

# The Mineral Industry of Idaho—1981

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**BUREAU OF MINES MINERALS YEARBOOK**

# **The Mineral Industry of Idaho**



**UNITED STATES DEPARTMENT OF THE INTERIOR**



**UNITED STATES DEPARTMENT OF THE INTERIOR • James G. Watt, Secretary**

**BUREAU OF MINES • Robert C. Horton, Director**

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# The Mineral Industry of Idaho

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the Idaho Bureau of Mines and Geology, Idaho Department of Lands, for collecting information on all nonfuel minerals.

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Nonfuel mineral production value from Idaho declined in 1981 to \$431 million, a 17% decrease from the \$522 million reported for 1980. The decrease was shared by nearly all commodities produced within the State; however, the major decline was reflected mostly in precious metals. Silver again was the leading mineral commodity in terms of revenue, followed by phosphate

rock, lead, and zinc. Metallic minerals accounted for more than 60% of total mineral revenue for the year.

Major developments during the year were company mergers and the announced closing of the Bunker Hill Co. operations in Kellogg. Lower metal prices slowed development of new mines, and may further curtail proposed operations.

Table 1.—Nonfuel mineral production in Idaho<sup>1</sup>

Mineral	1980		1981	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Antimony ore and concentrate, antimony content ----- short tons	88	W	432	W
Clays ----- thousand short tons	27	\$301	26	\$288
Copper (recoverable content of ores, etc.) ----- metric tons	3,103	7,006	4,245	7,966
Gem stones -----	NA	60	NA	75
Lead (recoverable content of ores, etc.) ----- metric tons	38,607	36,139	38,397	30,923
Phosphate rock ----- thousand metric tons	4,991	100,873	5,361	108,964
Sand and gravel <sup>2</sup> ----- thousand short tons	5,299	14,203	<sup>P</sup> 5,100	<sup>P</sup> 13,200
Silver (recoverable content of ores, etc.) ----- thousand troy ounces	13,695	282,663	16,546	174,033
Stone <sup>3</sup> ----- thousand short tons	2,007	7,240	1,437	6,206
Zinc (recoverable content of ores, etc.) ----- metric tons	27,722	22,876	W	W
Combined value of cement, garnet (abrasives), gold, gypsum, lime, perlite, pumice, sand and gravel (industrial), stone (dimension), tungsten (1980-81), vanadium, and values indicated by symbol W -----	XX	50,734	XX	89,093
Total -----	XX	522,095	XX	430,748

<sup>P</sup>Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; value included in "Combined value" figure. XX Not applicable.

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

<sup>2</sup>Excludes industrial sand; value included in "Combined value" figure.

<sup>3</sup>Excludes dimension stone; value included in "Combined value" figure.

Table 2.—Value of nonfuel mineral production in Idaho, by county<sup>1</sup>

(Thousands)

County	1979	1980	Minerals produced in 1980 in order of value
Ada	W	\$3,573	Sand and gravel.
Adams	W	W	Copper, stone, silver.
Bannock	W	W	Cement, stone, sand and gravel.
Bear Lake	W	--	
Benewah	W	W	Garnet and stone.
Bingham	W	W	Phosphate rock, sand and gravel.
Blaine	W	W	Sand and gravel, gold, silver, lead.
Boise	W	W	Gold, silver, lead, stone.
Bonner	W	250	Sand and gravel.
Bonneville	\$3,258	2,746	Sand and gravel, pumice, stone.
Boundary	W	W	Stone, sand and gravel.
Butte	( <sup>2</sup> )	--	
Canyon	W	W	Sand and gravel, lime.
Caribou	93,104	102,308	Phosphate rock, vanadium, stone, sand and gravel.
Cassia	W	W	Sand and gravel, stone.
Clark	84	40	Sand and gravel, clays.
Clearwater	430	688	Stone.
Custer	1,750	W	Silver, lead, zinc, copper, gold, stone.
Elmore	W	W	Stone, sand and gravel, clays.
Franklin	174	102	Stone.
Fremont	702	49	Sand and gravel.
Gem	1,918	W	Sand and gravel, stone.
Gooding	W	W	Sand and gravel.
Idaho	W	883	Stone, sand and gravel.
Jerome	--	W	Sand and gravel.
Kootenai	1,474	W	Sand and gravel, stone, silver, gold, copper, lead.
Latah	W	W	Stone and clays.
Lemhi	W	680	Silver, lead, gold, stone, copper, gypsum.
Lewis	117	45	Stone.
Lincoln	3	W	Sand and gravel.
Madison	1,639	365	Do.
Minidoka	W	W	Lime, sand and gravel.
Nez Perce	W	584	Sand and gravel, silver, stone, lead.
Oneida	W	W	Perlite, pumice, stone.
Owyhee	W	W	Silver and gold.
Payette	130	114	Sand and gravel.
Power	44	W	Do.
Shoshone	W	W	Silver, lead, zinc, copper, gold, antimony.
Twin Falls	W	W	Lime, sand and gravel.
Valley	249	W	Stone, sand and gravel, tungsten.
Washington	W	W	Gypsum.
Undistributed <sup>3</sup>	*327,806	409,665	
Total	*437,882	*522,095	

<sup>1</sup>Revised. W Withheld to avoid disclosing company proprietary data; included with "Undistributed."<sup>2</sup>Camas, Jefferson, and Teton Counties are not listed because no nonfuel mineral production was reported.<sup>3</sup>Less than 1/2 unit.<sup>4</sup>Includes some clays (1980) that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.<sup>5</sup>Data do not add to total shown because of independent rounding.

