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2009 Minerals Yearbook

NEW MEXICO

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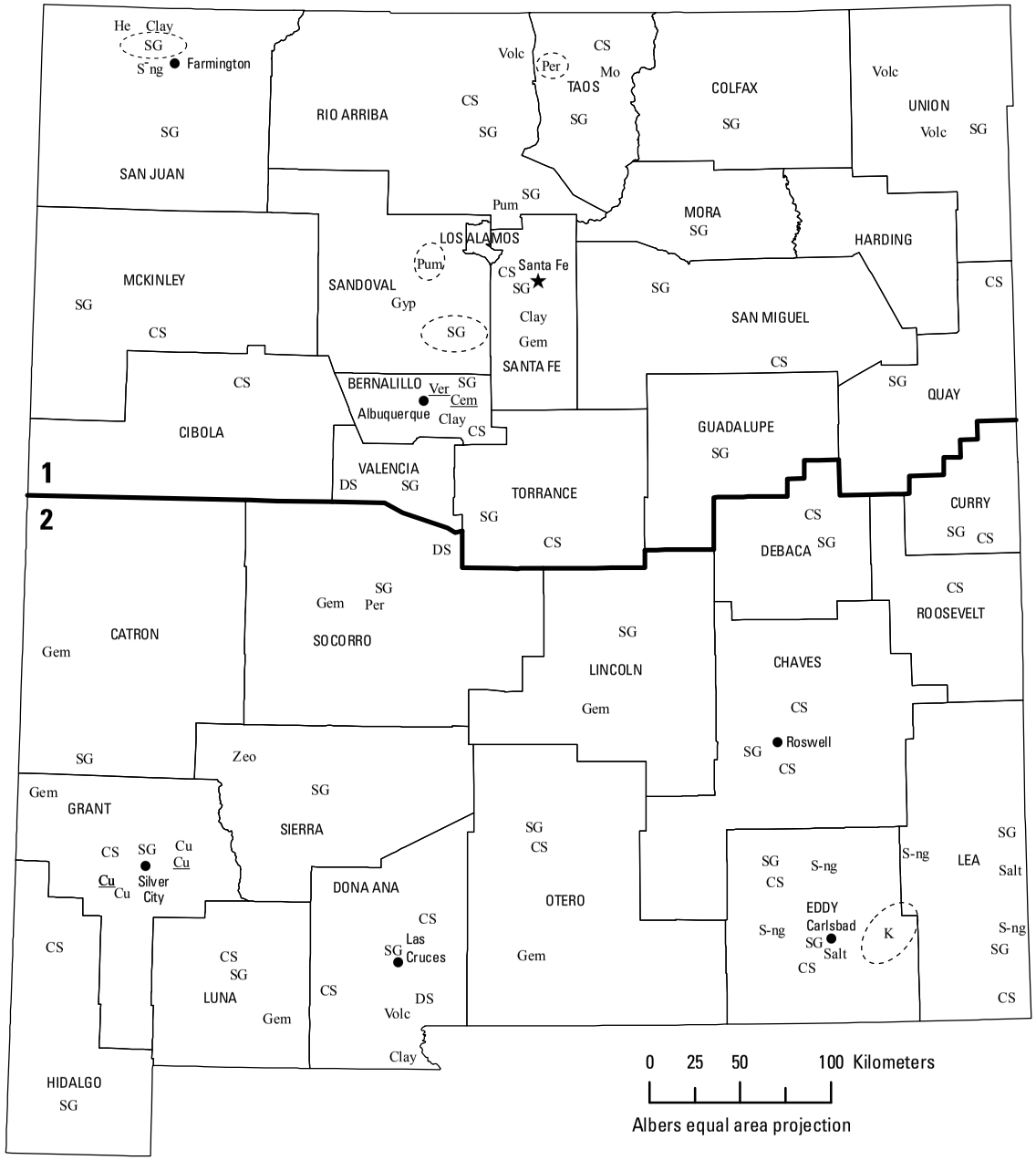

LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel district boundary

MINERAL SYMBOLS
(Principal producing areas)

Cem	Cement plant
Clay	Common clay
CS	Crushed stone
Cu	Copper
Cu	Copper plant
DS	Dimension stone
Gem	Gemstones
Gyp	Gypsum
He	Helium
K	Potash
Mo	Molybdenum
Per	Perlite
Pum	Pumice and pumicite
S-ng	Sulfur (natural gas)
Salt	Salt
SG	Construction sand and gravel
Ver	Vermiculite plant
Volc	Volcanic cinder
Zeo	Zeolites

Concentration of mineral operations

Source: New Mexico Bureau of Geology and Mineral Resources/U.S. Geological Survey (2009).

The Mineral Industry of New Mexico

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the New Mexico Bureau of Geology and Mineral Resources for collecting information on all nonfuel minerals.

In 2009, New Mexico's nonfuel raw mineral production[1] was valued at $886 million, based upon annual U.S. Geological Survey (USGS) data. This was a $744 million, or almost 46%, decrease from the State's total nonfuel mineral value of $1.63 billion in 2008, which had increased by nearly $50 million, or 3%, from a total of $1.58 billion in 2007. The State decreased to 23d from 15th in rank among the 50 States in total nonfuel mineral production value and accounted for 1.5% of the U.S. total. This is the State's lowest ranking since it ranked 25th in 2003, then accounting for 1.44% of the U.S. total.

