Nevada Bureau of Mines and Geology

Special Publication MI-1993

The Nevada Mineral Industry 1993

Metals

Industrial Minerals

Oil and Gas

Geothermal

Exploration

Development

Mining

Processing

This report, fifteenth of an annual series, describes 1993 mineral, oil and gas, and geothermal activities and accomplishments in Nevada: production statistics, exploration and development including drilling for petroleum and geothermal resources, discoveries of orebodies, new mines opened, and expansion and other activities of existing mines. Statistics of known gold and silver deposits, and directories of mines and mills are included.

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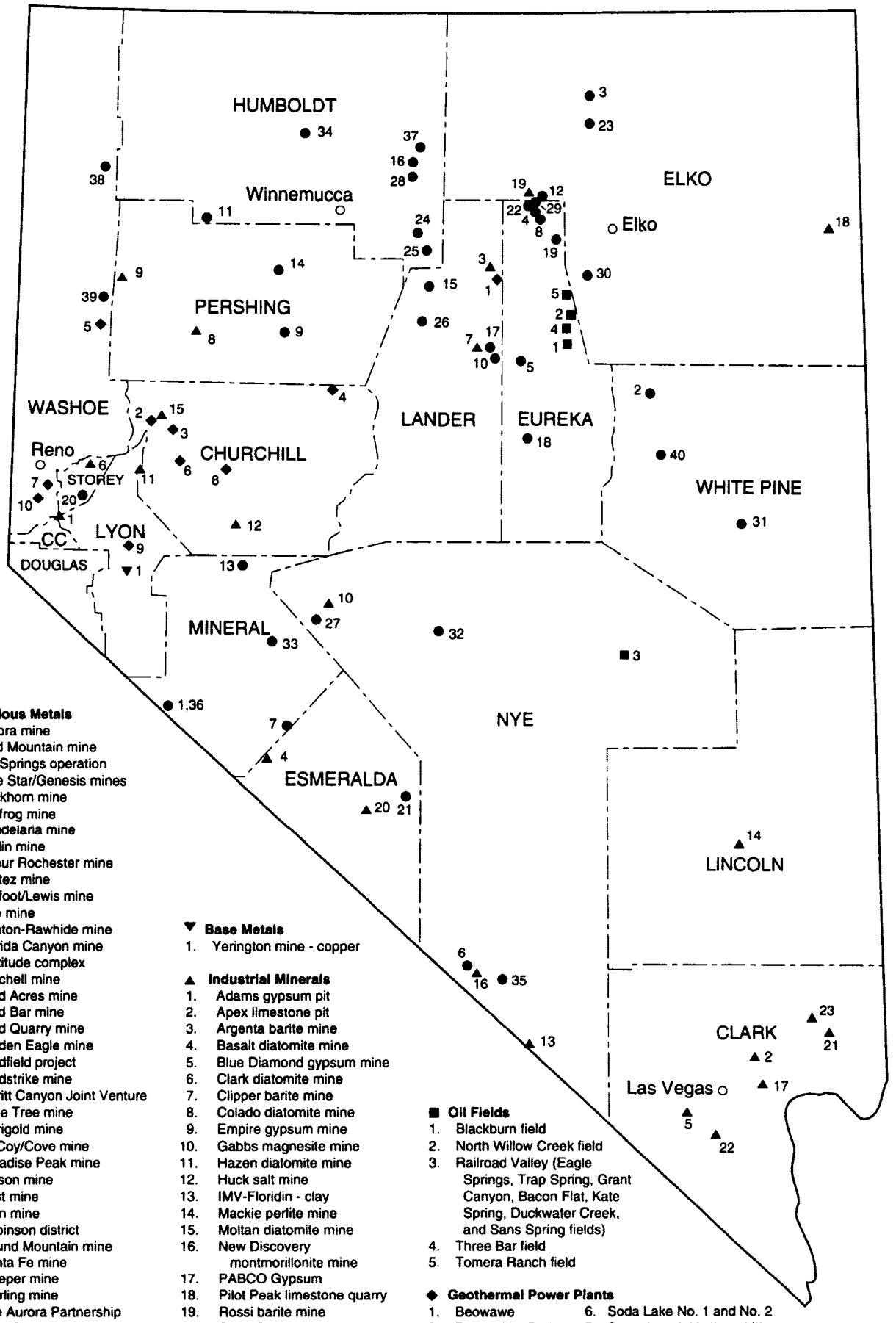

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Major mines, oil fields, and geothermal plants, 1993.

Summary

by Harold F. Bonham, Jr.

The mineral industry in 1993 continued to make a major contribution to the economy of both Nevada and the nation. Nevada, as it has for several years, led the nation in the production of gold, silver, mercury, and barite; was second in diatomite and lithium; and was the only producer of mined magnesite. Total nonfuel mineral production in Nevada in 1993 had an estimated value of $2.8 billion, which ranked Nevada second among the states in 1993 production value.

This report highlights activities through 1993 in metals, industrial minerals, geothermal energy, and petroleum. Numerous graphs and charts are incorporated in this report for rapid inspection of data trends.

Through a survey conducted in early 1994, the Nevada Division of Minerals collected data for Nevada Bureau of Mines and Geology Special Publication P-5, *Major Mines of Nevada 1993*. The publication includes, in handbook form, location maps, names and telephone numbers of operators, numbers of employees, and preliminary, non-proprietary production figures for most mines in Nevada. The data from the survey of mines are used, along with information from other sources, in the figures of this publication and will be used to update, revise, or check preliminary statistics collected and released by the U.S. Bureau of Mines.

The section on **Metals** and the table of **Major Precious-Metal Deposits** provide details on new deposit discoveries, new mine openings or closures, additions or depletion of reserves, and mine expansions. As has been the case for several years, gold continued to be Nevada's most valuable mineral commodity. Gold production reached 6.7 million troy ounces valued at $2.41 billion, a new record. Two mines, Newmont's Gold Quarry and American Barrick's Goldstrike, each produced over a million

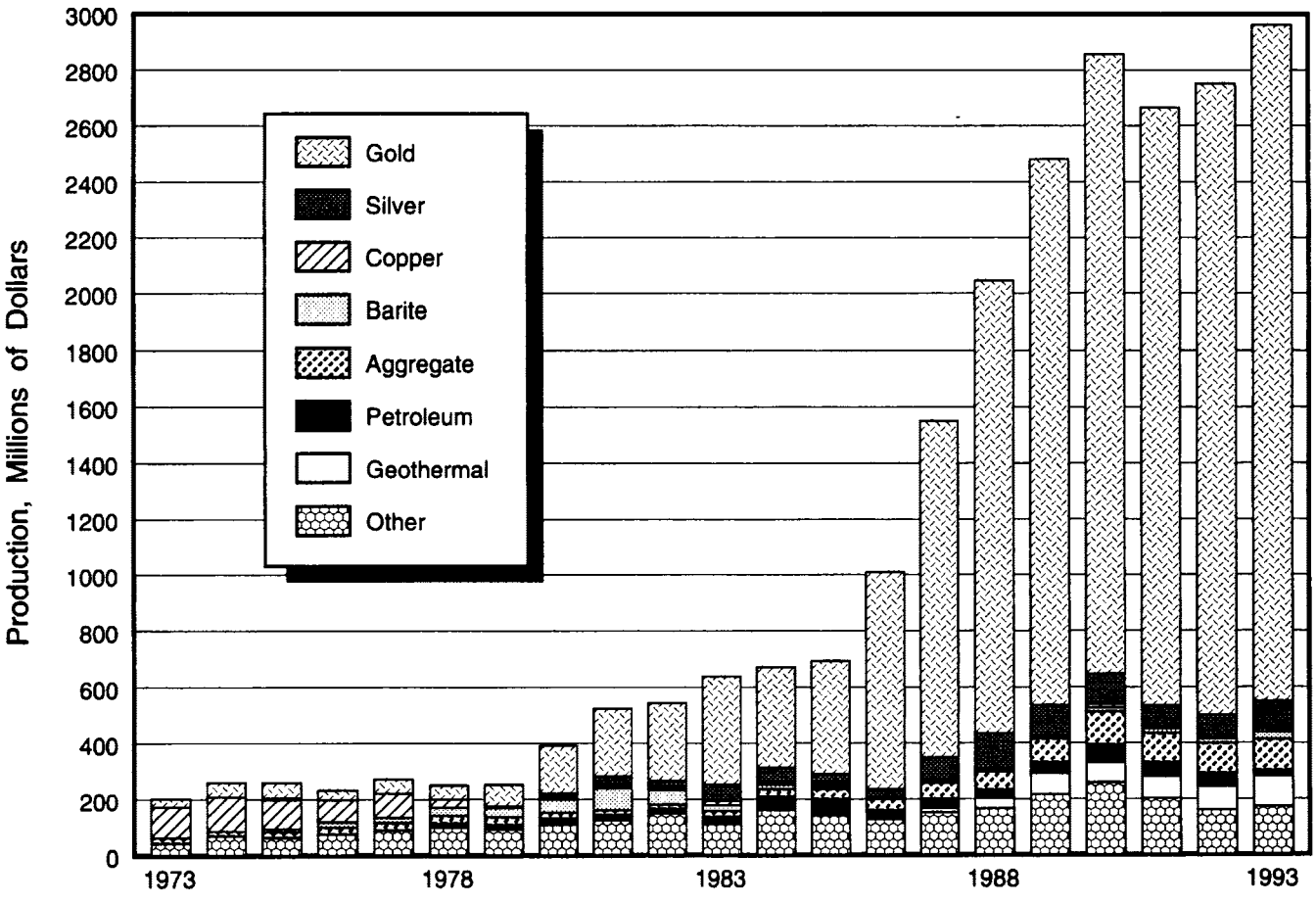
MINERAL, PETROLEUM, AND GEOTHERMAL POWER PRODUCTION IN NEVADA[1]

Minerals	1992		1993 preliminary		% change from 1992 to 1993	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value
Barite (thousand short tons)	344	$14,670	529	$26,380	54	80
Copper (thousand pounds)	7,000	7,280	10,000	9,200	43	26
Geothermal energy (thousand megawatt-hours)	1,035	85,000	1,349	108,000	30	27
Gold (thousand troy ounces)	6,532	2,253,300	6,700	2,412,000	3	7
Petroleum (thousand 42-gallon barrels)	3,728	46,000	1,862	22,270	-50	-52
Sand, gravel, crushed stone (thousand short tons)	24,000	108,000	25,000	112,500	4	4
Silver (thousand troy ounces)	19,800	78,000	23,200	100,220	17	28
Other minerals[2]	—	160,000	—	171,860	—	7
Total	—	2,752,250	—	2,962,430	—	8

[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers); compiled by the Nevada Bureau of Mines and Geology, the Nevada Division of Minerals, and the U.S. Bureau of Mines.

[2]Production data for cement, clay, diatomite, building stone, gemstones, gypsum, lime, lithium carbonate, magnesite, mercury, perlite, salt, and silica sand are combined. See text for details of some of the commodities.

Products milled or processed in Nevada but mined from deposits in California are not included. Specifically, 66,500 ounces of gold and 40,700 ounces of silver from the Buckskin Leach Plant in Douglas County, colemanite from a mill in Amargosa Valley in Nye County, and zeolite from the Ash Meadows plant in Nye County are excluded from these totals.



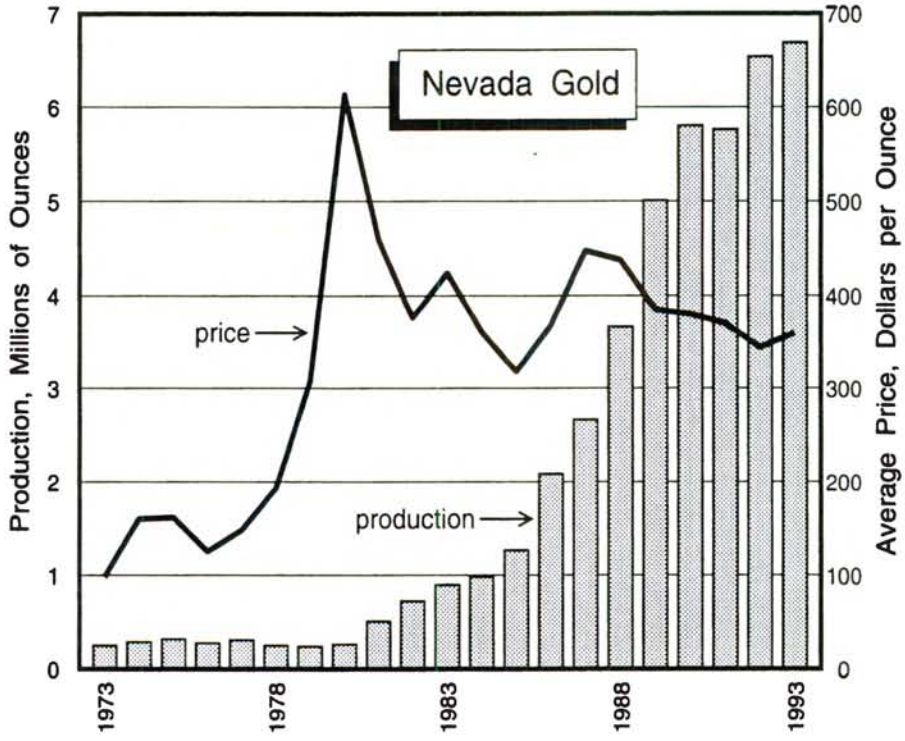
Nevada mineral, petroleum, and geothermal production, 1973–1993.

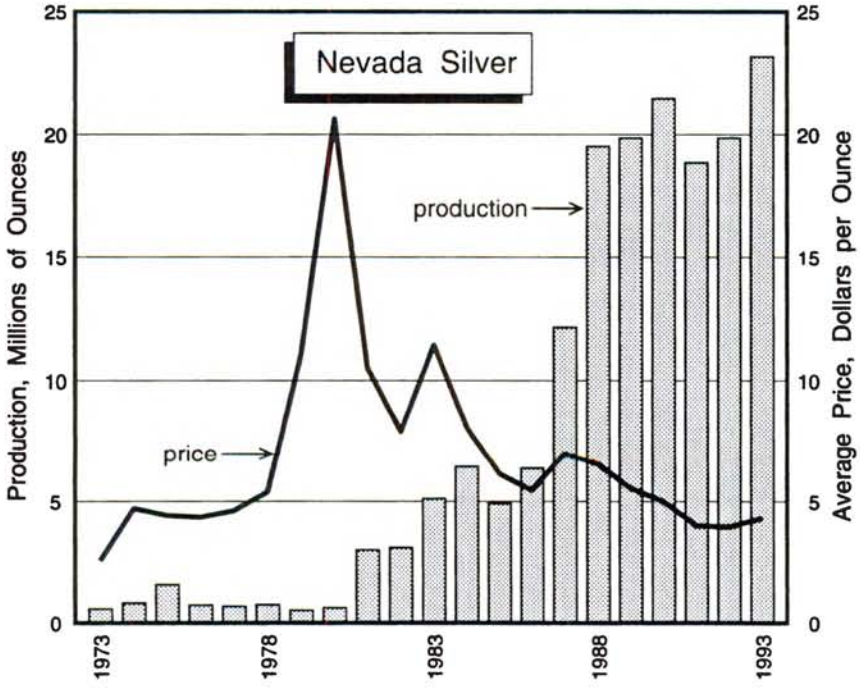
ounces in 1993. Nevada produces over 60% of the gold mined in the United States and approximately 10% of world production. Nevada's gold production makes the United States the second leading gold producer in the world. Published gold resources, including mineable reserves and perhaps some subeconomic resources totaled about 132,485,800 million troy ounces at the end of 1993, a decrease of 5.5 million ounces from 1992.

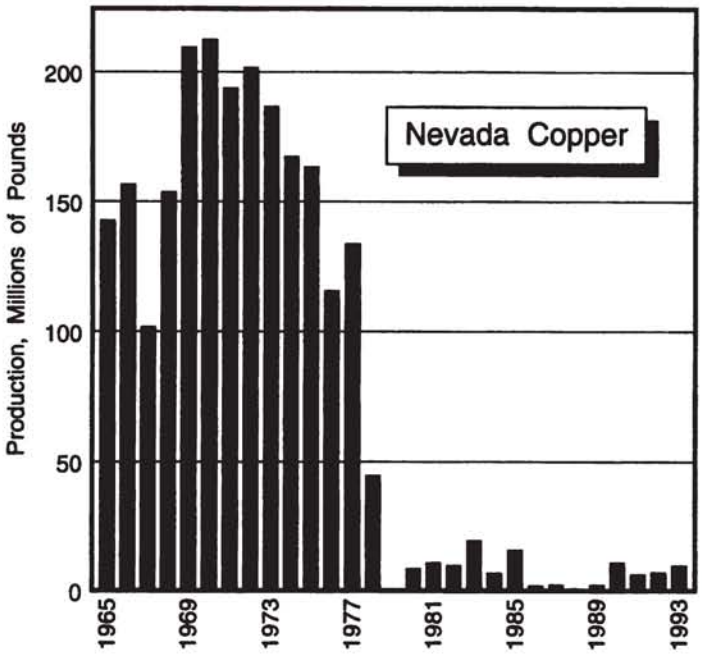
Nevada was the leading silver producer in the United States in 1993 with a total production of 23.2 million troy ounces, largely as a by- or co-product of gold mining. The McCoy/Cove mine was the largest producer with an output of 12.5 million ounces in 1993. The Candelaria mine, a former major silver producer, reopened in late 1993 and will materially increase Nevada's silver production in 1994.