Table 3.—Indicators of Idaho business activity

	1980	1981 <sup>P</sup>	Change, percent
<b>Employment and labor force, annual average:</b>			
Total civilian labor force ----- thousands	413.1	420.4	+1.8
Unemployment ----- do -----	32.4	39.8	+22.8
<b>Employment (nonagricultural):</b>			
Mining ----- do -----	4.7	4.9	+4.2
Manufacturing ----- do -----	53.3	52.3	-1.9
Contract construction ----- do -----	17.4	16.3	-6.3
Transportation and public utilities ----- do -----	20.1	19.7	-2.0
Wholesale and retail trade ----- do -----	80.6	79.8	-1.0
Finance, insurance, real estate ----- do -----	23.4	23.2	-.9
Services ----- do -----	60.0	60.0	--
Government ----- do -----	70.5	70.1	-.6
Total nonagricultural employment ----- do -----	330.0	326.3	-1.1
<b>Personal income:</b>			
Total ----- millions -----	\$7,735	\$8,544	+10.4
Per capita ----- do -----	\$3,176	\$3,906	+8.9
<b>Construction activity:</b>			
Number of private and public residential units authorized -----	5,795	3,056	-47.3
Value of nonresidential construction ----- millions -----	\$110.1	\$111.5	+1.3
Value of State road contract awards ----- do -----	\$23.5	\$50.0	+112.8
Shipments of portland and masonry cement to and within the State ----- thousand short tons -----	364	313	-14.0
<b>Nonfuel mineral production value:</b>			
Total crude mineral value ----- millions -----	\$522.1	\$430.7	-17.5
Value per capita, resident population ----- do -----	\$563	\$456	-17.6
Value per square mile ----- do -----	\$6,248	\$5,155	-17.5

<sup>P</sup>Preliminary.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

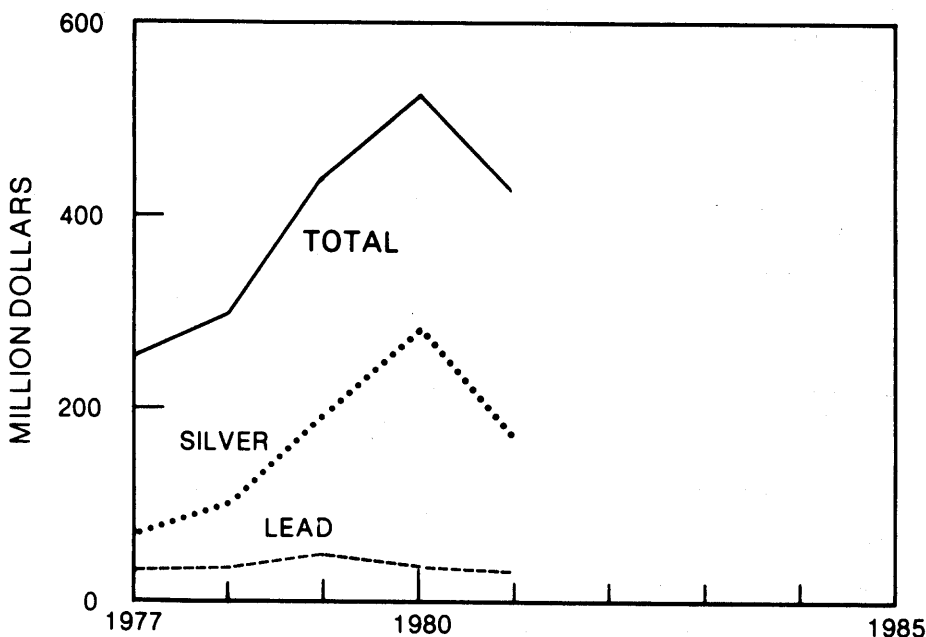


Figure 1.—Value of silver and lead, and total value of nonfuel mineral production in Idaho.

**Trends and Developments.**—Declining metal prices had an adverse effect on Idaho's economy, especially within the Coeur d'Alene district. On August 25, 1981, Gulf Resources and Chemical Corp. announced it was closing the Bunker Hill Co.'s Kellogg operation permanently. Closure would affect the lead smelter and refinery, zinc plant, and acid plant by the end of the year, with mining and milling operations to close in early 1982. The lead smelter and zinc plant had an annual capacity of 130,000 and 104,000 short tons, respectively. Shutdown will affect 2,100 employees and mean a loss of \$50 million annual payroll. Bunker Hill was the largest single employer in northern Idaho.

The rationales behind the closure include (1) declining silver prices; (2) long-term depressed prices for lead and zinc; (3) problems in securing zinc concentrates (Bunker Hill imported nearly 70% of its zinc plant feedstock); (4) cost of installation of new antipollution equipment (estimates ranged up to \$100 million); (5) problems in meeting Occupational Safety and Health Administration (OSHA), Mine Safety and Health Administration, and Environmental Protection Agency (EPA) regulations; (6) declining ore grades at the Bunker Hill Mine; (7) a proposal by the General Services Administration to sell silver from the national stockpile; (8) high labor costs; (9) maintenance problems in operating old facilities; and (10) competition for imported concentrates due to increased costs of transportation for inland shipping.

After the Gulf announcement, Governor Evans formed the Silver Valley Economic Task Force in an effort to find a buyer for the Bunker Hill complex. At the same time, the United Steel Workers local union examined the feasibility of establishing an Employees' Stock Ownership Plan; this plan was subsequently rejected as inoperable by the company in November 1981. The task force was able to obtain a 5-year postponement of OSHA regulations on lead levels, and the cooperation of EPA in specifying what the antipollution requirements would be for a buyer over the same 5-year period.

In December 1981, a local group of investors secured an option to purchase the Bunker Hill Co. for over \$65 million in cash, notes, and a share in future profits. The group began seeking concessions from the craft unions, suppliers, and utilities in order

to trim first-year losses from an estimated \$40 million to \$10 million. At yearend, no decision had been reached; however, the option had been extended into January 1982.

Shutdown of Bunker Hill will result in a loss of 26% of the Nation's refined silver output, 21% of primary refined lead production, 21% of primary slab zinc production, and 15% of its refined cadmium output. In recent years, nearly 75% of the lead and 60% of the zinc concentrates processed at the plant were obtained from other domestic and foreign sources.

A major corporate shift occurred when Sunshine Mining Co. merged with four companies that controlled mineralized ground that it was mining near the Sunshine Mine. The merged companies were Silver Dollar Mining Co.; Sunshine Consolidated, Inc.; Big Creek Apex Mining Co.; and Silver Syndicate, Inc. The agreement involved a reported \$55 million stock swap. The only remaining outside interests in the Sunshine Mine Area are Hecla Mining Co., with 33.25% of the Unit Area production; Silver Surprise, Inc., with 50% of production from the "S" Area; and Metropolitan Mines Corp., with 50% from the Metropolitan Area and 16% from the Yankee Girl Area. Sunshine continued work on the No. 12 shaft, which passed the 5,000-foot level at yearend and is targeted for a depth of 5,200 feet. The building that will house the company's new silver refinery was completed, and equipment for it was purchased during the year. The price decline in silver has resulted in a delay of operation at the \$15 million facility.

