

## Arizona Mining Update – 2007

Circular 129, June 2008

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*Strong demand for copper in developing nations such as China and India, plus the additional demand for industrial minerals to supply the construction market in this growth state, brought about a record-setting year for Arizona's mining industry. The value of Arizona's copper production set a new high of \$5.5 billion and pushed the total value of mineral production to \$7.58 billion! This is also a record. As it has for many years, Arizona ranked first in nonfuel mineral production in the U.S. In addition to leading the Nation in copper, Arizona ranks in the top five in molybdenum, sand and gravel, gemstones, perlite, silver, zeolites, and pumice. Generally strong and rising prices, especially toward year's end, fostered a bullish atmosphere that encouraged significant levels of acquisition and exploration. This activity has spread far beyond the normal commodities to include some, such as manganese and fluorspar, which have not been mined in Arizona for decades!*

Commodity	2005 Value <sup>3</sup>	2006 Value <sup>3</sup>	2007 Value <sup>3</sup>
<b>Clay (bentonite)</b>	na	\$1,710,000	\$1,730,000
<b>Copper</b>	\$2,640,000,000	4,950,000,000	5,540,000,000
<b>Gemstones</b>	1,370,000	1,560,000	1,580,000
<b>Sand &amp; gravel</b>	516,000,000	662,000,000	597,000,000
<b>Stone, crushed</b>	69,300,000	102,000,000	116,000,000
<b>Other<sup>1</sup></b>	1,120,000,000	1,040,000,000	1,120,000,000
<b>Coal<sup>2</sup></b>	290,000,000	190,000,000	200,000,000
<b>Total</b>	<b>\$4,640,000,000</b>	<b>\$6,940,000,000</b>	<b>\$7,580,000,000</b>

1) Includes cement, clay, lime, gypsum, gold, molybdenum, perlite, pumice, silver, salt, dimension stone, and zeolites.

2) Arizona Department of Mines and Mineral Resources value for coal.

3) Unpublished U.S. Geological Survey (USGS) data, subject to change; data rounded and may not add to totals shown, final 2005 - 2007 data will be published in the Arizona Chapter of the USGS Mineral Yearbook, Area Reports: Domestic 2005 - 2007, volume II.

### Copper and Molybdenum

Copper prices that averaged a record \$3.28 per pound in 2007 resulted in a production value of \$5.5 billion in Arizona. Continued strong demand and high prices are driving exploration and development activity to the highest level in many years. In 2007, Arizona accounted for over 60 percent of the U.S. domestic copper production. The copper industry had a \$4.7 billion direct and indirect impact on the Arizona economy in 2006 and will probably have similar high impact when 2007 figures are released. Production increased only slightly in 2007, but 2008 should see a large increase. Two new projects, Mercator and Carlota, will be completed, while Safford and Pinto Valley, with minor contributions for 2007, will contribute for the whole year.

Byproducts of mining porphyry copper deposits continue to be significant, accounting for all of Arizona's gold, silver, and molybdenum production. The average price for molybdenum oxide in 2007 was \$29.91 per pound, an increase of 22 percent over 2006.

### U.S. and Arizona Copper Production and Prices

Year	U.S. (metric ton)	Arizona (metric ton)	Arizona (billion lbs)	Change	Price cents/lb*	Change
2003	1,130,000	741,000	1.630	-3.3%	85.25	12.4%
2004	1,170,000	723,000	1.590	-2.5%	133.94	57.1%
2005	1,140,000	691,000	1.520	-4.4%	173.49	29.5%
2006	1,200,000	713,000	1.570	5.7%	314.75	81.9%
2007	1,190,000	750,000	1.650	5.3%	328.00	4.2%

Source: USGS production data

\*Metals Week U.S. Copper Cathode Producer

#### Freeport McMoRan

In March 2007 Freeport McMoRan Copper and Gold (FCX) completed its acquisition of Phelps Dodge. The \$26 billion merger created the world's largest publicly-traded copper company. Freeport McMoRan moved its headquarters from New Orleans to the former Phelps Dodge offices in Phoenix.

At Morenci, by far Arizona's largest mine, Freeport McMoRan and Sumitomo completed a \$241 million investment to build the first commercial-scale copper concentrate pressure leach operation. Two leach vessels have been installed and began commissioning during the second half of the year. Morenci resumed concentration to supply feed to the new plants during 2006 and production is ramping up to 54k tpd capacity. Production of copper cathodes will be via electrowinning solutions from the new plants and continued feed from heap and dump leaches. Production was 808 million lbs in 2007, nearly half of Arizona's total. The mine fleet currently has 115 260-ton capacity trucks, however an additional \$100 million will be invested in 2008 to expand the mining fleet and add EW capacity, increasing production capacity by 100 million lbs per year.

Freeport McMoRan also operates Bagdad and Sierrita, the state's third and fourth largest copper mines, both recover large amounts of byproduct molybdenum. In 2007, Bagdad produced 202 million pounds of copper and about 10 million pounds of molybdenum. In December plans were announced to convert the pioneering copper concentrator pressure leach facility to process molybdenum concentrates by 2010. That is expected to increase Freeport McMoRan's annual molybdenum processing capacity by approximately 20 million pounds. The changes will allow the plant to convert 4 tons per hour of molybdenum sulfide concentrate into molybdenum trioxide and a solution extraction system will produce a rhenium solution byproduct. Sierrita, with Arizona's largest mill capacity of 112,000 tpd, produced 150 million pounds of copper and an estimated 20 million pounds of molybdenum. The facilities at Sierrita include two molybdenum roasters, a rhenium processing facility, as well as a copper sul-

fate plant. Incremental expansions have been announced for both mines. At Bagdad a \$110 million 21k tpd mill expansion is expected to increase annual copper production by 55 million pounds starting in 2009, while at Sierrita a \$160 million 16k tpd mill expansion is expected to increase annual copper production by 25 million pounds starting in 2010.

At Freeport McMoRan's Safford project in Graham County, expenditures of \$675 million were required to construct the giant leach pad, associated SX-EW plant, and for development of the Dos Pobres pit. The crushing facility has a design rate of 114,000 tpd while mining capacity is 314,000 tpd. While construction continued, and despite the worker and housing shortages experienced, the first cathode production was reached ahead of schedule in December 2007. This marks the first major new copper mine to start in Arizona since the San Manuel open pit, heap leach operation began in 1985. Production should increase to design capacity over the next 6 months. An 18-year life is expected for the Dos Pobres and San Juan deposits combined 538-million tons that contain 0.37percent of oxide copper. Freeport expects to spend \$70 million on exploration, primarily at Lone Star in the Safford district and Morenci in 2008.

At Miami, residual leach production was 20 million pounds. The restart of mining there has been delayed until 2010 with the planned expansions by Freeport McMoRan elsewhere in Arizona. Capital investment is expected to be approximately \$100 million, primarily for mining equipment. During the project's 5-year life it should produce 100 million pounds of copper per year.

#### Asarco LLC

Asarco has continued operations of its Arizona properties under the protection of the U.S. Bankruptcy Court. Asarco owns three copper mines in Arizona, Ray, Mission, and Silver Bell, as well as copper smelting operations at Hayden. The company filed for bankruptcy protection in 2005 under the weight of massive debt and environmental cleanups and asbestos liability claims. Asarco's three mines produced nearly 400 million pounds of copper last year, including Mitsui's share of Silver Bell, and are

hoping to produce 500 million pounds in 2008. At year's end Asarco had accumulated more than \$950 million in cash. In early 2008 Asarco announced plans to sell its assets as part of a bankruptcy exit plan that would pay creditors claiming to be owed \$13.5 billion.