The top nonfuel minerals in 2009 were, in descending order by production value, potash, copper, construction sand and gravel, crushed stone, and portland cement. These accounted for nearly 94% of the State's total nonfuel raw mineral production value. Potash, which had been the State's second leading nonfuel mineral produced in 2008, became the State's leading mineral in 2009. Copper decreased to second, accounting for almost 34% of the State's total nonfuel mineral production value, down from 45% in 2008. Copper had led for 38 of the past 41 years (from 1968 through 2009). Potash, which had been reported as potassium salts prior to 1990, was the State's leading nonfuel mineral in the early 1950s through 1967, in 1982, and in 2002–03.

In 2009, only five mineral commodities produced in New Mexico saw an increase or no change in total production value from those in 2008: salt (up by 13%), masonry cement (up by 35%), zeolites (up by 5%), dimension stone (up by 5%), and gemstones (no change). All other mineral commodities saw decreases in production value in 2009, most notably copper, down almost $434 million, or 59%. Following copper was molybdenum concentrates (down by 95%), potash (down by 26%), and portland cement (down by almost 25%); combined these three mineral commodities—actual production data are withheld to protect company proprietary data—were down almost $278 million. Other commodities that saw very substantial decreases in total production value included construction sand and gravel (down by $9.3 million), gold, silver, crude perlite, and crushed stone.

Quantities of mineral commodities produced in New Mexico were also down, except for increases that took place in the production of salt (up by 18%), masonry cement (up by 40%), dimension stone (up by 18%), and construction sand and gravel (up by 0.7%). Metal production in the State was down significantly, with the production of molybdenum concentrates down 93% and gold and silver down 99% each. Copper production was down by 48,000 metric tons (t), or 46%, from a total of 104,000 t in 2008 to 56,500 t in 2009.

In 2009, New Mexico continued to lead the Nation in the quantities of crude perlite, potash, and zeolites (descending order of value) produced and remained sixth in molybdenum concentrates. The State rose in rank to 3d from 4th in pumice and pumicite production, while it decreased in rank to 4th from 3d in copper production, 10th from 7th in crude gypsum production, and to 11th from 7th and 9th, in both silver and gold production, respectively.

The following narrative information was provided by the New Mexico Bureau of Geology and Mineral Resources[2] (NMBGMR). Production data and information in the text that follows are those reported by the NMBGMR and are based on the agency's own surveys and estimates, data obtained from the New Mexico Energy, Minerals and Natural Resources Department (NMEMNRD), Mining and Minerals Division (MMD), personal mine visits by NMBGMR staff, company Web sites, and cited references. These may differ from some production figures published by the USGS.

Overview

As some mineral commodity prices increased in 2009, mining and exploration in New Mexico continued to increase from past levels, while other mineral commodity prices decreased as demand for minerals fluctuated worldwide due to the uncertain economy. The value of fuel and nonfuel mineral production in 2009 from New Mexico exceeded $1.7 billion, down from the record high production value in 2008 of $2.3 billion. These figures include coal production, which is not included in USGS total production values (New Mexico Energy, Minerals and Natural Resources Department, 2010a). Mining industry payroll exceeded $287 million, also down from 2008 values (New Mexico Energy, Minerals and Natural Resources Department, 2010a). The average price of copper in 2009, using the average annual COMEX prices, was $5.19 per kilogram (kg) ($2.35 per pound). The average price of molybdenum in 2009, using the average Platts Metals Week molybdenum prices, was $25.84 per kg ($11.72 per pound).

Active mining operations in New Mexico in 2009 included: 5 coal mines; 3 potash mines, 1 potash compaction plant, and 5 potash refineries; 1 molybdenum mine and 1 molybdenum mill; 1 copper mine and 2 solvent extraction/electro-winning (SX/EW) plants; 1 gold mine; about 17 industrial mineral

[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2009 USGS mineral production data published in this chapter are those available as of September 2011. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Virginia T. McLemore, Senior Economic Geologist, authored the State mineral industry information provided by the New Mexico Bureau of Geology and Mineral Resources.

mines and 16 industrial minerals mills; and about 150 stone and aggregate operations (New Mexico Energy, Minerals and Natural Resources Department, 2010b).

Ten minimal impact exploration permits were approved for operations with an estimated impact of less than about 2 hectares (ha) (5 acres) of disturbance, with one operation of this type approved, one denied an operating permit, with an additional eight pending approval. Twelve general permits allowing less than 153 cubic meters (200 cubic yards) per year of disturbance were approved. For new mining projects, two operations that would disturb greater than about 4 ha (10 acres) had permits pending, whereas for new minimal impact mining operations disturbing less than about 2 ha (5 acres), there were five permits pending and one approved (New Mexico Energy, Minerals and Natural Resources Department, 2010b). These figures could include uranium operations, but exclude potash and coal, as per the New Mexico Mining Act of 1993. Nearly every company currently mining had comprehensive reclamation plans, and reclamation activities were ongoing throughout the State during 2009 (New Mexico Energy, Minerals and Natural Resources Department, 2010b).

