

THE MINERAL INDUSTRY OF UTAH

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Utah Geological Survey for collecting information on all nonfuel minerals.

In 1998, the preliminary estimated value¹ of nonfuel mineral production for Utah was \$1.3 billion, according to the U.S. Geological Survey (USGS). This was a 23% decrease from that of 1997,² following a 3% decrease from 1996 to 1997. The State dropped from 8th to 10th among the 50 States in total nonfuel mineral production value, of which Utah accounted for 3.25% of the U.S. total.

In 1998, the decrease in Utah's nonfuel mineral production value (table 1) was mainly attributable to declines in the value of copper (31%), gold (55%), magnesium metal (4%), molybdenum (44%), and salt (5%). Offsetting this were increases in the value of construction sand and gravel (26%), crushed stone (8%), magnesium compounds (56%), portland cement (6%), and potash (8%).

Based on USGS estimates of quantities produced in the 50 States during 1998, Utah remained the only State to produce beryllium concentrates; was second² in copper, magnesium metal, and potash; third in magnesium compounds and mercury; fourth in molybdenum and phosphate rock; fifth in bentonite, gold, crude perlite, silver, and grade-A helium; and sixth in salt. Utah remained the second largest copper-producing State but declined from third to fifth place in gold.

The Utah Geological Survey³ (UGS) provided the narrative information that follows. Base-metal production, valued at \$688 million, was the largest contributor to the value of minerals produced in 1998. In descending order of value, those metals are copper, magnesium metal, molybdenum, beryllium, and vanadium. Precious-metal production, valued at \$154 million, included gold (85% of total value) and silver (15% of total value). Kennecott Utah Copper Corp.'s Bingham Canyon Mine in Salt Lake County is the State's sole producer of copper, silver, and molybdenum and is a major

producer of gold. The combined value of minerals produced from the Bingham Canyon Mine is more than one-third of the total value of all minerals produced Statewide.

Copper is the largest contributor to the value of nonfuel minerals in the State. Copper prices fell significantly in 1998; the average U.S. producer price, \$0.79 per pound, was down from \$1.07 per pound in 1997 and was at its lowest level since 1986. Copper production from Kennecott's Bingham Canyon Mine decreased modestly in 1998 to about 280,000 metric tons (t) from 1997 production of about 300,000 t of copper metal. With the completion of their modernization and expansion program, Kennecott's copper production has stabilized at a rate slightly higher than 272,000 t per year.

Magnesium metal was the second largest contributor to the value of base metals in 1998. Magnesium metal is produced from Great Salt Lake brines by Magnesium Corp. of America at its electrolytic plant at Rowley in Tooele County. The plant has a capacity to produce 40,000 t of magnesium metal (99.9% purity) annually and is one of only two active primary processing facilities in the United States. Magnesium production was near capacity in 1998, although demand has decreased worldwide. Domestic producer prices were at their lowest level since 1994.

The sole molybdenum producer in Utah is Kennecott's Bingham Canyon Mine, which produced about 9,100 t of molybdenum concentrate (MoS₂) in 1998, a significant decrease from the nearly 18,000 t produced in 1997. The Bingham Canyon Mine was 1 of 11 molybdenum producers in the United States in 1998. Molybdenum is recovered as a byproduct from the copper milling operation.

Utah continued to be the Nation's leading producer of beryllium metal. Beryllium ore (bertrandite) is mined at Brush Wellman, Inc.'s Topaz and Hogs Back Mines in Juab County and processed with imported beryl at the company's plant a few kilometers north of Delta in Millard County. The Hogs Back Mine began producing in 1998. In 1998, more than 154,000 t of ore was mined and trucked to the company's Delta plant for processing. The product (beryllium hydroxide) is then sent to the company-owned refinery and finishing plant in Ohio where it is converted into beryllium metal, alloys, and oxide. The demand for beryllium alloys and beryllium oxide has increased modestly over the past several years as alloys are being introduced into components for the automobile and electronics industries. Beryllium production in 1998 was the highest that it has been in the past several years.

