

GROSS COPPER CONTENT OF ALL ARIZONA COPPER ORES, 1949-1958
COPPER RECOVERED FROM ALL ARIZONA COPPER ORES, 1949-1958
COMPARATIVE COPPER RECOVERIES BY PERIODS FROM 1910-1958
METAL PRODUCTION OF PRINCIPAL LEAD-ZINC MINING DISTRICTS, 1956-1958

Tables Compiled By The Arizona Department of Mineral Resources - December, 1959

The Arizona Department of Mineral Resources has compiled tables showing a radical drop in the pounds of copper recovered per ton of copper ore mined in Arizona during the last forty-nine years. The ten-year period 1910-1919 recorded a recovery of 48.38 pounds of copper per ton of ore, which dropped to 34.18 pounds per ton in the period 1920-1929, to 32.26 pounds per ton in the period 1930-1939, to 20.60 pounds per ton in the period 1940-1948, and to only 16.68 pounds per ton in the latest period 1949-1958. In terms of recoverable copper, the assays for those periods indicated a drop from 2.419% copper in the first ten-year period, to 0.834% copper in the last ten-year period.

The details of the last ten-year period showed a drop in total copper content in Arizona copper ore from a high of 22.06 pounds of copper per ton in 1950 to a low of 18.30 pounds per ton in 1956. The low rate of extraction for the period (83.87%) indicates a larger proportion of oxidized copper in the ores treated. The flotation process has been unsuccessful in recovering much oxidized copper, except that portion which has been recovered because of its attachment to sulphide copper particles. Recently, steps have been taken to leach the oxidized copper with acid, precipitating on sponge iron, and floating the precipitated copper in conjunction with the sulphide copper. This will keep Arizona copper mines in business in spite of the low grade of the ore and the higher costs for labor and supplies.

LEAD-ZINC

Table V shows an average metal content of 2.826% lead, 7.993% zinc, 0.1309 ounces of gold per ton, and 3.754 ounces of silver per ton in the Big Bug District, as compared with 7.921% lead, 9728% zinc, 0.0041 oz. gold, and 3.952 oz. silver in the Harshaw District, and 2.856% copper, 5.462% zinc, and 0.556 oz. silver in the Cochise (Draoon) District. The annual ore tonnage from these districts was 289,655 tons, 54,363 tons, and 60,692 tons respectively. Big Bug's average was for the three years, 1956-1958; Harshaw's and Draoon's averages were for 1956 and 1957; the averages for 1958 were not available.

COPPER CONTENT OF ARIZONA'S MILLING, LEACHING AND DIRECT SMELTING ORES
TEN YEARS (1949-1958)
 Source: U.S.B.M.

TABLE I

COPPER MILLING AND LEACHING ORES

	Tons Ore	Gross Lbs. Copper	% Copper	Net Lbs. Cu Recovered	% Ex- traction
1949	36,896,677	769,366,129	1.043	644,435,459	83.75
1950	41,342,153	882,679,110	1.068	728,805,816	82.57
1951	42,241,627	876,562,831	1.038	725,651,828	82.78
1952	43,911,085	823,526,472	0.938	679,280,139	82.48
1953	44,573,676	822,143,913	0.922	684,709,171	83.28
1954	42,396,182	787,478,589	0.929	649,072,985	82.42
1955	51,641,043	941,447,603	0.912	801,768,400	85.16
1956	59,801,872	1,041,748,589	0.871	874,741,900	83.97
1957	58,948,055	1,072,854,601	0.910	884,959,700	82.49
1958	55,805,752	1,040,219,217	0.933	863,889,500	83.05
Yrly.Avg.	47,755,812	905,802,705	0.9484	753,731,490	83.21

DIRECT SMELTING COPPER ORE

1949	468,934	41,082,098	4.380	38,694,396	94.19
1950	415,120	38,534,609	4.641	36,528,698	94.79
1951	542,761	51,744,359	4.767	49,957,686	96.55
1952	561,437	53,206,537	4.739	51,529,664	96.85
1953	614,162	55,500,000	4.518	53,695,282	96.75
1954	676,712	68,922,797	5.092	65,081,810	94.43
1955	548,685	58,953,021	5.372	54,502,450	92.45
1956	666,708	64,874,339	4.865	60,297,500	92.95
1957	623,779	67,118,620	5.380	62,880,400	93.69
1958	450,057	53,394,762	5.932	50,084,300	93.80
Yrly.Avg.	556,736	55,333,114	4.969	52,325,218	94.56