The quantity of minerals produced in New Mexico had been declining since maximum annual minerals production was achieved in 1989 (McLemore and others, 2002); however, in 2008, production values increased to record values for nonfuel mineral production (New Mexico Energy, Minerals and Natural Resources Department, 2009). By yearend, the cumulative number of exploration and mining permits on file in the State totaled to more than 400, with an increase in the filing of exploration permits. With the increase in most mineral commodity prices, exploration in New Mexico was expected to increase and some of these exploration projects were anticipated to result in new mining operations. However, the outlook for the aggregate industry remained depressed for the next few years as the housing and construction industries recover from the economic recession.

Exploration and Development

In 2009, the number of exploration permits increased compared with those in previous years. Several companies are exploring for copper, gold, potash, rare earths, and silver throughout New Mexico, especially in Catron, Dona Ana, Grant, Lincoln, Rio Arriba, and Socorro Counties.

Industrial Minerals

Clay and Shale.—Daleco Resources Corp. drilled 16 holes in 2005 and continued to evaluate its Sierra Kaolin deposit throughout 2009 (also known as the Kline Mountain deposit) in the Black Range of the Gila National Forest in northwestern Sierra County. The hydrothermal kaolin deposit was in an advanced argillic alteration zone within the tuff of Kline Mountain and has been estimated to contain more than 180 million metric tons (Mt) (more than 200 million short tons) of kaolin (Isik and others, 1994). In January 2009, the company submitted its Environmental Assessment for the proposed mine to the U.S. Forest Service (Daleco Resources Corp., 2009).

Garnet, Industrial.—Although garnet has not been produced in New Mexico for the past decade, at least one company—B.O.W. Corp.—continued to explore for garnet resources in the Orogrande District, east of Las Cruces, for potential uses as an abrasive. Garnet typically has been found in skarn deposits in southern and central New Mexico, in some areas being a major constituent of waste rock piles remaining after the recovery of metals (Lueth, 1996). In one example, approximately 135,000 metric tons (t) of 20% to 36% garnet was estimated to occur in four tailing piles at Hanover, Grant County (Cetin and others, 1996).

Perlite.—Atlas Minerals Inc. (formerly Toro Mining and Minerals, Inc.) continued to evaluate its Toro perlite deposit northwest of Deming. The site has been estimated to contain 14 Mt (15 million short tons) of perlite. St. Cloud Mining continued to examine the production potential of the McCauley Ranch (Thompson Canyon) perlite deposit in Grant County.

Potash.—After the acquisition of remaining shares of Intercontinental Potash Corp. (formerly a wholly owned subsidiary of Trigon Uranium Corp.) in early December 2009, Trigon announced its new name of IC Potash Corp. later that month (IC Potash Corp., 2009a, b). At yearend, IC Potash announced results of their drilling at the Ocha Potash Project in Lea County (IC Potash Corp., 2009c). The Ocha deposit contains as much as 85% polyhalite with halite and anhydrite in the Rustler Formation (Crowl and others, 2011). Potash is a leaseable mineral and mining and exploration activities are administered by the Bureau of Land Management and excluded from the New Mexico 1993 Mining Act.

Metals

Copper.—Exploratory drilling in 1975–89 and most recently in 2006–09 northwest of the carbonate-hosted silver deposits at the Lone Mountain property, owned by Copper One Inc., in Grant County, indicated at least three distinct zones of copper mineralization (Moran and Moore, 2006; Ray and Pawlowski, 2009). A near-surface zone of copper oxide and sulfide minerals had assays over 15 meters (m) (50 feet) of core, which were reported to contain grades up to 0.9% copper. Weak pyrite-chalcopyrite porphyry-style disseminated stockwork and fissure veins were hosted by the Lone Mountain Stock and its associated dikes and sills and were reported to have grades between 0.05% and 0.1% copper. High-grade, polymetallic exoskarn copper mineralization was hosted by various calcareous sedimentary rocks close to their contact with the Lone Mountain intrusive complex and was found to be grading in some 3-m intervals greater than 7% copper with 0.7 parts per million (ppm) gold and 116 ppm silver (Ray and Pawlowski, 2009, p. 2). The intrusions have been dated at 50.6 to 51.5 million years old (Moran and Moore, 2006, p. 51). Copper One planned to continue drilling and recalculate the resources based upon current economic conditions—final exploration permits were expected either in 2010 or 2011. The Copper One Mimbres property is a copper porphyry deposit discovered by Bear Creek Exploration in the 1950–60s, also in Grant County. Assays have ranged up to 1% copper. Copper

One planned exploration drilling to delineate specific ore bodies (Copper One Inc., 2009).

In 2007, Entrée Gold Inc. announced the discovery of a porphyry copper deposit in the Lordsburg district. Assays of drilling conducted in 2008–2009 contained ore-grade material, grading at as much as 0.33% copper and 0.26 grams per metric ton (g/t) gold over 14 m from the deposit (Entrée Gold Inc., 2009). Andesites in the Lordsburg area have been dated at 67 million years old and the granodiorite and associated rocks have been dated at 57.3 to 58.8 million years old (McLemore and others, 2000b). Additional drilling was planned.