Ray produced 229 million lbs of copper in 2007. A new \$46 million in-pit crusher and conveying system will be installed and should be completed by the end of the first quarter 2009. The mine received five new Liebherr T282B 400-ton trucks last year, the largest operating in Arizona. Asarco plans to purchase 20 of these trucks over a 5-year period. Total cost of the trucks will be \$81 million, or about \$4 million each. The price is without tires, which currently cost about \$35,000 each!

At Mission copper production increased 28 percent to 121 million lbs and the byproduct molybdenum concentration circuit was in operation for the entire year. An SX-EW expansion was studied for the Silver Bell mine where production exceeded 46 million pounds. The Number 2 dump leach project was approved at year's end and production is expected to increase by 5 percent.

#### BHP

BHP resumed mining at Pinto Valley in October 2007 following an investment of \$140 million to rehabilitate the 75k tpd sulfide concentrator. A \$300 million contract was issued to the Washington Group to finish mining the slice 6 pushback that contains 85 million tons of mill ore at 0.41 percent Cu plus Mo and 37 million tons of 0.21 percent Cu leach material. Additional resources could be mined

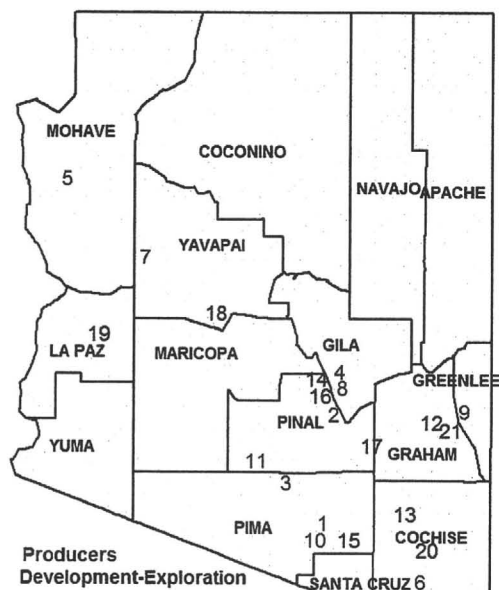
from pushback slices 7 and 8 depending on copper prices. The Pinto Valley Division produced 27.6 million lbs of copper in 2007 including ongoing leach operations and 150 million lbs is forecast for 2008.

#### Mercator Minerals

Mercator Minerals' Mineral Park mine produced 11 million lbs of copper from SX-EW leach operations in 2007. Construction is underway on a flotation mill that will produce copper-silver and molybdenum concentrates that will greatly increase production. Mercator expects that concentrate recovery will commence by June 2008 at 25k tpd operation. Full production capacity of 50k tpd is expected to be reached 9 months later. An annual production rate of 56 million lbs of copper, 10 million lbs of molybdenum and 600,000 ounces of silver is anticipated. Mill and leach reserves of 430 million tons are expected to provide for a 21-year mine life.

#### Nord Resources

Nord began residual leaching of existing heaps at Johnson Camp in November 2007 and announced the first copper cathodes had been harvested in January 2008. Nord anticipates that copper production from newly-mined ore will add an additional 14 to 20 weeks to their forecast production schedule, subject to the timing of the receipt of an air quality permit. Copper production in 2008 is forecast to be about 4 million lbs. Nord hopes to reach the full production rate of 25 million lbs per year by early 2009.



#### Copper mines 2007

##### Producers

- 1) Mission - Asarco
- 2) Ray - Asarco
- 3) Silver Bell - Asarco / Mitsui
- 4) Pinto Valley - BHP Copper
- 5) Mineral Park - Mercator Minerals
- 6) Bisbee - FCX
- 7) Bagdad - FCX
- 8) Miami - FCX
- 9) Morenci - FCX /Sumitomo
- 10) Sierrita - FCX
- 11) Tohono - FCX
- 12) Safford -FCX \*

##### Development & Exploration

- 13) Johnson Camp - Nord\*
- 14) Carlota - Quadra
- 15) Rosemont - Augusta
- 16) Resolution - Rio Tinto/BHP
- 17) Copper Creek - Redhawk; Bell Res.
- 18) Sheep Mtn - Lebon Gold; Lone Tree
- 19) Yuma King - Big Bar Gold
- 20) Turquoise Dist. Aurelio
- 21) Lone Star - FCX; Red Knoll - Franconia;
- Coyote Springs - Nord; Markham Wash -
- High Desert Res.Sol Dos - Entrée Gold

\* reached production at year's end.

#### Development and Exploration

At Quadra's Carlota mine, primary access and haul roads have been completed and work is progressing on SX-EW platform concrete work, pre-production mining activities and development of the leach pad grading and drainage. Quadra has expended about \$93 million of an estimated \$218 million to complete construction of the 75 million lbs per year capacity open pit, leach operation. SX-EW plant construction, leach pad liner placement, and pre-production mining activities continue. Quadra anticipates commencement of copper production in the second half of 2008. Resolution Copper's proposed land exchange suffered a setback when the U.S. Representative who sponsored the bill was indicted by a federal grand jury in early 2008. Rep. Ed Pastor has replaced Rep. Rick Renzi as sponsor of the Southeastern Arizona Land Exchange and Conservation Act. Hearings have been held in the House Natural Resources subcommittee. Sen. Jon Kyl has authored a parallel bill in the Senate.

The Resolution deposit, with its huge size and high primary grades, would result in the largest copper mine in Arizona. Resolution Copper (Rio Tinto 55 percent/BHP-Billiton 45 percent JV) is prepared to spend \$3.5 billion on development before any ore

is extracted. To date, Resolution has spent \$250 million planning, engineering and buying land for the stalled trade. The delay is forcing suspension of underground development work and planned shaft sinking, and the layoff of recently trained underground miners.

In July, Augusta filed a Plan of Operations for the Rosemont project with the U.S. Forest Service. The planned project will produce 230 million pounds of copper per year for at least 20 years and provide employment for 500 workers and at least 1000 indirect jobs. The main Rosemont porphyry skarn occurrence has 543 million tons with a 0.75 percent Cu equivalent grade. The company acquired rights to use Central Arizona Project water for the project and has stored 15,000 acre feet of water, a 3-year supply for operation of the mine.

Ascendant Copper signed an agreement to acquire St. Geneviève Resources Ltd. who hold two past-producing properties Zonia and Emerald Isle.

### Arizona Copper Mine Production 2003 – 2007

Cu (million lb)

Mine, Company	2003	2004	2005	2006	2007
Morenci, Freeport McMoRan <sup>2</sup> and Sumitomo	842.4	840.6	800.0	815.6	808.0
Ray, Asarco	272.0	241.2	225.1	232.9	228.9
Bagdad, Freeport McMoRan <sup>2</sup>	214.0	220.2	201.2	165.4	202.0
Sierrita, Freeport McMoRan <sup>2</sup>	151.2	155.0	158.6	161.6	150.0
Mission, Asarco	51.6	54.0	38.2	95.6	121.3
Silver Bell, Asarco and Mitsui	48.6	47.5	47.7	46.9	46.7
Pinto Valley, BHP	22.0	20.3	19.4	18.1	27.6
Miami, Freeport McMoRan <sup>2</sup>	35.6	19.6	24.6	19.0	20.0
Mineral Park, Mercator <sup>1</sup>	3.2	3.7	6.4	9.5	11.2
Tohono, Freeport McMoRan <sup>2</sup>	0	0	5	5.2	3.0
Safford, Freeport McMoRan <sup>2</sup>	0	0	0	0	1.0
<b>Total</b>	<b>1,640.6</b>	<b>1,602.1</b>	<b>1,526.2</b>	<b>1,569.8</b>	<b>1,619.7</b>

Data from company annual reports, form 10-ks, and personal communication.