Grass-roots exploration for gold and other metals in Nevada and elsewhere in the western United States continued the decline that started in 1989. Exploration for precious metals in Nevada continued to emphasize deep targets in known districts and/or concealed targets rather than frontier areas. Examples of successful exploration for deep and concealed targets included new discoveries in the Independence Range, continued expansion of reserves in the South Pipeline area of the Cortez-Gold Acres district by Cortez Joint Venture and their discovery of new concealed mineralized area nearby, and Kennecott's Gemfield discovery in the

Goldfield district. A major contributory factor for the continued decline in exploration on public lands was passage of a bill in the U.S. House of Representatives that makes major changes in the 1872 mining law that all major mining companies active in the United States consider unduly onerous. The U.S. Senate passed a mining reform bill that was more favorably received by the mining companies, but no final action on these bills was taken in 1993. Other contributory factors included changes in tax codes and mining laws in a number of foreign countries, principally in Latin America, making exploration and investment in these areas much more attractive than before, and the perception that many of these countries are underexplored relative to the United States. Increasing environmental restrictions and regulations on mining and exploration in the United States, both on the state and federal level, and increased environmental activism by groups such as the Mineral Policy Center were also significant factors contributing to the decline in exploration expenditures. It appears that the decline in exploration for mineral deposits, particularly in the western United States, will continue in 1994 and beyond, particularly if a mining reform bill similar to the one passed by the House is approved in 1994.

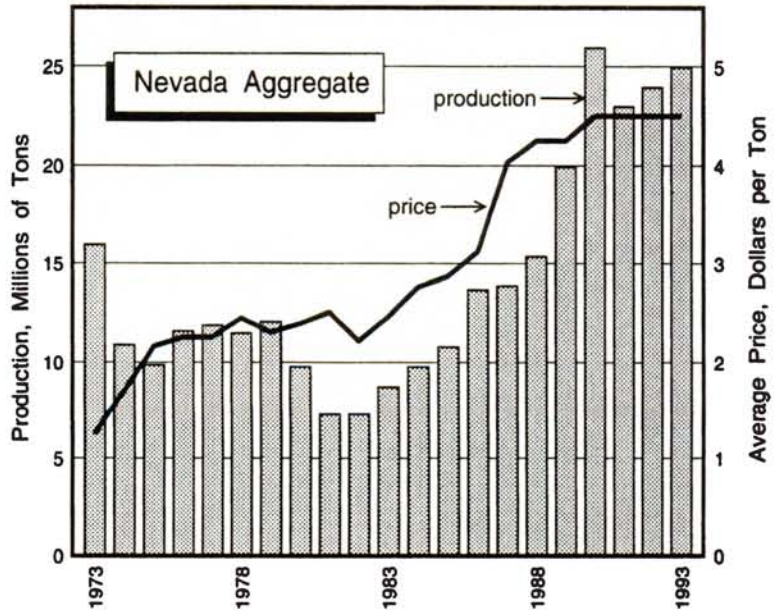






Copper production in Nevada in 1993 totaled about 10 million pounds and was entirely from the Yerington district. Production should increase significantly in 1995 with the reopening of the Robinson district by Magma and increased production at Yerington by Arimetco.

The section on **Industrial Minerals** covers developments during 1993 and gives details on commodities such as barite, aggregate, cement, diatomite, lithium carbonate, and magnesite. The value of industrial minerals produced in Nevada in 1993 was about $303 million. Production of aggregate increased in 1993 due to increased construction in and around the Reno and Las Vegas metropolitan areas. Barite and gypsum production increased significantly in 1993; production of most other industrial minerals was about the same as 1992.



ANNUAL TAX ON NET PROCEEDS OF MINERALS

Year	Annual net proceeds[1] (thousands)	Annual tax (thousands)
1982	$159,999	$1,800
1983	245,688	4,152
1984	184,987	3,222
1985	198,263	3,527
1986	374,664	6,091
1987	627,330	12,084
1988	798,253	13,568
1989	748,052	36,238
1990	887,035	42,737
1991	706,250	33,678
1992	694,457	33,128
1993	839,578	40,409

[1]Net proceeds are gross income minus direct costs incurred at the mine site.
Source: Nevada Department of Taxation.

OTHER REVENUE TO THE STATE OF NEVADA FROM THE MINERAL INDUSTRY

Fiscal year[1]	Mining claim fee[2] (thousands)	Oil production tax[3] (thousands)
1984	$158	$52
1985	160	129
1986	160	155
1987	175	146
1988	337	158
1989	402	161
1990	408	178
1991	386	202
1992	351	156
1993	333	159

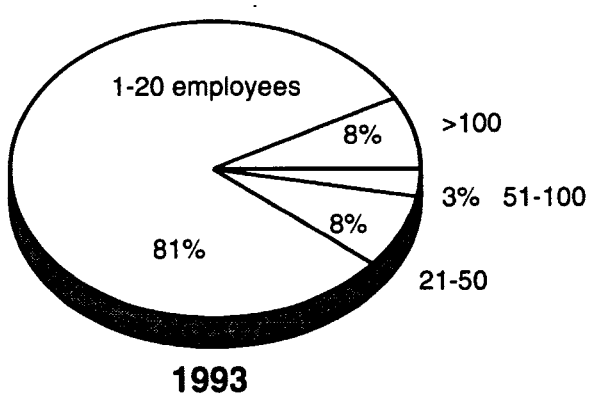
[1]July 1 through June 30.
[2]The state receives a fee of $1.25 for each new claim and each assessment report.
[3]Does not include drill permit fee: $.05 per barrel of oil produced.
Source: Nevada Division of Minerals.

NUMBER OF MINES AND EMPLOYEES IN NEVADA'S MINERAL INDUSTRY

Data for 1978-1987 are from the State Mine Inspector's Reports; 1988-89 data were compiled from the Directory of Mining and Milling Operations in NBMG Special Publications MI-1988 and MI-1989; 1990 data are from NBMG Special Publication 11 and the State Mine Inspector's Report; 1991-1992 data are adapted from the State Mine Inspector's Report; 1993 data are adapted from NBMG Special Publication P-5 and the State Mine Inspectors Report, March 1993.

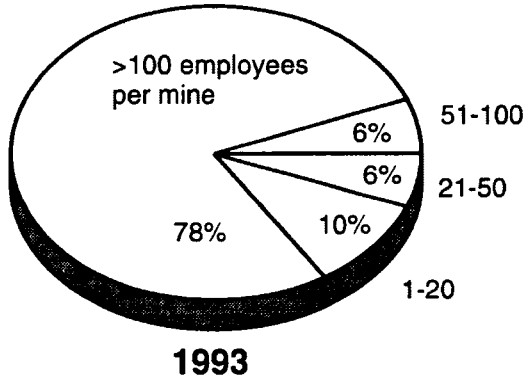
NUMBER OF MINES BY WORK-FORCE SIZE

Year	Work-force size (employee/mine)				
	1-20	21-50	51-100	>100	Total
1978	306	18	9	9	342
1979	340	25	10	7	382
1980	392	30	11	17	450
1981	383	34	12	16	445
1982	312	22	8	14	356
1983	315	22	8	15	360
1984	325	24	12	18	379
1985	289	24	16	15	344
1986	250	26	14	21	311
1987	260	26	16	24	326
1988	155	25	22	33	235
1989	148	24	23	30	225
1990	226	31	21	36	314
1991	215	24	11	34	284
1992	245	21	13	35	314
1993	286	27	13	26	352



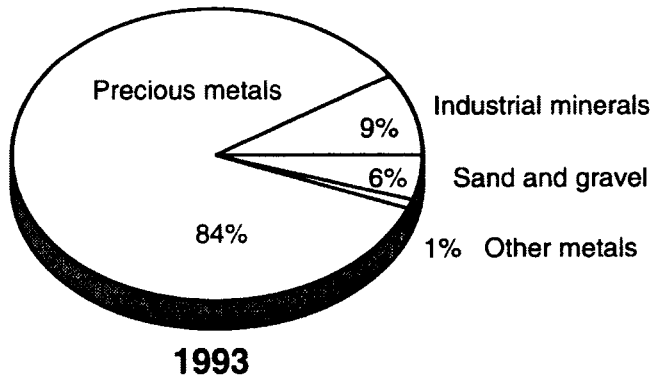
NUMBER OF EMPLOYEES BY WORK-FORCE SIZE

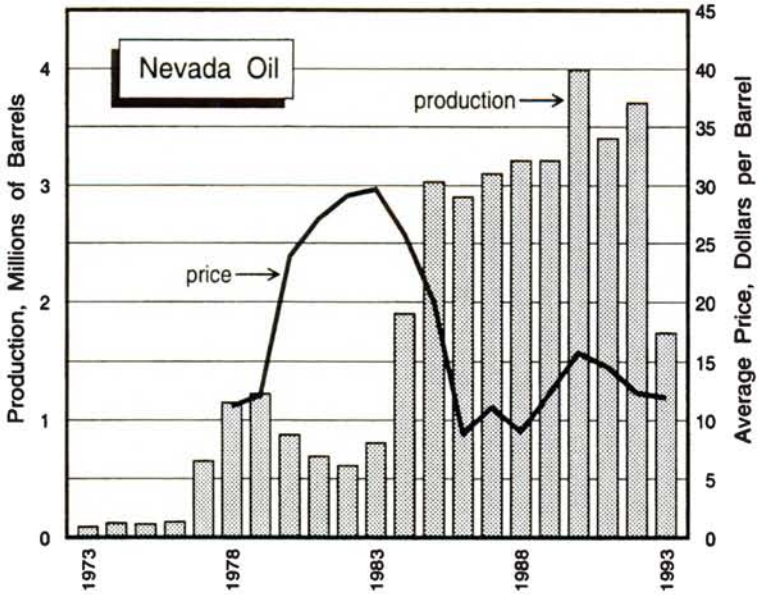
Year	Work-force size (employee/mine)				
	1-20	21-50	51-100	>100	Total
1978	1,544	609	626	2,205	4,984
1979	1,738	791	588	1,311	4,428
1980	2,139	1,037	799	4,195	8,170
1981	2,124	1,128	884	4,400	8,536
1982	1,640	716	533	2,632	5,521
1983	1,635	742	561	2,812	5,750
1984	1,437	767	887	3,127	6,218
1985	1,279	722	1,129	3,310	6,440
1986	1,315	848	921	5,171	8,255
1987	1,376	799	1,166	6,973	10,314
1988	941	832	1,483	9,441	12,697
1989	945	854	1,821	9,936	13,556
1990	1,243	1,019	1,314	11,643	15,219
1991	1,217	787	784	11,518	14,306
1992	1,245	719	891	11,534	14,389
1993	1,392	851	873	10,963	14,079



NUMBER OF EMPLOYEES BY COMMODITY

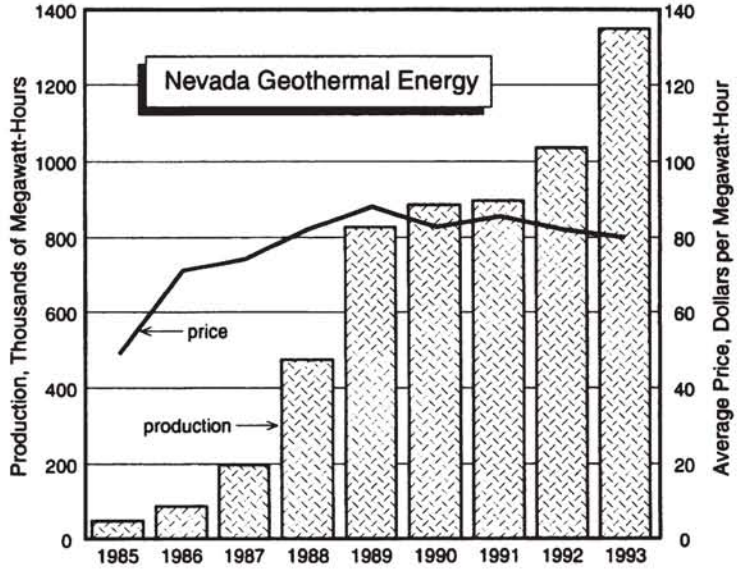
Year	Precious metals	Other metals	Industrial minerals	Sand & gravel	Total
1978	1,096	1,859	1,479	550	4,984
1979	1,503	833	1,604	488	4,428
1980	3,808	1,918	1,804	640	8,170
1981	4,263	2,018	1,760	495	8,536
1982	2,905	867	1,357	392	5,521
1983	3,616	598	1,104	432	5,750
1984	4,097	646	1,049	426	6,218
1985	4,595	256	1,046	543	6,440
1986	6,460	175	976	644	8,255
1987	8,636	160	901	617	10,314
1988	10,638	412	1,090	557	12,697
1989	11,088	510	1,448	510	13,556
1990	12,957	492	1,132	638	15,219
1991	12,123	344	975	864	14,306
1992	12,144	168	1,191	886	14,389
1993	11,860	156	1,209	854	14,079





Developments in the Nevada petroleum industry are covered in the section on **Oil and Gas**. Oil production in 1993 fell by 1.73 million barrels, almost entirely due to loss of production from the Grant Canyon field. Thirty-one new wells were drilled in 1993 compared to 20 in 1992. Oil produced in 1993 was 1,862,118 barrels, valued at $22.3 million.

Developments in the geothermal industry are covered in the section on **Geothermal Energy**. Geothermal electric production reached a new high in 1993 with sales of 1.35 million megawatts. Production capacity is 208.6 megawatts. Nevada is second only to California in the production of electric power from geothermal energy. NBMG is currently conducting research on the utilization of low and moderate temperature geothermal resources in Nevada. Many of these uses are covered in the section on geothermal energy and include such diverse uses as space heating, dehydrating vegetables, and raising catfish.



Metals

by Joseph V. Tingley

The information in this section was compiled from news releases in The Mining Record (DMR), Skilling's Mining Review (SKL), Engineering and Mining Journal (EMJ), California Mining Journal (CMJ), The Nevada Miner (NM), Society of Economic Geologists Newsletter (SEG), U.S. Bureau of Mines Minerals Today (USBM), and the Reno Gazette-Journal (RGJ). Information was also extracted from various company annual reports and news releases on file at the Nevada Bureau of Mines and Geology.

Nevada mines produced record amounts of gold and silver in 1993 although no major new mines opened in the state during the year. Nevada maintained its rank as the leading state in the production of gold, silver, and mercury. Gold production grew about 3% in 1993 over 1992, and silver production grew about 17% over 1992. All mercury production in Nevada was as a by-product of gold mining.

Gold retained its position as the major commodity in dollar value produced in the state. Nevada's largest gold producers were the Carlin trend mines of Newmont Gold Operations which accounted for 1,666,400 oz, and the Betze-Post mine of American Barrick Resources Corp., also in the Carlin trend, which produced 1,439,929 oz of gold in 1993. Other large gold producers included Santa Fe Pacific Gold's Twin Creeks mine (482,600 oz of gold), Echo Bay Minerals Co.'s McCoy/Cove mine (395,610 oz of gold), Smoky Valley Common Operation's Round Mountain mine (370,000 oz of gold), Independence Mining Co.'s Jerritt Canyon mine (361,820 oz of gold), LAC Minerals Ltd.'s Bullfrog mine (340,000 oz of gold), and FirstMiss Gold, Inc.'s Getchell mine (210,000 oz of gold).

Production from two major silver mines plus significant by-product silver from many of the state's gold mines maintained Nevada's position as the nation's largest silver producer. Echo Bay Minerals Co.'s McCoy/Cove mine, the largest silver-producing mine in North America, produced 12,454,340 oz in 1993. Coeur d'Alene Mines Corp.'s Rochester mine, second largest in Nevada, produced 5,900,000 oz of silver in 1993. The Candelaria silver mine, now owned by Kinross Gold Corp., resumed production in late 1993 and produced over 900,000 oz by the end of the year. FMC Gold Co.'s Paradise Peak mine produced 795,000 oz of silver in 1993, but closed operations when reserves were exhausted late in the year.