Hecla Mining Co. also joined the merger ranks in 1981, when it completed a stock purchase of Day Mines, Inc. The deal was valued at nearly \$100 million. This combination will make Hecla the largest domestic silver producer. Hecla now owns the Lucky Friday Mine, the Knob Hill Mine (Washington), 50% of the Star Mine, and 64% of the Consolidated Silver Project. The company will also receive 60% of the profits from the Sherman Mine (Colorado), 12.5% from the Galena Mine, 5% from the Coeur Mine, and 33.25% from the Sunshine Mine. In addition to its producing properties, Hecla now controls 21,800 acres of mining claims in the Western United States, many of which are in the Coeur d'Alene mining district.

The Lucky Friday Mine was closed by a strike from March 21 to May 23. Progress

on construction of its Silver Shaft continued under budget and 44 weeks ahead of schedule, passing the 4,900-foot level at yearend; present plans call for the sinking to bottom out at the 6,100-foot level.

Shaft sinking continued also at the Caladay Project (Callahan Mining Corp.), where depth exceeded 1,600 feet at yearend. That shaft is expected to bottom out at 5,100 feet. Installation was completed of a pump station and a 27,000-horsepower Nordberg hoist.

The Consolidated Silver Project, operated by Hecla Mining Co., continued shaft sinking at the Silver Summit Mine; the shaft was extended from the 4,590-foot level to the 4,950-foot level. Exploration of the upper workings progressed throughout the year. The 5-year program cost is expected to approach \$11 million.

In January, ASARCO Incorporated negotiated and signed a new 3-year contract with the United Steel Workers Union, covering workers at the Galena Mine.

Outside of the Coeur d'Alene district, major developments occurred at the Thompson Creek Mine, Custer County (molybdenum), and the Blackbird Mine, Lemhi County (cobalt).

Progress was extensive during the year at Cyprus Mining Corp.'s Thompson Creek Mine. Nearly 1,300 people were employed in removing overburden and building site facilities for the largest surface mine in the State. Overburden ranged from 50 to 600 feet thick. Excavation was completed for the crushing plant, as was site preparation for the mill. A 7,000-foot conveyor belt system will move crushed ore to the mill. Mining will be done with 4 25-yard shovels and 23 170-ton trucks. When fully operational, the mine is expected to produce 25,000 tons of ore per day and employ nearly 550 workers. Approximately 2,500 acres will be disturbed for the operation.

A 3- to 4-month gain on construction schedules, mostly due to good weather and a 20% cost overrun by primary contractors, caused Cyprus to shut down working operations at yearend. The company will renew operations in the spring after contracts have been renegotiated.

During the year, construction began on a new 95-mile, 230-kilowatt power transmission line to the mine; cost will approach \$15 million. The first year budget for the \$350 million venture totaled about \$172 million.

Cyprus has built 262 houses in Challis, for

purchase by its future employees, and a 162-unit trailer park. The company also prepaid \$600,000 in 1981 property taxes to enable the community to prepare for the rapid growth.

Even though molybdenum prices declined sharply during the year, Cyprus intends to complete the Thompson Creek Mine in spite of adverse economic conditions.

At Noranda Mining Co., Inc.'s Blackbird Mine, Lemhi County, work continued during the year and the two lower levels were dewatered. Sampling and underground drilling programs continued. The work force was reduced to 90 in October 1981, and further curtailments in the work force occurred by yearend.

Exploration continued outside the immediate mine area; several new target areas were delineated. Exploration was also conducted in the Special Management Zone of the River of No Return Wilderness Area, which is adjacent to and northwest of the mine site.

Noranda announced early in the year that a \$50 million cobalt refinery would be built on a 212-acre site near Blackfoot, in southeast Idaho. A 1985 completion date is planned. The facility would employ 180, and have an annual operating budget of \$14 million. Noranda obtained a favorable zoning decision from the Bingham County Planning and Zoning Commission, but a suit filed by local residents sought to reverse that decision. By yearend, Noranda announced that plans for its proposed refinery were being delayed because of adverse economic conditions, and by the uncertainty of whether or not the Government will set a floor price for cobalt.

In January 1981, MAPCO Minerals Corp. completed purchase of all mining and mineral-related properties of Earth Resources Co., which included the Delamar Mine in Owyhee County. Ongoing development drilling on the property has increased reserves to a 20-year mine life. A new open pit mine named the Glen Silver was developed during the year. The deposit is northwest of the present Summer Camp Pit operation.

With an environmental impact statement completed early in the year, Canadian Superior Mining Co. began construction of production heap leach pads at its Stibnite property. Sixty people were employed on the project, which was 90% complete by yearend. The project included five 200-by



325-foot leach pads, each with the capacity to hold 25,000 to 30,000 tons of ore. The company anticipates recovering 1 ounce of gold per 10 to 20 tons of ore. The mine has a 7- to 10-year life, but will operate 6 months per year because of severe winter conditions. Preproduction costs are estimated at \$10 million.

A pilot heap leach test was carried out by Yellow Jacket Mines, Inc., on 3,000 tons of gold ore at the Yellow Jacket Mine in Lemhi County. The company plans to go from start to full-scale production in 1982. Annual production of ore is estimated at 50,000 tons, with an average grade of 0.1 ounce of gold per ton.

Inspiration Development Co. dropped its option on the Rams Horn Mine (Custer County), but continued its drilling program with favorable results on the adjacent Keystone property in the Bay Horse mining district. The mine contains fluorite, silver, and lead mineralization, and has changed its status from exploration to development. The company also continued development work at the Ima Mine (Lemhi County) by driving a new adit and opening a new haulage level.

U.S. Antimony Corp. processed dump material that had been taken from the Charles Dickens Mine. Processing was done at its 300-ton-per-day mill near Preacher's Cove on the Yankee Fork of the Salmon River. The company also did development tunneling on at least two other properties in this historic mining district.