ALL COPPER MILLING, LEACHING AND SMELTING ORES

	Tons Ore	Gross Lbs. Copper	% Copper	Net Lbs. Cu Recovered	% Ex- traction	Lbs. Cu Recovered Per Tn Ore
1949	37,365,611	810,448,227	1.085	683,129,855	84.29	18.28
1950	41,757,273	921,213,719	1.103	765,334,514	83.08	18.33
1951	42,784,388	928,307,190	1.085	775,609,514	83.55	18.13
1952	44,472,522	876,733,009	0.986	730,809,803	83.36	16.43
1953	45,187,838	877,643,913	0.973	738,404,453	84.13	16.34
1954	43,072,894	856,401,386	0.994	714,154,795	83.39	16.58
1955	52,189,728	1,000,400,624	0.958	856,270,850	85.59	16.41
1956	60,468,580	1,106,622,928	0.915	935,039,400	84.50	15.46
1957	59,571,834	1,139,973,221	0.957	947,840,100	83.15	15.91
1958	56,255,809	1,093,613,979	0.972	913,973,800	83.57	16.25
Yrly.Avg.	48,312,548	961,135,820	0.9947	806,056,708	83.87	16.68

TABLE II

COPPER RECOVERED FROM OTHER ORES AND MINE WATER PRECIPITATES
GRAND TOTAL ALL ARIZONA PRODUCTION

Year	Pounds Copper Recovered		
	From Ores Other Than Copper	From Mine Water Precipitates	All Ariz. Mines
1949	14,966,519	19,923,626	718,020,000
1950	16,489,365	24,778,121	806,602,000
1951	21,958,171	34,172,315	831,740,000
1952	17,145,089	43,483,108	791,438,000
1953	8,210,700	40,434,847	787,050,000
1954	5,698,390	36,000,815	755,854,000
1955	6,814,250	45,124,900	908,210,000
1956	7,139,400	69,637,200	1,011,816,000
1957	8,687,200	75,180,700	1,031,708,000
1958	4,574,700	53,129,500	971,678,000
Yrly Avg.	11,168,378	44,186,513	861,411,600

TABLE III

TONNAGE AND GRADE OF CONCENTRATE SHIPPED TO SMELTERS
VALUE OF GOLD & SILVER RECOVERED FROM COPPER ORES (Per Ton Ore)
PROPORTION OF COPPER ORE MINED BY OPEN PIT

Year	Tons Copper Concentrate	Lbs. Copper Content	Percent Copper	Value of Gold & Silver Recovered Per Ton Ore	Proportion of Open-Pit Copper Ore	
					Tons	Percent
1949	1,144,348	611,578,914	26.722	\$ 0.13	29,082,000	77.8
1950	1,228,254	692,529,675	28.192	0.13	33,358,000	79.9
1951	1,240,853	680,059,771	27.425	0.13	34,839,000	80.1
1952	1,214,509	642,620,244	26.456	0.13	37,445,000	84.2
1953	1,239,026	627,947,697	25.340	0.13	38,678,000	85.6
1954	1,276,464	614,549,934	24.072	0.15	37,400,000	86.8
1955	1,543,362	762,640,554	24.707	0.13	47,000,000	90.0
1956	1,725,696	844,501,048	24.469	0.13	49,569,000	82.0
1957	1,808,557	874,184,791	24.168	0.13	46,125,000	77.4
1958 Est.	1,661,000	806,250,000	24.27	0.13	42,000,000	74.7
Yrly Avg.	1,408,207	715,686,263	25.411	\$ 0.132	39,549,600	81.86

TABLE IV

COPPER RECOVERED FROM ALL ARIZONA COPPER ORES
By Periods From 1910-1958 Inclusive Source: U.S.B.M.

Period	Tons All Copper Ores	Lbs. Copper Recovered	Lbs. Copper Recov'd Per Ton Ore
1910-1919	102,383,727	4,952,633,753	48.38
1920-1929	178,520,237	6,101,298,433	34.18
1930-1939	110,648,703	3,568,487,430	32.26
1940-1948	286,519,496	5,902,485,909	20.60
1949-1958	483,125,477	8,060,567,084	16.68

TABLE V

METAL PRODUCTION OF THREE PRINCIPAL LEAD-ZINC AND COPPER-ZINC
MINING DISTRICTS IN ARIZONA

Years 1956, 1957 & 1958

Source: U.S.B.M.

	Tons Ore	Tons Copper	Tons Lead	Tons Zinc	Ozs. Gold	Ozs. Silver	Total Value
BIG BUG							
1956	253,971	242	5,776	13,934	25,327	799,858	\$ 7,447,916
1957	300,729	366	6,678	17,942	27,279	922,210	8,055,623
1958	314,266	420	7,616	20,501	28,145	930,314	8,182,827
TOTALS	868,966	1,028	20,070	52,377	80,751	2,652,382	\$23,686,366
Recoverable Metal Content, % or Oz.		0.118%	2.310%	6.028%	0.0929oz.	3.052oz.	\$ 27.26/ton
Approx. Assay of Ore		0.181%	2.826%	7.993%	0.1309oz.	3.754oz.	-
HARSHAW (Tyndall & Oro Blanco)							
1956	55,448	120	3,326	3,975	153	172,869	\$ 2,396,789
1957	53,278	11	3,736	3,958	166	175,594	2,215,024
1958	Not Available						
TOTALS	108,726	131	7,062	7,933	319	348,463	\$ 4,611,813
Recoverable Metal Content, % or Oz.		0.120%	6.495%	7.296%	0.0029oz.	3.201oz.	\$ 42.42/ton
Approx. Assay of Ore*		0.185%	7.921%	9.728%	0.0041oz.	3.952oz.	-
COCHISE (Dragoon)							
1956	76,668	1,669	-	2,795	-	31,147	\$ 2,212,442
1957	44,716	1,105	-	2,510	-	22,926	1,267,890
1958	Not Available						
TOTALS	121,384	2,774	-	5,305	-	54,073	\$ 3,480,332
Recoverable Metal Content, % or Oz.		2.285%	-	4.370%	-	0.445oz.	\$ 28.67/ton
Approx. Assay of Ore**		2.856%	-	5.462%	-	0.556oz.	-