High Desert Gold Corp. (formerly General Minerals Corp.) continued to analyze rock chip samples collected from the Gold Lake porphyry (copper, molybdenum, and gold) deposit in the White Signal District, Grant County. The deposit was hosted by quartz monzonite and rhyolite intrusions in Proterozoic rocks and was associated with porphyry-style alteration and veins. Numerous small historic mine workings are found within this area, mostly exploiting and prospecting for copper, gold, and uranium. In 2008, six drill holes confirmed the presence of copper porphyry-style mineralization. Additional drilling was planned to confirm and delineate the economic potential of the property.

Gold and Silver.—Santa Fe Gold Corp.'s combined resources from the Carache and Lucas deposits in the Ortiz Mine Grant in Santa Fe County contained an estimated 32,000 kg of gold, within the boundaries of two conceptual pits previously designed by the LAC Minerals–Pegasus joint venture, using a gold price of almost $385 per troy ounce ($12,380 per kg) (Santa Fe Gold Corp., 2012). LAC Minerals continued to perform reclamation and groundwater remediation work at the closed Cunningham Hill open pit mine in the Ortiz Mine Grant.

Micrex Development Corp. continued exploration at the Deadwood-Sunburts Claims in the Mogollon District, Catron County, and at the Banks and Mt. Royal Mines in the Steeple Rock District, Grant County. Columbus Silver Corp. was also exploring in the Mogollon District along several volcanic rock-hosted epithermal veins, where drilling returned assays of as much as 14 g/t (0.41 troy ounces per short ton) gold and 531 g/t (15.5 troy ounces per short ton) silver (Columbus Silver Corp., 2009).

El Capitan Precious Metals Inc. continued to explore for iron and gold from iron skarns adjacent to the Capitan pluton in Lincoln County. The San Lorenzo claims permit in Socorro County was still under development to mine for gold. Two new gold mines had Mining Act permit applications under review in 2008–09—the Orogrande placer gold mine in Otero County and the Northstar Mine in Rio Arriba County (New Mexico Energy, Minerals and Natural Resources Department, 2009). Exploration began for precious and base metals in the Burro Mountains mining district by Black Hawk Exploration.

Molybdenum.—In 2008, Galway Resources Ltd. announced that the Victorio Mountains deposit in Luna County contained indicated resources of 21.5 Mt at 0.15% molybdenum and 0.13% tungsten trioxide with a combined $40 per metric ton cutoff. The inferred resources were 10.6 Mt (11.7 million short tons) of 0.13% molybdenum and 0.14% tungsten trioxide (SRK Consulting (USA) Inc., 2008, p. 134). Exploration continued in 2009 to refine these results. The Victorio Mountains deposit consisted of molybdenum, tungsten and beryllium skarns, and carbonate hosted deposits associated with Tertiary intrusions (McLemore and others, 2000a, p. 267).

Polymetallic Deposits.—Southern Silver Exploration Corp. acquired mining claims for its Oro project (gold, silver, copper, lead, and zinc) in the Eureka mining district in Hidalgo County. In June, drill permits were granted by the State and the Bureau of Land Management for 10 drill sites (Southern Silver Exploration, 2009a). In December, the company announced that drilling would begin in January 2010 and would focus on four separate gold-rich targets (Southern Silver Exploration, 2009b).

Historically, approximately 230 t (500,000 pounds) of copper, 155 kg (5,000 troy ounces) of gold, almost 14,000 kg (450,000 troy ounces) of silver, more than 1,300 t (2.9 million pounds) of lead, and 771 t (1.7 million pounds) of zinc were produced from polymetallic veins and skarn deposits in the Eureka district from 1880–1961 (McLemore and others, 2000b). Turquoise also is found in the district.

Commodity Review

Industrial Minerals

Cement.—Portland and masonry cement is produced at Tijeras cement plant near Albuquerque, which was operated by Grupos Cementos de Chihuahua (GCC); the estimated capacity was 800,000 metric tons per year (t/yr) of cement. The Tijeras cement plant was commissioned in 1959, and GCC took over operations in 1994. The raw material used to make cement is limestone mined at Tijeras, with additional varying quantities of alumina, gypsum, iron ore, and sandstone/shale (locally obtained from throughout New Mexico).

Clays.—Common clay and fire clay were mined in New Mexico. Common clay was used in the manufacture of bricks, quarry tile, and roofing granules. Commercial adobe yards are mostly in northern New Mexico, and bricks are manufactured at the Kinney Brick Mill Co.'s plant in Albuquerque and American Eagle Brick Co's. plant in Sunland Park, Dona Ana County.

