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Department of Mineral Resources

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To the Honorable Paul Fannin Governor of Arizona Capitol Building Phoenix, Arizona

Dear Governor Fannin:

I herewith submit the Annual Report of the Department of Mineral Resources, covering the fiscal year July 1, 1960 to June 30, 1961.

Respectfully yours,

Frank P. Knight
FRANK P. KNIGHT,
Director.

EXCERPTS FROM THE LAW CREATING THE ARIZONA

DEPARTMENT OF MINERAL RESOURCES

"Aid in the promotion and development of the mineral resources of the State.

Conduct studies of the economic problems of prospectors and operators of small mines with a view to assisting in their solution.

Assist in discovering sources of supply for persons desiring to buy minerals.

List and describe available mining properties.

Make mineral resource surveys and conduct such other investigations as may interest capital in the development of the State's mineral resources.

Serve as a bureau of mining information in conjunction with the Arizona Bureau of Mines.

Publish and disseminate such information and data as may be necessary or advisable to attain its objectives.

Cooperate with the State Land Department to encourage mining activity on state lands.

Cooperate with the Corporation Commission in its investigations and administration of laws relating to the sale of mining securities.

Cooperate with the Arizona Bureau of Mines, and turn over to said Bureau such problems as the field work of the division may show to be within the scope of the activities of said Bureau.

Cooperate with federal and other agencies having for their purposes the development of mines and minerals.

Work against all congressional acts favoring reciprocal or duty free imports of foreign materials.

Do such other things as may assist the more extensive exploration and development of the Mineral Resources of the State."

ARIZONA MINING

PRODUCTION

Based on U. S. Bureau of Mines reports for 1960 output, Arizona ranked first in copper production in the United States (including Alaska), as it has done since 1910. It ranked 3rd in silver, 4th in zinc, 4th in gold and 5th in lead.

Arizona production and value of the five principal metals in 1960, as reported by the U. S. B. M., were as follows:

538,605	tons	copper	@	32.1 ¢/1b	\$ 345,784,000
8,495	tons	1ead	@	11.7 ¢/1b	1,988,000
35,811	tons	zinc	@	12.9 ¢/1b	9,239,000
143,064	ozs.	gold	a	\$ 35.00 /oz	5,007,000
4,774,992	ozs.	silver	@	90.5+ ¢/oz	 4,322,000
					\$ 366,340,000

This compares with the following final figures for 1959:

430,297 tons copper 9,999 tons lead 37,325 tons zinc 124,627 ozs. gold 3,898,336 ozs. silver	@ 11.5 ¢/lb @ 11.5 ¢/lb @ \$ 35.00 /oz	\$ 264,202,000 2,300,000 8,585,000 4,362,000 3,528,000
		\$ 282,977,000

Following are tables showing:

- 1. Mineral Production of Large and Small Producers in Arizona in 1960.
- Arizona Metal Production with ten year figures for the five principal metals.
- 3. Relative 1960 Production in the United States for the five principal metals.
- 4. Copper, Gold, Silver, and Molybdenum Recovered from Mines in Arizona in 1958, 1959 and 1960.

MINERAL PRODUCTION OF LARGE AND SMALL PRODUCERS IN ARIZONA IN 1960 Source: U.S.B.M. Area Report III-123

LARGE COPPER PRODUCERS 1/	PRODUCTION	VALUE
Copper (1bs.)	1,065,541,925 115,602 3,689,622 4,359,000	\$ 342,038,950 4,046,070 3,339,108 5,211,000
Total Value of Large Mine Production in 1960 . SMALL MINERAL PRODUCERS:		\$ 354,635,128
Clays 2/(short tons) Coal (short tons) Copper (recoverable content of ores,etc.)(lbs.) Gem stones Gold(recoverable content of ores,etc.)(troy ozs.) Lead(recoverable content of ores,etc.)(lbs.) Lime (short tons) Manganese ore and concentrate (35+ percent manganes (short tons) Manganiferous ore and concentrate (5 to 35 percent manganese (short tons) Mica (scrap) Petroleum(crude) thousand 42-gal. barrels Pumice (short tons)		\$ 260,000 58,000 3,745,050 120,000 960,930 1,988,000 2,430,000 40,000 190,000 4/4/4/
Sand and Gravel (short tons) Silver(recoverable content of ores,etc.)(troy ozs.) Stone (short tons). Uranium ore (short tons). Zinc(recoverable content of ores,etc.)(lbs.) Value of items that cannot be disclosed: Asbestos, beryllium concentrate (1960), cement, clays(benton feldspar, gypsum, mercury, perlite, pyrites, tungs concentrate, vanadium, and values indicated by footnote 4	14,490,000 1,086,370 4,233,000 283,684 71,622,000	1,164,000 14,235,000 992,892 5,107,000 6,219,000 9,239,000
Total Value of Small Mine Production $\underline{6}/\ldots$		\$ 61,140,872
GRAND TOTAL VALUE OF MINERAL PRODUCTION $\underline{6}/$		\$ 415,776,000
PERCENTAGE DUE TO SMALL MINES		14.7%

^{1/} Phelps Dodge, Kennecott, Inspiration, Miami, Magma, Asarco's Silver Bell, Pima, Bagdad and Duval's Esperanza.