The Sunbeam Mining Corp., a subsidiary of Geo Dome Petroleum Co., Vancouver, British Columbia, Canada, started heap leaching gold material from the Sunbeam Mountain of Jordan Creek, Custer County. A trommel was installed to separate clay from the ore, and carbon towers were built to recover the gold from cyanide solution. Their operation will employ between 40 and 50 people, and approximately 7 million tons of ore will be moved during the proposed 10-year mining program.

Silver King Mines, Inc., continued copper-silver mining operations at its Copper Cliff surface mine at Cuprum (Adams County), but closed down in December 1981, because of low metal prices. The company also processed ore taken from the Iron Dyke Mine in Oregon. A potential merger between Silver King and a German company was called off at yearend.

Extensive exploration projects were un-

derway in many of the State's counties during the year, notably Adams, Blaine, Boise, Custer, Lemhi, Shoshone, and Valley. In Custer County, Noranda Mining, Inc., drilled three holes at its Red Mountain molybdenum prospect; their exploration will continue in 1982. Noranda announced dropping of its claims on Basin Creek because of the depressed uranium market. Anaconda Mining Co. dropped claims on the Beaver Creek molybdenum prospect (Lemhi County), a few miles west of Leesburg. The company will maintain its Tango-Pioneer molybdenum claims west of Loon Creek until at least 1982. Denison Mines (U.S.) Inc. was actively exploring its Parker Mountain property north of Challis. Molybdenum Corp. Inc. staked claims in the Copper Basin Area and initiated a geology, geophysics, and geochemistry program in the Star Hope Canyon and Muldoon Canyon Areas. Utah International drilled a porphyry copper molybdenum deposit near the Copper Basin Mine.

Sunshine Mining Co. drilled three holes in the Pearl district, north and west of Boise in Gem County. Monica Mines, active in the same area last year, was building a cyanide heap leach facility in early 1981. Loss of funding forced shutdown of the operation by midyear. The Golden Gate tungsten property near Yellow Pine (Valley County), another Monica venture, suffered the same fate. AMAX Inc. continued a long-standing exploration program at the CUMO molybdenum deposit near Grimes Pass, north of Idaho City (Boise County). A small drilling program was conducted during the summer. In Adams County, 12 holes were drilled on the Hercules silver prospect owned by Anglo-Bomarc. Twin Rivers Development Minerals, Inc., sold its option on the property to the Copper Lakes Co.; work ceased in midyear because of funding shortages and declining silver prices. In Kootenai County, Bear Creek Mining Co. continued exploration at the Chilco Mountain molybdenum prospect. This project is a joint venture with Union Carbide Corp. and Noranda; a deep diamond drill hole was tentatively planned for 1982. The Turtle Mining Co. examined the Big Turtle Mine near Clayton, in Custer County. The company estimates reserves of 40,000 short tons with 21 ounces of silver per ton and 8% lead. Work for the year included a geochemical survey and a detailed geologic mapping program; a drilling program was planned for 1982.

COMINCO American Inc. continued detailed geologic studies on its Bobcat Gulch prospect on Napoleon Ridge, east of Leesburg, in Lemhi County. Over 10,000 feet of new road was built on the porphyry-copper-molybdenum prospect, and a new zone of secondary copper mineralization was discovered. Molybdenite mineralization and quartz vein occurs across a 1,000- to 2,000-foot zone. This project is a joint venture with Bear Creek Mining Co.

COMINCO also continued its exploration program in the Pine Creek district. The company holds leases on the Lookout, Signal, Silver and Gold, and New Era properties through an agreement with Epic Silver Mining Co. Final agreements were reached during the year with Hypotheek Mining and Milling Co., Constitution Mining Co., Sidney Mining Co., and Mascot Mining Co. COMINCO did some surface drilling in the area during the year, and anticipates the possibility of a complete geophysical survey in 1982.

A diamond drilling program was begun by Sunshine Mining Co. on property controlled by Allied Silver-Lead Co., to explore and develop 400 acres located under the city of Mullen, near the Lucky Friday Mine. A diamond drill hole planned to reach 4,000 feet was down 3,700 feet by late October. Several siderite veins with low silver values were intersected by the hole. Sunshine is committed to spend \$1.2 million on the Allied property by 1985.

Coeur d'Alene Mines Corp. continued an extensive drilling project on the Harlow property of Royal Apex Silver, in Shoshone County. Early in the year, diamond drill holes intercepted several zones of silver-bearing mineralization. The company also signed an agreement with Capital Silver Mines Inc. to expend \$150,000 during the first 2 years of an exploration venture on Capital Silver's 300 claims. The company may terminate the agreement after the expenditure of \$100,000. Coeur d'Alene Mines will receive 65% of any ore found on the property after recovering preproduction costs. The company also negotiated an exploration agreement with Highland Aurora Mining Co. to examine that company's 37 mining claims in the Coeur d'Alene district. A minimum of \$75,000 will be spent on the property by the end of 1982.

Helena Silver Co. signed an option to lease agreement with Bear Creek Mining Co. (a subsidiary of Kennecott Corp.). Bear

Creek has conducted detailed geologic and geochemical work on Helena Silver's 30-claim Wonderful Creek property, and plans to do deep diamond drilling. Shoshone Silver Mining Co. also signed option and exploration agreements with Bear Creek for its 75 claims adjacent to Helena Silver's. The option provides for expenditure of as much as \$500,000 in exploration effort from 1985 to 1991. Bear Creek Mining Co. also signed option agreements with Beacon Light Mining Co., Border Silver Mines Co., Idaho Copper & Gold Inc., Idora Silver Mines Inc., Park Copper Co., Reindeer Queen Mining Co., and Silver Crest Mines Inc. This gives Bear Creek a very large land holding east of the silver belt in the Coeur d'Alene district.

In the nonmetallic mineral sector, a draft environmental statement was released in September 1981 for the J. R. Simplot Co.'s Smokey Canyon Mine. The new mine, on Federal Phosphate Lease I-012890, will eventually replace diminishing reserves at the company's Conda Mine. The lease area covers nearly 2,500 acres 25 miles east of Soda Springs, in Caribou County. Simplot plans to mine approximately 2 million tons of phosphate rock annually over a projected 30-year life. Preproduction costs are estimated at \$20 million. The mine will be an open pit operation, using shovels and 170-ton haul trucks. The present proposal features a 25-mile, 8-inch pipeline for transporting slurry phosphate from the new mine site to Simplot's processing plant at Conda. The project will employ 95 people during full operation. Construction is scheduled to begin early in 1982, with the mill, slurry pipeline, and tailings dam to be completed by 1984.