1. Equatorial prior to June 2003.

2. Phelps Dodge prior to March 2007.

Exploration drilling occurred on many projects with large footages drilled despite widespread complaints about difficulty in obtaining a drill rig and contractor. All this activity has overwhelmed the assay labs and many projects have yet to report results.

Aurelio Resource continued assembling property and gathering historic data and drill core for its Hill Copper Zinc project in the Turquoise district. Three drill-indicated mineralized areas have been identi-

fied. These include the MAN area where historic drilling has an inferred resource of 64 million tons with grade of 0.56 of copper equivalent; the Courtland area to the north that received drilling during 2006 and 2007; and the South Courtland area where 29 holes drilled in 2007 identified an area of zinc mineralization not previously recognized. A 50,000-foot, two-phase core drilling program is planned to acquire data to complete a feasibility study in 2009.



Redhawk Resources is exploring the Keel and American Eagle deposits in the Copper Creek district. Phase I drilling started in September 2006 and was completed in late 2007. Significant copper grades were encountered in a number of the core holes of its 15,000-foot drill program. The program was designed to expand and upgrade resources in the Mammoth Breccia and test other breccia bodies where historical drilling contained potential "ore grade" intercepts. Phase II commenced near year's end and includes a 70,000-foot drilling program to confirm and expand the American Eagle resources. It also will attempt to connect the Keel zone with the American Eagle, and drill some of the breccia targets near the proposed exploration decline. Phase II also includes metallurgical testing, continued environmental work, hydrologic studies, and ground water monitoring. All work will lead to an updated resource study and a scoping study to be completed before the end of 2008.

Also at the Copper Creek district, Bell Resources Corporation completed their Phase II drill program comprised of 12 drill holes at Sombrero Butte, a breccia pipe deposit with a suspected underlying porphyry copper system. Assay results should be announced in early 2008, Bell has plans to initiate Phase III drilling.

At Bell's Kabba project in Mohave County, the Phase I drill program followed up geophysical studies that targeted a suspected down-faulted copper-molybdenum porphyry system. Four diamond holes totaling 3,630 meters were completed in November. The holes showed indications of proximity to a mineralized system including interceptions of thick alteration and in-hole K-4 porphyritic dikes and anomalously mineralized veins. A new site, 1.2 kilometers east of the porphyry dike swarm encountered in drill hole K-4, has been selected to be drill tested.

In April, Bell announced that it had entered into an alliance with Bronco Creek Exploration to explore four properties; Mesa West, Red Hills, Silver Bell West and Superior West. A drilling program was begun at Mesa West to test a magnetic anomaly below gravel cover. Red Hills, based on previous exploration, has been reported to contain 500 million tons at 0.1 percent of copper oxides. Structural reinterpretation and geophysics suggests rotation of the deposit. Deeper portions of the system will be drill tested. Work at Silver Bell West is focusing on mapping and geochemical sampling to identify porphyry/skarn targets hosted in Paleozoic rocks below Mesozoic volcanics. Permitting is underway for a 2008 drill program. At Superior West there are two target types, the down-dropped extension of the

high-grade Magma vein system and the suspected deep-seated porphyry copper source for the vein mineralization. Drilling is scheduled to begin in the 1st quarter of 2008.

Big Bar Gold completed four drill holes in late 2007 on the Troy Ranch prospect east of the Ray mine where it has earned a 51 percent interest in a joint venture with Freeport McMoRan. Numerous intercepts of copper and molybdenum mineralization were encountered along with long potassic-altered intervals coincident with an AMT geophysical target. Big Bar also was active at Yuma King where step out drilling resulted in the discovery of a porphyry copper system with significant molybdenum values in a Jurassic age thrust fault complex. Favorable geology continues to the northeast and southeast that remains to be tested.

Lebon Gold Mines controls a second area of mineralization west of Sheep Mountain. A three-hole drill program totaling 2,026 feet found significant thicknesses of copper oxide mineralization in 2007. The holes however failed to reach to the redox boundary where historic reports of higher grades of chalcocite up to 0.8 percent copper had been reported. The company is debating further solo work or opting for a joint venture partner.

Black Pearl Minerals Consolidated completed a Phase I drilling program on the Four Metals breccia pipe in 2007. The seven-hole drilling program totaled 996 meters. It confirmed historic grades while adding width and depth to the south and east sides of the deposit. Permitting is underway for additional drilling.

In addition to Freeport, four other groups were exploring in the Safford district. Franconia Minerals announced the core-drilling program at Red Knoll in Graham County confirmed that the property has widespread potential host rocks for porphyry copper mineralization at reasonable depth. Three holes were completed in 2007. Hole RK-4 intersected Laramide meta-volcanics displaying intense phyllic alteration, 1-3 percent pyrite and anomalous copper values from 979 to 2,456 feet. Follow up geophysics and further drilling is planned. High Desert Gold (previously General Minerals/Sprott Resources) reported in November 2007 that two 600-meter drill holes were completed at the Markham Wash property optioned by Teck Cominco. Assay results are pending. Nord Resources completed IP and resistivity geophysical surveys in early 2007 on Coyote Springs. A drill program was planned to test anomalous IP values. Entrée Gold began to test an IP anomaly on its Sol Dos property with a 6,550-foot drill program planned. Entrée Gold also entered into an agreement with Empirical Discovery LLC to

explore for additional porphyry copper targets in southeastern Arizona.

Lone Tree Exploration LLC has acquired the partially delineated copper molybdenum deposit at Sheep Mountain and assembled historic exploration data. The property has had 56 core and rotary holes drilled totaling 75,000 feet. A 2007 preliminary feasibility study on only the supergene portion of the deposit concluded an 8-10k tpd operation could generate a 28 percent rate of return at \$1.50 per lb copper and \$12 per lb molybdenum.

American Copper announced it will drill in early 2008 at its Squaw Creek project located 70 miles north of Phoenix. The initial core-drilling program is targeting high-grade copper/molybdenum veins and stock works last mined in the 1940s. The company plans to drill approximately 5,000 feet in 10 to 15 holes.

Teryl Resources reported in early 2008 that five reverse circulation drill holes had been completed on four separate copper targets on the patented Gold Hill property southeast of Bisbee. The highest grade interception was at a depth of 275-280 with 4.84 percent copper reported.

## Uranium

Uranium spot prices softened to \$70 at year's end but remained 10 times the price of 5 years ago. That strength, along with the knowledge that plants under construction in Asia will create strong future demand, supported continued high levels of exploration activity in Arizona, particularly for high grade (over 0.5 percent  $U_3O_8$ ) collapse breccia pipes.

### Colorado Plateau

In February Denison Mines acquired five deposits on the Arizona Strip from Pathfinder Mines, a subsidiary of Avrea, for \$5.5 million cash plus a 1 percent yellowcake royalty and a commitment to sell Avrea 6.5 million pounds of  $U_3O_8$  per a sale and price agreement. Included properties were the EZ1, EZ2, DB and WHAT breccia pipes and the Moonshine Springs deposit hosted in the Chinle Formation. The deposits contain an estimated 7 million pounds of uranium.

Denison reported that Redpath Corp. was engaged as mining contractor to resume development work on the Arizona 1 mine that contains an inferred resource 0.96 million pounds  $U_3O_8$ . Rehabilitation and deepening of the shaft continued for most of the year; work has now shifted to mine development. The mine is substantially permitted and production is expected to begin during mid-2008. In July, the company announced an ore buying program to provide supplemental feed for its White Mesa mill at Blanding, Utah.

Dumont Nickel (aka Red Butte Uranium) acquired 132 unpatented mining claims mid-year, and in the fall, field work identified five possible breccia pipe targets.

In June, Energy Fuels began drilling the Weap pipe and formed a joint venture with Mesa Uranium acquiring 13 Arizona State sections in Mohave and Coconino Counties. These holdings are in addition to the 25 pipe targets in the High Plains joint venture formed in 2006. Five of those targets are confirmed breccia pipes based on historical data from prior drilling.