 $\frac{2}{3}$ / Excludes bentonite; included with "Value of items that cannot be disclosed".

3/ Weight not recorded.

5/ Preliminary figure.

^{4/} Figure withheld to avoid disclosing individual company confidential data.

^{6/} Total adjusted to eliminate duplicating value of raw materials used in manufacturing cement and lime.

ARIZONA'S METAL PRODUCTION

Source: United States Bureau of Mines

	GOLD ozs.	SILVER ozs.	COPPER Lbs.	LEAD	ZINC Lbs.	TOTAL VALUE
1951 1952 1953 1954 1955 1956 1957 1958 1959	116,093 112,355 112,824 114,809 127,616 146,110 152,449 142,979 124,627 143,064	5,120,985 4,701,330 4,351,429 4,298,811 4,634,179 5,179,185 5,279,323 4,684,580 3,898,336 4,774,992	831,740,000 791,438,000 787,050,000 755,854,000 908,210,000 1,011,816,000 1,031,708,000 971,678,000 860,594,000 1,077,210,000	34,786,000 33,040,000 18,856,000 16,770,000 19,634,000 23,998,000 24,882,000 23,780,000 19,998,000 16,990,000	105,998,000 94,286,000 55,060,000 42,922,000 45,368,000 51,160,000 67,810,000 57,064,000 74,650,000 71,622,000	\$ 235,289,045 220,686,278 242,572,489 237,818,952 355,928,786 450,599,680 332,081,963 273,398,148 282,977,000 366,340,000

RELATIVE 1960 PRODUCTION

	UNITED STATES	ARIZONA	ARIZONA %	ARIZONA'S PLACE	LEADING STATE State	IN THE U.S.A. Production
Gold - ozs. Silver - ozs. Copper - tons Lead - tons Zinc - tons	1,666,772	143,064	8.58	4th	So.Dakota	554,771
	30,766,327	4,774,992	15.52	3rd	Idaho	13,646,508
	1,080,169	538,605	49.86	1st	Arizona	538,605
	246,669	8,495	3.44	5th	Missouri	111,948
	435,427	35,811	8.22	4th	Tennessee	91,394

COPPER, GOLD, SILVER, AND MOLYBDENUM RECOVERED FROM MINES IN ARIZONA IN 1958, 1959, and 1960

Source: U.S.B.M. Area Reports

	1958	1959	1960
Tons copper concentrating and leaching ore mined	55,805,752	E2 7/1 020	65 500 600
reaching of mineu	33,803,732	52,741,920	65,528,603
% Copper in ore (estimated assay)	0.933	0.917	0.84
Tons direct smelting copper ore	450,057	379,625	503,836
% Copper in ore (estimated assay)	5.932	4.557	4.07
TOTAL TONS COPPER ORE MINED	56,255,809	53,121,545	66,032,439
Ozs. gold recovered from all copper ores mined	114,262	96,153	115,602
Ozs. silver recovered from all copper ores mined	3,543,044	2,724,701	3,689,622
Lbs. molybdenum recovered from all copper ores mined	2,320,000	2,659,000	4,359,000
Lbs. copper recovered from all copper ores mined	913,973,800	803,087,000	993,370,700
Lbs. copper recovered from mine waters	53,129,500	48,610,000	66,691,000
TOTAL LBS. COPPER RECOVERED FROM ALL COPPER MINES	967,103,300	851,697,000	1,060,061,700
TOTAL LBS. COPPER RECOVERED FROM MINES OTHER THAN COPPER	4,574,700	8,897,000	17,148,300
GRAND TOTAL LBS. COPPER RECOVERED FROM ALL ARIZONA MINES	971,678,000	860,594,000	1,077,210,000

ACTIVE MINES

The Department's active mine list in February, 1961, consisted of 36 copper properties, 7 copper combined with lead or zinc, 13 lead and/or zinc, 14 uranium, 13 gold and/or silver, 3 quicksilver, and 2 manganese, for a total of 88 metal mines. There were 51 active producers of non-metallics, consisting of 17 sand, rock, building stone and flagstone, 7 silica, 7 asbestos, 4 gypsum, 8 lime, limestone and cement, 2 marble, 3 perlite, 1 bentonite, 1 mica and 1 diatomaceous earth.