The Conda Partnership, a joint venture of Beker Industries Corp. and Western Co-op Fertilizers, closed the Maybie Canyon Mine in December 1981, due to a soft market and an oversupply of phosphate.

Oneida Perlite Co. installed the largest vertical furnace manufactured for expanding perlite. A new filler plant was completed and storage facilities were expanded.

Cash Industries processed barite from a stockpile at the Bonnie Barite surface mine (Blaine County). The company processed nearly 60,000 tons of barite at its mill during the year. It is anticipated that Cash will open a new mine in 1982, when the stockpiled ore is exhausted. A drilling and exploration program was conducted on new barite claims close to the present mine. NL Industries, Inc. (Baroid Div.), which owns

the Bonnie Barite Mine, submitted a mining plan to the Idaho Department of Lands and the U.S. Forest Service, for surface mining operations to begin in 1982. The company also has plans to build a processing plant somewhere in the vicinity in 1982.

Occidental Petroleum continued with plans to produce zeolites from its claims near Sheaville, Owyhee County. A primary crushing plant is to be built at the site. The product would then be shipped to a new processing plant tentatively planned for construction in Nampa.

**Legislation and Government Programs.**—The 46th Idaho Legislature, first regular session, dealt with several bills that would affect Idaho's mineral industry. New laws now in effect concern provisions for exploration and lease of mineral rights on State lands, and to protect the "Good Samaritan Act" of miners in mine rescue situations. There were a number of legislative meetings and discussions over a proposal to impose a gross percent State severance tax on all minerals. The proposed bill was not reported out of committee.

The 116th Engineer Battalion of the Idaho National Guard continued rehabilitation work at the Jack Waite Mine. The Guard, as part of its summer training, is stabilizing the old mine tailings. Erosion of these has been of concern to the public and to the U.S. Forest Service, because the unstable tailings could be washed into Eagle Creek during a flood and cause metallic contamination in the North Fork of the Coeur d'Alene River.

A 3-year, \$827,000 research program that began in 1981, is conducted jointly by the U.S. Geological Survey and the University of Idaho's College of Mines and Earth Resources. The program will involve surface mapping, remote sensing, and geochemical studies including isotope and fluid inclusion work. The goal is to gain further geologic knowledge of the Coeur d'Alene mining district in the search for more economic mineralization.

The Idaho Bureau of Mines and Geology (IBMG) completed the 1:250,000-scale mines and prospects map series during 1981. The 20 maps show locations and give references for over 8,000 mines and prospects in the State. The IBMG project was completed in cooperation with the U.S. Geological Survey, the Federal Bureau of Mines, the U.S. Bureau of Land Management, and the U.S.

Forest Service. Third-year field work in support of the U.S. Geological Survey's Challis Conterminous U.S. Minerals Assessment Program was completed. Six 15-minute quadrangles have been mapped in the Atlanta Lobe of the Idaho Batholith, and petrologic studies are underway.

The description of a newly discovered volcanic feature in southwest Idaho, the Bruno Jarbridge Eruptive Center, was the subject of several publications during the year. The largest single publishing project ever undertaken by the IBMG was initiated during the year. The publication was a volume of more than 45 papers on the Cenozoic geology of Idaho. The phosphate study in southeast Idaho, supported by the U.S. Geological Survey, continued on schedule. A contract extension increased the number from 15 to 21 of 7.5-minute quadrangles to be evaluated for phosphate; projected completion is mid-1982.

In cooperation with the Geological Survey, IBMG continued field work and compilation of its Quaternary Mapping Project. A new surficial geology map series (scale 1:250,000) was started; the first two maps are scheduled for publication in 1982. The Landsat application program for evaluating geologic hazards in the State was completed for the Pacific Northwest Regional Commission. A National Science Foundation project was completed, studying the depositional environment of Mount St. Helens ash.

The Mining and Mineral Resources and Research Institute at the University of Idaho received no new 1981 research grant money. However, the institute did receive annual allotments of \$110,000 for operations and \$40,000 for fellowships.

**Employment.**—The weakening in metal markets and construction industries caused a substantial decline in employment by yearend in the State's mineral sector. Total mining employment was down 8% from that of 1980, while primary metal products employment, reflecting the Bunker Hill Co. shutdown, plunged 45%. Layoffs in stone, clays, and concrete product areas were increased 12% over the figures reported by December 1980. Phosphate mine employment began decreasing in late November 1981, and by yearend had reached its lowest level in 8 years.

Earnings for mining workers in 1981 were the highest of all the manufacturing groups, averaging nearly \$600 per week.

**Table 4.—Idaho: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county**

County	Lode mines producing	Material sold or treated <sup>1</sup> (metric tons)	Gold		Silver		Total value
			Troy ounces	Value	Troy ounces	Value	
1979, total -----	34	2,121,412	24,140	\$7,423,057	17,144,209	\$190,129,279	
1980, total -----	21	2,198,556	W	W	13,694,902	282,662,776	
<b>1981:</b>							
Blaine -----	2	21	---	---	( <sup>2</sup> )	( <sup>2</sup> )	
Bonner -----	2	5,952	W	W	5,424	57,052	
Custer -----	5	80,477	300	137,891	112,656	1,184,959	
Kootenai -----	1	4,354	415	190,751	38,602	406,030	
Shoshone -----	14	1,626,781	W	W	14,836,789	156,058,835	
Undistributed <sup>3</sup> -----	9	799,960	W	W	1,552,177	16,326,374	
<b>Total<sup>4</sup> -----</b>	<b>33</b>	<b>2,516,946</b>	<b>W</b>	<b>W</b>	<b>16,545,648</b>	<b>174,033,250</b>	
<b>Copper                      Lead                      Zinc</b>							
	Metric tons	Value	Metric tons	Value	Metric tons	Value	Total value
1979, total -----	3,618	\$7,420,583	42,636	\$49,479,186	29,660	\$24,390,724	\$278,842,829
1980, total -----	3,103	7,005,766	38,607	36,139,250	27,722	22,876,264	W
<b>1981:</b>							
Blaine -----	( <sup>2</sup> )	( <sup>2</sup> )	1	468	1	788	5,441
Bonner -----	( <sup>2</sup> )	( <sup>2</sup> )	5	4,211	4	4,348	105,976
Custer -----	( <sup>2</sup> )	( <sup>2</sup> )	W	W	59	57,494	1,678,951
Kootenai -----	9	16,014	7	5,786	---	---	618,581
Shoshone -----	3,423	6,423,322	37,914	30,535,041	W	W	226,281,428
Undistributed <sup>3</sup> -----	814	1,526,770	469	377,989	W	W	29,778,428
<b>Total<sup>4</sup> -----</b>	<b>4,245</b>	<b>7,966,106</b>	<b>38,397</b>	<b>30,923,495</b>	<b>W</b>	<b>W</b>	<b>258,468,805</b>