Gemstones.—Gemstones and semiprecious stones produced in the State included agate, azurite, fluorite, geodes, moonstone, onyx, peridot, smithsonite, and turquoise. However, depletion of the known deposits and difficulty in and expense of adhering to Federal, State, and local environmental regulations have closed most of the commercial mines. In New Mexico, peridot (a gem variety of olivine) can be found at three different locations—Buell Park, McKinley County, and in the Kilbourne Hole and the Potrillo Mar depression, Dona Ana County. Other examples of gemstone resources were turquoise, found in the Little Hatchet Mountains in Hidalgo County and near Orogrande, Otero County, and fluorite and other minerals at Bingham, Hansonburg District, in Socorro County.

Other smaller gypsum mines were operated in Dona Ana and Sandoval Counties. The Alley Gypsum Mine, located in Dona Ana County, began mining gypsum as agricultural amendment in November 2008 (New Mexico Energy, Minerals and Natural Resources, 2009). Gypsum was primarily used in the manufacture of wallboard for homes, offices, and commercial

buildings, as well as in the manufacture of portland and masonry cement and plasters; it was also used as a soil conditioner.

Perlite.—Perlite is weathered (hydrated), natural glass that is formed by the rapid cooling of viscous, high-silica rhyolite lava. The distinguishing feature of perlite from other volcanic glasses is that when heated above 871ºC, it expands or pops to 4 to 20 times its original volume to form a lightweight glass foam. This expansion is due to the presence of 2% to 6% combined water in the mined perlite. While the mined, crude perlite may range from waxy to pearly, light gray to black or even brown, blue, or red, the color of expanded perlite ranges from snowy white to grayish white. Perlite is used in building construction products, horticultural aggregate, filter aid, fillers, and other applications.

In New Mexico, perlite is found in high-silica rhyolite lava flows and lava domes that are typically 3.3 to 7.8 million years old (Chamberlin and Barker, 1996; Barker and others, 1996). Perlite is produced from three mines in New Mexico: Socorro, El Grande, and No Agua (Chamberlin and Barker, 1996).

Potash.—The Carlsbad potash district is the largest potash-producing area in the United States. Intrepid Mining LLC and Mosaic Co. operate mines in the district. Potash is used as fertilizer and as a chemical in specialty and industrial markets. Langbeinite (potassium magnesium sulfate (K2SO4(MgSO4)2)) and sylvite (KCl) were the primary potash ore minerals found in Permian evaporates of the Permian Basin in New Mexico. Mining was by underground methods at depths of about 240 to 460 m. The potash reserves in the district have been estimated to be greater than 501 Mt (553 million short tons) (Barker and others, 1996).

The production capacity of the Mosaic potash mines was about 450,000 t/yr (500,000 short tons per year) of red potash and about 1.1 Mt per year (Mt/yr) (1.2 million short tons per year) of potassium magnesium sulfate (langbeinite). The total ore reserves at Mosaic reportedly include an estimated 92 Mt (101 million short tons) of potash ore in three mining beds at thickness ranging from 1.4 to 3.4 m. These ore reserves have been estimated to yield 4.5 Mt (5 million short tons) of concentrate from sylvinite with an average grade of 60% potash (K2O) and 16 Mt (18 million short tons) of langbeinite concentrate with an average grade of approximately 22% K2O. These reserves are expected to last 15 to 23 years.

Intrepid Potash Inc. operated four potash properties in Carlsbad. Intrepid employs approximately 650 people in New Mexico. The West Facility, which consisted of a potash mine and refinery was originally built in 1929 by U.S. Potash and had a production capacity of approximately 490,000 t/yr of red potash. The East Facility, which consisted of a potash mine, refinery, and compaction plant, had a production capacity of approximately 510,000 t/yr of white potash. The North facility consisted of a granular compaction plant and storage facilities. Two types of ore were processed; flotation was used to produce red potash and hot-leach crystallization was used to produce the higher purity white potash. Plans were underway to produce potash by solution mining at the HB Solar Solution Mine. This mine had operated as an underground mine by a previous owner until 1997.

Pumice.—The main use for pumice was as an aggregate in lightweight building blocks and assorted building products. Other major applications for pumice and pumicite included abrasive, absorbent, concrete aggregate and admixture, filter aid, horticulture (including landscaping), and the stonewashing of denim.

Pumice was found in the Jemez Mountains and in the Mogollon-Datil volcanic field (Hoffer, 1994, p. 12–15); however, only four operations were active in New Mexico in 2009—Copar Pumice's El Cajete Mines and the San Ysidro plant, CR Minerals Co.'s Rocky Mountain Mine and Santa Fe plant, Utility Block's U.S. Forest Service Mine and Unity Block mill, and Urban Trucking and Excavating's operation in Sandoval County.

Copar Pumice Company, Inc. has been in the pumice mining industry for more than 40 years and produced pumice from two quarries, the Guaje Canyon Mine, Los Alamos County, and El Cajete Mine, Sandoval County. The El Cajete pumice mine opened in 1997; reclamation will and has taken place as mining is completed in specific areas. Reserves were estimated at about 91,000 t (100,000 short tons) of pumice that will be used in making stonewashed jeans and building blocks. In Sandoval County, Urban Trucking and Excavating began mining pumice in April 2008 (New Mexico Energy, Minerals and Natural Resources Department, 2009).