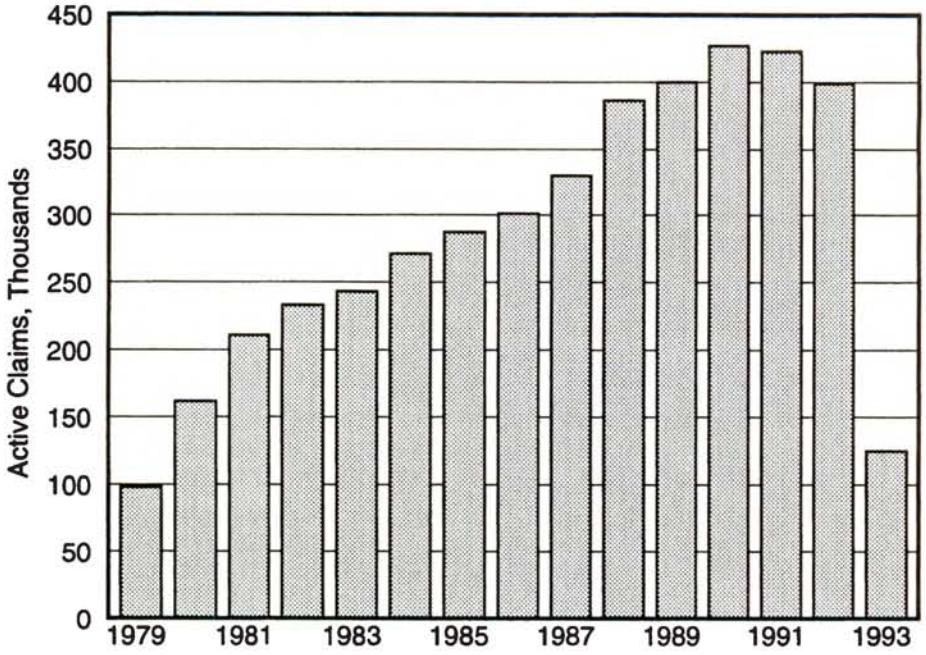
Both of Nevada's major copper districts, Yerington in Lyon County and Robinson in White Pine County, were active during 1993. Heap leaching at the Yerington mine by Arimetco International Inc. continued and the mine produced 10,000,000 pounds of copper in 1993. In the Robinson district, Magma Copper Co. continued with environmental studies related to its Robinson copper-gold project located at the old copper mining camp of Ruth, west of Ely. The project startup was scheduled for late 1994 but additional studies required by the U.S. Bureau of Land Management as part of an Environmental Impact Study have significantly delayed the project. When placed into operation, the project will produce about 125 million pounds of copper and 100,000 oz of gold per year over a 16-year mine life.

The uncertain future of the 1872 Mining Law was still under debate in Congress at the end of 1993. Separate measures to modernize the law were passed in each house of Congress and differences must now be discussed in conference committee. New claim holding fees for all mining claims on public lands came due at the end of the 1993 assessment year under Public Law 102-381. The law required a fee of $200 per claim ($100 per claim for each of the 1992-93 and 1993-94 assessment years) be paid by August 31, 1993, a prospect that caused many exploration groups in Nevada and other western states to carefully evaluate their claimholdings. The effect of the new fee on Nevada can be seen on the bar graph on the next page. Active mining claims in Nevada dropped by about 69% between September 30, 1992 and September 1, 1993.

CLARK COUNTY

Eldorado district

Alta Gold Co. has reached an agreement with Intermountain Exploration Co. and Juno Resources, Inc. to acquire a 100% interest in the Eldorado and Copper Canyon properties. The properties include 34 patented, 134 unpatented, and 5 millsite claims near the town of Nelson. The acquisition also includes the Orion group of nine patented claims located four miles south of Nelson. A body of copper mineralization has been discovered on the Copper Canyon property. Results of Phase I drilling on the Eldorado



Number of active claims in Nevada as of September 30, 1979 through 1992, and as of September 1, 1993. Data from the Nevada State Office of the Bureau of Land Management.

property have defined a continuous gold mineralized horizon, 20 to 55 feet thick, with grades ranging from 0.02 to 0.18 oz of gold per ton with significant silver credits in many of the drill holes. Results are sufficiently encouraging to proceed with delineation drilling. (DMR, 4/14/93, 6/16/93)

Goodsprings district

Durga Resources Ltd. announced closing of its Yellowhorse small-scale heap-leach and high-grade mill operation after producing $550,000 worth of gold. Durga plans to take the property to the next stage of operation which will include $5 million for drilling, sampling, and blocking-out of ore reserves. (SKL, 6/26/93)

ELKO COUNTY

Bootstrap district

At the Dee mine, drilling by Rayrock Yellowknife Resources, Inc. has defined a new gold orebody of oxidized mineralization to the north of the existing open pit. The geological resource of this new orebody is approximately 1 million oz of gold, of which 700,000 to 800,000 oz are likely to be mineable at $400/oz. (DMR, 2/9/94)

Trio Gold Corp. has concluded an option agreement with Profile Capital Corp. totaling $7.5 million to explore Trio's Rodeo Creek property. A staged exploration program was started in mid-1993 to test a number of the potential deep, high-grade gold targets on the property. By the end of the year, the first deep hole in the initial phase of drilling was completed at a depth of 2,584 feet but assay results were not yet in. Drilling, however, is reported to have successfully confirmed the existence of a major gold-bearing structure on the property. The Rodeo Creek property is 30 miles north of Carlin and 1 mile northwest of the Dee gold mine. (DMR, 3/3/93, 3/24/93, 10/20/93,12/29/93)

FMC Gold Co. completed purchase of TRE Management Company's 50% joint interest in the Humboldt Gold venture which is targeting deep gold mineralization at the Rossi property; FMC paid TRE Management $5.5 million for 100% of all precious metals in the Rossi property. In addition, FMC Gold simultaneously finalized an agreement with the Baroid Corp. whereby Baroid conveyed 50% ownership interest of the property to FMC Gold. The Rossi property is located north of and adjacent to the Dee gold mine operation and is 3 miles northwest of Barrick's Purple Vein deposit. (DMR, 4/28/93, 6/9/93)

Independence Mountains district

Independence Mining Co. has made progress on driving an exploration drift at the Gracie property. (SEG, 10/1/93)

Ivanhoe district

During 1993, a total of 88 square miles was geologically mapped and 1,900 rock chip samples were collected on the Ivanhoe Joint Venture property (Cornucopia Resources Ltd. 25%; Newmont 75%).

detailed geophysical surveys were conducted over the Hollister deposit and the Hatter, Silver Cloud, and Quiver exploration targets. A total of 30,320 feet in 11 core and 23 reverse circulation holes was drilled in these areas. One drill hole, in the Hatter area of the property, is reported to have intercepted 525 feet (1,330 to 1,855 feet) grading 0.012 oz of gold per ton. The mineralization is hosted in upper-plate Valmy Formation mudstones and siltstones. A comprehensive 1994 budget of $4,649,000 has been approved for the property. (SEG, 1/1/94; DMR, 2/9/94)

Kinsley district

Alta Gold Co. announced that it has entered into a six month option agreement with Cominco American Resources Inc. and USMX Inc. to purchase 100% interest in the Kinsley gold property for $2 million in cash plus shares of Alta stock valued at $1 million. Alta is reviewing permit requirements to put the property into production. The property has reserves of 2.6 million tons grading 0.047 oz of gold per ton.(DMR, 12/1/93; Cominco Resources International Ltd. 1993 annual report)

Railroad district

Consolidated Ramrod Gold Corp. completed a formal agreement with Westmont Gold Inc. to acquire their interest in the 30 square-mile Railroad property. Three near-surface gold deposits (totaling about 150,000 oz of gold) have been discovered on the property to date. Ramrod intends to begin a drilling program to extend these deposits and to test other known targets on the property. (DMR, 12/22/93)

Robinson Mountain district

To date, Crown Resources Corp. has drilled 15 holes totaling over 12,000 feet on the Cord Ranch property, but no new mineralized zones have been intersected. (Crown Resources Corp. news release, 8/25/93)

ESMERALDA COUNTY

Goldfield district

Kennecott Exploration continues drilling the Gemfield property located just north of the town of Goldfield. U.S. Highway 95 crosses over the top of this deposit. Four drills, drilling on 200-foot centers, were operating on the property through early December. Mineralization is reported to be low-grade gold with erratic higher-grade zones in quartz-alunite altered volcanic rocks. Drill holes typically bottom in fresh granodiorite. (SEG, 1/1/94)

American Resource Corp. proposes sale of 50% interest in its Goldfield joint venture to Red Rock Mining Corp. A project feasibility study for this property has almost been completed by Mine Development Associates of Reno. The study is indicating a measured and indicated in-place geological resource of 11.8 million tons grading 0.045 oz of gold per ton at 0.01 cut-off or 5.94 million tons at 0.068 oz of gold per ton at 0.02 cut-off. A drilling program conducted at McMahon Ridge, about 2 miles from the current mining activities, has intersected significant mineralized zones. Drilling has been over an 800-foot strike length within a prospective trend of 4,000 feet. (DMR, 6/23/93)

Silver Peak district

A first phase drilling program, consisting of nine core and 53 reverse circulation drill holes, was completed by Cornucopia Resources Ltd. on the Mary-Drinkwater property between July and September. The program was designed to delineate the area of resource potential around the previous workings and to test the northeast, down-dip potential of the detachment fault-hosted deposit. Drilling in the vicinity of the old workings has yielded a geological resource estimate of 1,640,000 tons grading 0.196 oz of gold per ton at a cutoff grade of 0.06. Further testing is planned in 1994. (DMR, 12/15/93)

EUREKA COUNTY

Antelope district

Atlas Corp. announced that it has resumed full-scale mining activities on the Goldstone North property. Fourth quarter (ending June 30, 1993) production was 15,200 oz of gold; total production for the fiscal year was 55,080 oz of gold compared to 81,832 oz in fiscal 1992. Lower production was the result of permitting delays at the Gold Pick deposit, and operational difficulties at the Gold Pick East and Goldstone North open pits. Additional information provided by fill-in drilling, as reviewed by an independent consultant, resulted in the reduction of proven and probable ore reserves from 445,500 oz of gold as of June 30, 1992 to 220,380 oz of gold as of June 30, 1993. (Atlas Corp. 1993 annual report; DMR, 6/16/93)

In early June, U.S. Gold Corp. reported the signing of an option agreement with Cornucopia Resources, Ltd. for the acquisition of an undivided 55% interest in the Tonkin Springs mine, mill, and properties from the Tonkin Springs Venture Limited Partnership for a purchase price of $5 million. In October, however, it was reported that the company dropped the option. (DMR, 6/2/93; SEG, 10/1/93)

Buckhorn district

In August, Equinox Resources Ltd. announced signing of an agreement with Pathfinder Exploration Corp., a subsidiary of Cogema Resources, Inc., which calls for Pathfinder to fund Equinox's share of exploration and development on the Buckhorn property. The main exploration target is deeper and higher grade mineralization below the existing open pits. In September the first round of drilling was completed. The six-hole, 2,085-foot program intercepted sulfide gold mineralization in all holes. Pathfinder Exploration Corp. is now preparing for an airborne geophysical survey over the entire property and a second and deeper round of drilling. Gold leaching and reclamation continue on the property. (SKL, 8/28/93; DMR 10/13/93; CMJ, 10/1/93; DMR, 12/1/93)

Eureka district

X-Cal Resources has confirmed earlier reported gold mineralization on the 1,800-acre Eureka gold property located on the southern end of the Battle Mountain trend about 16 miles southwest of the town of Eureka. The favorable structural setting is accompanied by an exposure of gold mineralization that extends for 2,500 feet along the range front. Gold values up to 0.07 oz/ton have been obtained. (DMR, 12/1/93; DMR, 12/8/93)

Homestake Mining Co. announced the discovery of a major new mineralized zone on the Ruby Hill property near Eureka. More than 50 of 125 drill holes completed in the area intersect significant mineralization grading better than 0.03 oz of gold per ton over a minimum thickness of 30 feet. Individual holes have intersected mineralization ranging from 0.066 oz of gold per ton over 180 feet to 0.51 oz of gold per ton over 120 feet. One hole encountered 0.147 oz of gold per ton over 435 feet. Mineralization is currently indicated over a strike length of 3,000 feet and is covered by 50 to 500 feet of alluvium. Preliminary indications are that the ore is oxidized. The discovery is on unpatented mining claims. Homestake plans a $4 million delineation program in 1994. The company recently staked all of the open ground between Ruby Hill and the southern end of the Roberts Mountains. (DMR, 12/8/93; SEG, 1/1/94)

Lynn district

A four-year, $1-billion development program at American Barrick Resources Corp.'s 7,000-acre Goldstrike property, which includes the Betze-Post mine and the Meikle (Purple Vein) deposit, was completed in the first quarter of 1993.

Total gold reserves on the Goldstrike property were 29.1 million oz at year end, with the Betze-Post portion of the reserves totaling 22.5 million oz after having produced 1,439,929 oz of gold during the year.

At the Meikle deposit, exploration drilling added 1.8 million oz to the reserves, and increased the reserve grade to 0.68 oz of gold per ton. Total reserves at the Meikle deposit are now 6.6 million oz of gold. Full production at the Meikle is planned by 1996.

Also within the Goldstrike property, American Barrick has completed 11 out of 17 holes planned for the Screamer area, located about 1/2 mile west of the Betze-Post pit, and drilling results have been encouraging. (American Barrick Resources Corp. annual report, quarterly reports, 4/22/93, 10/22/93; CMJ, 9/1/93; DMR, 2/1/93, 4/28/93)

Maggie Creek district

Silver Eagle Resources Ltd. has entered into a joint venture agreement with ASARCO Inc. on Silver Eagle's 46-claim High Dollar property. High Dollar is a grass-roots property situated a few miles southwest of Newmont's Gold Quarry mine. During the first year of the agreement, ASARCO will spend a minimum of $50,000 on the property for drilling. (DMR, 12/29/93)

Newmont Gold Co. began its expansion at the Gold Quarry mine with the start of construction of Mill No. 6, the refractory ore treatment plant. (U.S. Bureau of Mines, Mineral Industry of Nevada 1993)

HUMBOLDT COUNTY

Awakening district

York Mines of Northern Nevada has signed a lease agreement with Pathfinder Gold Inc. on the 2,000-acre Electrum Gold group near Amax Gold Co.'s Sleeper mine. The Electrum Gold properties were closed during World War II and have been relatively idle since that time. (CMJ, 10/1/93)

Amax Gold Co. reported that mill head grades and heap-leach tonnages were lower at the Sleeper mine in the third quarter of 1993; average mill head declined from 0.119 oz of gold per ton early in 1992 to 0.066 oz of gold per ton in the third quarter 1993. Total gold produced during the first 9 months of 1993 was 71,578 oz compared to 111,571 oz during the same period in 1992. A total of 13.8 million tons was mined in the first 9 months of the year. Mining experience and reinterpretation of geologic data at the Sleeper mine during the fourth quarter of 1993 led to a downward adjustment of the mine reserves, including both proven and probable ore, to 6.7 million tons, grading 0.037 oz of gold per ton. (DMR, 2/16/94, 12/1/93)

Battle Mountain district

Drilling by Rayrock Yellowknife Resources, Inc. at the East Hill area of the Marigold property was successful in adding to the mineable reserves and in locating further areas of mineralization which will require more drilling to establish reserves. (DMR, 2/9/94)

Buffalo Mountain district

Drilling by Santa Fe Pacific Gold Corp. at the Lone Tree property identified enough reserves to more than offset the gold mined there during the last half of 1993. Proven and probable ore at the property contains 4,028,000 oz of gold. The first phase of mill construction is complete and the oxide processing circuit began operation on October 13, 1993. The sulfide circuit is scheduled to begin operating by the second quarter of 1994. (DMR, 2/9/94)

Potosi district

FirstMiss Gold Inc. reported that, for the-fiscal year ending June 30, 1993, reserves at the Getchell mine consisted of 6,002,500 tons of sulfide ore at grade of 0.206 oz of gold per ton and 2,772,900 tons of oxide ore at grade of 0.028 oz of gold per ton. Final phase of the underground mining plan at Getchell is on schedule, development mining is anticipated in fiscal 1994 with production mining in fiscal 1995. Total proven and probable mineable underground ore reserves on June 30, 1993 were 2.4 million tons at a grade of 0.282 oz of gold per ton. Gold production for the first six months of the fiscal year (7/1/93 through 12/31/93) was 117,314 oz, essentially unchanged from the same period last year. Average cost of production was $262/oz. (FirstMiss Gold Inc. fourth quarter report, 6/30/93)

Rayrock Yellowknife Resources Inc. reported that additional reserves found at the Pinson mine during the year were sufficient to replace those mined during 1993. Additional reserve potential exists at depth beneath the current CX pit where drilling has encountered grades of 0.10 to 0.45 oz of gold per ton over widths of 15 to 45 feet (DMR, 2/9/94)

The Santa Fe Pacific Gold Corp.-Hanson Natural Resources (Gold Fields Corp.) coal-for-gold swap resulted in combining two major gold mines in this district; the Santa Fe Rabbit Creek mine, and the former Gold Fields Chimney Creek mine. Both mines produced gold from a common orebody and, with the asset exchange, have been combined into one large operation. The resulting mine, known as Twin Creeks, is the third largest primary gold mine in the United States. Reserves at Twin Creeks, including all categories, total 8,523,000 oz of gold. (NM, 11/1/93; DMR, 2/9/94)

Sulfur district

Hycroft Resources and Development Corp./Granges Inc. announced that a significantly larger zone of mineralization has been estimated to occur at the Brimstone deposit, located about 1 mile east of the current Crofoot/Lewis mining operations. Evaluation of the Brimstone deposit continues, and exploration in the Alberts area, west of Brimstone, intersected material of potential ore grade and width. An additional 3.7 million tons of proven ore has been defined along the margins of the South Central pit. Total reserves at the end of 1993 were 56.7 million tons grading 0.018 oz of gold per ton. The Crofoot/Lewis mine produced 86,516 oz of gold and 310, 559 oz of silver in 1993. (Hycroft Resources and Development Corp. news release, 3/1/93, 8/24/93, 9/30/93; DMR, 4/28/93, 2/23/94; CMJ, 11/1/93)