During the year 1960, the State Mine Inspector reported inspection of 41 copper mines, 13 lead and/or zinc, and/or copper, no manganese mines, 31 uranium, 9 asbestos mines, 15 other metallic mines and 17 other non-metallic mines, a total of 126.

The U. S. Bureau of Mines reported production, during the calendar year 1960, from 44 copper mines, 4 copper-zinc, 9 lead, 4 lead-zinc and 1 zinc mine. It also reported production of copper precipitates from 11 mines, and gold and silver from 42 lode mines shipping fluxing ores to the 8 copper smelters in Arizona.

EMPLOYMENT

The Arizona Employment Security Commission reported for 1960 that there were employed in mining and quarrying a total of 15,837 covered employees with total wages of \$102,175,093, and an average wage of \$6,452. Smelting employment brought the grand total payroll to \$108,170,873 with an average of 16,870 covered employees, earning an average of \$6,412 per year. Fringe benefits are not included in these figures, but are estimated to amount to over 25 percent of the regular payroll.

COPPER

The Arizona copper mines in 1960 again accounted for over half of the United States production. Production during the fiscal year 1960-61 was relatively steady, as was employment. The producers' price for copper dropped from 33 to 30 cents per pound in October, 1960, rose to 31 cents in May, 1961 and remained at 31 for the balance of the fiscal year.

Copper mining activities in the fiscal year were high. The largest development, the \$43.5 million Mission Mine project of the American Smelting and Refining Co. continued ahead of schedule and at the end of the fiscal year the start of production at the planned rate of 15,000 tons of ore per day expected to yield 45,000 tons of copper annually, was only a month away.

The 18-foot diameter McDonald shaft at the Christmas Mine project of Inspiration Consolidated Copper Co. was completed to its final depth of 1785 feet, and construction of surface plant to handle 4,000 tons of ore per day was well along. Underground work from the No. 3 shaft still was being delayed by unexpected mine water, at the close of the year. A 12-foot diameter ventilating shaft was nearing its planned connection at the 1600 level.

Kennecott Copper Corporation completed its \$40 million expansion program at its Ray Division properties, the crushing plant at Hayden being the last of the installations. The expansion brought the production level to 22,400 tons of ore per day. At its Lone Star property at Safford, Kennecott sank an 804-foot vertical shaft. At 754 feet down, it started the 3900 level, driving a cross-cut into the ore body found at that level, the work being done by Boyles Bros. Drilling Company. A sampling plant was constructed and a pilot leaching plant planned.

Kennecott's exploration company, Bear Creek Mining Co., did exploration work in the Courtland-Gleeson, Copper Creek (east of Mammoth) and Twin Buttes (south of Tucson) areas.

Banner Mining Co. completed its new Palo Verde shaft to its planned depth of 960 feet, cut stations and pockets on the 700, 800 and 900 levels and conducted intensive development work on all three of them.

Banner Mining Co. and Pima Mining Co. entered into an agreement whereby Pima would extract and mill 1.8 million tons of Banner's Daisy mine ore adjacent to the Pima pit. Pima started the necessary stripping and enlargement of its concentrator to handle a planned increase from 3,000 to 3,800 tons per day capacity.

Transarizona Resources, Inc. operated its open pit mine and 250 ton pilot plant the last half of 1960. It then sought financing for plant expansion to 750 tons, the size originally planned. The test plant demonstrated the ability to successfully treat the copper-silicate ore by the salt-coke segregation process. Transarizona was the only bidder for one of three tracts of the Papago Indian Reservation opened for prospecting permit bids. Metals Engineering Company was the only bidder for the other two tracts.

Cyprus Mines Corporation completed the 500-foot Copper Queen shaft near its Old Dick mine. Stations were cut and development headings run on the 300 and 450-foot levels to intersect the copper-zinc vein. Development ore was treated at the Old Dick mill, which was operating throughout the year.

Bagdad Copper Corporation produced at about the same rate as in the previous 12 months. It completed construction of a sulphuric acid plant and a copper precipitation unit and began leaching its oxidized copper ore dumps at the end of the fiscal year.

Duval Sulphur and Potash Co.'s Esperanza mine ran at capacity throughout the year. The company also continued exploration of the Ithaca Peak copper deposits in the Mineral Park District of Mohave County. The drilling stage of the exploration was temporarily suspended at the end of the fiscal year.