Salt.—United Salt Corp. operated a solar evaporation salt plant near Carlsbad City in 2009. United harvested the salt from a 1,050-hectare (ha) salt lake after the sun and wind had evaporated the water from the brine. Following thorough washing, the salt was packaged as solar salt for use in agricultural feed products, for chemical feed stocks, for swimming pool chlorine generation, for water conditioning, and for numerous other industrial applications. New Mexico Salt and Minerals Corp. also produced solar salt from a facility in the Carlsbad area. Originally, the salt at Carlsbad City was sold mostly as deicing salt for roads, but contemporary uses included water conditioning, agricultural feed products, chemical feed stocks, for swimming pool chlorine generation, and numerous other industrial applications.

Zeolites.—Zeolites are minerals found disseminated in altered volcanic ash. Clinoptilolite is the predominant mineral with unique physical, chemical, and cation exchange properties for uses in agriculture, industrial, and environmental applications. Markets included odor control and hygiene products (cat litter), industrial fillers and absorbents, filtration media, environmental products, animal-feed supplements, soil conditioners, floor-drying agents, mineral fillers, water and wastewater treatment, air-filtration media, and cation exchanged products.

Clinoptilolite was found in the altered Tertiary tuff of Little Mineral Creek (White and others, 1996). Clinoptilolite was mined, crushed, dried, and sized without beneficiation and shipped packaged to meet customer's specifications. Zeolites were produced at two mines in New Mexico: St. Cloud Mining Co.'s Stone House zeolite mine and Coyote Cliff's Nos. 1 and 2 mines (New Mexico Energy, Minerals and Natural Resources Department, 2009).

St. Cloud Mining Co. (a subsidiary of Imagin Minerals, Inc.) operates the largest zeolite mine in the United States at the Stone House Mine in Sierra County. Imagin Minerals, Inc. bought St. Cloud from The Goldfield Corporation in December 2002. St. Cloud has operated the open pit mine since 1993. The mining property consisted of approximately 607 ha (1,500 acres) and contained more than 16.6 Mt (18.3 million short tons) of reserves with a yearly capacity of almost 91,000 t (100,000 short tons). The company also made several modifications to its zeolite operation, including the addition of cation exchange capacity for added-value products and additional classification capabilities to expand markets for their products. The modern facility had a crushing and sizing capacity of about 450 t per day (500 short tons per day).

Other Industrial Minerals

New Mexico has significant deposits of humate, predominantly in the Fruitland and Menefee formations in the eastern San Juan Basin. Humates are weathered coal or highly organic mudstones found in the coal-bearing sequences. Humate was produced from nine mines and mills in the State: Rammsco's Eagle Mesa Mine near Cuba, Morningstar's Minerals Corp.'s San Juan mill in San Juan County, Horizon Ag-Products' San Luis Mine and mill south of Cuba, Mesa Verde Resources' Star Lake Mine and San Ysidro Mill, Menefee Mining Corp.'s open pit Star Lake Mine and Menefee mill, and U-Mate International's U-Mate Mine. The mining operations, processing site, and transportation facility of U-Mate International Inc. was located in the Gallup area. Humate was used as a soil conditioner and as an additive to drilling muds (Hoffman and others, 1996). Approximately 11 billion metric tons of humate resources were within the San Juan Basin (Hoffman and others, 1996).

Freeport-McMoRan Copper & Gold Inc. continued to ship magnetite (for use in cement manufacture and other minor uses) from the stockpiles at the Cobre Mining Co.'s Continental Mine.

Small flagstone dimension stone operations, located throughout the State, produced sandstone, travertine, and other ornamental rock. The largest was the New Mexico Travertine, Inc., a fully integrated stone processing plant located near Belen in Valencia County. New Mexico Travertine produced travertine for dimension stone from the Lucero quarry in Valencia County.

Metals

Copper.—Freeport-McMoRan Copper and Gold Inc., the only copper producer in New Mexico in 2009, continued to leach copper at the Chino Mine in Santa Rita, after suspending mining and milling operations at Chino in December 2008 (Freeport-McMoran Copper & Gold Inc., 2009b, p. 9). The Chino Mine was the largest porphyry copper deposit in New Mexico and has operated since 1910. Copper sulfides (chalcocite and chalcopyrite), along with azurite and chrysocolla, were found in fractured granodiorite and adjacent sedimentary rocks. In 2009, the company produced 16,300 t (36 million pounds) of copper from the SX/EW plant. Proven and probable leaching reserves in 2009 at the Chino Mine were 82 Mt of ore grading at 0.39% copper; proven and probable millable reserves were 60 Mt of ore grading at 0.65% copper, 0.03 grams per metric ton (g/t) gold, 0.48 g/t silver, and 0.013% molybdenum (Freeport-McMoRan Copper & Gold Inc., 2009a). The company continued reclamation activities of the inactive areas of the Chino Mine.