LANDER COUNTY

Battle Mountain district

Battle Mountain Gold Co. reported that feasibility and design work on the low-grade Phoenix milling project (formerly called the Fortitude Extension) was expected to be completed in the first quarter of 1994. The Phoenix deposit is estimated to contain about 900,000 oz of gold and has the potential to average about 120,000 oz of gold production per year. Work is also moving forward on the design and permitting of the Reona heap-leach project. Construction on this facility should begin in early 1994 and production is expected to begin in the second half of the year. When in full operation, the Reona facility is expected to produce between 50,000 and 60,000 oz of gold per year. Reona reserves are about 370,000 oz of gold and 600,000 oz of silver. (Battle Mountain Gold Co. quarterly report, 9/30/93, 1993 annual report; SKL, 4/24/93)

Bullion district

The initial drilling program of Akiko Gold Resources Ltd., Bradner Resources, and Ramrod Gold on the Bru-Lovie project consisted of eight reverse-circulation holes, totaling 5,000 feet. Six of these holes yielded encouraging gold intercepts. The second phase program focused on the eastern Colorback target, where low-grade but thick gold intercepts encountered in the initial program appear to represent leakage peripheral to higher grade gold bearing structures in bedrock concealed by alluvium. (DMR, 10/20/93, 12/1/93)

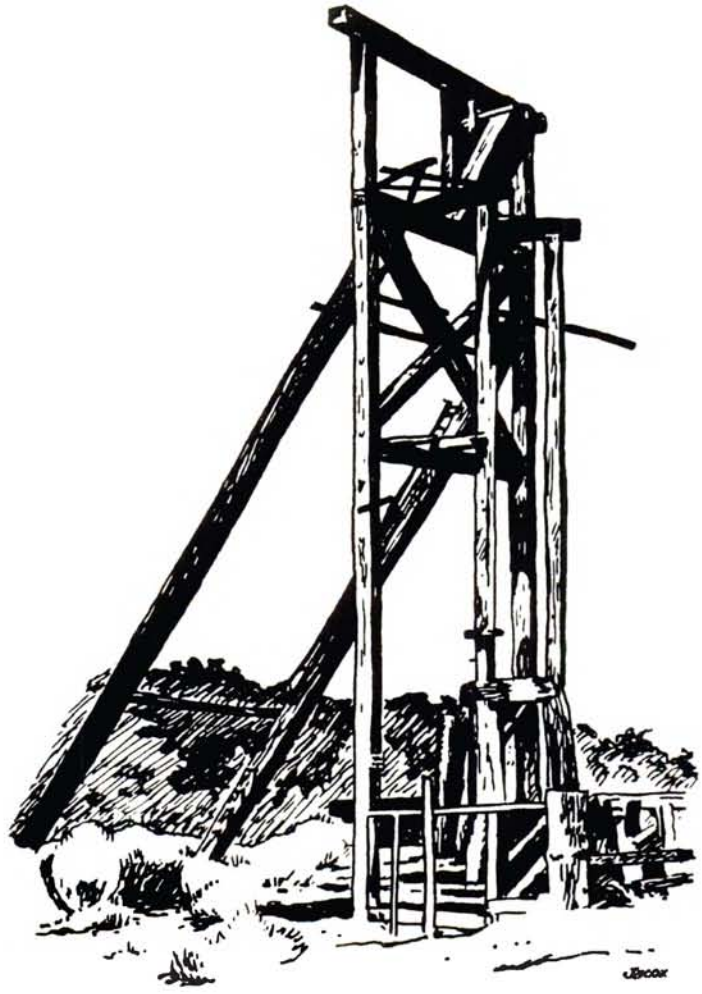
The initial phase of exploration on the E & E claims of First International Metal Corp. is underway. Work will include mapping and a geochemical survey

to identify targets for subsequent trenching and drilling. Grab samples from the property have produced traces of gold and assays as high as 1.5 oz of silver per ton along with pathfinder elements including arsenic, mercury, and barite. (DMR, 10/27/93)

Consolidated Ramrod Gold Corp. has an option to purchase 100% interest in the Mud Springs gold prospect from Bru-Ventures. The property, composed of 296 unpatented lode claims, 13 placer claims, and 80 acres of fee land, covers an area of about 9 square miles. The extent of gold mineralization at Mud Springs is indicative of a large hydrothermal system. Three targets in particular have been defined, Bald Mountain, Tub Spring, and the Amy/BB claims, all in the upper plate of the Roberts Mountains thrust. These targets are thought to be the high level surface expression of ore at depth. Previous drilling on the Bald Mountain zone has outlined a geologic resource of 42,000 oz of gold. (DMR, 9/8/93)

Placer Dome Inc. is continuing with activities leading to the development of its 60%-owned Pipeline gold deposit despite its ongoing litigation with Gold Fields Mining Co. Placer Dome as manager of the Cortez Joint Venture plans to construct a $250 million, 4,600-ton/day open-pit mine, metallurgical plant, and heap-leach facility to produce 3,697,000 oz of gold over a 12-year mine life. Mineable ore reserves are estimated to be 35.3 million tons grading 0.120 oz of gold per ton, made up of 19.6 million tons of mill ore, 14.3 million tons of heap-leach ore, and 1.4 million tons of refractory ore suitable for treatment in the roaster at the nearby Cortez mine. (Placer Dome Inc. news releases, 5/4/93, 6/24/93; CMJ, 9/1/93)

Ongoing exploration on the South Pipeline property by Cortez Joint Venture (Placer Dome, 60% and Kennecott, 40%) and Royal Gold has determined a drill-indicated resource of 31.4 million tons of material with an average grade of 0.106 oz of gold per ton. Fill-in drilling is planned to continue to test both shallow and deep mineralized zones. Drill-indicated reserves are based on an assumed cutoff grade of 0.05 oz of gold per ton. Placer Dome said it has also encountered gold mineralization 1,000 feet west of the South Pipeline deposit. Drilling has confirmed a near-surface oxidized gold deposit and has indicated a new, higher grade gold zone at depth. Overburden removal and plant construction are scheduled for South Pipeline in 1994. (CMJ, 9/1/93; DMR, 9/8/93, 10/20/93, 12/29/93; SME, 1/1/93)



Coral Gold has announced a geological resource of 20 million tons on the Robertson (Tenabo) property, a joint venture of Amax Gold Exploration Inc. and Coral Gold Corp. The 20 million tons does not include the Porphyry Zone which adds significantly to the resource; total resources are rumored to be in the 1 million oz range. Amax Gold Inc. has informed Coral Gold that since drilling began in the Porphyry Zone, 18 of 28 reverse circulation drill holes have each intersected at least 100 feet or more of good grade mineralization at a depth of less than 400 feet. In August, Amax Gold gave Coral Gold notice that it intended to enter Phase 3 of the exploration program under the Amax/Coral option agreement. Two large-diameter drill holes are now exploring mineralized zones on the property. (Coral Gold Co. news release 8/1/93; DMR, 8/11/93, 12/15/93; SEG, 10/1/93)

Difficult drilling stopped completion of the first drill hole on the Trendline property of Cathedral Gold Corp. at 1,200 feet, short of its planned depth of 1,500 feet. A 200-foot-thick alteration system was encountered at the bottom of the hole but significant gold values were not found. The second drill hole on the property was completed to the target depth of

1,800 feet. A large alteration system was intersected at 1,445 feet in what is interpreted to be lower plate rocks of the Roberts Mountains thrust system but, as in the first hole, significant gold mineralization was not found. (DMR, 3/10/93, 3/31/93)

Hilltop district

Alta Gold Co. has purchased Nerco Exploration Co.'s 50% interest in the Havingdon Peak property in the Shoshone Range, 1 mile north of Placer Dome's Hilltop deposit. Alta is now sole owner of the property, which consists of 91 unpatented claims. (DMR, 12/1/93)

Recently completed drilling has indicated a new discovery of widespread near-surface gold mineralization on Equinox Resource's Slaven Canyon property. The drill program, consisting of 13 shallow holes, tested a series of strong gold geochemical anomalies up to 2,000 by 1,750 feet in size. Eleven of the 13 holes intersected mineralization in excess of 0.01 oz of gold per ton and ranging up to 25 feet of 0.047 oz of gold per ton. The mineralization is open and will be tested in a second stage drilling program in early 1994. The drill program was operated by Uranerz USA Inc. which holds right to acquire up to 70% of Equinox's interest, and was funded by Takla Star Resources which holds right to acquire 40% of Uranerz's interest. (DMR, 12/8/93; SKL, 12/11/93)

Kingston district

Verdstone Gold Corp. reports that a mineable, diluted, recoverable reserve has been calculated for the Victorine property at a 0.146 oz of gold per ton cut-off grade with an average mining width of 12 feet; reserve figures are 256,268 proven/probable tons grading 0.357 oz of gold per ton and 122,777 possible tons grading 0.241 oz of gold per ton. (DMR, 2/24/93)

McCoy district

The McCoy/Cove mine, operated by Echo Bay Mines, set new production records in 1993 with 395,000 oz of gold and 12,454,338 oz of silver. Underground mining was completed at Cove early in 1993 and the remainder of the Cove orebody will be mined from surface. Additional ore has been discovered at the western margin of the original McCoy pit, closed in 1991, and plans are to reopen this pit at some time in the future. Underground mining will continue at the McCoy mine until sometime in 1994. McCoy/Cove is the largest silver-producing mine in North America and one of the three largest in the world. (Echo Bay Mines 1993 annual report; DMR, 6/9/93, 9/8/93, 12/1/93)

LYON COUNTY

Yerington district

Arimetco International Inc. reported that Mine Reserve Associates Inc. of Denver has prepared a revised ore reserve estimate of 97 million tons at 0.21% copper for the MacArthur copper property based upon a copper price of $.85 per pound, 70% process recovery, and current operating costs at its Yerington operation. Reserves include both proven and probable oxide reserves and were calculated with an economic cutoff grade of 0.1% copper and a waste to ore stripping ratio of 16:1. The county special use permit had been modified, allowing ore from MacArthur to be hauled in mine trucks 4.5 miles downhill to the Yerington mine where it will be placed on leach pads. Mining at MacArthur is scheduled to commence during the first quarter of 1994. (DMR, 1/12/94, 2/9/94)

At the Yerington copper mine, Arimetco began construction of new leach pads in August, leaching commenced at the end of October, and leach solutions reached the SX-EW plant by early November. Solution grades in the plant are steadily increasing and cathode copper production at Yerington is expected to increase by 40,000 pounds per day. (DMR, 2/9/94)

MINERAL COUNTY

Aurora district

At the close of fiscal year 1993 (6/30/93), mineable reserves at the Consolidated Nevada Goldfields Corp. Aurora mine were sufficient to sustain another 4 years of mining; production of 8,536 oz of gold from 93,844 tons processed at 0.1 oz of gold per ton during fiscal year 1993 is projected to nearly double during fiscal 1994. Most of the 1993 open-pit production came from the Ann pit located 4 miles north of the mill. Other open-pit sources included the Prospectus, Last Chance and, in the later part of the year, the Chesco. A total of 15,300 tons of ore grading 0.19 oz of gold per ton was mined from two shrink stopes in the Chesco underground mine. Exploration in the Sawtooth/Redstar area has potential to significantly extend the life of the Aurora mine. In the first half of fiscal 1994, narrower than projected vein widths in the Two West area of the Chesco pit resulted in greater than projected dilution and consequently lower grades. Both the Chesco vein system and the adjacent, parallel Morning Glory system were drilled during the first half of the fiscal year (7/1-12/31/93) along a 1,200-foot strike length with 29 drill holes, totaling 11,707 feet. Drilling has confirmed the economic potential of ore-bearing veins over a minimum strike

length of 575 feet. (Consolidated Nevada Goldfields Corp, 1993 annual report; quarterly reports, 6/30/93, 9/30/93, 1/1/94)

Candelaria district

Kinross Gold Corp. purchased the Candelaria silver mine on August 3, 1993 and resumed mining in November. The mine is expected to produce over 3 million oz of silver and 16,000 oz of gold in 1994. Current operations are directed at recovery of silver from previously constructed leach heaps. (Kinross Gold Corp. 1993 annual report; SKL, 12/18/93)

Rawhide district

The Denton-Rawhide gold mine, a joint venture of Kinross, Kennecott and the Kiewit Mining Group, produced 103,800 oz of gold and 984,000 oz of silver in 1993; direct operating costs averaged $151 per ounce of gold for the year. At the end of 1993, proven and probable reserves for the mine were 44 million tons containing 1.3 million oz of gold and 15 million oz of silver (Kinross Gold Corp. 1993 annual report)

NYE COUNTY

Bare Mountain district

Inter-Rock Gold Inc. recently completed the first stage of exploration at its Daisy Gold property near Secret Pass in the north part of the district. Previous work on the deposit identified an oxidized gold resource of 11.8 million tons grading 0.021 oz of gold per ton and a sulfide resource of 6.1 million tons grading 0.030 oz of gold per ton at a 0.01 ounce gold per ton cut-off. The mineable oxide resource is believed to be 4.7 million tons grading 0.024 oz of gold per ton. (CMJ, 12/1/93)

In the southern part of this district, the Sterling mine had its best year for ore production in its 13-year operating history, producing 80,925 tons grading 0.252 oz of gold per ton. The lowest levels of the mine continue to intercept ore, and the Sterling orebody is open down dip to the south, east, and west. Two thousand feet of underground development work, outside the current reserve, is planned for 1994. (DMR, 2/9/94)

Bruner district

Encouraging results have been announced from 17 drill holes completed at the Bruner Project in 1992 in the area southeast of the Penalas mine and around the main Duluth zone, to the northwest. In early 1993, the first stage of drilling in a pediment area to locate the source of some high-grade float was completed without encountering mineralization. Exploration is continuing on this property. Reserves need to be increased to provide for an economically viable operation. The largest of a number of mineralized zones identified on the property is the Duluth with 385,000 oz of gold. (Miramar Mining Corp. news releases, 3/15/93, 5/6/93, 1/1/94)

Gold from the High-Grade vein at Smoky Valley Common Operation's Round Mountain gold mine. Each of the slabs in this picture is composed of 80 to 100% electrum (65% Au - 35% Ag). All were recovered from the same general part of the High-Grade vein, a shallowly dipping, 1- to 6-inch-thick, faulted, sericite-gold-quartz-adularia vein mined in part during 1992 and 1993. The slab on the bottom measures 5.5 × 10.0 inches, ranges from 0.5 to 0.75 inches thick, and weighs 101.65 ounces. *Photo by Bruce Veek.*

Fairplay district

After more than 7 years production, mill-grade ore at FMC Gold Co.'s Paradise Peak mine has been exhausted and the mill was shut down in May 1993. Leach production accelerated and continued through the remainder of 1993. (DMR, 9/8/93, 12/1/93)

Round Mountain district

Gold production at the Round Mountain mine (Echo Bay Mines, 50%; Homestake Mining Co., 25%; Case, Pomeroy & Co., Inc., 25%) rose to 374,694 oz in 1993 and production costs were reduced to $205/oz. Round Mountain is primarily a heap-leaching operation, but a small gravity plant is currently operating and construction of a larger gravity plant is under review. Gravity feed is from a narrow but high-grade gold vein not amenable to heap-leaching. This high-grade vein contributed 53,376 oz of gold to Round Mountain's 1993 production. Total reserves at Round Mountain are 7.1 million oz of gold. (Echo Bay Mines 1993 annual report; DMR, 12/1/93)

Rye Patch district

Kennecott is exploring an epithermal gold system adjacent to State Route 376 near the Belmont turnoff, northeast of Tonopah. The Midway project, near the old camp of Maggie Blue's, is in the historic Rye Patch mining district, first active about 1906. (SEG, 10/1/93)

PERSHING COUNTY

Central district

Sky Scientific Inc., the precious metals mining and processing subsidiary of Winners Circle Inc., announced it would begin limited production on its Danner mine property. The presence of large reserves of low-grade ore is indicated. In six zones studied so far, potential could exceed 1 million oz of gold. (CMJ, 11/1/93)

Goldbanks district

More than 100 holes, many on 25- to 50-foot centers, have been drilled on Restoration Minerals Goldbanks Hills property along a 3,000-foot, north-trending zone next to the old mercury workings at Squaw Butte. Some high-grade zones with visible gold have been reported to have been drilled. (SEG, 1/1/94)

Imlay district

Pegasus Gold Inc.'s Florida Canyon mine set an all-time high production record for the property by producing 109,200 oz of gold in 1993. The mine treated 5.4 tons of primary ore. (NM, 2/1/94)

Rochester district

The Rochester silver mine, operated by Coeur Rochester, Inc., produced 5,943,894 oz of silver in 1993, more than ever before in its 7 years of operation. Gold production for the year was 66,412 oz. Cash operating costs for 1993 were $3.55 per oz of silver, up from the previous year. At the year end, proven and probable ore reserves stood at 75 million tons with an average grade of 1.32 oz of silver per ton and 0.0113 oz of gold per ton. This will allow 10 to 12 more years of mining at Rochester, assuming current mining rates and precious metals prices.(Coeur d'Alene Mines Corp. 1993 annual report)

Rosebud district

Equinox Resources Ltd. announced the completion of its purchase of LAC Minerals (USA)'s interest in the Rosebud property for $5.5 million and, at the same time, the sale for $3 million by Equinox to Euro-Nevada Mining Corp. of a 2.5% NSR royalty. The property did not meet LAC's corporate size threshold of 1 million oz. The 9,000-acre property has been extensively explored since 1988, and is reported to contain a high-grade mineral resource of more than 600,000 oz of gold ready for development by underground mining methods. The last hole drilled in the Dozer Hill zone intersected 100 feet of ore grading 1.09 oz of gold per ton. Using an onsite mill, current probable reserves would enable a 7-year mine life averaging 75,000 oz of gold production per year starting in late 1995. Equinox now plans to complete a final feasibility study including underground development, fill-in drilling, and bulk sampling to enable a production decision to be made. (CMJ, 9/1/93; DMR, 8/11/93, 12/1/93; SKL, 5/15/93, 8/7/93)