International Uranium Corp. (IUC) mined a small amount of vanadium ore from the Rim Mine in San Juan County. The ore was shipped to IUC's White Mesa mill near Blanding for processing. The mine had been on standby for several years. Vanadium production is expected to increase at the Rim Mine,

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or 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 1998 USGS mineral production data published in this chapter are preliminary estimates as of February 1999 and are expected to change. For some mineral commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. A telephone listing for the specialists may be retrieved over the Internet at <http://minerals.usgs.gov/minerals/contacts/comdir.html>; by using MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset (request Document #1000 for a telephone listing of all mineral commodity specialists); or by calling USGS information at (703) 648-4000 for the specialist's name and number. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at <http://minerals.usgs.gov/minerals>; facsimile copies may be obtained from MINES FaxBack.

²Values, percentage calculations, and rankings for 1997 may vary from the *Minerals Yearbook, Area Reports: Domestic 1997, Volume II*, owing to the revision of preliminary 1997 to final 1997 data. Data for 1998 are preliminary and expected to change, while related rankings may also be subject to change.

³Robert Gloyn, a Senior Geologist with the Utah Geological Survey, authored the text of State minerals information provided by that agency.

and several new vanadium mines are planning to begin operations in 1999. Vanadium prices reached their highest level in the past 5 years in early 1998 before declining significantly by yearend. This spike in price led to a resurgence of new Small Mine permits but to almost no increase in ore production.

Gold production in 1998 is estimated to be more than 12,400 kilograms (kg), a significant decrease from the record high of nearly 24,900 kg produced in 1997. Gold is produced from two surface mines owned by Kennecott Corp.: one primary producer (Barneys Canyon Mine) and one byproduct operation (Bingham Canyon Mine), both in Salt Lake County. Several small mines in the State are known to produce minor amounts of precious metals, but metal-specific production is not reported and not included in the above totals.

In 1998, silver production statewide was estimated at about 120,000 kg, about 24,900 kg less than 1997. Silver was produced as a byproduct metal from the Bingham Canyon Mine.

The industrial minerals segment, valued at \$543 million, was the second largest contributor to the value of minerals produced in 1998. Major mineral commodities produced, by group or individual commodity in descending order of value, included (1) salines, including sulfate of potash, salt, potash (KCl), and magnesium chloride, (2) sand and gravel, and crushed stone, (3) portland cement, lime, limestone, and dolomite, (4) phosphate, (5) gilsonite, (6) gypsum, (7) common clay and bentonite, and (8) expanded shale.

Brine-derived products including salt are the largest contributors to the value of industrial mineral production in Utah. In addition to salt, other brine-derived products include magnesium chloride and potash [potassium chloride and sulfate of potash (SOP)]. The production of salt and other brine-derived products statewide is estimated to be 2.4 million metric tons (Mt) in 1998, the same as 1997.

Salt production alone is estimated to be 1.5 Mt in 1998, with most of the production coming from three operators using brine from Great Salt Lake. These operators are, in descending order of production, (1) IMC Kalium Ogden, Inc. (formerly GSL Minerals), (2) Morton Salt Co., and (3) Cargill Salt Co. (formerly Akzo Nobel Salt). In addition, three other companies produce salt and/or potash from operations not related to Great Salt Lake: (1) Reilly Chemical Co. at Wendover in Tooele County (potash), (2) Moab Salt Co. near Moab in Grand County (salt and potash), and (3) Redmond Minerals, Inc. near Redmond in Sanpete County (salt only).

Potash (KCl and SOP) is produced by three companies: IMC Kalium Ogden, Inc., Reilly Chemical Co., and Moab Salt Co. at their above-mentioned facilities. Potash production is estimated to be more than 390,000 t in 1998 and about 82,000 t less than 1997.

Sand and gravel and crushed stone (including limestone and dolomite) are the second highest value industrial minerals produced in 1998. These materials are produced in every county in Utah by commercial operators and by State, Federal, and county agencies. Because of the large number and diversity of producers, operators are not sent UGS production questionnaires. However, data are compiled by the USGS. The latest production data show that in 1998, 40.7 Mt of sand and gravel and 11.8 Mt of crushed stone were produced with a combined value of \$179.3 million. Because of increased

highway construction, airport runway construction, and rapid population growth, usage should remain relatively high for the next several years.