Phelps Dodge exercised its option to purchase the Greater Arrowhead claims about 15 miles north of Safford and continued exploration of these and others located by the company. This company continued its expansion of the Lavender Pit at Bisbee, without interruption of production. Its other properties operated throughout the year, much of the time at a rate about 10 percent below normal. The company also did exploration work in the Miami, Gunsight Hills, Naco Hills, Little Copper Creek and other areas in the state. Phelps Dodge built a sponge iron plant at Douglas to make iron to replace the de-tinned

cans used for copper precipitation at Bisbee. The company also successfully changed to the use of reformed gas for the reduction of its anode copper.

The D. M. B. D. Mining Co. operated the Childs-Aldwinkle mine at Copper Creek and started construction of a mill at Mammoth.

Miami Copper Division of Tennessee Corporation operated its Sleeping Beauty Pit and its leaching operations at the Miami and Castle Dome properties. It also did exploration work near its Castle Dome property and elsewhere.

C. D. Wilson Mining, Inc. suspended operations at its Narragansett property in February, 1961.

Arivaca Land and Development Co. constructed a new crushing and screening plant for ore leaching operations at the Del Rio mine at Helvetia.

Paramount Mining Co. discontinued leaching operations at the Mame Mine at Courtland in late 1960.

B. S.& K. Mining Co. at the end of the fiscal year was well over half way down with its 500 to 600 foot shaft at the Atlas Mine in Pima County, which is to provide access to a new copper orebody. The mine produced lead-zinc concentrates throughout the year.

Hunting Geophysical Services, Inc. continued exploration work for Apache Development Co., which had relinquished some of its prospecting permit area in the San Carlos Apache Indian Reservation, but retained an area which they desired to drill.

Much of Magma Copper's Magma mine production continued to come from the east orebody. For the Main Vein, a level was cut at 4950 feet.

American Metal Climax, Inc. discontinued exploration work in the Twin Buttes area.

McFarland and Hullinger continued copper-zinc production from the Republic and Moore mines at Johnson Camp but stopped exploration work at the Three R mine.

Coronado Copper and Zinc Co. drilled for extension of the orebody being mined in the Burro claims at Johnson Camp for copper-silica flux.

The Bunker Hill Company drilled at the Copper Queen property in the Quartzsite area, Yuma County, but only for a short time.

Yuma Copper Company did intermittent development work at the Yuma Copper mine.

The Copper Giant Mine at Hackberry was taken over by an Idaho group, and rehabilitation and development were begun.

R. E. Chilson terminated his leach-in-place operation at the De Soto Mine near Cleator, Yavapai County.

Many claims were staked at the Cleopatra copper-gold property and surrounding areas. Inspiration Consolidated drilled a hole in the Cleopatra and a hole was put down on the adjoining Lucky Strike property. No work was being done at the close of the fiscal year.

the

Drilling and geological work were done intermittently during the year at/Squaw Peak mine near Camp Verde.

The old McMahan property near Kirkland, Yavapai County was investigated by a Texas group. An acid leaching vat was built and testing began in June, 1961. Another Texas group began a small mill on the Charlie Brown property adjoining the McMahan and Zonia properties.

Drilling was continued at the Mineral Hill property near the Planet in northern Yuma County.

The Gold Hill and Catalina mines, 8 miles southwest of Oracle, were operated during the fiscal year.

Zontelli Bros. began drilling in the Coppermine Trading Post region on White Mesa, Coconino County. This is a copper-in-sandstone area in which much exploration and test work has been done in the past.

Mike Guzman left the Chillito mine north of Hayden and started pit mining of copper-silica flux at the Blue Copper mine about 20 miles southeast of Florence.

The above by no means lists all of the copper exploration done during the year. Expenditures for such work in Arizona probably exceeded \$5 million in 1960-61. The Pima District continued to receive most attention.

With five major copper mines within a radius of 40 miles and more in prospect, Tucson in a brief period of 7 years has become the center of one of the important copper producing areas of the world.

LEAD - ZINC

The New York lead price remained at 12 cents per pound until December 13 when it dropped to 11 cents and stayed there for the balance of the fiscal year. The East St. Louis price for zinc held at 13 cents per pound until December, when it fell to 12 cents. It dropped to $11\frac{1}{2}$ cents in January, 1961 and held there for the balance of the fiscal year. Low prices and rising costs further impaired the distressed lead-zinc industries.

The Iron King Mine of Shattuck Denn Mining Corp. produced the bulk of Arizona's lead output. It was faced with labor trouble at the close of the year, June 30, 1961. During the year, deeper drilling confirmed the continuation of the mineralized veins.

The Flux mine operated by Nash and McFarland was the only other important lead producer in Arizona.