Eagle Hill Exploration reported in December it was negotiating two separate agreements to acquire the Rimshot and Lombardo properties totaling 469 claims, plus five Arizona State section leases that include 157 breccia pipe targets.

Liberty Star Uranium and Metals conducted extensive geochemical sampling across hundreds of breccia pipe targets, and detailed sampling and mapping on 110. During the year the company drilled with joint venture partner XState Resources on the Elle pipe area. Drilling was underway on the Neola pipe, with three other high priority targets scheduled to be drilled in 2008.

Mesa Uranium acquired the Moonshine Springs project a mile from Denison's Moonshine Springs deposit. Later it drilled two holes that confirmed previous Exxon intercepts of 6 feet grading 0.40 percent  $U_3O_8$ .

Monster Uranium (formerly VMX Resources) acquired an option on three uranium properties including the Rose breccia pipe from Energy Metals (now Uranium One). Historic drill data on the Rose pipe shows an intercept of 11 feet of 1.0 percent  $U_3O_8$ .

Vane drilled a number of pipes beginning in January, finding mineralization in the Miller, Miller SW, Big Red, and Red Dike pipes. Work on its land package increased the number of identified breccia targets to 39.

Quatara in early 2007, contracted Geotech Ltd. to conduct the first extensive test of an airborne time-domain electromagnetic system on the Arizona Strip to identify mineralized collapse structures. The VTEM system has identified anomalies related to collapse structures in a majority of the known breccia pipes as well as 200 additional anomalies with similar geophysical signatures.

Takara Resources and DIR Exploration's Kaibab Joint Venture project hold seven drill-ready breccia pipe targets discovered as a result of previous geophysical and geochemical surveys. The group increased its land position by staking in 2007 to acquire a total of 221 breccia pipe targets.

Tournigan's sampling program identified 22 of 65 pipe targets as being geochemically anomalous. Twelve of those were prioritized for a drill program that began in May

#### **Central Arizona**

Rodinia Minerals currently controls the Workman Creek and Red Bluff properties in the Sierra Ancha Mountains. Recent estimates from drilling indicate resources of over 9 million lbs of  $U_3O_8$ . The company drilled its Mormon Lake property to confirm stratigraphy and mineralization outlined in previous exploration data.

Golden Patriot's multi-hole drilling project on the past-producing heap leach Lucky Boy mine has returned positive results showing  $U_3O_8$  grades from 0.12 percent to 0.13 percent.

Universal Uranium commenced a 41-hole drill program to confirm historical data on its Artillery Peak area uranium property that contains mineralization and stratigraphy similar to the past producing Anderson Mine. Previous work in the 1970s identified a resource of 1.7 million pounds  $U_3O_8$  in the northern portion of the property. Concentric Energy controls the nearby Anderson mine, and while going through a corporate reorganization, is continuing to evaluate mining and milling options for the huge, but low grade deposit.

Uranium Energy acquired Dry Mountain south-east of Safford, Coyote Ranch property east of Springerville, and New River, aka Los Cuatros, property located north of Phoenix and is evaluating historic data.

#### **Industrial Minerals**

In early 2007, Cemex S.A.B de C.V. made a bid for Rinker Materials. They succeeded in April by raising the offer and proceeded with the acquisition subject to requirements of the U.S. Department of Justice. In November 2007, Cemex complied with those conditions that in Arizona required the disposal of 2 quarries and 5 ready-mix concrete operations in the Flagstaff and Tucson markets. Cemex announced plans to sell these to CRH plc, an Ireland-based building materials group.

Cemex announced in September 2007 that it began permitting to construct a 1.9 million tpy cement plant near Seligman. The company plans to invest \$400 million in the Seligman Crossing Plant that will begin operation by 2012. The state-of-the-art facility will increase supply to meet the growing needs of the southwestern U.S.

National Gypsum's construction of a wallboard plant at Eloy, mid-way between Phoenix and Tucson, has been delayed with the slow down in the construction market. When completed, the plant will

have a production capability of 1 billion square feet of wallboard annually.

TSX Venture Exchange approved the Zeox acquisition of GSA Resources' zeolite assets. The company has also acquired the White Cliffs diatomite plant and mine located near San Manuel from Atlas Minerals Inc. The plant has been refitted to process both diatomite and zeolites.

Alpha Calcit Arizona conducted percussion drilling on its Dragoon marble and is proceeding with permitting to develop a new quarry.

#### **Coal**

Peabody Energy operated the Kayenta mine through lease agreements with the Navajo Nation and the Hopi Tribe. The mine produced about 8 million tons of coal from multiple seams and splits of seams, ranging in thickness from 3 to 18 feet that is shipped via automated unit trains to the Navajo Generating Station near Page. Peabody's Arizona mines have earned numerous awards for industry-leading reclamation efforts, including being honored at the Energy Globe Awards in 2007. Peabody was second in its category and was the only mining company honored.

#### **Gold and Silver**

Fueled by rising gold prices, interest in Arizona gold deposits was widespread and numerous companies conducted exploration drilling and other work programs.

American Bonanza Gold controls the Copperstone deposit, La Paz County, with 335,000 ounces of measured and indicated underground resources. A two-phase drilling program completed during 2007, consisting of 44 holes totaling 43,227 feet, discovered two new gold zones.

Patriot Gold now controls the Margarita mine area, Santa Cruz County, covering approximately 900 acres of patented and unpatented mining claims. A drilling program was permitted by American Goldrush to test for high-grade faults that feed the near surface cap of disseminated mineralization. Drilling is planned to begin in early 2008.

Northern Freegold Resources acquired Burro Creek, Mohave County. The 2,000-acre property covers a low-sulfidation epithermal vein system that has been traced for over 1.7 km with widths up to 45 meters. A previous drilling program identified over 2.5 million tons of 0.03 grade gold mineralization in the central portion of the property. A 3,000-meter drill program began in January of 2008 to confirm historical work and test additional areas.

Kent Exploration holds an option on the Rosebud, Mohave County. Following a limited under-

ground sampling program, a 5,000-foot diamond drill program commenced in September 2007 and resumed in November. Incomplete results in early 2008 for two of seven drill holes found mineralized intercepts in numerous narrow veins.

In August 2007, Ventura Gold commenced a core-drilling program at the 100 percent held Gold Gulch property near the Morenci mine in Greenlee County. A 10,000 feet program of six to eight holes was planned.

A private group holds the Verdstone, in Yuma County where a drift to collect a bulk sample for metallurgical testing is planned.

Kinross sold the previously drilled Yarnell resource in Yavapai County containing approximately 300,000 ounces of gold to CaNev Resources.

Wildcat Silver controls 80 percent of the Hardshell deposit, Santa Cruz County, along with Arizona Minerals. In February 2007, a preliminary assessment reported an inferred resource of 53.5 million ounces of silver along with 1.2 billion lbs of

manganese. Wildcat commenced a 7,500-foot drill program in July 2007 to obtain material for metallurgical testing and to explore untested deep extensions of Hardshell mineralization.

Southern Silver and Tombstone Exploration have both assembled large land positions in the historic Tombstone silver district in Cochise County to explore for silver and base metals. Southern Silver began a drill program late in 2007 to follow up on a series of mineralized east-northeast trending fracture zones identified in a portion of the property by mapping and suggested to be persistent by geophysical surveys.

For more information on mining, order Directory 51 *Active Mines in Arizona 2007* and for more details on the geology and distribution of metallic commodities discussed here, download the Arizona Department of Mines and Mineral Resource's OFR08-26 *Arizona's Metallic Resources - Trends and Opportunities* posted at: [www.mines.az.gov](http://www.mines.az.gov).