W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Operations from which gold, silver, copper, lead, or zinc, were recovered only from tailings or cleanup are not counted as producing mines.

<sup>2</sup>Included in "Undistributed" to avoid disclosing company proprietary data.

<sup>3</sup>Ada, Adams, Boise, Camas, Idaho, Lemhi, and Owyhee and items indicated by footnote 2 combined to avoid disclosing company proprietary data.

<sup>4</sup>Data may not add to totals shown because of independent rounding.

**Table 5.—Idaho: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1981, by class of ore or other source material**

Source	Number of mines <sup>1, 2</sup>	Material sold or treated (thousand metric tons)	Gold (troy ounces)	Silver (thousand troy ounces)	Copper (metric tons)	Lead (metric tons)	Zinc (metric tons)
<b>Lode ore:</b>							
Gold, gold-silver, copper, lead, zinc <sup>3</sup> -----	8	801,678	W	1,541,789	<sup>4</sup> 1,090	2	W
Silver -----	15	867,203	2,719	13,161,698	3,154	11,562	1,100
Lead-zinc -----	10	845,579	W	1,836,133	W	26,821	W
<b>Total<sup>5</sup> -----</b>	<b>33</b>	<b>2,514,459</b>	<b>W</b>	<b>16,539,620</b>	<b>4,243</b>	<b>38,385</b>	<b>W</b>
<b>Other lode material:</b>							
Gold tailings, silver tailings, lead-zinc cleanup	1	2,487	241	6,023	2	12	5
<b>Total lode material<sup>6</sup> -----</b>	<b>33</b>	<b>2,516,946</b>	<b>W</b>	<b>16,545,648</b>	<b>4,245</b>	<b>38,397</b>	<b>W</b>

W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Operations from which gold, silver, copper, lead and zinc were recovered only from tailings or cleanup are not counted as producing mines.

<sup>2</sup>Detail will not add to total because one mine produced more than one class of material.

<sup>3</sup>Combined to avoid disclosing company proprietary data.

<sup>4</sup>Includes copper from lead-zinc ores.

<sup>5</sup>Data may not add to totals shown because of independent rounding.

**Table 6.—Idaho: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1981, by type of material processed and method of recovery**

Type of material processed and method of recovery	Gold (troy ounces)	Silver (thousand troy ounces)	Copper (metric tons)	Lead (metric tons)	Zinc (metric tons)
Lode ore:					
Cyanidation and direct smelting of ore <sup>1</sup> -----	W	1,551	14	160	36
Smelting of concentrates -----	3,047	14,995	4,231	38,236	W
Total -----	W	16,546	4,245	*38,397	W

W Withheld to avoid disclosing company proprietary data.

<sup>1</sup>Combined to avoid disclosing company proprietary data. Includes recovery from tailings and cleanup.

\*Data do not add to total shown because of independent rounding.

## REVIEW BY NONFUEL MINERAL COMMODITIES

### METALS

**Antimony.**—Production rose five times over that reported in 1980. The Sunshine Mine, Idaho's only antimony producer, operated for the entire year. The low 1980 production was due to an 8-1/2-month strike at the Sunshine Mine.

**Cadmium.**—The entire State production came from the Bunker Hill Co. Because of the planned shutdown of Bunker's smelting complex, cadmium will no longer be produced in Idaho.

**Cobalt.**—There was no recorded production of cobalt in Idaho for 1981. Noranda Mining Inc. continued development work at its Blackbird Mine, but at a greatly reduced rate from that of 1980 owing to weak market prices. Employment was reduced 50% during the year.

**Copper.**—Output and value both increased in 1981. Production increase was attributable to the Sunshine Mine being operated for the full year. Eighteen mines reported copper output for the year; nearly 71% of total State production came from eight mines in the Coeur d'Alene district. Asarco's Galena and Coeur Mines were the largest producers. Copper was produced in seven counties; the only notable producer outside of Shoshone County was the Copper Cliff Mine (Adams County), operated by Silver King Mines Inc. Idaho ranked ninth in the Nation in 1981 copper output. Copper exploration projects by several companies were reported in the Seven Devils Area of Adams and Washington Counties.

**Gold.**—Output increased slightly in 1981. MAPCO Inc.'s Delamar Mine in Owyhee County remained the State's largest producer. The company completed a planned ex-

pansion in 1981, which resulted in increased production. Hecla's Lucky Friday Mine was the only other operation that produced over 1,000 ounces. There was gold output reported from nine counties for the year.

Canadian Superior Mining Co. should have its Stibnite project (Valley County) onstream in 1982.

There were a number of placer operations active in the State during 1981. Small operators were known to be producing in Boise, Custer, Idaho, and Lemhi Counties. The Napias Mining Co. ran a 1,000-yard-per-day operation near Leesburg (Lemhi County), and a 1,200-yard-per-day trommel was being tested at Warren Meadows (Idaho County).

Idaho ranked eighth in the Nation in gold output.

**Iron Ore.**—There was no reported production of iron ore in the State in 1981.

**Lead.**—Lead was produced from 23 mines in the State, although over 90% came from 3 mines in the Coeur d'Alene district. The Bunker Hill Mine was the largest producer, followed by Hecla's Star and Lucky Friday Mines. The only notable producers outside of the Coeur d'Alene district were the Clayton Mine (Custer County) and the Democrat Mine (Lemhi County); each produced over 200,000 pounds of lead. Idaho was the second ranked producing State, accounting for 9% of the Nation's primary lead production.