* Based on estimated 65% Extraction on Cu; 82% on Pb; 75% on Zn; 71% on Au; 81% on Ag.

** Based on estimated 80% Extraction on Cu; 80% on Zn; 80% on Ag.

TABLE VI

MINE PRODUCTION OF LEAD, ZINC, LEAD-ZINC, COPPER-ZINC AND COPPER-LEAD-ZINC MINES
IN ARIZONA, IN 1956, 1957, 1958

Source: U.S.B.M.: Minerals Yearbooks

	Tons Ore	R E C O V E R E D M E T A L S				
		Tons Lead	Tons Zinc	Tons Copper	Ozs. Gold	Ozs. Silver
<u>ALL LEAD MINES:</u>						
1956	5,977	1,112	74	16	114	27,543
1957	9,762	1,722	132	15	153	38,779
1958	6,571	1,590	85	7	189	56,153
<u>ALL ZINC MINES:</u>						
1956	2,132	-	328	19	8	523
1957	7,072	-	1,464	44	23	1,405
1958	14,210	-	2,636	85	28	2,620
<u>ALL LEAD-ZINC MINES:</u>						
1956	356,283	10,571	21,853	649	25,437	1,071,595
1957	371,412	10,497	23,542	530	26,300	1,044,073
1958	361,488	10,278	24,706	530	27,420	1,052,987
<u>ALL COPPER-ZINC MINES:</u>						
1956	75,957	3	2,861	1,592	-	31,231
1957	88,171	13	8,455	2,337	66	41,596
1958	5,961	3	762	151	11	3,204
<u>ALL COPPER-LEAD-ZINC MINES:</u>						
1956	4,309	300	400	99	3	46,354
1957	2,888	182	299	68	-	27,215
1958	-	-	-	-	-	-

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TABLE VII
LEAD OR ZINC CONCENTRATES SHIPPED TO SMELTERS

1956 AND 1957

Source: U.S.B.M.

	G R O S S M E T A L C O N T E N T					
	Tons	Gold Ozs.	Silver Ozs.	Copper Lbs.	Lead Lbs.	Zinc Lbs.
<u>ZINC:</u>						
1956	50,639	3,190	185,174	833,226	1,888,835	53,166,002
1957	65,833	3,250	271,952	1,076,130	1,508,341	70,970,880
TOTALS	116,472	6,440	457,126	1,909,356	3,397,176	124,136,882
AVG. ASSAY		0.055oz.	3.925oz.	0.82%	1.46%	53.3%
<u>LEAD AND LEAD-ZINC:</u>						
1956	24,799	19,467	800,611	535,797	16,228,081	4,498,647
1957	29,902	20,212	790,662	630,307	19,246,246	5,236,962
TOTALS	54,701	39,679	1,591,273	1,166,104	35,474,327	9,735,609
AVG. ASSAY		0.725oz.	2.91oz.	1.07%	32.4%	8.9%
<u>COPPER-LEAD-ZINC:</u>						
1956	3,763	3	115,733	606,514	3,714,828	767,499
1957	1,737	-	53,586	286,676	1,562,107	441,708
TOTALS	5,500	3	169,319	893,190	5,276,935	1,209,207
AVG. ASSAY		-	30.8oz.	8.12%	48.0%	11.0%
<u>MISC. COPPER-LEAD, COPPER-ZINC:</u>						
1956	1,448	-	40,831	267,280	1,231,541	66,157
1957	442	-	19,706	96,554	276,263	83,575
TOTALS	1,890	-	60,537	363,834	1,507,804	149,732
AVG. ASSAY		-	32.03oz.	9.6%	39.9%	3.96%
<u>LEAD CRUDE ORE (Direct Smelting):</u>						
1956	5,677	114	27,017	39,067	2,212,005	188,968
1957	8,412	148	36,925	36,624	3,383,755	339,341
TOTALS	14,089	262	63,942	75,691	5,595,760	528,309
AVG. ASSAY		0.019oz.	4.54oz.	0.27%	19.85%	1.9%

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