Portland cement and lime were respectively the third and fourth highest value industrial minerals produced in 1998. Two operators produce portland cement in Utah: Holnam, Inc. and Ash Grove Cement Co. Holnam's Devil's Slide plant is east of Morgan in Morgan County, and Ash Grove's Leamington plant is east of Lynndyl in Juab County. Both companies have recently expanded production capacity, and the two plants have a combined capacity of more than 1.4 Mt of cement annually, up from 900,000 t in 1997. Both plants operated at or near capacity in 1998.

Lime demand and production remained strong in 1998. Continental Lime Co., which produces high-calcium lime, and Chemical Lime of Arizona, Inc., which produces dolomitic lime, are the two suppliers of calcined limestone (quick lime) and hydrated lime in Utah, with a combined capacity of more than 900,000 t per year. Both operations serve markets in Utah and surrounding States. Continental Lime's plant is in the Cricket Mountains, approximately 56 kilometers (km) southwest of Delta in Millard County, which is rated as one of the 10 largest lime plants in the United States. Chemical Lime of Arizona's plant is near Grantsville in Tooele County.

Nine companies quarried 2.2 Mt of limestone and dolomite in 1998, which was used mainly in the construction industry (1.9 Mt). Approximately 270,000 t was used in steelmaking and for flue gas desulfurization in powerplants. The three largest suppliers of crushed aggregate used in construction are Valley Asphalt Co. from two quarries in Utah County, Larsen Limestone Co. from one quarry in Utah County, and Harper Construction Co. from one quarry in Salt Lake County. A small amount of limestone and dolomite was also crushed to a fine powder and marketed as "rock dust" to the coal mining industry.

Utah's only phosphate operation, SF Phosphate Ltd.'s Vernal Phosphate Operation, is 18 km north of Vernal in Uintah County. SF Phosphates is a partnership of Farmland Industries, Inc. (Missouri) and J.R. Simplot, Inc. (Idaho). The company mines roughly 2.3 Mt per year of ore, which is processed into about 900,000 t of concentrate and is transported in slurry form to the company's Rock Springs, WY, fertilizer plant via a 144-km-long underground pipeline. During 1998, the mine produced more than 2.7 Mt of ore, the highest production level in the past 7 years.

Gilsonite production⁴ for 1998 is estimated to be 59,000 t, about the same as 1997. Gilsonite is an unusual solid hydrocarbon that has been mined in Utah for more than 100 years. The three operations that produce gilsonite are all near the town of Bonanza in eastern Uintah County. In descending order of production, they are (1) American Gilsonite Co.'s Bonanza Mine, (2) Zeigler Chemical and Minerals Co.'s Zeigler and Tom Taylor Mines, and (3) Lexco, Inc.'s Cottonwood Mine. Gilsonite is used in more than 150 products ranging from printing inks to explosives and is marketed worldwide. Gilsonite production has been relatively stable for the past several years.

More than 363,000 t of gypsum was produced by six companies in 1998, slightly more than in 1997. In descending order of production, the companies are (1) Georgia Pacific

⁴Shown as asphaltite on map.

Corp., (2) U.S. Gypsum Co., (3) Thomas J. Peck and Sons, (4) H.E. Davis and Sons, (5) D.K. Gypsum Industries, and (6) Western Clay Co. Both U.S. Gypsum and Georgia Pacific operate wallboard plants near Sigurd in Sevier County. The majority of gypsum produced in Utah is used for making wallboard, but several operators supply raw gypsum to regional cement companies where it is used as an additive to retard the setting time of cement and to the agriculture industry for use as a soil conditioner.