STOREY COUNTY

Comstock district

BMR Gold Corp. and Rea Gold Corp. announced agreement to begin production on the Comstock project. Current plans are to produce at the rate of 2,500

tons per day. The project has open-pit mineable reserves containing approximately 160,000 oz of gold and 1,600,000 oz of silver at the first of several targets. Mine life is now forecast at 6 to 10 years. (DMR, 2/10/93, 3/3/93)

At Miramar Mining Corp.'s 60%-owned Golden Eagle mine (Flowery mine) near Virginia City, 3,613 oz of gold and 50,786 oz of silver were produced and shipped during 1993. Since mining began in August 1993, 85,900 tons of ore with an average grade of 0.142 oz of gold per ton and 0.91 oz of silver per ton have been loaded on the leach pad. The mine is currently producing at an annualized rate of more than 10,000 oz of gold per year with significant silver. (Miramar Mining Corp. news releases, 10/20/93, 1/1/94, 1/24/94)

WASHOE COUNTY

Deephole district

Canyon Resources announced that it has discovered gold mineralization on the Mountain View property about 15 miles northwest of Gerlach. The discovery is an epithermal deposit within a rhyolite dome complex, similar to the nearby Hog Ranch deposit. Mineralization is localized along a north-trending fault zone. The discovery hole, drilled in 1992, intersected 155 feet grading 0.038 oz of gold per ton in highly altered rhyolite beneath only 30 feet of gravel. Later holes have typically hit zones ranging from 135 to 210 feet thick grading 0.022 to 0.035 oz of gold per ton; some grades up to 0.186 oz of gold per ton have been encountered. Gold mineralization is present in 20 of 27 holes drilled in an area adjacent to a range-front fault. The area extends at least 1,200 feet north-south and widens to 750 feet in an east-west direction at the south end of drilling. To the south, the rhyolite occurs beneath a thicker cover of gravel, and mineralization extends throughout the entire thickness of rhyolite to the bottom of several drill holes. The mineralization is open both north and south and at depth. Canyon Resources is operator of an exploration and development joint venture with Independence Mining Co. on this project. (DMR, 11/17/93,12/1/93; SEG, 1/1/94; SKL, 11/20/93)

San Emidio district

The Wind Mountain mine of Amax Gold Inc. produced 19,570 oz of gold in 1993. Residual leaching will continue as long as it remains economical. (CMJ, 12/1/93)

WHITE PINE

Bald Mountain district

USMX Inc. sold its mining assets located at Alligator Ridge, including the Alligator Ridge mine, Yankee mine, the Casino/Winrock mine, and about 30,000 acres of unpatented mining claims to Placer Dome U.S. for a total of $20 million cash plus the assumption by Placer Dome of all related obligations. Due to continued threats of adverse amendment to the U.S. Mining Law of 1872 as well as to other existing regulations, USMX is primarily directing its interest toward the evaluation of private lands in the United States and to opportunities in Latin America. (DMR, 4/28/93; SKL, 6/26/93)

Pancake district

Alta Gold Co. entered into a one-year option agreement with Griffon Resources to purchase 100% interest in the Griffon gold property located about 15 miles east of Alta Gold's Easy Junior mine. Initial exploration has defined a geological reserve of approximately 60,000 oz of gold at the Griffon deposit. The gold deposit is hosted in decalcified, sanded, calcareous siltstone of the upper Joana Limestone, and it shows excellent continuity, has a low stripping ratio, and is open to the south. (CMJ, 12/1/93; DMR, 11/3/93, 12/1/93; RGJ, 11/2/93; SEG, 1/1/94)

Robinson district

The Magma Copper Co. is conducting an Environmental Impact Study to analyze the proposed redevelopment of its Robinson property. The study will delay the project startup, which was scheduled for late 1994. When placed into operation, the project will produce about 125 million pounds of copper and 100,000 oz of gold per year over a 16-year mine life. (SKL, 6/19/93, 10/2/93)

White Pine district

Alta Gold Co. reopened the Easy Junior mine during the summer of 1993. Operation of the mine commenced in 1989 but was suspended in 1990 due to depressed gold prices. The first recovery of gold from the leaching system was expected in December and full production capacity is estimated at 2,500 oz per month. A secondary round of exploration drilling has begun. (CMJ, 9/1/93; DMR, 6/16/93; RGJ, 11/5/93)

Major Precious-Metal Deposits

by Harold F. Bonham, Jr., and Ronald H. Hess

The information in this compilation was obtained from the Nevada Division of Minerals and from published reports, articles in mining newsletters, and company annual reports and press releases. Locations of most of these deposits are shown on NBMG Map 91, and most active mines are shown on page 2 of this publication.

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
CHURCHILL COUNTY				
Bell Mountain	1989: *reserves*—30,000 oz Au, 125,000 oz Ag	no production	rhyolitic tuff	Miocene
Dixie Comstock	1991: 2.4 million tons, 0.049 oz Au/ton	1989: development 1990-93: exploration	Tertiary rhyolite	Miocene?
Fondaway Canyon	1988: 400,000 tons, 0.06 oz Au/ton 1990: 400,000 tons, 0.06 oz Au/ton	1989: 1,065 oz Au, 87 oz Ag 1990: 12,000 oz Au 1993: idle	Triassic slate and phyllite	Cretaceous
CLARK COUNTY				
Crescent property	1992: 390,000 tons, 0.05 oz Au/ton; 3.3 million tons, 0.022 oz Au/ton			
Goodsprings (Keystone)	1990: *estimated geologic resource* 64 million tons, 0.05 oz Au/ton 1992: 110,000 tons, 0.11 oz Au/ton	1990: ~1,000 oz Au 1993: idle	lower Paleozoic carbonate rocks	Triassic
ELKO COUNTY				
Big Springs (Sammy Creek)	1989: 1.55 million tons, 0.172 oz Au/ton	1987-88: ~106,000 oz Au 1989: 60,376 oz Au, 4,416 oz Ag 1990: 73,224 oz Au, 3,060 oz Ag 1991: 69,539 oz Au, 3,327 oz Ag 1992: 71,035 oz Au, 600 oz Ag 1993: 52,752 oz Au	Mississippian to Permian overlap assemblage clastic and carbonate rocks	Cretaceous or Tertiary
Bootstrap/ Capstone	1989: *geologic resource*—25.1 million tons, 0.039 oz Au/ton 1990: 18.3 million tons, 0.044 oz Au/ton	1988-90: NGO	dacitic dikes, Paleozoic siltstone and laminated limestone/chert	~37 Ma
Burns Basin	Reserves and production included in Jerritt Canyon figures		Roberts Mountains and Hanson Creek Formations	Cretaceous or Tertiary
Cobb Creek	1988: *geologic resource*—3.2 million tons 0.045 oz Au/ton			
Cord Ranch	1991: 3.5 million tons, 0.037 oz Au/ton 1992: 6.0 million tons, 0.03 oz Au/ton			
Dark Star	1991: 4.5 million tons, 0.022 oz Au/ton 1992: 5.76 million tons, 0.02 oz Au/ton			
Dee	1990: 4.5 million tons, 0.059 oz Au/ton 1992: 5.2 million tons, 0.049 oz Au/ton 1994: *geologic resource*—958,000 oz Au	1987-88: ~97,000 oz 1989: 44,500 oz Ag, 45,000 oz Ag 1990: 48,095 oz Au, 64,650 oz Ag 1991: 42,000 oz Au, 42,000 oz Ag 1992: 38,150 oz Au, 35,500 oz Ag 1993: 25,860 oz Au	Vinini Formation Devonian carbonates, dacitic dikes	Cretaceous or Tertiary
Emigrant Springs	1989: 30.3 million tons, 0.021 oz Au/ton	exploration	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Hollister (Ivanhoe)	1989: *oxide*—18.4 million tons, 0.035 oz Au/ton; estimated mineral inventory 83.5 million tons, 0.034 oz Au/ton, with 52.8 million tons of oxide and 30.7 million tons of sulfide	1990: 6,000 oz Au 1991: 60,000 oz Au 1993: exploration	rhyolitic tuff, flows, volcaniclastic rocks, Paleozoic sedimentary rocks	Miocene

continued

NGO: Newmont Gold Operations (Bootstrap/Capstone, Blue Star, Genesis, and Gold Quarry mines) reported production of 895,500 oz Au in 1988, 1,467,800 oz Au and 117,400 oz Ag in 1989, 1,676,000 oz Au in 1990, 1,575,700 oz Au in 1991, 1,588,000 oz Au and 98,000 oz Ag in 1992, and 1,666,400 oz Au and 175,000 oz Ag in 1993.

MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
ELKO COUNTY (continued)				
Jerritt Canyon (includes Saval Canyon)	1989: 21.6 million tons, 0.143 oz Au/ton mill ore; 6.5 million tons, 0.043 oz Au/ton leachable 1990: new discovery south of current mine has a geologic resource of 3.2 million tons, 0.284 oz Au/ton 1991: *geologic resource*—4.7 million oz Au	1981-89: ~2.3 million oz Au 1990: 323,000 oz Au 1991: 374,354 oz Au, 4,727 oz Ag 1992: 318,020 oz Au, 8,264 oz Ag 1993: 361,820 oz Au, 6,470 oz Ag	Hanson Creek and Roberts Mountains Formations	~40 Ma
Kinsley Mountain	1988: 2.1 million tons, 0.048 oz Au/ton 1993: 2.6 million tons, 0.047 oz Au/ton	1993: evaluation	upper Paleozoic carbonate rocks	Oligocene?
Meikle (Purple Vein)	1992: *geologic resource*—7.9 million tons, 0.613 oz Au/ton 1993: *geologic resource*—6.6 million oz Au	underground development	Popovich and Roberts Mountains Formations	Cretaceous or Tertiary
Rain	1989: *geologic resource*—22.6 million tons, 0.052 oz Au/ton 1990: 9 million tons, 0.063 oz Au/ton	1988: 29,000 oz Au 1991: 135,400 oz Au	Webb Formation	36-37 Ma
SMZ	1989: *geologic resource*—1.6 million tons, 0.019 oz Au/ton			
Trout Creek	1988: 1.5 million tons, 0.04 Au/ton	1988: exploration	lower Paleozoic rocks	Cretaceous or Tertiary
Tuscarora (Dexter)	1987: 2 million tons, 0.039 oz Au and 1.9 oz Ag/ton 1988: 1.8 million tons, 0.037 oz Au/ton 0.74 oz Ag/ton	1896-1902: 29,940 oz Au, 28,543 oz Ag 1987-89: 33,000 oz Au, 143,000 oz Ag 1990: 1,163 oz Au, 41,865 oz Ag 1992-93: idle	Eocene rhyolitic ignimbrite and andesite	38 Ma
Winters Creek	1986: 1.4 million tons, 0.146 oz Au/ton	evaluation, exploration	lower Paleozoic carbonate rocks	Cretaceous or Tertiary
Wood Gulch	1988: 500,000 tons, 0.098 oz Au and 0.4 oz Ag/ton 1991: mined out	1989: 19,810 oz Au, 31,122 oz Ag 1990: 14,926 oz Au, 35,374 oz Ag	lower Paleozoic sedimentary rocks, andesite-dacite dikes and sills	Cretaceous or Tertiary
Wright Window	1986: 1.3 million tons, 0.095 oz Au/ton	1992: 3,500 oz Au	lower Paleozoic carbonate rocks	Cretaceous or Tertiary
ESMERALDA COUNTY				
Boss Mine	1987: 500,000 tons, 0.07 oz Au/ton	1993: idle	Ordovician sedimentary rocks	Miocene?
Boss property	1990: *reserves*—637,500 tons, 0.023 oz Au/ton 1990: *geologic resource*—31,000 oz Au			
Divide	1988: 500,000 tons, 0.04 oz Au and 0.40 oz Ag/ton	evaluation 1991-93: idle	Miocene silicic tuff	16 Ma
Goldfield Project	1983: 1.75 million tons, 0.087 oz Au/ton 1991: 1.2 million tons, 0.05 oz Au/ton 1993: 2.3 million tons, 0.073 oz Au/ton	1903-45: 4.19 million oz Au, 1.45 million oz Ag 1989: 1,987 oz Au, 200 oz Ag 1993: 11,350 oz Au	andesite, rhyodacite, rhyolite	21 Ma
Hasbrouck	1986: 12.9 million tons, 0.0291 oz Au and 0.59 oz Ag/ton	1986-92: exploration 1993: idle	Siebert Formation tuff and volcaniclastic rocks	16 Ma
Mary-Drinkwater	1993: 1.6 million tons, 0.196 oz Au/ton			
Silver Peak	1991: 531,300 tons, 0.124 oz Au/ton	1991: 25,000 oz Au. 8,000 oz Ag	Wyman Formation	Mesozoic?
Top	1986: *geologic resource*—5.2 million tons, 0.093 oz Au/ton			
Weepah	1986: 200,000 tons, 0.1 oz Au and 0.4 oz Ag/ton	1986-87: 58,000 oz Au 1988-90: idle	Wyman Formation	Cretaceous

MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
EUREKA COUNTY				
Blue Star	1989: *geologic resource*—22.2 million tons, 0.030 oz Au/ton 1990: 32 million tons, 0.047 oz Au/ton (includes Genesis)	1974-84: intermittent 1988-92: NGO	lower Paleozoic sandy siltstone and carbonate rocks, granodiorite	Cretaceous or early Tertiary
Bobcat	1988: *geologic resource*—17.7 million tons, 0.029 oz Au/ton		lower Paleozoic rocks	Cretaceous or Eocene
Buckhorn	1990: 700,000 tons, 0.05 oz Au/ton; *geologic resource*—200,350 oz Au 1991: 409,000 tons, 0.062 oz Au/ton 1992: open pit ore mined out 1993: *geologic resource*—1.1 million tons, 0.11 oz Au/ton	1988-91: 97,922 oz Au, 376,487 oz Ag 1992: 7,700 oz Au, 28,800 oz Ag 1993: 3,800 oz Au, 4,600 oz Ag	basaltic andesite, sinter, silicified sedimentary rocks	14.6 Ma
Bullion Monarch	1987: 1 million tons, 0.10 oz Au/ton	exploration, evaluation	lower Paleozoic sedimentary rocks	Tertiary or Mesozoic
Carlin	1989: *geologic resource*—20.8 million tons, 0.029 Au/ton 1990: 1.4 million tons, 0.066 oz Au/ton	1965-84: 4.3 million oz Au 1988: 25,320 oz Au 1989: idle 1991: 35,500 oz Au 1993: underground development	Roberts Mountains Formation	Cretaceous or early Tertiary
Genesis	1989: *geologic resource*—35.8 million tons, 0.044 oz Au/ton 1990: 32 million tons, 0.047 oz Au/ton (includes Blue Star)	1986: production commenced 1988-93: NGO	Ordovician-Devonian limestone, argillite chert	Cretaceous or early Tertiary
Gnome	1988: 2.7 million tons, 0.048 oz Au/ton	exploration	Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Gold Bar	1988: 2.75 million tons, 0.10 oz Au/ton 1989: *geologic resource*—1.45 million oz Au 1990: mined out in December	1987-88: 91,000 oz Au 1989: 66,000 oz Au 1990: 81,263 oz Au 1991: 80,727 oz Au, 3,000 oz Ag 1992: 80,000 oz Au 1993: 55,080 oz Au	Devonian Nevada Formation	Eocene?
Gold Canyon	1992: *reserves*—86,500 oz Au, *geologic resource*—131,000 oz Au 1993: 770,000 tons, 0.080 oz Au/ton			
Gold Pick	1988: 10 million tons, 0.06 oz Au/ton 1990: 9.7 million tons, 0.057 oz Au/ton includes Gold Ridge and Goldstone 1991: 4.5 million tons, 0.055 oz Au/ton 1992: *geologic resource*—329,700 oz Au, includes eastern deposit 1993: 1.4 million tons, 0.079 oz Au/ton	exploration	Paleozoic sedimentary rocks	Eocene?
Gold Quarry	1987: 197.8 million tons, 0.042 oz Au/ton 1988: *geologic resource*—503 million tons, 0.04 oz Au/ton 1990: 212.6 million tons, 0.042 oz Au/ton, *geologic resource*—534.3 million tons, 0.037 oz Au/ton 1991: *reserves*—9.3 million oz Au	1985 170,000 oz Au 1988-93: NGO	Ordovidian to Devonian chert, shale, siltstone, and impure carbonates; in part, Vinini Formation	Cretaceous or early Tertiary
Gold Ridge	1988: 4 million tons, 0.06 oz Au/ton 1990: *see* Gold Pick 1991: 2.9 million tons, 0.04 oz Au/ton 1992: 1.4 million tons, 0.038 oz Au/ton 1993: 426,000 tons, 0.059 oz Au/ton	exploration, evaluation	Paleozoic sedimentary rocks	Eocene?
Goldstone	1988: 1.7 million tons, 0.08 oz Au/ton 1990: *see* Gold Pick 1991: 845,000 tons, 0.063 oz Au/ton 1992: 878,000 tons, 0.061 oz Au/ton 1993: 130,928 tons, 0.104 oz Au/ton	exploration, evaluation	Paleozoic sedimentary rocks	Eocene?
Goldstrike (Betze, Post)	1988: 128.4 million tons, 0.095 oz Au/ton 1990: *geologic resource*—18.4 million oz Au 1992: 112.1 million tons, 0.180 oz Au/ton, *geologic resource*—21 million oz Au 1993: *geologic resource*—29.1 million oz Au	1980-88: 440,000 oz Au 1989: 207,264 oz Au, 15,500 oz Ag 1990: 352,880 oz Au, 20,112 oz Ag 1991: 546,146 oz Au, 22,000 oz Ag 1992: 1,108,218 oz Au, 34,735 oz Ag 1993: 1,439,929 oz Au	Ordovician to Devonian chert, shale, siltstone, and impure carbonates; in part, Vinini Formation	Cretaceous or early Tertiary

continued

NGO: Newmont Gold Operations (Bootstrap/Capstone, Blue Star, Genesis, and Gold Quarry mines) reported production of 895,500 oz Au in 1988, 1,467,800 oz Au and 117,400 oz Ag in 1989, 1,676,000 oz Au in 1990, 1,575,700 oz Au in 1991, 1,588,000 oz Au and 98,000 oz Ag in 1992, and 1,666,400 oz Au and 175,000 oz Ag in 1993.

MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
EUREKA COUNTY (continued)				
Horse Canyon	1984: 3.94 million tons, 0.055 oz Au/ton 1988: included in Gold Acres figures	1984: 40,000 oz Au 1988-93: included with Gold Acres	Vinini Formation, Wenban Limestone	34 Ma?
Lantern	1988: *geologic resource*—15.45 million tons, 0.028 oz Au/ton	exploration	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Maggie Creek	1988: *geologic resource*—303,000 tons, 0.092 oz Au/ton	1984: 1,250,000 tons 1986: intermittent production 1988: no production reported	Ordovician to Devonian siltstone, chert, sandstone, impure limestone	Cretaceous or early Tertiary
North Star	1989: *geologic resource*—6.9 million tons, 0.052 oz Au/ton 1990: 3.9 million tons, 0.052 oz Au/ton	1988: 4,250 oz Au	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Pete	1988: *geologic resource*—15.7 million tons, 0.030 oz Au/ton 1989: 4.3 million tons, 0.036 oz Au/ton, *geologic resource*—15.8 million tons, 0.030 oz Au/ton	exploration	Roberts Mountains Formation	Cretaceous or early Tertiary
Post/Deep Post	Newmont Gold Co. holdings only- 1988: *geologic resource*—195 million tons, 0.062 oz Au/ton 1990: 40.1 million tons, 0.147 oz Au/ton 1992: 9 million oz Au	1988: 4,930 oz Au 1991: 177,500 oz Au	Vinini Formation, lower Paleozoic carbonate rocks	Cretaceous?
Project Glister		1989: 8,450 oz Au, 23,519 oz Ag		
Ratto Canyon	1984: ~200,000 oz Au	exploration	Dunderberg Shale, Hamburg Dolomite	Oligocene
Rock Creek	1988: 30,000 oz Au			
Tonkin Springs	1987: *oxide*—1.5 million tons, 0.05 oz Au/ton; *sulfide*—2.5 million tons, 0.09 oz Au/ton 1991: 9 million tons, 0.05 oz Au/ton	1987: ~9,700 oz Au 1988: 565 oz Au 1989: 1,753 oz Au, 1,402 oz Au 1990: 2,068 oz Au, 470 oz Ag 1992: idle, exploration, metallurgical testing	Vinini Formation, dacitic dikes	Oligocene?
Tusc	1988: *geologic resource*—15.8 million tons, 0.059 oz Au/ton 1990: 13.3 million tons, 0.062 oz Au/ton	exploration	lower Paleozoic sedimentary rocks	Cretaceous or early Tertiary
Windfall	1988: 3 million tons, 0.03 oz Au/ton	1908-16: 24,000 oz Au 1975-84: 90,000 oz Au 1988: 6,380 oz Au, 59 oz Ag	Hamburg Dolomite	Eocene or Oligocene
Zeke	1989: 2 million tons, 0.056 oz Au and 0.224 oz Ag/ton			
HUMBOLDT COUNTY				
Adelaide Crown	1989: *south pit*—585,000 tons, 1.313 oz Ag and 0.043 oz Au/ton; *additional area* - 165,000 tons, 0.015 oz Au and 1.10 oz Ag/ton	1990: 3,068 oz Au, 37,537 oz Ag 1991: 1,849 oz Au, 15,937 oz Ag 1992: idle	Preble Formation	Tertiary
Ashdown	1988: 1 million tons, 0.11 oz Au/ton 1992: 1.1 million tons, 0.12 oz Au/ton	exploration	Mesozoic granite	Mesozoic
Chimney Creek	1988: *proven, probable*—26.9 million tons, 0.068 oz Au/ton; *inferred in south pit*—2.1 million oz Au 1989: *geologic resource*—4.6 million oz Au 1993: *see* Twin Creeks	1987-88: 300,000 oz Au 19989: 222,556 oz Au, 55,953 oz Ag 1990: 220,000 oz Au 1991: 228,065 oz Au, 100,000 oz Ag 1992: 247,969 oz Au, 113,463 oz Ag 1993: *see* Twin Creeks	upper Paleozoic sedimentary rocks	~90 Ma
Crofoot/Lewis	1988: 25 million tons, 0.025 oz Au/ton 1990: 12 million tons, 0.020 oz Au/ton 1991: 13.9 million tons, 0.019 oz Au/ton 1992: 29.8 million tons, 0.024 oz Au/ton, *geologic resource*—45 million tons, 0.021 oz Au/ton 1993: 29.8 million tons, 0.024 oz Au/ton 1994: *geologic resource*—56.7 million tons, 0.018 oz Au/ton	1988: 75,800 oz Au 1989: 82,000 oz Au, 123,000 oz Ag 1990: 92,000 oz Au, 110,000 oz Ag 1991: 94,340 oz Au, 151,553 oz Ag 1992: 100,000 oz Au, 280,000 oz Ag 1993: 86,516 oz Au, 310,559 oz Ag	Camel conglomerate, rhyolite dikes	1-2 Ma

MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
HUMBOLDT COUNTY (continued)				
Getchell	1989: 8.1 million tons, 0.154 oz Au/ton mill grade and 1.43 million tons, 0.049 Au/ton heap-leach ore; *additional geologic resource* - 5.7 million tons, 0.092 oz Au/ton sulfide and 2.6 million tons, 0.055 oz Au/ton oxide 1991: 6.5 million tons, 0.192 oz Au/ton sulfide and 1.8 million tons, 0.039 oz Au/ton oxide. 1992: *sulfide*—7.0 million tons, 0.194 oz Au/ton; *oxide*—2.5 million tons, 0.031 oz Au/ton 1993: *geologic resource*—1.3 million oz Au	1938-50, 1962-67: 788,875 oz Au 1987-88: ~35,000 oz Au 1989: 120,730 oz Au, 9,407 oz Ag 1990: 172,029 oz Au 1991: 200,958 oz Au 1992: 230,600 oz Au, 78,700 oz Ag 1993: 210,000 oz Au, 51,000 oz Ag	Comus and Preble Formations, granodiorite dikes, granodiorite	90 Ma
Lewis	1984: 10 million tons, 0.04 oz Au/ton 1987: 9 million tons, 0.032 oz Au/ton	1984: 3,500 tons/day 1987: ~8,800 oz Au 1988-90: included in Crofoot/Lewis	Camel conglomerate, rhyolite dikes	1-2 Ma
Lone Tree	1990: 5.4 million tons oxide mill ore, 0.159 oz Au/ton, 5.7 million tons heap-leach ore, 0.025 oz Au/ton and 1.2 million oz Au in sulfide ore 1991: *reserves*—1 million oz Au 1992: 3.14 million oz Au 1993: 3.8 million oz Au 1994: 4 million oz Au	1991: 36,424 oz Au 1992: 128,000 oz Au 1993: 155,000 oz Au	Havallah Formation and dacite porphyry	38 Ma
Marigold	1990: 4.3 million tons, 0.105 oz Au/ton mill ore, 7.6 million tons, 0.026 oz Au/ton heap-leach ore 1992: 10 million tons, 0.055 oz Au/ton	1989: 16,000 oz Au, 484 oz Ag 1990: 60,750 oz Au, 1,600 oz Ag 1991: 65,469 oz Au, 2,000 oz Ag 1992: 90,000 oz Au, 4,000 oz Ag 1993: 90,000 oz Au, 1,700 oz Ag	Paleozoic chert, argillite, and carbonate rocks	early Oligocene
North Stonehouse	1991: 2.5 million tons, 0.103 oz Au mill ore		Havallah Formation and porphyry dikes	39 Ma
Pinson (includes Mag pit)	1989: 480,000 oz Au 1992: 4.98 million tons, 0.064 oz Au/ton	1980: 56,000 oz Au 1986-88: 189,864 oz Au 1989: 72,489 oz Au (includes Preble) 1990: 56,382 oz Au 1991: 55,640 oz Au 1992: 50,340 oz Au, 5,730 oz Ag 1993: 50,870 oz Au, 3,470 oz Ag	Comus Formation	90 Ma
Preble	1989: 15,110 oz Au 1992: idle, mined out	1985: 17,000 oz Au 1987: 28,000 oz Au 1988: 18,828 oz Au 1989: included with Pinson 1990: 1,161 oz Au	Preble Formation	90 Ma?
Rabbit Creek	1989: 4.1 million oz Au; *additional geologic resource*—1 million Au in refractory material 1990: *reserves*—2.5 million oz Au; *geologic resource*—5.1 million oz Au 1992: *reserves*—3.26 million oz Au 1993: *see* Twin Creeks	1990: 25,000 oz Au 1991: 115,500 oz Au 1992: 156,000 oz Au 1993: *see* Twin Creeks	Valmy Formation	Cretaceous?
Sleeper	1989: 1,975,000 oz Au 1990: 44.1 million tons, 0.038 oz Au and 0.152 oz Ag/ton 1991: 1.7 million oz Au, 6.7 million oz Ag 1993: 751,000 oz Au	1986: 128,000 oz Au, 94,000 oz Ag 1987: 158,696 oz Au 1988: 230,410 oz Au 1989: 256,000 oz Au, 339,650 oz Ag 1990: 250,131 oz Au, 391,886 oz Ag 1991: 183,346 oz Au, 289,463 oz Ag 1992: 132,383 oz Au, 285,011 oz Ag 1993: 100,020 oz Au, 254,690 oz Ag	Miocene "latite" flows and dikes, silicic ash-flow tuff, Triassic slate and phyllite	Miocene
Trout Creek	1989: 50,000 oz Au			
Twin Creeks (Chimney and Rabbit Creeks)	1993: 5.7 million oz Au 1994: *geologic resource*—8.5 million oz Au	1993: 482,600 oz Au, 206,200 oz Ag		

continued

MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
LANDER COUNTY				
Austin Gold Venture	1989: mined out	1986-88: 141,000 oz Au 1989: 50,000 oz Au	Antelope Valley Limestone	Cretaceous or Tertiary
Buffalo Valley	1988: 1.5 million tons, 0.05 oz Au/ton 1991: idle	1988: 9,238 oz Au 1989: 14,660 oz Au 1990: 15,770 oz Au 1991: W		Eocene?
Cortez	mined out	1968-82: 1.0 million oz Au	Roberts Mountains Formation	Cretaceous or early Tertiary
Elder Creek Project/ Shoshone	1989: 91,500 oz Au 1990: 1.5 million tons, 0.041 oz Au/ton	1990: 17,400 oz Au 1991: 2,702 oz Au	Valmy Formation	Cretaceous or Eocene
Fire Creek	1982: 350,000 tons, 0.06 oz Au/ton	1983-84: 767 oz Au	basaltic andesite	Miocene
Fortitude (Copper Canyon) (Battle Mtn.)	1989: *proven, probable*—6.7 million tons, 0.13 oz Au and 0.47 oz Ag/ton (includes Surprise and Labrador) 1992: *reserves*—3.1 million tons, 0.05 oz Au and 0.4 oz Ag/ton	1986: 259,000 oz Au, 902,000 oz Ag 1987: 255,000 oz Au 1988: 243,000 oz Au, 675,000 oz Ag 1989: 254,507 oz Au, 301,272 oz Ag 1990: 261,338 oz Au, 458,143 oz Ag (1988-90 production includes Surprise) 1991: 233,522 oz Au, 417,193 oz Ag 1992: 178,569 oz Au, 421 oz Ag 1993: 57,630 oz Au, 109,650 oz Ag	Battle Formation, Antler Peak Limestone, Pumpernickel Formation	37 Ma
Fortitude Extension (Phoenix)	1992: 500,000 oz Au 1993: *geologic resource*—900,000 oz Au			
Gold Acres and Little Gold Acres	1987: 4.8 million tons, 0.105 oz Au/ton 1988: 5.4 million tons, 0.093 oz Au/ton 1992: *reserves*—3.1 million tons, 0.05 oz Au and 0.4 oz Ag/ton	1942-84: 2.4 million tons, 0.13 oz Au/ton; 2 million tons, 0.041 oz Au/ton leached. *Little Gold Acres:* 800,000 tons, 0.124 oz Au/ton 1988: 42,322 oz Au (includes Horse Canyon) 1989: 39,993 oz Au, 12,234 oz Ag (includes Horse Canyon) 1990: 53,945 oz Au, 10,150 oz Ag 1991: 53,500 oz Au, 6,600 oz Ag 1992: 75,000 oz Au 1993: 66,850 oz Au	Roberts Mountains Formation, Wenban Limestone, Valmy Formation, quartz porphyry dikes	92.8-94 Ma and 36 Ma
Hilltop	1984: 10.5 million tons, 0.073 oz Au/ton 1989: 10 million tons, 0.049 oz Au/ton	no production	Valmy Formation	Oligocene?
Klondike property	1989: 100,000 oz Au equivalent			
McCoy/Cove	1989: *proven and probable reserves* - 2.9 million oz Au, 128 million oz Ag *geologic resource*—3.5 million oz Au, 1.50 million oz Ag 1990: *reserves*—58.7 million tons, 0.045 oz Au, 2.32 oz Ag/ton 1993: *reserves*—63.3 million tons, 0.037 oz Au, 1.66 oz Ag/ton, *geologic resource*—2.43 million oz Au, 107 million oz Ag	1986: 50,000 oz Au 1987: 200,000 oz Au, 5 million oz Ag 1988: 100,000 oz Au, 700,000 oz Ag 1989: 214,566 oz Au, 2.26 million oz Ag 1990: 255,044 oz Au, 1.98 million oz Ag 1991: 284,327 oz Au, 5.62 million oz Ag 1992: 301,512 oz Au, 7.92 million oz Ag 1993: 395,610 oz Au, 12.45 million oz Ag	Panther Canyon Formation (conglomerate, sandstone), Augusta Mountain Formation (limestone), granodiorite	39.5 Ma
Mud Springs (Bald Mtn. Zone)	1993: *geologic resource*—42,000 oz Au			
Mule Canyon	1992: 8.5 million tons, 0.136 oz Au/ton	1992: exploration	basalt and basaltic andesite	15-16 Ma
Pipeline	1991: *geologic resource*—11.3 million tons, 0.237 oz Au/ton 1993: 35.3 million tons, 0.120 oz Au/ton		Roberts Mountains Formation	Cretaceous or early Tertiary
Reona project	1992: 360,000 oz Au, *geologic resource*—800,000 oz Au			