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Circular 129, June 2008

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*Strong demand for copper in developing nations such as China and India, plus the additional demand for industrial minerals to supply the construction market in this growth state, brought about a record-setting year for Arizona's mining industry. The value of Arizona's copper production set a new high of \$5.5 billion and pushed the total value of mineral production to \$7.58 billion! This is also a record. As it has for many years, Arizona ranked first in nonfuel mineral production in the U.S. In addition to leading the Nation in copper, Arizona ranks in the top five in molybdenum, sand and gravel, gemstones, perlite, silver, zeolites, and pumice. Generally strong and rising prices, especially toward year's end, fostered a bullish atmosphere that encouraged significant levels of acquisition and exploration. This activity has spread far beyond the normal commodities to include some, such as manganese and fluorspar, which have not been mined in Arizona for decades!*

Commodity	2005 Value <sup>3</sup>	2006 Value <sup>3</sup>	2007 Value <sup>3</sup>
<b>Clay (bentonite)</b>	na	\$1,710,000	\$1,730,000
<b>Copper</b>	\$2,640,000,000	4,950,000,000	5,540,000,000
<b>Gemstones</b>	1,370,000	1,560,000	1,580,000
<b>Sand &amp; gravel</b>	516,000,000	662,000,000	597,000,000
<b>Stone, crushed</b>	69,300,000	102,000,000	116,000,000
<b>Other<sup>1</sup></b>	1,120,000,000	1,040,000,000	1,120,000,000
<b>Coal<sup>2</sup></b>	290,000,000	190,000,000	200,000,000
<b>Total</b>	<b>\$4,640,000,000</b>	<b>\$6,940,000,000</b>	<b>\$7,580,000,000</b>

1) Includes cement, clay, lime, gypsum, gold, molybdenum, perlite, pumice, silver, salt, dimension stone, and zeolites.

2) Arizona Department of Mines and Mineral Resources value for coal.

3) Unpublished U.S. Geological Survey (USGS) data, subject to change; data rounded and may not add to totals shown, final 2005 - 2007 data will be published in the Arizona Chapter of the USGS Mineral Yearbook, Area Reports: Domestic 2005 - 2007, volume II.

### Copper and Molybdenum

Copper prices that averaged a record \$3.28 per pound in 2007 resulted in a production value of \$5.5 billion in Arizona. Continued strong demand and high prices are driving exploration and development activity to the highest level in many years. In 2007, Arizona accounted for over 60 percent of the U.S. domestic copper production. The copper industry had a \$4.7 billion direct and indirect impact on the Arizona economy in 2006 and will probably have similar high impact when 2007 figures are released. Production increased only slightly in 2007, but 2008 should see a large increase. Two new projects, Mercator and Carlota, will be completed, while Safford and Pinto Valley, with minor contributions for 2007, will contribute for the whole year.

Byproducts of mining porphyry copper deposits continue to be significant, accounting for all of Arizona's gold, silver, and molybdenum production. The average price for molybdenum oxide in 2007 was \$29.91 per pound, an increase of 22 percent over 2006.

### U.S. and Arizona Copper Production and Prices

Year	U.S. (metric ton)	Arizona (metric ton)	Arizona (billion lbs)	Change	Price cents/lb*	Change
2003	1,130,000	741,000	1.630	-3.3%	85.25	12.4%
2004	1,170,000	723,000	1.590	-2.5%	133.94	57.1%
2005	1,140,000	691,000	1.520	-4.4%	173.49	29.5%
2006	1,200,000	713,000	1.570	5.7%	314.75	81.9%
2007	1,190,000	750,000	1.650	5.3%	328.00	4.2%

Source: USGS production data

\*Metals Week U.S. Copper Cathode Producer

#### Freeport McMoRan

In March 2007 Freeport McMoRan Copper and Gold (FCX) completed its acquisition of Phelps Dodge. The \$26 billion merger created the world's largest publicly-traded copper company. Freeport McMoRan moved its headquarters from New Orleans to the former Phelps Dodge offices in Phoenix.

At Morenci, by far Arizona's largest mine, Freeport McMoRan and Sumitomo completed a \$241 million investment to build the first commercial-scale copper concentrate pressure leach operation. Two leach vessels have been installed and began commissioning during the second half of the year. Morenci resumed concentration to supply feed to the new plants during 2006 and production is ramping up to 54k tpd capacity. Production of copper cathodes will be via electrowinning solutions from the new plants and continued feed from heap and dump leaches. Production was 808 million lbs in 2007, nearly half of Arizona's total. The mine fleet currently has 115 260-ton capacity trucks, however an additional \$100 million will be invested in 2008 to expand the mining fleet and add EW capacity, increasing production capacity by 100 million lbs per year.

Freeport McMoRan also operates Bagdad and Sierrita, the state's third and fourth largest copper mines, both recover large amounts of byproduct molybdenum. In 2007, Bagdad produced 202 million pounds of copper and about 10 million pounds of molybdenum. In December plans were announced to convert the pioneering copper concentrator pressure leach facility to process molybdenum concentrates by 2010. That is expected to increase Freeport McMoRan's annual molybdenum processing capacity by approximately 20 million pounds. The changes will allow the plant to convert 4 tons per hour of molybdenum sulfide concentrate into molybdenum trioxide and a solution extraction system will produce a rhenium solution byproduct. Sierrita, with Arizona's largest mill capacity of 112,000 tpd, produced 150 million pounds of copper and an estimated 20 million pounds of molybdenum. The facilities at Sierrita include two molybdenum roasters, a rhenium processing facility, as well as a copper sul-

fate plant. Incremental expansions have been announced for both mines. At Bagdad a \$110 million 21k tpd mill expansion is expected to increase annual copper production by 55 million pounds starting in 2009, while at Sierrita a \$160 million 16k tpd mill expansion is expected to increase annual copper production by 25 million pounds starting in 2010.

At Freeport McMoRan's Safford project in Graham County, expenditures of \$675 million were required to construct the giant leach pad, associated SX-EW plant, and for development of the Dos Pobres pit. The crushing facility has a design rate of 114,000 tpd while mining capacity is 314,000 tpd. While construction continued, and despite the worker and housing shortages experienced, the first cathode production was reached ahead of schedule in December 2007. This marks the first major new copper mine to start in Arizona since the San Manuel open pit, heap leach operation began in 1985. Production should increase to design capacity over the next 6 months. An 18-year life is expected for the Dos Pobres and San Juan deposits combined 538-million tons that contain 0.37percent of oxide copper. Freeport expects to spend \$70 million on exploration, primarily at Lone Star in the Safford district and Morenci in 2008.

At Miami, residual leach production was 20 million pounds. The restart of mining there has been delayed until 2010 with the planned expansions by Freeport McMoRan elsewhere in Arizona. Capital investment is expected to be approximately \$100 million, primarily for mining equipment. During the project's 5-year life it should produce 100 million pounds of copper per year.

#### Asarco LLC

Asarco has continued operations of its Arizona properties under the protection of the U.S. Bankruptcy Court. Asarco owns three copper mines in Arizona, Ray, Mission, and Silver Bell, as well as copper smelting operations at Hayden. The company filed for bankruptcy protection in 2005 under the weight of massive debt and environmental cleanups and asbestos liability claims. Asarco's three mines produced nearly 400 million pounds of copper last year, including Mitsui's share of Silver Bell, and are

hoping to produce 500 million pounds in 2008. At year's end Asarco had accumulated more than \$950 million in cash. In early 2008 Asarco announced plans to sell its assets as part of a bankruptcy exit plan that would pay creditors claiming to be owed \$13.5 billion.