The Tyrone porphyry copper deposit in the Burro Mountains occurs within a quartz monzonite laccolith and adjacent Proterozoic rocks. Several ore bodies, sometimes considered to be separate porphyry copper deposits, have been found and mined by open pit methods in these mountains. The concentrator processed approximately 270 Mt (300 million short tons) of ore grading at 0.81% copper from 1969 to 1992, when the mill closed and the mine began processing only leach material. Currently, Tyrone consists of a SX/EW plant with a capacity to produce 76,200 Mt/yr (168 million pounds per year) of copper cathode. In 2009, more than 36,000 t (80 million pounds) of copper by SX/EW was produced. Proven leaching reserves were 180 Mt of ore grading at 0.3% recoverable copper (Freeport-McMoRan Copper & Gold Inc., 2009a, p. 104). The Tyrone Mine was among the lowest grade ore bodies operated by Freeport-McMoRan. At yearend 2008, the company announced a 50% reduction in the mining rate; however, by yearend 2009, the company reported that operations were restored to 80% of capacity (Freeport-McMoRan, 2009b, p. 9).

Freeport-McMoRan estimated its Cobre Mine reserves to be about 73 Mt of ore grading at 0.39% copper (Freeport-McMoRan Copper & Gold Inc., 2009a, p. 104). Most of the copper reserves at the Cobre Mine, consisting of a porphyry copper deposit and adjacent skarn deposits, were in the Syrena and upper part of the Lake Valley limestones north of the Barringer fault.

Gold and Silver.—In 2009, production began at New Mexico's first new gold-silver mine since 1993, the Summit Mine in the Steeple Rock District, Grant County, operated by Santa Fe Gold Corp. In years prior, all gold and silver production in the State had been byproduct recovered from copper refining by Freeport-McMoRan. The Summit Mine was a volcanic-epithermal deposit similar to the Carlisle and Center Mines also in the Steeple Rock District, Grant County (McLemore, 2008). Reserves were 480,000 t (almost 532,000 short tons) of ore grading at approximately 4.4 g/t (0.129 troy ounces per short ton) gold and almost 290 g/t (8.6 troy ounces per short ton) silver (Santa Fe Gold Corp., 2012). The company had previously purchased a ball mill and flotation plant in Lordsburg, Hidalgo County, to process the Summit ore; the permitted Banner mill was expected to begin operations in early 2010. In October, the company received the necessary permits to begin construction of a tailings disposal impoundment at the mill site; construction was finished at yearend.

Molybdenum.—In New Mexico, molybdenum was produced from Chevron Corp.'s Questa Mine in Taos County. Molybdenum is a refractory metallic element used principally as an alloying agent in steel, cast iron, and superalloys to enhance hardness, strength, toughness, and wear and corrosion resistance. Molybdenum also was used in fire retardants and in catalysts, and the mineral molybdenite is used as a lubricant.

The Questa molybdenum mine continuously operated from 1923 through 1986 when soft market conditions caused the temporary shutdown of the mine until 1989. Mining operations again were placed on standby in 1992 and resumed in 1995.

The company mined approximately 73 Mt (81 million short tons) of ore from its open pit at a grade of 0.191% molybdenum between 1965 until 1983. Underground block caving of ore commenced in 1983 and continued throughout 2009. In 2009, production was almost 227 t (0.5 million pounds) of molybdenum, down from 2,040 t (4.5 million pounds) in 2008 (Chevron Corp., 2009).

With demonstrated reserves considered, mine life was expected to be 25 to 35 years; when inferred resources are included, the mine life could be as much as 50 to 80 years. Chevron also continued with a reclamation and revegetation program to cover overburden rock piles at the inactive open pit site. The company began construction of a solar facility on the Questa tailings site in 2009. In December 2008, the company completed funding for a research project at New Mexico Tech to evaluate the effects of weathering on the long-term slope stability of the waste rock piles; results of the specific reports and theses can be obtained from http://geoinfo.nmt.edu/staff/mclemore/projects/environment/home.html.

Mine Reclamation

In 2009, the New Mexico Energy, Minerals and Natural Resources Department continued to oversee the New Mexico Mining Act of 1993. As of December 2009, more than 10,300 ha (more than 25,500 acres) of land have been disturbed by mining activities and almost 2,100 ha (more than 5,100 acres) of that disturbance has been reclaimed under the act (New Mexico Energy, Minerals and Natural Resources Department, 2010b).

Legislation and Governmental Affairs

The State continued to be an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects; (2) STATEMAP, which is a matching-funds grants program with State geological surveys; and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2009, the New Mexico STATEMAP program completed 12.5 quadrangles, including quadrangles in the Grants uranium mining district and Nogal and Capitan mining districts. The Geologic Map of the Albuquerque-Rio Rancho metropolitan area and vicinity, Bernallilo and Sandoval Counties, New Mexico, had been released in 2008. The NMBGMR periodical Earth Matters featured an article on The New Mexico Library of Subsurface Data, which includes drill cores, cuttings, geophysical well logs, and other subsurface data vital to minerals exploration (New Mexico Bureau of Geology and Mineral Resources, 2009).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NEW MEXICO[1, 2]

(Thousand metric tons and thousand dollars)

Mineral	2007		2008		2009	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	28	269	14	120	10	90
Copper[3]	108	783,000	104	734,000	56	300,000
Gemstones, natural	NA	24	NA	21	NA	21
Sand and gravel:						
Construction	18,400 r	158,000 r	14,600 r	127,000 r	14,700	118,000
Industrial	W	W	W	W	--	--
Stone:						
Crushed	7,590	56,700	7,020 r	43,400 r	6,130	40,200
Dimension	W	W	27	939	32	986
Combined values of cement, gold, gypsum (crude), helium (Grade–A), lime (2007–08), molybdenum concentrates, perlite (crude), potash, pumice and pumicite, salt, silver, zeolites, and values indicated by symbol W	XX	582,000 r	XX	720,000	XX	427,000
Total	XX	1,580,000	XX	1,630,000 r	XX	886,000

rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined values" data.
XX Not applicable. -- Zero.