The Iron King mine also was by far the largest producer of zinc in Arizona. The Old Dick (copper-zinc producer owned by Cyprus Mines Corp.), Atlas (B.S. & K. Mining Co.), Johnson Camp (copper-zinc operated by McFarland and Hullinger), and the Flux mine (Nash and McFarland), followed in importance. These mines accounted for 99 percent of Arizona's zinc production in 1960.

A heavy media unit was added to the Old Dick mill.

Arizona Michigan Mining Co. (merged with Oro Fino, Inc.) operated the Silver Crown (silver-lead, Yavapai County) mine and mill throughout the fiscal year.

The Silver Cord (silver-lead, Yavapai County) mine and mill were operated intermittently on a small scale.

The Antlers Mine and mill (Mohave County) of Yucca Mining and Milling Co. was rehabilitated, operated several months and then shut down.

Golden Gate Mining Company built a small mill at the Hackberry (lead-zinc) mine near Mayer, operated on dump ore for a brief time and then quit.

Chem-Metal (H.K.Thomas of Phoenix) started a small plant at Humboldt for processing zinc dross from California.

During the fiscal year, exploration and development work, with some ore shipment, were conducted as follows: by J. F. Rydbom of Elfrida in the March mine in the Swisshelm Mts.; by F. R. Bekins at the Tia Juana, J. V. Marino at the Bonanza-Illinois-Estrella Louise, Alvaro Alvarez at the Indiana, and Larry Drake at the Montezuma and Royal Blue mines, all in Santa Cruz County.

C. E. Goetz, lessee of the "79" mine (Gila County) continued development work and operated the mill for a brief period.

GOLD - SILVER - MOLYBDENUM

Practically all of Arizona's output of these metals was recovered as by-products of copper, lead and zinc mining.

Continued outflow of United States gold and lowering of U. S. stocks of free silver, increased pressures for price changes of these metals. Consequently, search for both gold and silver mines increased in 1960-61.

Dry separation of gold is necessary in arid regions in Arizona and dry placer mining with gold separation by various dry separating machines received much attention during the fiscal year. Such methods had been under investigation in the San Domingo wash area north of Morristown and large numbers of claims had been located. McDonald Construction Co. continued to do test work with its dry concentration plant. No significant amount of gold was produced.

In the fiscal year, Desert Gold Mining Co. applied for patent on over 8,000 acres in the San Domingo Wash area. Liz-Don Corp. was another of the number of parties active in the region.

Much claim staking also was done in the Weaver Gulch region near Octave. A Texas group and Western Gold and Uranium, Inc. were the principal operators in this area, but many others, including Liz-Don, staked claims. Production is not known, but is believed to have been very small.

James Stewart undertook some placer mining on the Hassayampa as did some others. Andy Zinkl and associates installed a placer plant in Big Bug Creek. No production resulted from either of these operations.

There was sporadic placer activity in the Kofa and Plomosa areas of Yuma County. A test plant at the Applington placers in the Plomosa area was

removed. Other mines doing development work or producing in the region were the Gold Nugget, Copper Bell, and Coiner. Exploration work was carried on at the Carlotta group in the Pikes Peak district northwest of Beardsley.

Glendel Mining Co. advanced to about 1800' in the planned 3,000 foot adit to connect with the old workings of the Congress Mine at old Congress.

Some intermittent work was done at the Silver Creek, Gold Key, and Bald Eagle properties in the Oatman-Union Pass region.

Several crude, small plants installed in the Cleator area produced no significant amounts of gold. The 50-ton Golden Belt mill at Cleator was rehabilitated and milled a small amount of non-pay custom ore (lead-zinc copper, as well as gold-silver), but was idle at the end of the year.

The Golden Eagle Mining Co. slowly continued rehabilitation and investigation of the Bonanza (Harqua Hala) and Golden Eagle mines in the Ellsworth District of northern Yuma County. Between these two mines G. B. Franks began a prospect shaft on his Fontana property.

The Smoke-Hole-Little Butte properties in the Bouse area were further investigated by Wyoming people under an agreement with Loma Grande Mining Co. No work was in progress at year's end.

Treatment of tailings with patented gravity separation equipment was resumed at the Katherine mine in the Katherine district, Mohave County. No production was realized.

The Golden Gem mine and mill near Chloride was rehabilitated and new equipment installed. Ore treatment commenced as the year closed.

Silver

Walter Bopp reached a depth of 512 feet with his continuing shaft sinking project at the Silver Ray mine in the Arivaca district, Pima County. Exploration work at the Vizina mine at Tombstone was suspended.