Ray produced 229 million lbs of copper in 2007. A new \$46 million in-pit crusher and conveying system will be installed and should be completed by the end of the first quarter 2009. The mine received five new Liebherr T282B 400-ton trucks last year, the largest operating in Arizona. Asarco plans to purchase 20 of these trucks over a 5-year period. Total cost of the trucks will be \$81 million, or about \$4 million each. The price is without tires, which currently cost about \$35,000 each!

At Mission copper production increased 28 percent to 121 million lbs and the byproduct molybdenum concentration circuit was in operation for the entire year. An SX-EW expansion was studied for the Silver Bell mine where production exceeded 46 million pounds. The Number 2 dump leach project was approved at year's end and production is expected to increase by 5 percent.

#### BHP

BHP resumed mining at Pinto Valley in October 2007 following an investment of \$140 million to rehabilitate the 75k tpd sulfide concentrator. A \$300 million contract was issued to the Washington Group to finish mining the slice 6 pushback that contains 85 million tons of mill ore at 0.41 percent Cu plus Mo and 37 million tons of 0.21 percent Cu leach material. Additional resources could be mined

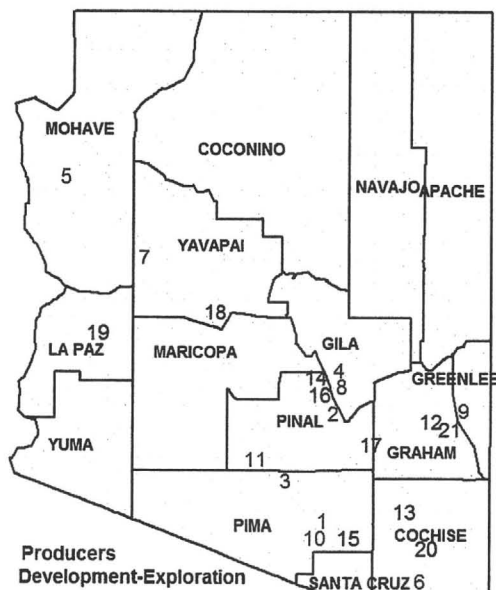
from pushback slices 7 and 8 depending on copper prices. The Pinto Valley Division produced 27.6 million lbs of copper in 2007 including ongoing leach operations and 150 million lbs is forecast for 2008.

#### Mercator Minerals

Mercator Minerals' Mineral Park mine produced 11 million lbs of copper from SX-EW leach operations in 2007. Construction is underway on a flotation mill that will produce copper-silver and molybdenum concentrates that will greatly increase production. Mercator expects that concentrate recovery will commence by June 2008 at 25k tpd operation. Full production capacity of 50k tpd is expected to be reached 9 months later. An annual production rate of 56 million lbs of copper, 10 million lbs of molybdenum and 600,000 ounces of silver is anticipated. Mill and leach reserves of 430 million tons are expected to provide for a 21-year mine life.

#### Nord Resources

Nord began residual leaching of existing heaps at Johnson Camp in November 2007 and announced the first copper cathodes had been harvested in January 2008. Nord anticipates that copper production from newly-mined ore will add an additional 14 to 20 weeks to their forecast production schedule, subject to the timing of the receipt of an air quality permit. Copper production in 2008 is forecast to be about 4 million lbs. Nord hopes to reach the full production rate of 25 million lbs per year by early 2009.



#### Copper mines 2007

##### Producers

- 1) Mission - Asarco
- 2) Ray - Asarco
- 3) Silver Bell - Asarco / Mitsui
- 4) Pinto Valley - BHP Copper
- 5) Mineral Park - Mercator Minerals
- 6) Bisbee - FCX
- 7) Bagdad - FCX
- 8) Miami - FCX
- 9) Morenci - FCX / Sumitomo
- 10) Sierrita - FCX
- 11) Tohono - FCX
- 12) Safford - FCX \*

##### Development & Exploration

- 13) Johnson Camp - Nord\*
- 14) Carlota - Quadra
- 15) Rosemont - Augusta
- 16) Resolution - Rio Tinto/BHP
- 17) Copper Creek - Redhawk; Bell Res.
- 18) Sheep Mtn - Lebon Gold; Lone Tree
- 19) Yuma King - Big Bar Gold
- 20) Turquoise Dist. Aurelio
- 21) Lone Star - FCX; Red Knoll - Franconia; Coyote Springs - Nord; Markham Wash - High Desert Res. Sol Dos - Entrée Gold

\* reached production at year's end.

#### Development and Exploration

At Quadra's Carlota mine, primary access and haul roads have been completed and work is progressing on SX-EW platform concrete work, pre-production mining activities and development of the leach pad grading and drainage. Quadra has expended about \$93 million of an estimated \$218 million to complete construction of the 75 million lbs per year capacity open pit, leach operation. SX-EW plant construction, leach pad liner placement, and pre-production mining activities continue. Quadra anticipates commencement of copper production in the second half of 2008. Resolution Copper's proposed land exchange suffered a setback when the U.S. Representative who sponsored the bill was indicted by a federal grand jury in early 2008. Rep. Ed Pastor has replaced Rep. Rick Renzi as sponsor of the Southeastern Arizona Land Exchange and Conservation Act. Hearings have been held in the House Natural Resources subcommittee. Sen. Jon Kyl has authored a parallel bill in the Senate.

The Resolution deposit, with its huge size and high primary grades, would result in the largest copper mine in Arizona. Resolution Copper (Rio Tinto 55 percent/BHP-Billiton 45 percent JV) is prepared to spend \$3.5 billion on development before any ore

is extracted. To date, Resolution has spent \$250 million planning, engineering and buying land for the stalled trade. The delay is forcing suspension of underground development work and planned shaft sinking, and the layoff of recently trained underground miners.

In July, Augusta filed a Plan of Operations for the Rosemont project with the U.S. Forest Service. The planned project will produce 230 million pounds of copper per year for at least 20 years and provide employment for 500 workers and at least 1000 indirect jobs. The main Rosemont porphyry skarn occurrence has 543 million tons with a 0.75 percent Cu equivalent grade. The company acquired rights to use Central Arizona Project water for the project and has stored 15,000 acre feet of water, a 3-year supply for operation of the mine.

Ascendant Copper signed an agreement to acquire St. Genevieve Resources Ltd. who hold two past-producing properties Zonia and Emerald Isle.

### Arizona Copper Mine Production 2003 – 2007

Cu (million lb)

Mine, Company	2003	2004	2005	2006	2007
Morenci, Freeport McMoRan <sup>2</sup> and Sumitomo	842.4	840.6	800.0	815.6	808.0
Ray, Asarco	272.0	241.2	225.1	232.9	228.9
Bagdad, Freeport McMoRan <sup>2</sup>	214.0	220.2	201.2	165.4	202.0
Sierrita, Freeport McMoRan <sup>2</sup>	151.2	155.0	158.6	161.6	150.0
Mission, Asarco	51.6	54.0	38.2	95.6	121.3
Silver Bell, Asarco and Mitsui	48.6	47.5	47.7	46.9	46.7
Pinto Valley, BHP	22.0	20.3	19.4	18.1	27.6
Miami, Freeport McMoRan <sup>2</sup>	35.6	19.6	24.6	19.0	20.0
Mineral Park, Mercator <sup>1</sup>	3.2	3.7	6.4	9.5	11.2
Tohono, Freeport McMoRan <sup>2</sup>	0	0	5	5.2	3.0
Safford, Freeport McMoRan <sup>2</sup>	0	0	0	0	1.0
<b>Total</b>	<b>1,640.6</b>	<b>1,602.1</b>	<b>1,526.2</b>	<b>1,569.8</b>	<b>1,619.7</b>

Data from company annual reports, form 10-Ks, and personal communication.

