton per year cement plant. Drake Cement has increased the design capacity of the project to 650,000 tons of Type II and Type V Portland cement annually. Expectations are for construction of the \$130 million project to begin in March of 2005 and production of cement to commence in March of 2007. The new company seeks additional U.S. partners for the project.

Therm-O-Rock West Inc. began producing perlite microspheres at its Chandler plant for customers of Basin Perlite. Perlite from Basin's Utah mine is processed under a toll agreement and shipped to joint compound manufacturers in Arizona, Mexico, and Malaysia.

The Federal Energy Regulatory Commission denied an Aquila subsidiary's application for the proposed underground gas storage facility to be located at Red Lake 30 miles north of Kingman. The commission was in favor of development of natural gas infrastructure, but rejected the project's request to proceed using market-based pricing. El Paso Natural Gas pursued another gas storage facility to be developed in the Luke salt dome northwest of Phoenix. The project was purchased in mid-year from subsidiaries of Pinnacle West, Gaz de France and Gulf Terra Energy Partners. Plans for Copper Eagle proceeded but drew concern due to its proximity to Luke Air Force base. The project's proposed 9.6 billion cubic feet storage capacity would provide reserve supplies for the numerous natural gas powered electrical generation plants in the Phoenix area.

Government News

The Arizona Dept. of Mines and Mineral Resources posted two reports on its website www.admmr.state.az.us that are now among the most frequently downloaded.

The first is a BLM mineral report entitled *Results of Analyses of Standard and Blank Samples Tested at Selected Assay Laboratories in North America*. In the survey, standards and blanks for gold, silver, platinum and palladium were sent to 65 North American laboratories that perform assays for the general public. The survey lists the name and location of each laboratory tested, with results of the tests.

The BLM's National Training Center in Phoenix implemented the survey because of Public Land administration problems caused by inaccurate or non-reproducible precious metal assays.

Arizona Mining Scams and Unassayable Ore Projects of the Late 20th Century is the other popular download. In this report W. Scott Donaldson, a Phoenix mining attorney, provides details from a number of Arizona cases. He characterizes most 1980s schemes as "desert dirt" ventures with little evidence offered to explain why precious metals were present. In the 1990s a more sophisticated approach of unassayable gold and platinum group metals came into vogue where it was argued that a particular "ore" was not amenable to conventional fire assaying.

The future use of State trust lands continues to be an issue. Conflicts resulting from the constitutionally mandated revenue maximizing uses and pressure from urban sprawl resulting in a desire for preservation have a variety of groups lobbying for change and designating their "favorite" lands. Opportunities, especially related to industrial minerals, may result if the state constitution is changed. State Trust Land Reform Proposal draft maps Incentive and Option lands are viewable at www.land.state.az.us.