Uranium

The Tuba City mill of Rare Metals Co. in Coconino County operated steadily during the year. Construction of a carbonate section is planned for the mill in order to handle the increasing lime content of the Orphan Mine ores. The mill and the Orphan Mine, its principal supplier, were handicapped by uncertainty regarding renewal of the A. E. C. purchasing contract, which is in part dependent upon settlement of extra-lateral mineral rights of the mine. Production in the Cameron area of Coconino County continued to decline.

Vanadium Corporation of America and Kerr-McGee Oil Industries, Inc., with mines in Apache County, and Industrial Uranium Co. with mines in Navajo County, were the major operators in those counties at the close of the year. Scattered production elsewhere in the state dried up during the fiscal year.

Iron

Interest in Arizona iron increased in 1960-61 and the U. S. Bureau of Mines commenced a survey of the State's iron deposits.

Arkota Steel Co. constructed a Madaras process sponge and pig iron plant near Coolidge with capacity of 70 tons of iron per day. Arkota Mining Co. was formed to produce magnetite concentrates for the Coolidge plant from the Omega property southeast of Florence, but no mining was done in this magnetite sand placer deposit.

Among the other deposits of magnetite sands investigated during the year were the Santa Margarita (Octave District), Bauer-Kelly (Harquahala District) and Brown (Big Horn District).

Colorado Fuel and Iron Corp. continued exploration work under its 120,000 acre permit in the northwest corner of the Fort Apache Indian Reservation. Other deposits to the west in the Cherry Creek-Sierra Ancha areas received attention. Cerro Corp. drilled the Iron King deposit near Asbestos Peak and moved out.

The proposed Webb & Knapp, Inc. steel plant to process iron bearing slag from the old Clarkdale copper smelter, remained in the planning stage, apparently with no prospect of early completion.

Activity in the Bouse-Parker area by parties talking of a \$75 million steel plant to process the magnetite-hematite ores of the area, was small and of short duration; but interest in the iron of the area continued and some exploration work was done in the Planet district.

Manganese

The only Arizona manganese production in 1960-61 was in shipments of Humphrey spiral concentrates from treatment of old tailings from the Ambrosia mill south of Aguila. These concentrates went to Nevada and Utah uranium plants for use as oxidizing agents. Shipments were stopped near the close of the year.

Century Mining Co. built a 200 tons-per-day manganese concentrator, using some of the equipment from the liquidated plants of the Mohave Mining and Milling Co. The mill remained idle following completion in early 1961.

Foreign manganese continued to be made available in this country at prices with which domestic producers could not compete.

Mercury

The Pine Mountain mine and Rattlesnake mill, and the Mercuria and Ward mines, all in the Mt. Ord-Sunflower area, were active during 1960-61, but imports again lowered the price to a point of little or no return to all but one or two of the remaining producers in the United States. Seven of the eleven larger U. S. producers shut down, and others of the remaining four were expected to do so.

Rare Earths

L. L. Edgerton was the only producer and shipped small amounts from his property in the Aquarius mountains.

Beryllium |

Dye and Bathrick's Boriana mine was examined with a nuclear energized beryllium detector with some degree of success.

Beryl shipments from Arizona in 1960-61 were very small, if any.

Non-Metallic Minerals

Phoenix Cement Co. increased the capacity of its Clarkdale plant to 2.6 million bbls. per year, up 800,000 bbls. from its prior capacity. The plant continued to supply the cement for Glen Canyon Dam. Arizona Portland Cement Co. also increased the facilities of its plant at Rillito.

The Nelson lime plant, the pozzolan plant north of Flagstaff and the Consolidated feldspar plant at Kingman operated normally during the year.

Arizona Gypsum Co. ran at near capacity through the year. It also took over the Larson mine near Camp Verde, built a new plant there, and steadily shipped to the new Clarkdale cement plant. National Gypsum Co. of Buffalo, N. Y., acquired Union Gypsum Co. with a plant at Phoenix and mines near Feldman. Its shipments fell off along with construction in 1960 but picked up near the end of the fiscal year. Garcia and Peters Gypsum Co. shipped agricultural gypsum from its property near Mammoth.

Arizona Silica Sand Co. operated its sand plant at Houck rather steadily and relatively free from former operating difficulties.

Alba Mining Co. supplied bleaching clay to its parent, Filtrol Corp., at about normal rate from leased McCarrell property near Sanders. C. H. McCarrell made small shipments from his adjoining property.

The principal flagstone producers were in Coconino and Yavapai Counties. Among the larger ones in Coconino were George Armstrong, American Stone and Materials Co., T. A. Maesta, Western States Stone Co., and Dunbar Stone Co.; and in Yavapai, Coconino Building Stone Co., and J. O. Baker. After a sharp fall-off in late 1960, normal conditions returned by the year's end.