1. Equatorial prior to June 2003.

2. Phelps Dodge prior to March 2007.

Exploration drilling occurred on many projects with large footages drilled despite widespread complaints about difficulty in obtaining a drill rig and contractor. All this activity has overwhelmed the assay labs and many projects have yet to report results.

Aurelio Resource continued assembling property and gathering historic data and drill core for its Hill Copper Zinc project in the Turquoise district. Three drill-indicated mineralized areas have been identi-

fied. These include the MAN area where historic drilling has an inferred resource of 64 million tons with grade of 0.56 of copper equivalent; the Courtland area to the north that received drilling during 2006 and 2007; and the South Courtland area where 29 holes drilled in 2007 identified an area of zinc mineralization not previously recognized. A 50,000-foot, two-phase core drilling program is planned to acquire data to complete a feasibility study in 2009.



Redhawk Resources is exploring the Keel and American Eagle deposits in the Copper Creek district. Phase I drilling started in September 2006 and was completed in late 2007. Significant copper grades were encountered in a number of the core holes of its 15,000-foot drill program. The program was designed to expand and upgrade resources in the Mammoth Breccia and test other breccia bodies where historical drilling contained potential "ore grade" intercepts. Phase II commenced near year's end and includes a 70,000-foot drilling program to confirm and expand the American Eagle resources. It also will attempt to connect the Keel zone with the American Eagle, and drill some of the breccia targets near the proposed exploration decline. Phase II also includes metallurgical testing, continued environmental work, hydrologic studies, and ground water monitoring. All work will lead to an updated resource study and a scoping study to be completed before the end of 2008.

Also at the Copper Creek district, Bell Resources Corporation completed their Phase II drill program comprised of 12 drill holes at Sombrero Butte, a breccia pipe deposit with a suspected underlying porphyry copper system. Assay results should be announced in early 2008, Bell has plans to initiate Phase III drilling.

At Bell's Kabba project in Mohave County, the Phase I drill program followed up geophysical studies that targeted a suspected down-faulted copper-molybdenum porphyry system. Four diamond holes totaling 3,630 meters were completed in November. The holes showed indications of proximity to a mineralized system including interceptions of thick alteration and in-hole K-4 porphyritic dikes and anomalously mineralized veins. A new site, 1.2 kilometers east of the porphyry dike swarm encountered in drill hole K-4, has been selected to be drill tested.

In April, Bell announced that it had entered into an alliance with Bronco Creek Exploration to explore four properties; Mesa West, Red Hills, Silver Bell West and Superior West. A drilling program was begun at Mesa West to test a magnetic anomaly below gravel cover. Red Hills, based on previous exploration, has been reported to contain 500 million tons at 0.1 percent of copper oxides. Structural reinterpretation and geophysics suggests rotation of the deposit. Deeper portions of the system will be drill tested. Work at Silver Bell West is focusing on mapping and geochemical sampling to identify porphyry/skarn targets hosted in Paleozoic rocks below Mesozoic volcanics. Permitting is underway for a 2008 drill program. At Superior West there are two target types, the down-dropped extension of the

high-grade Magma vein system and the suspected deep-seated porphyry copper source for the vein mineralization. Drilling is scheduled to begin in the 1st quarter of 2008.

Big Bar Gold completed four drill holes in late 2007 on the Troy Ranch prospect east of the Ray mine where it has earned a 51 percent interest in a joint venture with Freeport McMoRan. Numerous intercepts of copper and molybdenum mineralization were encountered along with long potassic-altered intervals coincident with an AMT geophysical target. Big Bar also was active at Yuma King where step out drilling resulted in the discovery of a porphyry copper system with significant molybdenum values in a Jurassic age thrust fault complex. Favorable geology continues to the northeast and southeast that remains to be tested.

Lebon Gold Mines controls a second area of mineralization west of Sheep Mountain. A three-hole drill program totaling 2,026 feet found significant thicknesses of copper oxide mineralization in 2007. The holes however failed to reach to the redox boundary where historic reports of higher grades of chalcocite up to 0.8 percent copper had been reported. The company is debating further solo work or opting for a joint venture partner.

Black Pearl Minerals Consolidated completed a Phase I drilling program on the Four Metals breccia pipe in 2007. The seven-hole drilling program totaled 996 meters. It confirmed historic grades while adding width and depth to the south and east sides of the deposit. Permitting is underway for additional drilling.

In addition to Freeport, four other groups were exploring in the Safford district. Franconia Minerals announced the core-drilling program at Red Knoll in Graham County confirmed that the property has widespread potential host rocks for porphyry copper mineralization at reasonable depth. Three holes were completed in 2007. Hole RK-4 intersected Laramide meta-volcanics displaying intense phyllic alteration, 1-3 percent pyrite and anomalous copper values from 979 to 2,456 feet. Follow up geophysics and further drilling is planned. High Desert Gold (previously General Minerals/Sprott Resources) reported in November 2007 that two 600-meter drill holes were completed at the Markham Wash property optioned by Teck Cominco. Assay results are pending. Nord Resources completed IP and resistivity geophysical surveys in early 2007 on Coyote Springs. A drill program was planned to test anomalous IP values. Entrée Gold began to test an IP anomaly on its Sol Dos property with a 6,550-foot drill program planned. Entrée Gold also entered into an agreement with Empirical Discovery LLC to

explore for additional porphyry copper targets in southeastern Arizona.

Lone Tree Exploration LLC has acquired the partially delineated copper molybdenum deposit at Sheep Mountain and assembled historic exploration data. The property has had 56 core and rotary holes drilled totaling 75,000 feet. A 2007 preliminary feasibility study on only the supergene portion of the deposit concluded an 8-10k tpd operation could generate a 28 percent rate of return at \$1.50 per lb copper and \$12 per lb molybdenum.

American Copper announced it will drill in early 2008 at its Squaw Creek project located 70 miles north of Phoenix. The initial core-drilling program is targeting high-grade copper/molybdenum veins and stock works last mined in the 1940s. The company plans to drill approximately 5,000 feet in 10 to 15 holes.

Teryl Resources reported in early 2008 that five reverse circulation drill holes had been completed on four separate copper targets on the patented Gold Hill property southeast of Bisbee. The highest grade interception was at a depth of 275-280 with 4.84 percent copper reported.

## Uranium

Uranium spot prices softened to \$70 at year's end but remained 10 times the price of 5 years ago. That strength, along with the knowledge that plants under construction in Asia will create strong future demand, supported continued high levels of exploration activity in Arizona, particularly for high grade (over 0.5 percent  $U_3O_8$ ) collapse breccia pipes.

### Colorado Plateau

In February Denison Mines acquired five deposits on the Arizona Strip from Pathfinder Mines, a subsidiary of Avrea, for \$5.5 million cash plus a 1 percent yellowcake royalty and a commitment to sell Avrea 6.5 million pounds of  $U_3O_8$  per a sale and price agreement. Included properties were the EZ1, EZ2, DB and WHAT breccia pipes and the Moonshine Springs deposit hosted in the Chinle Formation. The deposits contain an estimated 7 million pounds of uranium.

Denison reported that Redpath Corp. was engaged as mining contractor to resume development work on the Arizona 1 mine that contains an inferred resource 0.96 million pounds  $U_3O_8$ . Rehabilitation and deepening of the shaft continued for most of the year; work has now shifted to mine development. The mine is substantially permitted and production is expected to begin during mid-2008. In July, the company announced an ore buying program to provide supplemental feed for its White Mesa mill at Blanding, Utah.

Dumont Nickel (aka Red Butte Uranium) acquired 132 unpatented mining claims mid-year, and in the fall, field work identified five possible breccia pipe targets.

In June, Energy Fuels began drilling the Weap pipe and formed a joint venture with Mesa Uranium acquiring 13 Arizona State sections in Mohave and Coconino Counties. These holdings are in addition to the 25 pipe targets in the High Plains joint venture formed in 2006. Five of those targets are confirmed breccia pipes based on historical data from prior drilling.