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Recoverable content of ores, etc.

TABLE 2
NEW MEXICO: CRUSHED STONE SOLD OR USED, BY TYPE[1]

Type	2008			2009		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone	21 r	3,830 r	$20,400 r	19	3,690	$21,200
Volcanic cinder and scoria	6	334	3,280	6	290	2,640
Sandstone and quartzite	2	287	2,450	3	208	1,630
Miscellaneous stone	22 r	2,570 r	17,300 r	20	1,940	14,800
Total	XX	7,020 r	43,400 r	XX	6,130	40,200

rRevised. XX Not applicable.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2009, BY USE[1]

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch), riprap and jetty stone	W	W
Coarse aggregate graded:		
Concrete aggregate, coarse	137	1,630
Bituminous aggregate, coarse	W	W
Bituminous surface-treatment aggregate	W	W
Railroad ballast	W	W
Other graded coarse aggregate	585	1,930
Fine aggregate (-⅜ inch):		
Stone sand, concrete	111	1,240
Stone sand, bituminous mix or seal	W	W
Screening, undesignated	W	W
Coarse and fine aggregates:		
Graded road base or subbase	230	2,190
Unpaved road surfacing	W	W
Crusher run or fill or waste	W	W
Other coarse and fine aggregates	64	1,090
Special, asphalt fillers or extenders	W	W
Other miscellaneous uses and specified uses not listed	2	40
Unspecified:[2]		
Reported	109	580
Estimated	3,950	22,900
Total	6,130	40,200

W Withheld to avoid disclosing company proprietary data; included in "Total."
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Reported and estimated production without a breakdown by end use.

TABLE 4
NEW MEXICO: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2009,
BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch)[2]	W	W	W	W	--	--
Coarse aggregate, graded[3]	1,220	7,570	W	W	--	--
Fine aggregate (-⅜ inch)[4]	W	W	129	1,310	--	--
Coarse and fine aggregate[5]	W	W	105	1,270	--	--
Special[6]	--	--	W	W	--	--
Other miscellaneous uses	--	--	2	40	--	--
Unspecified:[7]						
Reported	1	4	75	550	33	27
Estimated	2,060	10,200	1,890	12,700	--	--
Total	3,570	20,900	2,530	19,300	33	27

W Withheld to avoid disclosing company proprietary data; included in "Total." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes riprap and jetty stone.
[3]Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete railroad ballast, aggregate (coarse), and other graded coarse aggregate.
[4]Includes screening (undesignated), stone sand (bituminous mix or seal), and stone sand (concrete).
[5]Includes crusher run or fill or waste, graded road base or subbase, unpaved road surfacing, and other coarse and fine aggregates.
[6]Includes asphalt fillers or extenders.
[7]Reported and estimated production without a breakdown by end use.

TABLE 5
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009,
BY MAJOR USE CATEGORY[1]

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	1,350	$13,200	$9.83
Concrete products (blocks, bricks, pipe, decorative, etc.)[2]	245	2,160	8.83
Asphaltic concrete aggregates and other bituminous mixtures	1,240	13,100	10.57
Road base and coverings[3]	1,510	9,530	6.32
Fill	362	1,170	3.23
Other miscellaneous uses[4]	91	2,530	27.78
Unspecified:[5]			
Reported	2,330	9,270	3.98
Estimated	7,600	66,600	8.76
Total or average	14,700	118,000	7.99

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes railroad ballast.
[5]Reported and estimated production without a breakdown by end use.

TABLE 6
NEW MEXICO: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2009, BY USE AND DISTRICT[1]

(Thousand metric tons and thousand dollars)

	District 1		District 2		Unspecified districts	
Use	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregates and concrete products[2]	1,130	11,400	459	4,040	--	--
Asphaltic concrete aggregates and other bituminous mixtures	W	W	W	W	311	3,550
Road base and coverings[3]	836	5,390	360	2,170	311	1,970
Fill	117	645	245	525	--	--
Other miscellaneous uses[4]	921	10,500	97	1,560	--	--
Unspecified:[5]						
Reported	899	6,080	45	288	1,390	2,900
Estimated	5,530	49,500	2,070	17,100	--	--
Total	9,440	83,500	3,270	25,700	2,010	8,430

W Withheld to avoid disclosing company proprietary data; included in "Other miscellaneous uses." -- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes plaster and gunite sands.
[3]Includes road and other stabilization (cement).
[4]Includes railroad ballast.
[5]Reported and estimated production without a breakdown by end use.