Producers of other ornamental stones were Melluzzo Stone Co., and Arizona Mist Quarries (Mohave County).

Crystal White Rock Co., (Tucson) David C. Hartley (N.E. of Helvetia) and Ligier Arizona Marble Quarries (Dragoon) operated marble quarries and sizing plants for production of roof covering granules and terrazzo.

Of the three new asbestos mills at Globe, those of Jaquays Mining Corp., and Metate Asbestos Corp. were the most active. The LeTourneau Asbestos Corp. operated intermittently, as did the Phillips mill west of Seneca. Regal and Chrysotile (Jaquays), Emsco and Apache (Metate), Phillips (Guy Phillips), Sloan Creek (Kyle) and Asbestos Peak (LeTourneau) were the principal operating mines. Marketing of the high priced Nos. 1 and 2 crude asbestos grades continued difficult. The principal mill tonnage shipped was of grades 3 to 8 for filter mediums, etc.

Union Carbide Nuclear Co. explored a bed of zeolitized volcanic ash 12 to 15 miles northeast of Bowie.

American Diatom Inc. made additions and improvements to their processing plant at the Whitecliffs Mine 11 miles southeast of Mammoth.

Tombstone Mica Co. and Stewart Construction Co. made plans for jointly resuming sericite production and processing at the latter's Charleston mine near Tombstone.

Arizona Perlite Roofs, Inc. and Harborlite Corp. operated their perlite mines and mills at Superior during 1960-61. Perlite shipments picked up in the 1961 half of the year.

Buckeye Mica Co's mill at Buckeye made a substantial gain in shipments of ground mica for roofing paper and paint and had a busy year.

Pumice (scoria) for use in concrete blocks was mined by Superlite Builders Supply Co., Paul Zanzucche, San Xavier Rock and Sand Co., Gila Cinder Co. and Yavapai Block Co. The Darling pit of the A. T. and S. F. Railway, near Winona, was the largest producer, the scoria being used for road ballast.

56 percent of the 1960 sand and gravel output was Government-and-contractor production. Six of the 14½ million tons produced were in Maricopa County.

Paul Lime Plant, Inc., in Cochise County, continued to be the major Arizona producer of lime, chiefly for metallurgical use. Kennecott Copper Corp. completed a lime plant with 5 vertical kilns at Hayden to supply its concentrator there.

A few thousand tons of coal were taken from the Cow Spring No. 3 mine in Coconino County and the Keams Canyon No. 4 mine in Navajo County, both in the Navajo Indian Reservation.

Considerable interest was shown in deposits which might yield clays suitable for use in vitrified tile and pipe.

Gem stone production increased in 1960-61. The 1960 output was 36 percent above the 1959 figure.

Arizona's fluorspar mines remained closed.

1960 petroleum production was nearly three times that of 1959, according to the U. S. Bureau of Mines. Of 20 exploration wells drilled in 1960, one, located near the Bita Peak field, was listed as a discovery.

DEPARTMENT ACTIVITIES

Valuable mine information in the files of two well-known Arizona mining engineers was made available to the Department in 1960-61. Much information also was acquired by the department field engineers, catalogued and filed. The more than 3,000 individual files and the library of books and maps relating to the State's mineral properties and mining activities, are in constant use.

During the fiscal year, the field engineers travelled 37,312 miles, attended 159 Arizona Small Mine Operators Association meetings, made 322 visits to mining properties, and discussed mining problems with individuals on 2280 occasions - 533 in the field, 819 in the office and 928 over the phone. They compiled lists of mines active in September, 1960 and February, 1961, lists of non-metallic mineral properties and special bibliographies. At the A.S.M.O.A. meetings, they discussed and obtained opinions on matters of importance to mining, including import tariffs and quotas, federal subsidies, stockpile purchases, bartering of agricultural surplus for competing foreign metal, federal and state mining law proposals, public land laws and their administration, and sources of minerals, materials and services. Their services included: Secretary member of program committee, Maricopa Subsection, A.I.M.E; Secretary-treasurer, chairman program committee, Phoenix Council, A.S.M.O.A. Special meetings attended were: Flagstaff meeting of county, state, tribal and business representatives regarding continuance of Tuba City mill and Orphan mine operations; Bureau of Land Management patent hearings; National Watershed Congress at Tucson, Arizona Geological Society; Annual state safety meeting; and state hearings on proposed rules and laws for mining activities in state lands. Considerable time of the engineer at the Tucson office was taken up with the controversial matters of mining locations of reserved minerals in Stock-raising Homestead lands in the Tucson area. A special paper was written on Arizona Asbestos.