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MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
LANDER COUNTY				
Robertson	1988: 11 million tons, 0.04 oz Au/ton 1993: *geologic resource*—20 million tons, 0.036 oz Au/ton	1989: 3,700 oz Au	Valmy Formation	early Oligocene
South Pipeline	1992: 9 million tons, 0.082 oz Au/ton 1993: *geologic resource*—31.4 million tons, 0.106 oz Au/ton		Roberts Mountains Formation	Cretaceous or early Tertiary
Surprise	1987: 225,000 oz Au 1988-91: production and reserve included in Fortitude figures	1987: 2,000 oz Au	skarn	37 Ma
Tolyabe	1988: 813,400 tons, 0.066 oz Au/ton	1988: 32,000 oz Au, 10,300 oz Ag 1990: 11,700 oz Au, 9,100 oz Ag 1991: 8,780 oz Au, 6,025 oz Ag	lower Paleozoic calcareous siltstone	Eocene?
Victorine (Kingston district)	1992: 915,000 tons, 0.304 oz Au/ton			
LINCOLN COUNTY				
Atlanta	1980: 1.1 million tons, 0.08 oz Au and 1.6 oz Ag/ton 1991: idle	1980: 88,000 oz Au, 1,710,000 oz Ag 1987-89: idle 1990-93: idle	Pogonip Group, Ely Springs and Laketown Dolomites, Oligocene silicic tuff, dacite dikes	early Miocene
Delamar	1988: 200,000 tons, 0.079 Au/ton	1988: exploration 1990: exploration	Cambrian quartzite	Miocene
LYON COUNTY				
Fire Angel	1989: 5,600 oz Au, *geologic resource*—148,500 oz Au			
Talapoosa	1988: 2.5 million tons, 0.041 oz Au and 0.53 oz Ag/ton *oxide* 14.9 million tons, 0.03 oz Au and 0.49 oz Ag/ton *sulfide* 1989: *additional resources delineated* - 2.7 million tons, 0.054 oz Au and 0.654 oz Ag/ton 1991: *geologic resource* - 19.6 million tons, 0.045 oz Au and 0.61 oz Ag/ton 1992: *geologic resource*—18 million tons, 0.044 oz Au and 0.61 oz Ag/ton	preproduction	Kate Peak Formation	Miocene
MINERAL COUNTY				
Aurora	1989: 347,000 tons, 0.253 oz Au/ton 1990: 433,000 tons, 0.21 oz Au/ton 1992: 493,000 tons, 0.15 oz Au/ton 1993: 537,400 tons, 0.123 oz Au/ton, *geologic resource*—100,000 oz Au	1989: 12,683 oz Au, 16,400 oz Au 1990: 12,973 oz Au, 18,162 oz Ag 1991: 15,000 oz Au 1992: 15,000 oz Au, 35,000 oz Ag 1993: 8,600 oz Au, 17,200 oz Ag	andesite, rhyolite	10 Ma
Aurora Partnership	1983: 1.5 million tons, 0.129 oz Au 0.3 oz Ag/ton 1990: 816,880 tons, 0.103 oz Au/ton 1992: 790,000 tons, 0.13 oz Au/ton *geologic resource*—267,640 oz Au	1930's: 100,000 oz Au 1983: 10,000 oz Au 1988: 10,302 oz Au 1989: 27,825 oz Au, 26,000 oz Ag 1991: 36,000 oz Au, 68,000 oz Ag 1992: 39,100 oz Au, 79,200 oz Ag 1993: 30,120 oz Au, 59,880 oz Ag	andesite, rhyolite	10 Ma
Borealis	1988: 1.792 million tons, 0.046 oz Au/ton 1991: known reserves mined out	1981-84: 170,000 oz Au 1986-88: 116,256 oz Au 1989: 89,060 oz Au, 37, 032 oz Ag 1990: 18,435 oz Au, 15,396 oz Ag, production ceased 1992: exploration	rhyolite flow dome, andesite flows, breccias, volcaniclastic rocks	5 Ma

continued

MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
MINERAL COUNTY (continued)				
Candelaria	1988: 24 million tons, 1.267 oz Ag and 0.011 oz Au/ton 1992: mine idle, heap-leaching continuing 1993: *geologic resource*—20,000 oz Au, 5.8 million oz Ag	1982: 1.7 million oz Ag, 9,000 oz Au 1987: total production was 10 million oz Ag as of June 1987 1988: 3.8 million oz Ag, 11,000 oz Au 1989: 4.36 million oz Ag, 13,800 oz Au 1990: 4.89 million oz Au, 11,796 oz Au, 1991: 1.68 million oz Ag, 2,870 oz Au 1992: 1.06 million oz Ag, 2,431 oz Au 1993: 904,810 oz Ag, 1,810 oz Au	Candelaria Formation serpentinite, granitic dikes	Cretaceous
Denton-Rawhide	1989: *reserves*—29.4 million tons, 0.040 oz Au and 0.368 oz Ag/ton; *geologic resource*—59.3 million tons, 0.0274 oz Au and 0.298 oz Ag/ton 1991: 29.4 million tons, 0.040 oz Au and 0.368 oz Ag/ton; *geologic resource*—59.3 million tons, 0.0274 oz Au and 0.298 oz Ag/ton 1992: *geologic resource*—54 million tons, 0.026 oz Au/ton with 29.4 million tons, 0.04 oz Au and 0.39 Ag/ton and 29.9 million tons, 0.015 oz Au/ton and 0.23 oz Ag/ton 1993: 1.3 million oz Au, 15 million oz Ag	1990: 39,000 oz Au, 170,000 oz Ag 1991: 76,000 oz Au, 500,000 oz Ag 1992: 92,000 oz Au, 804,000 oz Ag 1993: 105,000 oz Au, 1 million oz Ag	rhyolite plugs, flows, tuffs, breccias	16 Ma
Mindora	1988: 1.0 million tons, 0.037 oz Au and 1.78 oz Ag/ton	1988: exploration		
Santa Fe	1990: 6.8 million tons, 0.035 oz Au and 0.241 oz Ag/ton	1989 60,000 oz Au, 150,000 oz Ag 1990: 64,336 oz Au, 177,244 oz Ag 1991: 67,102 oz Au, 149,168 oz Ag 1992: 61,000 oz Au, 100,000 oz Ag 1993: 54,030 oz Au, 64,950 oz Ag	Luning Formation	Miocene
NYE COUNTY				
Baxter Springs	1988: 1 million tons, 0.050 oz Au/ton 1990: *geologic resource*—5 million tons 0.050 oz Au/ton			
Bruner property, Duluth zone	1992: *geologic resource*—15 million tons, 0.026 oz Au/ton	1993: exploration	Tertiary volcanic rocks	Miocene
Bullfrog	1989: 18.6 million tons, 0.097 oz Au/ton 1992: 8.8 million tons, 0.14 oz Au/ton plus an additional *geologic resource*—1.8 million tons, 0.102 Au/ton	1989: 50,011 oz Au, 40,905 oz Ag 1990: 220,000 oz Au, 229,000 oz Ag 1991: 205,000 oz Au, 189,000 oz Ag 1992: 323,800 oz Au, 313,000 oz Ag 1993: 340,000 oz Au, 400,000 oz Ag	rhyolitic ash-flow tuff	9.5 Ma
Daisy Gold property	1993: 4.7 million tons, 0.024 oz Au/ton *geologic resource*—430,000 oz Au			
Cuervo (Sullivan)	1987: 10.2 milliom tons, 0.039 oz Au and 0.086 oz Ag/ton and 0.37% Cu 1988: *proven*—10.8 million tons, *probable* - 2.7 million tons, 0.025 oz Au/ton	1992: idle 1993: idle	Mesozoic granodiorite and metavolcanic rocks	Mesozoic
Gold Bar	1987: 1.23 million tons Au ore 1993: idle	1989-91: W	silicic volcanic rocks	Miocene
Ketchup Flat	1989: 300,000 oz Au, 3.1 million oz Ag 1993: mined out	preproduction included in Paradise Peak	Miocene volcanic rocks	Miocene
Longstreet property	1989: 4 million tons, 0.024 oz Au/ton, *geologic resource*—9.6 million tons, 0.024 oz Au/ton	idle	rhyolitic volcanic rocks	Oligocene
Manhattan	1988: 22.4 million tons, 0.021 oz Au/ton 1989: 1.7 million tons, 0.017 oz Au/ton 1991: mined out 1992: idle 1993: idle	1905-59: 500,000 oz Au 1983: 26,000 - 27,000 oz Au 1986: 3,000 tons/day 1987: 24,855 oz Au 1988: 4,752 oz Au 1989: 32,389 oz Au, 17,611 oz Ag 1990: included with Round Mountain	Gold Hill Formation	16 Ma

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MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
NYE COUNTY (continued)				
Manhattan property	1989: *geologic resource*—100,000 tons, 0.50 oz Au/ton			
Montgomery Shoshone	1988: 3.1 million tons, 0.072 oz Au and 0.240 oz Ag/ton	1989: preproduction 1992: idle 1993: pre-production	rhyolitic ash-flow tuff	9.5 Ma
Mother Lode (includes Sunday Night Anomaly)	1989: *reserves, proven and probable* - 4.9 million tons, 0.054 oz Au/ton, of which 1.8 million tons, 0.048 oz Au/ton are in the Sunday Night Anomaly 1990: Sunday Night Anomaly *oxide reserves* - 927,372 tons, 0.047 oz Au/ton; *sulfide ore reserves*—65,217 tons, 0.042 oz Au/ton 1992: mined out	1989: 1,000 oz Au, 150 oz Ag 1990: 30,000 oz Au, 3,100 oz Ag 1991: W 1992: idle 1993: idle	lower Paleozoic rocks, Tertiary dacite porphyry	14 Ma
Northumberland	1988: 12 million tons, 0.06 oz Au/ton	1939-42: 327,000 oz Au 1981-84: 950,000 tons/year 1988: 29,667 oz Au, 130,394 oz Ag 1989: W 1990-93: idle	Roberts Mountains and Hanson Creek Formations, granodiorite, tonalite, quartz porphyry dikes	85 Ma
Paradise Peak	1989: 5.22 million tons, 0.09 oz Au and 3.62 oz Ag/ton, mill ore; 11.52 million tons, 0.036 oz Au and 0.445 oz Ag/ton, leachable 1991: ~ 2 year mine life 1992: *reserves*—197,000 oz Au, 4.3 million oz Ag 1993: mining ceased, remaining resource refractory sulfides	1986-88: 560,000 oz Au, 8.5 million oz Ag 1989: 228,000 oz Au, 5.17 million oz Ag 1990: 198,800 oz Au, 5.42 million oz Ag 1991: 182,000 oz Au, 2.26 million oz Ag 1992: 251,000 oz Au, 1.85 million oz Ag 1993: 156,000 oz Au, 795,000 oz Ag	rhyolite and andesite flows, ash-flow and air-fall tuffs	Miocene
Round Mountain (Smoky Valley)	1989: *geologic resource*—271 million tons, 0.032 oz Au/ton 1990: 256.8 million tons, 0.033 oz Au/ton 1993: 151.2 million tons, 0.024 oz Au/ton, *geologic resource*—3,876,000 oz Au	1977-84: 313,480 oz Au, 160,419 oz Ag 1984: 70,000 oz Au 1987: 190,600 oz Au 1988: 233,700 oz Au 1989: 386,227 oz Au, 211,297 oz Ag 1990: 483,192 oz Au, 236,600 oz Ag (includes Manhattan) 1991: 339,000 oz Au, 260,000 oz Ag 1992: 370,600 oz Au, 316,700 oz Ag 1993: 370,000 oz Au, 300,000 oz Ag	rhyolite ignimbrite	25 Ma
Sterling	1989: 469,000 tons, 0.21 oz Au/ton 1990: 519,000 tons, 0.209 oz Au/ton 1992: 403,000 tons, 0.24 oz Au/ton *geologic resource*—765,000 tons, 0.178 oz Au/ton	1983-88: 75,900 oz Au 1990: 12,626 oz Au 1991: 12,215 oz Au	Wood Canyon and Bonanza King Formations	14 Ma
Tellis claims	1988: 850,000 tons, 0.053 oz Au/ton			
PERSHING COUNTY				
Bunce	1989: *geologic reserve* - 600,000 tons, 0.04 oz Au/ton 1990: 500,000 tons, 0.04 oz Au/ton	exploration	rhyolite	
Florida Canyon	1988: 37 million tons, 0.023 oz Au/ton 1991: 48.3 million tons, 0.018 oz Au/ton	1987-88: 109,300 oz Au 1989: 81,484 oz Au, 24,721 oz Ag 1990: 83,200 oz Au, 19,300 oz Ag 1991: 80,586 oz Au, 20,951 oz Ag 1992: 89,954 oz Au, 37,775 oz Ag 1993: 109,190 oz Au, 37,550 oz Ag	Grass Valley Formation	Cretaceous or Tertiary
Relief Canyon	1988: ~ 1.3 million tons, 0.03 oz Au/ton 1991: mined out	1984: 24,500 oz Au 1987-88: 82,000 oz Au 1989: 30,266 oz Au, 32,835 oz Ag 1990: 4,000 oz Au, 6,400 oz Ag	Natchez Pass Limestone, Grass Valley Formation	Cretaceous
Rochester	1989: *geologic resource*—94.5 million tons, 0.012 oz Au and 1.40 oz Ag/ton 1993: 75 million tons, 1.32 oz Ag and 0.0113 oz Au/ton	1986-88: 122,400 oz Au, 13 million oz Ag 1989: 76,032 oz Au,4.63 million oz Ag 1990: 59,000 oz Au, 4.8 million oz Ag 1991: 61,000 oz Au, 5.8 million oz Ag 1992: 57,000 oz Au, 5.6 million oz Ag 1993: 66,412 oz Au, 5.9 million oz Ag	Koipato Group, Weaver Rhyolite	Late Cretaceous

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MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
PERSHING COUNTY (continued)				
Rosebud project	1992: 570,000 oz Au (0.362 oz/ton), 5.5 million oz Ag (5.5 oz/ton)	1993: underground exploration	Tertiary volcanic rocks	Miocene
Standard	mined out	1932-51: 46,602 oz Au, 102,721 oz Ag	Natchez Pass Limestone, Grass Valley Formation	73 Ma
Tag-Wildcat	1989: *geologic resource*—1.5 million tons, 0.043 oz Au/ton 1989: 416,000 Ttons, 0.076 oz Au/ton	1989: exploration	Tertiary volcanic rocks	Miocene
Trinity	1988: 1 million tons, 5.25 oz Ag/ton 1991: mined out	1988: mining ended August 1988, heap-leaching continuing 1989: 718,714 oz Ag, 70 oz Au	rhyolite plugs	Miocene
Willard	1989: 3.61 million tons 1993: mined out	1989: preproduction 1992-93: W	Triassic siltstone	Cretaceous
STOREY COUNTY				
Comstock heap leach project	1992: 475,000 tons, 0.072 oz Au and 0.60 oz Ag/ton 1993: *geologic resource*—3.2 million tons, 0.05 oz Au and 0.5 oz Ag/ton			
Flowery (Golden Eagle)	1989: 1 million tons, 0.037 oz Au/ton 1990: 6.3 million tons, 0.043 oz Au/ton *geologic resource*—1.16 million oz Au 1991: *geologic resource*—29.3 million tons, 0.04 oz Au/ton 1993: 362,000 tons, 0.064 oz Au and 0.97 oz Ag/ton, *geologic resource*—88,128 oz Au and 1 million oz Ag	1988: 836 oz Au, 9,473 oz Ag 1990: 6,000 oz Au, 70,000 oz Ag 1991: W 1992: 2,253 oz Au, 34,572 oz Ag 1993: 2,200 oz Au, 30,000 oz Ag	Alta Formation	12 Ma
Oliver Hills	1990: 3.37 million tons, 0.054 oz Au/ton 1.2 oz Ag/ton 1991: *geologic resource*—8.5 million tons, 0.060 oz Au/ton and 0.60 oz Ag/ton 1993: 4 million tons, 0.05 oz Au and 0.5 oz Ag/ton, *geologic resource*—225,000 oz Au and 2.25 million oz Ag	1991: 573 oz Au, 6,947 oz Ag		
WASHOE COUNTY				
Western Hog Ranch	1988: *reserves, proven and probable* - 5.5 million tons, 0.064 oz Au/ton; *geologic resource*—20.1 million tons, 0.029 oz Au/ton 1990: 1.1 million tons, 0.05 oz Au/ton 1993: mined out at end of year	1986: 50,000 oz Au 1988: 30,000 oz Au 1989: 25,000 oz Au, 4,000 oz Ag 1990: 25,000 oz Au, 4,500 oz Ag 1991: 18,700 oz Au, 2,100 oz Ag 1992: 30,000 oz Au, 10,000 oz Ag 1993: 9,295 oz Au, 2,500 oz Ag	rhyolite, explosion breccia, sinter	15-16 Ma
Wind Mountain	1988: 15 million tons, 0.021 oz Au and 0.42 oz Ag/ton 1993: mined out, heap-leach only	1989: 30,900 oz Au, 335,000 oz Ag 1990: W 1991: 91,000 oz Au, 405,000 oz Ag 1992: 54,690 oz Au, 297,403 oz Ag 1993: 19,570 oz Au, 92,630 oz Ag	Tertiary sedimentary rocks	late Tertiary or Quaternary
WHITE PINE COUNTY				
Alligator Ridge	1989: 1 million tons, 0.064 oz Au/ton 1990: 624,000 tons, 0.059 oz Au/ton, *geologic resource*—2.1 million tons 0.043 oz Au/ton 1992: 11.5 million tons, 0.046 oz Au/ton; *geologic resource*—661,888 oz Au, includes Casino/Winrock	1981-88: 560,000 oz Au, 70,000 oz Ag 1989: 54,057 oz Au, 10,188 oz Ag 1990: 18,000 oz Au, 4,000 oz Ag 1991: 17,000 oz Au 1992: 10,450 oz Au 1993: *see* Bald Mountain	Pilot Shale	Mesozoic or early Tertiary

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MAJOR PRECIOUS-METAL DEPOSITS (continued)