More than 204,000 t of common clay and more than 64,000 t of bentonite were produced by five companies in 1998, a moderate increase in common clay production and a significant increase in bentonite production compared to 1997. In descending order of production, the companies are (1) Interstate Brick Co. (common clay), (2) Redmond Minerals, Inc. (bentonite), (3) Paradise Management Co. (common clay), (4) Western Clay Co. (bentonite), and (5) Interpace Industries, Inc. (common clay). More than 75% of all clay is used in the manufacture of brick. Bentonite is used as a sealant in many civil engineering applications, as a pet waste absorbent (litter box filler), as an additive in oil and gas drilling fluids, and as a binder in foundry molds.

One company, Utelite, Inc., mined about 163,000 t of shale to manufacture “expanded shale” for use as a lightweight aggregate for the construction industry. The mine is near the town of Wanship in Summit County. Production of “expanded shale” products has increased moderately over the past several years. Two other companies (Holnam and Ash Grove Cement) mine modest amounts of shale for use in the manufacture of cement.

Mineral exploration activity remained at a low level in 1998. Twenty-two Notices of Intent (NOI) to explore on public lands were filed with the Utah Division of Oil, Gas, and Mining in 1998, compared to 34 in 1997. Fourteen permits were issued for base metal and/or precious-metals exploration, seven permits were issued that targeted industrial minerals, and one permit was issued for a water well. Most exploration was concentrated in or around several well-known areas and mining districts, and most drilling was done to define reserves at known mines or as followup drilling to further test areas that had been previously drilled. There was very little grass roots exploration or new target generation.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN UTAH 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1996		1997 r/		1998 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Beryllium concentrates	5,260	6	5,760	6	5,750	6
Clays:						
Bentonite	W	1,400	W	W	W	W
Common	298	4,510	299	4,510	304	4,600
Fuller's earth	W	32	W	W	--	--
Gemstones	NA	1,150	NA	974	NA	949
Salt	1,720	70,400	1,670	69,000	2,130	65,600
Sand and gravel: Construction	24,700	80,500	33,200	99,400	40,700	125,000
Stone: Crushed	4,380	19,100	11,100	50,200	11,800	54,300
Combined values of cement [masonry (1996), portland], copper, gold, gypsum (crude), helium (Grade-A), lime, magnesium compounds, magnesium metal, mercury, molybdenum, perlite (crude), phosphate rock, potash, silver, stone [dimension quartzite and sandstone (1996)], and values indicated by symbol W	XX	1,570,000 r/	XX	1,450,000	XX	1,050,000
Total	XX	1,740,000 r/	XX	1,680,000	XX	1,300,000

p/ Preliminary. r/ Revised. NA Not available. W Withheld to avoid disclosing company proprietary data; value included with "Combined values" data. XX Not applicable.

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

2/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 2
UTAH: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1996				1997			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone 2/	11 r/	1,320 r/	\$6,870 r/	\$5.22 r/	14	2,500	\$14,500	\$5.80
Dolomite	5 r/	2,710 r/	10,400 r/	3.83 r/	4	3,790	13,800	3.65
Sandstone	1 r/	W	W	5.88 r/	1	W	W	6.05
Granite	1	W	W	3.67 r/	1	W	W	3.76
Quartzite	1	W	W	10.00 r/	1	W	W	10.14
Volcanic cinder and scoria	1	W	W	11.78 r/	3	80	591	7.39
Miscellaneous stone	--	--	--	--	1	3,790	16,900	4.46
Total	XX	4,380	19,100	4.35	XX	11,100	50,200	4.51

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

2/ Includes "limestone-dolomite" reported with no distinction between the two.

TABLE 3
 UTAH: CRUSHED STONE SOLD OR USED
 BY PRODUCERS IN 1997, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+ 1 1/2 inch):			
Riprap and jetty stone	29	\$451	\$15.55
Filter stone	W	W	2.20
Coarse aggregate, graded: Concrete aggregate, coarse	W	W	3.31
Fine aggregate (-3/8 inch):			
Stone sand, bituminous mix or seal	W	W	4.41
Screening, undesignated	W	W	3.86
Coarse and fine aggregates:			
Graded road base or subbase	78	225	2.88
Unpaved road surfacing	2	8	4.00
Agricultural:			
Agricultural limestone	W	W	3.43
Poultry grit and mineral food	W	W	24.04
Chemical and metallurgical:			
Cement manufacture	W	W	6.65
Lime manufacture	1,260	5,930	4.72
Flux stone	W	W	11.24
Sulfur oxide removal	W	W	6.18
Special: Mine dusting or acid water treatment	W	W	22.88
Unspecified: 3/			
Actual	7,090	27,100	3.82
Estimated	823	3,310	4.03
Total	11,100	50,200	4.51

W Withheld to avoid disclosing company proprietary data; included in "Total."