The department was kept in close touch with mining legislation and developments at Washington through its special assistant, who worked particularly for a favorable government mining program; aided seekers for further government purchase programs, particularly for manganese and asbestos, worked for favorable gold and silver legislation, lead-zinc subsidy, needed quotas and tariffs, favorable land and other policies; and worked against national stockpile sales, reduction of depletion allowances, and legislation adverse to Arizona mining.

The director continued as secretary of the Western Governors' Mining Advisory Council and attended its meetings at Las Vegas in September, 1960 and Salt Lake City in April, 1961. He also continued as chairman of the Maricopa Subsection, A.I.M.E. through 1960. He attended the American Mining Congress meeting in September, 1960, and various meetings in the State, including the Governor's conferences at Phoenix, Prescott, Yuma, Globe and Tucson in late 1960 at which he was on the Governor's panel.

Considerable of the director's time was devoted to proposed changes in Arizona laws and regulations pertaining to mining, most important of which was the prospecting permit bill, which became law in March, 1961. Much time also was given to federal legislation, particularly that related to the base metals, and to public lands.

The administrative assistant, a former employee of the U.S. Bureau of Land Management and with this department since 1950, rendered valuable assistance to many with mineral land problems and to many others besides.

The statistical department issued the following reports to its mailing list of over two hundred companies, legislators, agencies, banks, newspapers, individuals and libraries, and many copies were distributed by request following their announcement in industrial and other publications:

Appendix "A" to Wage Report of April, 1960.

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Copper Industry - Statistics for 1959 Compared with Other Years - Arizona, United States and Free World. (In two parts)

Lead Industry Statistics for 1959 Compared with Other Years - Arizona, United States and Free World.

Zinc Industry Statistics for 1959 Compared with Other Years - Arizona, United States and Free World.

U. S. Tariff Commission's Findings, March, 1960 Based on Hearings in January, 1960. (Re lead and zinc)

The Gold and Silver Industries in the World, United States and Arizona - Salient Statistics - Ten-Year Period, 1950-1959.

Mine Taxation in Arizona, Five Years - 1956-1960 Inclusive.

Final Valuation of All Properties Assessed to Producing Mining Companies For the Year 1960.

Fringe Benefits Paid by Arizona Copper Mines & Smelters for Year 1959.

Arizona Mine Tax Laws - Past and Present.

Preliminary Estimate of Copper, Lead, Zinc, Gold and Silver Production in Arizona and the United States, in 1960.

Copper Tariff History

Excise Tax on Copper Imports.

Copper in 1960.

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Inventory of Arizona Lands as of June 30, 1960.

Wage Statistics and Copper Output - Arizona and United States Copper Mines. Base Period (1947-1949) Compared with 1958-1960 Period.

Domestic Copper Production. Paper Submitted to the Subcommittee on the Impact of Imports and Exports on American Employment of The House Committee on Education and Labor on Behalf of The Arizona Copper Tariff Board and this Department.

The statistical engineer, a recognized authority on copper was again requested to write an annual review of the world copper industry for the Mining World magazine.

During the year the department booklets "Mining in Arizona" and "Mining's Part in Arizona's Economy" were revised, combined and printed under the former title. Also printed were supplemental sheets to bring up to date the last two editions of "Laws and Regulations Governing Mineral Rights in Arizona".

There were 1860 visitors and 4420 telephone calls to the Department during the fiscal year.

Exclusive of an estimated 45,000 visitors during the State Fair, there were approximately 9,000 visitors to the mineral museum during the fiscal year. The great loss to the museum and to the department through the long illness and death of Curator Arthur Flagg adversely affected the museum activity and attendance. However, by the fiscal year's end, Acting Curator Hammons had things well in hand.

The following financial statement shows a return to the General Fund of \$4,772.42, due largely to unused travel allowance.

FINANCIAL STATEMENT

Fiscal Year 1960-61

DEPARTMENT APPROPRIATION	\$ 75,991.00
EXPENDITURES:	
Current Expenditures: Utilities 1,02 Tel & Tel 1,21 Postage 98 Bldg & Equip. Mtnce 1,33 Supplies: Office, etc. 2,20 Fixed Charges 15 Subscription & Organization Dues 7 Capital Outlay 96 TOTAL EXPENDITURES Returned to General Fund Deposits: Insurance Refund	2.72 6.61 3.58 9.60 4.00 1.99
Sale of Regulations and Copper Stories booklets (out of s	tate) 51.40
MUSEUM ACCOUNT	
BALANCE BROUGHT FORWARD	\$ 223.52
DEPOSITS	3,000.00 \$ 3,223.52
EXPENDITURES:	
Employer's share OASI and State	80.00
TOTAL EXPENDITURES	\$ 3,066.30 -
Carried Forward	\$ 157.22