**Molybdenum.**—There was no reported molybdenum production from the State in 1981. Exploration for the metal continued, as did development of Cyprus Mines' Thompson Creek deposit.

**Silver.**—Idaho remained the Nation's top producer of silver, accounting for 41% of

the total domestic production. Eight mines in the Coeur d'Alene district accounted for approximately 90% of the total output reported from 28 mines. Sunshine Mining Co.'s Sunshine Mine was the largest producer, followed by Asarco's Galena and Coeur Mines. These mines, plus Hecla's Lucky Friday, each produced in excess of 2 million ounces of silver; the Lucky Friday output would have been greater were it not for a 9-week strike. Notable producers outside of the Coeur d'Alene district included the Clayton Mine (Custer County) and the Delamar Mine (Owyhee County); only the Delamar production exceeded 1 million ounces.

There were a number of exploration projects for silver in progress. Much of the work was occurring in Adams, Boise, Bonner, Custer, Idaho, Shoshone, and Owyhee Counties.

The building to house Sunshine Mining Co.'s new silver refinery was completed during the year. When finished, the facility will make Sunshine a totally integrated silver producer.

**Tungsten.**—Production was from a single operator in Valley County; output was up slightly over that reported in 1980. Inspiration Development Co.'s work at the Ima Mine, Lemhi County, passed from the exploration to the development phase as a new adit was driven and preparations were made for a new haulage level.

**Vanadium.**—Ferrophosphorus slag from Idaho phosphate was processed for vanadium by Kerr-McGee Chemical Corp. at Soda Springs, Idaho, and by Union Carbide Corp. at Hot Springs, Ark. Both output and value reflected a slight increase. Idaho ranked third in the Nation in 1981 in the production of elemental vanadium.

**Zinc.**—Zinc output was reported from 18 mines in 1981. Most of the production came from the Bunker Hill and Star Mines in the Coeur d'Alene district; Bunker Hill was the largest producer in the State. The Democrat Mine (Lemhi County) and Clayton and Phi Kappa Mines (Custer County) were the only notable producers outside of Shoshone County.

Idaho ranked fourth nationally for 1981 in the production of primary zinc.

## NONMETALS

**Abrasives.**—*Natural.*—Emerald Creek Garnet Co. was the State's only producer of garnet sands for its operation in Benewah County. Output was down slightly, but val-

ue increased from that reported in 1980.

**Cement.**—Output of cement continued throughout the year from the Oregon Portland Cement Co. plant at Inkom, Bannock County.

**Clays.**—Output and value were both down 4% from 1980 figures. Five companies reported production from five operations. The State's largest producer was North American Refractories Co. Clays, mined in the State in order of decreasing value, were common clay, fire clay, kaolin, and bentonite (swelling).

**Gem Stones.**—Fire opals and Owyhee Jasper (Owyhee County), opals (Clark County), and star garnets (Benewah County) were known to have been recovered in 1981 and sold within the State.

**Gypsum.**—All gypsum production came from the Consumers Coop Association deposit in Washington County. Reported output was nearly equal to that of 1980.

**Lime.**—Amalgamated Sugar Co. accounted for all of the State's lime output from its three operations in southern Idaho. Output was nearly equal to that reported in 1980.

**Perlite.**—Oneida Perlite Co., Oneida County, remained the only producer of perlite in the State. Output and value remained nearly constant with those reported in 1980. The company markets all sizes of industrial grade perlite and plans to enter the precast construction business.

**Phosphate Rock.**—Idaho ranked second in the Nation in marketable production of phosphate rock, producing 10% of total U.S. output. Production came from six mines in Southeastern Idaho (Bingham and Caribou Counties). The J. R. Simplot Co. was the largest producer from its two mines.

The Conda Partnership (Beker Industries Corp. and Western Cooperative Fertilizers, Ltd.) laid off 350 workers at its operations, citing bad winter conditions and high inventories; market conditions will determine when operations will resume in 1982. In a related move, Beker closed its ammonia plant at Soda Springs because of higher rates for natural gas. The company was looking for a new 1982 supplier.

Wet-process phosphoric acid (WPPA) plants were operated by both Simplot and Beker. The Bunker Hill Co. also operated a WPPA plant at its Kellogg lead-zinc smelter; the company received its phosphate from Stauffer Chemical Co. and shipped sulfuric acid to Beker.

**Pumice and Pumicite.**—Pumice output

came from Bonneville and Oneida Counties. Production and value declined 40% and 21%, respectively, from that of 1980. Amcor Inc. was the State's largest producer from its operation near Idaho Falls. Nearly 95% of State output was utilized as lightweight concrete aggregate.

**Sand and Gravel.**—To reduce the burdens and costs of reporting, the Bureau of Mines implemented new canvassing procedures for its surveys of sand and gravel producers. Beginning with the collection of 1981 production data, the survey of construction sand and gravel producers will be con-

ducted for even years only; the survey of industrial sand and gravel producers will continue to be conducted annually. Therefore, this chapter contains only estimates for construction sand and gravel production, but complete data on industrial sand and gravel. The estimates for production of construction sand and gravel for odd years will be revised and finalized the following year.

Martin Marietta Corp. was the State's only industrial sand producer; output was from an operation in Gem County. Production was down slightly from that reported in 1980.

Table 7.—Idaho: Sand and gravel sold or used by producers, by use

Use	1980			1981		
	Quantity (thousand short tons)	Value (thousands)	Value per ton	Quantity (thousand short tons)	Value (thousands)	Value per ton
Construction:						
Sand	1,690	\$4,745	\$2.81	NA	NA	NA
Gravel	3,609	9,458	2.62	NA	NA	NA
Total or average	5,299	14,203	2.68	<sup>P</sup> 5,100	<sup>P</sup> \$13,200	<sup>P</sup> \$2.59
Industrial sand	W	W	14.22	W	W	17.58
Grand total or average	W	W	2.95	W	W	<sup>P</sup> 2.90

<sup>P</sup>Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data.