1/ Data are rounded to three significant digits, except unit value; may not add to totals shown.

2/ Includes dolomite, granite, limestone, limestone-dolomite, miscellaneous stone, quartzite, sandstone, and volcanic cinder and scoria.

3/ Includes reported and estimated production without a breakdown by end use.

TABLE 4
 UTAH: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1997, BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:								
Coarse aggregate (+1 1/2 inch) 2/	--	--	W	W	3	(3/)	--	--
Coarse aggregate, graded 4/	--	--	W	W	--	--	--	--
Fine aggregate (-3/8 inch) 5/	--	--	W	W	--	--	--	--
Coarse and fine aggregate 6/	--	--	W	W	6	(3/)	--	--
Other construction materials	--	--	212	1,040	--	--	--	--
Agricultural 7/	(3/)	(3/)	(3/)	(3/)	--	--	--	--
Chemical and metallurgical 8/	2,340	13,400	(3/)	(3/)	31	(3/)	--	--
Special 9/	--	--	(3/)	(3/)	--	--	--	--
Unspecified: 10/								
Actual	(3/)	(3/)	(3/)	(3/)	29	(3/)	3,790	16,900
Estimated	823	3,310	--	--	--	--	--	--
Total	3,250	17,100	4,020	15,600	69	511	3,790	16,900

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, and riprap and jetty stone.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes concrete aggregate (coarse).

5/ Includes stone sand (bituminous mix or seal) and screening (undesigned).

6/ Includes graded road base or subbase, unpaved road surfacing.

7/ Includes agricultural limestone and poultry grit and mineral food.

8/ Includes cement manufacture, flux stone, lime manufacture, and sulfur oxide removal.

9/ Includes mine dusting or acid water treatment.

10/ Includes reported and estimated production without a breakdown by end use.

TABLE 5
 UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
 BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	3,510	\$13,800	\$3.93
Plaster and gunite sands	24	169	7.04
Asphaltic concrete aggregates and other bituminous mixtures	1,160	4,970	4.28
Road base and coverings 2/	3,810	12,300	3.23
Fill	5,130	6,760	1.32
Snow and ice control	39	67	1.72
Other miscellaneous uses	60	236	3.93
Unspecified: 3/			
Actual	9,080	29,800	3.28
Estimated	10,400	31,200	3.01
Total or average	33,200	99,400	2.99

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes road and other stabilization (cement).

3/ Includes reported and estimated production without a breakdown by end use.

TABLE 6
 UTAH: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1997,
 BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2	
	Quantity	Value	Quantity	Value
Concrete aggregates 2/	1,180	5,430	2,200	7,720
Asphaltic concrete aggregates and other bituminous mixtures	578	2,660	268	734
Road base and coverings 3/	1,730	4,670	767	3,110
Other miscellaneous uses 4/	280	353	4,640	6,260
Unspecified: 5/				
Actual	1,550	5,580	6,320	20,000
Estimated	212	908	9,450	26,100
Total	5,530	19,600	23,600	64,000
	District 3		Unspecified districts	
	Quantity	Value	Quantity	Value
Concrete aggregates 2/	164	831	--	--
Asphaltic concrete aggregates and other bituminous mixtures	215	1,150	101	422
Road base and coverings 3/	867	3,160	443	1,390
Other miscellaneous uses 4/	308	453	--	--
Unspecified: 5/				
Actual	813	3,050	401	1,160
Estimated	721	4,180	--	--
Total	3,090	12,800	945	2,960

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes road and other stabilization (cement).

4/ Includes fill, and snow and ice control.

5/ Includes reported and estimated production without a breakdown by end use.