Eagle Hill Exploration reported in December it was negotiating two separate agreements to acquire the Rimshot and Lombardo properties totaling 469 claims, plus five Arizona State section leases that include 157 breccia pipe targets.

Liberty Star Uranium and Metals conducted extensive geochemical sampling across hundreds of breccia pipe targets, and detailed sampling and mapping on 110. During the year the company drilled with joint venture partner XState Resources on the Elle pipe area. Drilling was underway on the Neola pipe, with three other high priority targets scheduled to be drilled in 2008.

Mesa Uranium acquired the Moonshine Springs project a mile from Denison's Moonshine Springs deposit. Later it drilled two holes that confirmed previous Exxon intercepts of 6 feet grading 0.40 percent  $U_3O_8$ .

Monster Uranium (formerly VMX Resources) acquired an option on three uranium properties including the Rose breccia pipe from Energy Metals (now Uranium One). Historic drill data on the Rose pipe shows an intercept of 11 feet of 1.0 percent  $U_3O_8$ .

Vane drilled a number of pipes beginning in January, finding mineralization in the Miller, Miller SW, Big Red, and Red Dike pipes. Work on its land package increased the number of identified breccia targets to 39.

Quatara in early 2007, contracted Geotech Ltd. to conduct the first extensive test of an airborne time-domain electromagnetic system on the Arizona Strip to identify mineralized collapse structures. The VTEM system has identified anomalies related to collapse structures in a majority of the known breccia pipes as well as 200 additional anomalies with similar geophysical signatures.

Takara Resources and DIR Exploration's Kaibab Joint Venture project hold seven drill-ready breccia pipe targets discovered as a result of previous geophysical and geochemical surveys. The group increased its land position by staking in 2007 to acquire a total of 221 breccia pipe targets.

Tournigan's sampling program identified 22 of 65 pipe targets as being geochemically anomalous. Twelve of those were prioritized for a drill program that began in May

### **Central Arizona**

Rodinia Minerals currently controls the Workman Creek and Red Bluff properties in the Sierra Ancha Mountains. Recent estimates from drilling indicate resources of over 9 million lbs of  $U_3O_8$ . The company drilled its Mormon Lake property to confirm stratigraphy and mineralization outlined in previous exploration data.

Golden Patriot's multi-hole drilling project on the past-producing heap leach Lucky Boy mine has returned positive results showing  $U_3O_8$  grades from 0.12 percent to 0.13 percent.

Universal Uranium commenced a 41-hole drill program to confirm historical data on its Artillery Peak area uranium property that contains mineralization and stratigraphy similar to the past producing Anderson Mine. Previous work in the 1970s identified a resource of 1.7 million pounds  $U_3O_8$  in the northern portion of the property. Concentric Energy controls the nearby Anderson mine, and while going through a corporate reorganization, is continuing to evaluate mining and milling options for the huge, but low grade deposit.

Uranium Energy acquired Dry Mountain south-east of Safford, Coyote Ranch property east of Springerville, and New River, aka Los Cuatros, property located north of Phoenix and is evaluating historic data.

### **Industrial Minerals**

In early 2007, Cemex S.A.B de C.V. made a bid for Rinker Materials. They succeeded in April by raising the offer and proceeded with the acquisition subject to requirements of the U.S. Department of Justice. In November 2007, Cemex complied with those conditions that in Arizona required the disposal of 2 quarries and 5 ready-mix concrete operations in the Flagstaff and Tucson markets. Cemex announced plans to sell these to CRH plc, an Ireland-based building materials group.

Cemex announced in September 2007 that it began permitting to construct a 1.9 million tpy cement plant near Seligman. The company plans to invest \$400 million in the Seligman Crossing Plant that will begin operation by 2012. The state-of-the-art facility will increase supply to meet the growing needs of the southwestern U.S.

National Gypsum's construction of a wallboard plant at Eloy, mid-way between Phoenix and Tucson, has been delayed with the slow down in the construction market. When completed, the plant will

have a production capability of 1 billion square feet of wallboard annually.

TSX Venture Exchange approved the Zeox acquisition of GSA Resources' zeolite assets. The company has also acquired the White Cliffs diatomite plant and mine located near San Manuel from Atlas Minerals Inc. The plant has been refitted to process both diatomite and zeolites.

Alpha Calcit Arizona conducted percussion drilling on its Dragoon marble and is proceeding with permitting to develop a new quarry.

### **Coal**

Peabody Energy operated the Kayenta mine through lease agreements with the Navajo Nation and the Hopi Tribe. The mine produced about 8 million tons of coal from multiple seams and splits of seams, ranging in thickness from 3 to 18 feet that is shipped via automated unit trains to the Navajo Generating Station near Page. Peabody's Arizona mines have earned numerous awards for industry-leading reclamation efforts, including being honored at the Energy Globe Awards in 2007. Peabody was second in its category and was the only mining company honored.

### **Gold and Silver**

Fueled by rising gold prices, interest in Arizona gold deposits was widespread and numerous companies conducted exploration drilling and other work programs.

American Bonanza Gold controls the Copperstone deposit, La Paz County, with 335,000 ounces of measured and indicated underground resources. A two-phase drilling program completed during 2007, consisting of 44 holes totaling 43,227 feet, discovered two new gold zones.

Patriot Gold now controls the Margarita mine area, Santa Cruz County, covering approximately 900 acres of patented and unpatented mining claims. A drilling program was permitted by American Goldrush to test for high-grade faults that feed the near surface cap of disseminated mineralization. Drilling is planned to begin in early 2008.

Northern Freegold Resources acquired Burro Creek, Mohave County. The 2,000-acre property covers a low-sulfidation epithermal vein system that has been traced for over 1.7 km with widths up to 45 meters. A previous drilling program identified over 2.5 million tons of 0.03 grade gold mineralization in the central portion of the property. A 3,000-meter drill program began in January of 2008 to confirm historical work and test additional areas.

Kent Exploration holds an option on the Rosebud, Mohave County. Following a limited under-

ground sampling program, a 5,000-foot diamond drill program commenced in September 2007 and resumed in November. Incomplete results in early 2008 for two of seven drill holes found mineralized intercepts in numerous narrow veins.

In August 2007, Ventura Gold commenced a core-drilling program at the 100 percent held Gold Gulch property near the Morenci mine in Greenlee County. A 10,000 feet program of six to eight holes was planned.

A private group holds the Verdstone, in Yuma County where a drift to collect a bulk sample for metallurgical testing is planned.

Kinross sold the previously drilled Yarnell resource in Yavapai County containing approximately 300,000 ounces of gold to CaNev Resources.

Wildcat Silver controls 80 percent of the Hardshell deposit, Santa Cruz County, along with Arizona Minerals. In February 2007, a preliminary assessment reported an inferred resource of 53.5 million ounces of silver along with 1.2 billion lbs of

manganese. Wildcat commenced a 7,500-foot drill program in July 2007 to obtain material for metallurgical testing and to explore untested deep extensions of Hardshell mineralization.

Southern Silver and Tombstone Exploration have both assembled large land positions in the historic Tombstone silver district in Cochise County to explore for silver and base metals. Southern Silver began a drill program late in 2007 to follow up on a series of mineralized east-northeast trending fracture zones identified in a portion of the property by mapping and suggested to be persistent by geophysical surveys.

For more information on mining, order Directory 51 *Active Mines in Arizona 2007* and for more details on the geology and distribution of metallic commodities discussed here, download the Arizona Department of Mines and Mineral Resource's OFR08-26 *Arizona's Metallic Resources - Trends and Opportunities* posted at: [www.mines.az.gov](http://www.mines.az.gov).