**Stone.**—Output and value of stone declined further in 1981 from the levels reported in 1980 and 1979. Decreased construction activity resulted in a declining demand for crushed stone. Three counties (Bannock, Caribou, and Idaho) accounted for 78% of the total State output. The Oregon Portland Cement Co. (Bannock County) and the Mon-

santo Co. (Caribou County) were the leading producers.

<sup>1</sup>State Liaison Officer, Bureau of Mines, Spokane, Wash.

<sup>2</sup>Associate chief, Idaho Bureau of Mines and Geology, Moscow, Idaho.

<sup>3</sup>Chief, Idaho Bureau of Mines and Geology, Moscow, Idaho.

Table 8.—Idaho: Crushed stone<sup>1</sup> sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1980		1981	
	Quantity	Value	Quantity	Value
Agricultural limestone	29	86	35	104
Poultry grit and mineral food	5	16	6	17
Bituminous aggregate	W	W	5	W
Dense-graded road base stone	41	123	318	1,106
Surface-treatment aggregate	365	1,062	W	W
Other construction aggregate and road stone	408	1,050	225	740
Riprap and jetty stone	419	1,673	49	164
Railroad ballast	55	104	20	38
Paper manufacture	17	45	—	—
Other <sup>2</sup>	668	3,082	780	4,037
Total <sup>3</sup>	2,007	7,240	1,437	6,206

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

<sup>1</sup>Includes limestone, granite, sandstone, traprock, and miscellaneous stone.

<sup>2</sup>Includes cement manufacture, flux stone, roofing granules, and other uses not specified.

<sup>3</sup>Data may not add to totals shown because of independent rounding.

Table 9.—Principal producers

Commodity and company	Address	Type of activity	County
<b>Abrasives:</b>			
Emerald Creek Garnet Co -----	Box 176 Fernwood, ID 83890	Placer mine ----	Benewah.
<b>Antimony:</b>			
Sunshine Mining Co -----	Box 1080 Kellogg, ID 83887	Mine, mill, plant ..	Shoshone.
<b>Cement:</b>			
Oregon Portland Cement Co -----	Old National Bank, Rm 622 Inkom, ID 83245	Surface mine and plant.	Bannock.
<b>Clays:</b>			
A. P. Green Refractories (U.S. Gypsum) --	Box 158 Troy, ID 83871	-----do -----	Latah.
North American Refractories Co -----	3502 Breakwater Ct. Harwood, CA 94545	Surface mine ----	Various.
<b>Copper:</b>			
ASARCO Incorporated -----	Box 440 Wallace, ID 83873	Mine and mill ----	Shoshone.
Hecla Mining Co -----	Box 320 Wallace, ID 83873	Mine, mill, plant ..	Do.
Silver King Mines Inc -----	1204 Deseret Bldg. Salt Lake City, UT 84111	Surface mine and mill.	Adams.
Sunshine Mining Co -----	Box 1080 Kellogg, ID 83887	Mine and mill ----	Shoshone.
<b>Gold:</b>			
Hecla Mining Co -----	Box 320 Wallace, ID 83873	-----do -----	Do.
MAPCO Inc -----	Box 52 Jordan Valley, OR 97910	Surface mine and mill.	Owyhee.
<b>Gypsum:</b>			
Consumers Coop Association -----	502 Pioneer Rd. Weiser, ID 83672	Surface mine ----	Washington.
<b>Lead:</b>			
The Bunker Hill Co -----	Box 29 Kellogg, ID 83887	Mine, mill, plant ..	Shoshone.
Clayton Silver Mines -----	Box 890 Wallace, ID 83873	Mine and mill ----	Custer.
Hecla Mining Co -----	Box 320 Wallace, ID 83873	-----do -----	Shoshone.
<b>Lime:</b>			
Amalgamated Sugar Co -----	First Security Bank Bldg. Ogden, UT 84402	Plant -----	Various.
<b>Perlite:</b>			
Oneida Perlite Corp -----	Box 162 Malad City, ID 83252	Surface mine and plant.	Oneida.
<b>Phosphate rock:</b>			
Conda Partnership -----	Box 37 Conda, ID 83230	-----do -----	Caribou.
Monsanto Co -----	800 North Lindbergh Blvd. St. Louis, MO 63166	Surface mine ----	Do.
J. R. Simplot Co -----	Box 912 Pocatello, ID 83201	Surface mine and plant.	Various.
<b>Pumice:</b>			
Amcor, Inc -----	Box 1141 Idaho Falls, ID 83401	Quarry -----	Bonneville.
Hess Pumice Products -----	Box 209 Malad City, ID 83252	-----do -----	Oneida.
<b>Sand and gravel (industrial):</b>			
Martin Marietta Corp -----	Emmet, ID 83617 -----	Pit -----	Gem.
<b>Silver:</b>			
ASARCO Incorporated -----	Box 440 Wallace, ID 83873	Mine and mill ----	Shoshone.
The Bunker Hill Co -----	Box 29 Kellogg, ID 83887	Mine, mill, plant ..	Do.
Hecla Mining Co -----	Box 320 Wallace, ID 83873	Mine and mill ----	Do.
MAPCO Inc -----	Box 52 Jordan Valley, OR 97910	Surface mine and mill.	Owyhee.
Sunshine Mining Co -----	Box 1080 Kellogg, ID 83887	Mine and mill ----	Shoshone.
<b>Stone:</b>			
FMC Corp -----	1356 North Main Pocatello, ID 83201	Quarry -----	Bannock.
Monsanto Co -----	800 North Lindbergh Blvd. St. Louis, MO 63166	-----do -----	Caribou.
Oregon Portland Cement Co -----	Old National Bank, Rm. 622 Inkom, ID 83245	Quarry and plant	Bannock.
Seubert Excavation Inc -----	Grangeville, ID 83530 -----	Quarry -----	Idaho.
<b>Vanadium:</b>			
Kerr-McGee Chemical Corp -----	Box 478 Soda Springs, ID 83276	Plant -----	Caribou.
<b>Zinc:</b>			
The Bunker Hill Co -----	Box 29 Kellogg, ID 83887	Mine, mill, plant ..	Shoshone.
Hecla Mining Co -----	Box 320 Wallace, ID 83873	Mine and mill ----	Do.