Deposit name	Reserves/resources	Production	Host rock	Mineralization age
WHITE PINE COUNTY (continued)				
Bald Mountain (Top)	1989: 6.7 million tons, 0.069 oz Au/ton 1990: 8.7 million tons, 0.062 Au/ton 1992: *geologic resource*—600,000 oz Au	1986: 50,000 oz Au 1988: 48,619 oz Au 1989: 55,112 oz Au 1990: 60,000 oz Au, 5,000 oz Ag 1991: 55,000 oz Au, 12,000 oz Ag 1992: 81,500 oz Au, 33,600 oz Ag 1993: 90,610 oz Au, 26,145 oz Ag (includes Alligator Ridge and Yankee Projects)	quartz porphyry, Cambrian shale and limestone	Jurassic
Bellview	1988: 277,000 tons, 0.040 oz Au/ton, *geologic resource*—1 million tons, 0.036 oz Au/ton			
Casino/ Winrock	1989: **Casino** - 804,000 tons, 0.054 oz Au/ton; **Winrock** 1.3 millon tons, 0.037 oz Au/ton 1990: **Winrock** - 993,000 tons, 39,000 oz Au 1992: *see* Alligator Ridge	1990: 7,000 oz Au 1991: 20,000 oz Au 1992: 19,800 oz Au	late Paleozoic sedimentary rocks	Eocene
Easy Junior (Nighthawk Ridge)	1989: 5.68 million tons, 0.031 oz Au/ton 1991: 137,000 oz Au	1990: 11,500 oz Au, 900 oz Ag	Devonian and Mississippian rocks	Eocene
Golden Butte	1989: 4.23 million tons, 0.031 oz Au/ton	1989: 12,187 oz Au, 1,448 oz Ag 1990: 22,362 oz Au, 7,700 oz Ag 1991: 8,970 oz Au, 7,763 oz Ag	Chainman Shale	Cretaceous or Eocene
Green Springs	1988: 1.25 million tons, 0.06 oz Au/ton *additional possible resource*—500,000 tons, 0.036 Au/ton 1992: mined out	1988: ~12,000 oz Au 1989: 30,000 oz Au, 5,000 oz Ag 1990: 16,000 oz Au, 4,000 oz Ag 1991: 5,000 oz Au	Paleozoic sedimentary rocks	Eocene?
Griffon Gold Property	1993: geologic resource—60,000 oz Au			upper Joana Limestone
Horseshoe	1991: 1.5 million tons, 0.039 oz Au/ton	exploration	Pilot Shale and intrusive quartz porphyry	36-38 Ma
Illipah	1988: mined out 1987: ~25,000 oz Au/year	Paleozoic sedimentary Eocene? 1988: 25,324 oz Au, mining ended 1989: 3,874 oz Au, heap-leached	rocks	
Little Bald Mtn.	1989: 200,000 tons, 0.13 oz Au/ton; *geologic resource*—260,000 tons, 0.127 oz Au/ton 1993: 140,000 tons, 0.13 oz Au/ton, *geologic resource*—21,800 oz Au	1985-88: 21,700 oz Au 1989: 5,500 oz Au, 1,500 oz Ag	Antelope Valley Formation	35-38 Ma
Mt. Hamilton	1988: 7.7 million tons, 0.05 oz Au and 0.5 oz Ag/ton	1988: preproduction 1993: idle	Dunderberg Shale	Cretaceous
Pan	1989: 241,000 oz Au			
Robinson	1989: 46.0 million tons, 0.019 oz/ton; *geologic resource*—1 million oz Au 1991: *geologic resource*—200 million tons 0.012 oz Au/ton 1992: 1.2 million oz Au, *geologic resource*—2.21 million oz Au	1986: 48,000 oz Au, 96,000 oz Ag 1987: 50,207 oz Au 1988: 38,750 oz Au 1989: 78,828 oz Au, 66,340 oz Ag 1990: 75,000 oz Au, 55,000 oz Ag 1991: 21,674 oz Au 1992: 35,581 oz Au, 55,000 oz Ag 1993: 13,432 oz Au	Rib Hill Sandstone Riepe Spring Limestone	Cretaceous
Sunnyside	1988: 32,000 oz Au at 0.187 oz/ton gold equivalent			
Taylor	1980: 10 million tons, 3 oz Ag/ton	1980: 1,200 tons/day	Guilmette and Joana Limestones, rhyolite dikes	Eocene or Oligocene
White Pine	1989: 63,000 oz Au, 0.04 oz Au/ton	1989: 20,654 oz Au	Pilot Shale	Oligocene?
Yankee	1992: 683,000 oz Au	1990: ~15,000 oz Au 1992: 10,800 oz Au 1993: *see* Bald Mountain	Pilot Shale	36-38 Ma?

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All-Lite Aggregate plant, Washington Hill, Storey County. *S. B. Castor photo.*

Industrial Minerals

by Stephen B. Castor

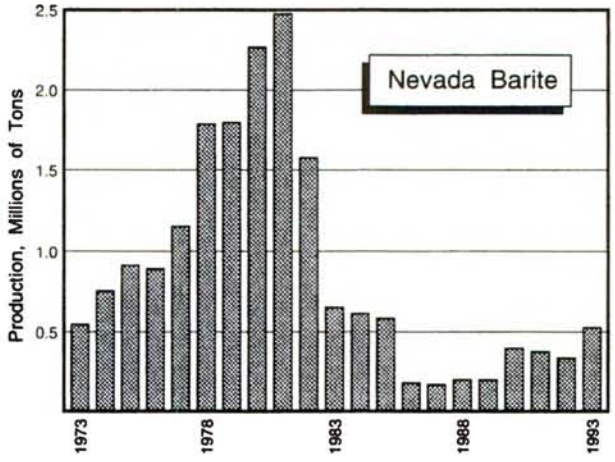
Industrial minerals produced in Nevada in 1993 had an estimated value of about $303 million, an increase of about 6% from 1992. Increases in production and dollar values of aggregate, barite, cement, gypsum, and salt in 1993 overshadowed decreases in clay, perlite, and silica. The most important Nevada industrial minerals produced in 1993, in order of estimated dollar value, were aggregate, diatomite, lime, barite, cement, gypsum, lithium carbonate, silica, clay, and magnesia. Data used for these estimates, and data reported for individual commodities below, were obtained from the Nevada Division of Minerals and from companies that produced industrial minerals. Information on national production was from the U.S. Bureau of Mines.

AGGREGATE (SAND, GRAVEL, AND CRUSHED STONE) Nevada's 1993 aggregate production is estimated at 25 million tons. Production in the Las Vegas area, which accounted for about 16 million tons, increased 10% over that in 1992, while production in the Reno-Sparks-Carson City area, estimated at 5 million tons, increased by about 3% over 1992. The trend of increased use of crushed stone and lightweight aggregate in the two metropolitan areas continued in 1993.

Companies in the Las Vegas area that produced more than a million tons in 1993, in approximate order of aggregate mined, were Nevada Ready Mix Corp., Bonanza Materials, Inc., WMK Transit Mix, Inc., and Las Vegas Paving Corp. Aggregate use in 1993 was spurred by construction of major resort hotels, airport runways, and state highways. Residential construction continued to be strong in the area. Most aggregate in the Las Vegas area was mined from alluvial sand and gravel deposits in the Lone Mountain, Henderson, Spring Mountain Road, and Nellis areas. Crushed stone aggregate, while still a minor part of the Las Vegas market, is beginning to become more important, with Frehner Construction Co. and Chemstar Lime Co. contributing significant amounts of crushed limestone. Lightweight aggregate continued to be a minor factor. Crushed limestone and lightweight aggregate together accounted for about 10% of Las Vegas area aggregate production.

In the Reno-Sparks-Carson City area, companies that produced 500,000 or more tons in 1993 were Granite Construction Co., R. L. Helms Construction Co., Sha-Neva, Inc., and All-Lite Aggregate Co. Although alluvial deposits continued to provide most of the area's production, crushed rock operations of Granite Construction and Rocky Ridge Inc. and lightweight rhyolite aggregate from All-Lite Aggregate Co. and Rilite Aggregate Co. accounted for about 35% of the aggregate used in 1993. R. L. Helms Construction declared Chapter 11 bankruptcy in 1993.

BARITE Nevada barite producers were a major factor in the increased value of industrial mineral production in Nevada in 1993. Nevada barite shipments were about 530,000 tons, an increase of more than 50% over 1992, and the largest annual production since 1985. Foreign producers continued to sell barite in the U.S. market; however, variable quality of Mexican shipments, unreliable deliveries of Indian material, and higher prices for Chinese barite resulted in increased shipments from most Nevada producers.



Annual production of barite in Nevada, 1973-1993, Production figures are from the U.S. Bureau of Mines (1973-1987) and the Nevada Bureau of Mines and Geology (1988-1993).

In the heyday of Nevada barite mining in the early 1980s, when annual production exceeded a million tons, more than 20 companies produced barite. Nevada barite production is now based on complex relationships among several companies, but major barite producing operations in the state now number only four.

In 1993, M.I. Drilling Fluids Co. was the largest producer, shipping barite from three operations in Lander County: processed barite from the Battle Mountain grinding plant and crude barite from the Greystone and Clipper mines. In 1992, Baroid Drilling Fluids Inc. reopened the Dunphy mill in Eureka

Baroid Drilling Fluids Inc. mill at Dunphy. *Keith Papke photo.*

County, which has two 50-inch mills and could produce more than 100,000 tons of ground barite annually. Crude ore, contract mined by Brown and Root, Inc. comes from the Rossi mine in Elko County. In 1993, Baroid Corp. and Dresser Industries Inc. announced a merger expected to be completed in 1994. Dresser Industries is no newcomer to Nevada barite production; its former subsidiary, Dresser Minerals, Inc., produced barite between 1967 and 1985 from the Greystone mine which is now operated by M. I. Drilling Fluids. In 1993 Baker Hughes INTEQ was formed by consolidation of several Baker Hughes, Inc. subsidiaries including Milpark, Inc. which produces barite from the Argenta mine and mill near Battle Mountain, Lander County. Between 1985 and 1992 Milpark also processed ore for Baroid from the Rossi mine, but this has been discontinued. Circle-A Construction, Inc., the smallest Nevada barite producer, increased production from its operation in Elko County. The company mines barite from the Big Ledge mine, processes it at the Dry Creek mill, and ships ground barite to a buyer in Iowa.

BORATE Newport Minerals Ventures produced about 16,000 tons of colemanite concentrate at the American Borate Co. mill in Amargosa Valley in 1993. Because the ore comes from the Billie mine in Death Valley, California, the colemanite production is not included in the estimate of total value of Nevada industrial minerals production.

BUILDING STONE Nevada Neanderthal Stone, which quarries and processes several varieties of Tertiary tuff near Beatty in Nye County, produced nearly 100,000 square feet of floor tile and wall panels in 1993. Las Vegas Rock produces building and landscape rock from Cretaceous Aztec Sandstone at Goodsprings, Clark County. The Stone of LaMadre General Partnership submitted operation plans for developing a building stone quarry in Aztec Sandstone on claims west of Las Vegas to the Bureau of Land Management in 1992. BLM rejected the plan because the claims are in a wilderness study area, and a contest action against the claims was recommended on the basis of non-locatability. The partnership has threatened legal action.

CEMENT The Nevada Cement Co. plant at Fernley, about 30 miles east of Reno, ships more than 400,000 tons of portland cement annually to markets in California and Nevada. In 1993, the company used about 650,000 tons of limestone mined from a deposit in Lyon County, and 60,000 tons of halloysite clay from a deposit in Washoe County, along with minor amounts of iron ore and gypsum that are mined in northwestern Nevada. Kiln fuel was mainly coal from Utah.

CLAY Overall production by the largest Nevada clay producer, IMV Division of Floridin Co., Amargosa Valley, Nye County, has decreased since 1991 when large amounts of clay were shipped to landfill reclamation projects. However, because relatively high-value specialty clay products account for most of the operation's cash flow, cash proceeds have not decreased correspondingly. Sales of sepiolite, much of which is exported to the Far East, and organoclays, which sell for over $3,000 per ton, continue to provide most of the operation's cash flow. In May 1993, IMV sold the organoclay portion of the operation to Southern Clay Products, Inc. in Texas, which has emerged as one of the largest players in organoclay products.

Vanderbilt Minerals Co. mines montmorillonite used in pharmaceutical and cosmetic products from several deposits in Nevada. During 1993, some clay was mined from the New Discovery mine near Beatty in Nye County but other mine sites were idle. New Discovery mine clay and stockpiled clay from the other locations were milled at the Beatty site and shipped to Kentucky. American Colloid Co. mined clay from a montmorillonite deposit near Lovelock in Pershing County and from a hectorite deposit near Disaster Peak in Humboldt County. Oil-Dri Corp. continued to work on a deposit of diatomaceous clay in the Smoke Creek Desert of Washoe County that it plans to market as cat litter. The company submitted a legal application for patent in 1992, but approval of all such applications was put on hold by the U.S. Department of the Interior. Nonetheless, the company is proceeding with a mineral examination for patent.

Although relatively large tonnages of halloysite are mined from a deposit near Pyramid Lake in Washoe

County by Nevada Cement Co., this production is not reported as clay in NBMG mineral production figures because it is included in cement.

DIATOMITE Production of diatomite in Nevada in 1993, which was about the same as in 1992, exceeded 200,000 tons, or about 30% of total U.S. production. On the basis of total value, diatomite is the second most important industrial mineral mined in the state. Diatomite filtration products from Nevada are shipped worldwide. Eagle-Picher Minerals, Inc. produces most of Nevada's diatomite, shipping filtration products from the Colado plant near Lovelock in Pershing County, absorbent and filler grade diatomite from the Clark plant in Storey County, and crude diatomite from a pit near Fernley in Lyon County. On November 10, 1993, the parent company, Eagle-Picher Industries Inc., announced that it had reached an agreement on principal elements of a reorganization plan to permit emergence from Chapter 11 bankruptcy which was filed in 1991 due to asbestos litigation. The bankruptcy has had no effect on the company's diatomite production in Nevada.

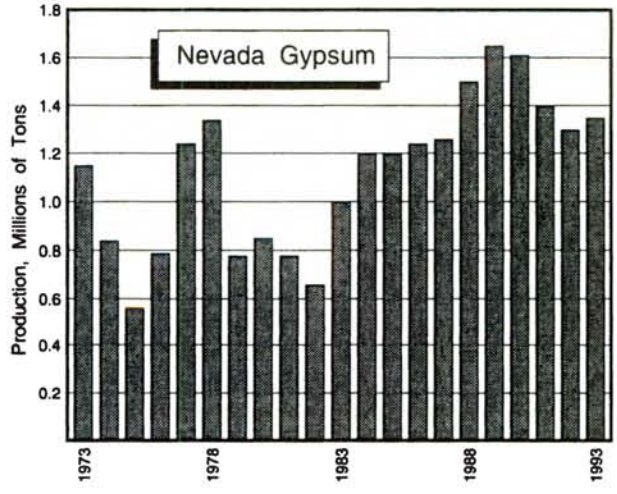
Three other companies produced diatomite in Nevada in 1993. Grefco, Inc. ships diatomite from its Basalt property which consists of a plant in Esmeralda County and pits in Esmeralda and Mineral Counties. Grefco ships much more diatomite from mines in California, but the Nevada diatomite is marketed mainly as uncalcined filler which is not available from the California facilities. Moltan Co. near Fernley markets absorbent and cat litter regionally. CR Minerals, also near Fernley, sells diatomite for insulation and absorbent manufacture.

GYPSUM Gypsum production in southern Nevada in 1993 increased substantially over 1992 due to booming Las Vegas construction activity, but production in northern Nevada declined slightly. Nevada gypsum production, about 1.4 million tons in 1993, was up about 7% over 1992, compared with an increase of about 3% nationwide. Most Nevada gypsum was used in the production of wallboard. In 1993, James Hardie Gypsum at Blue Diamond near Las Vegas was the largest producer at about 405,000 tons. U.S. Gypsum Corp., which mines gypsum in Pershing County and processes it at a mill and wallboard plant at Empire in Washoe County, was the second largest producer. This company, the largest gypsum producer in the United States, entered Chapter 11 bankruptcy in 1992, but emerged on May 6, 1993. PABCO Gypsum east of Las Vegas in Clark County mined over 480,000 tons of ore in 1993, but the ore contains only 60 to 70% gypsum. Georgia Pacific Corp. and Nevada Gypsum of Las Vegas, and Art Wilson Co. of Carson City also mined gypsum in 1993.

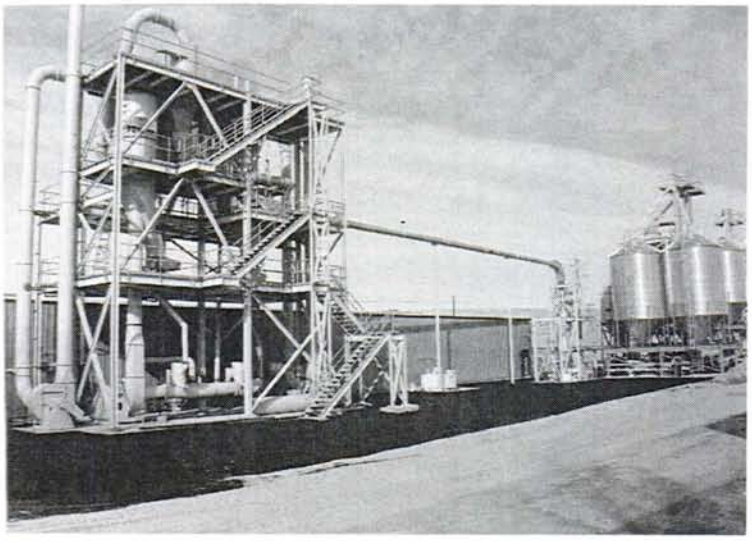
LIME AND DOLOMITE In 1993 lime production in Nevada was about the same as in 1992. Chemstar Lime Co. produced high-calcium lime at Apex just northeast of Las Vegas, and dolomitic lime in Henderson from dolomite mined at Sloan, south of Las Vegas. The Continental Lime, Inc. Pilot Peak high-calcium lime operation near Wendover in Elko County, which started production in 1989, continued to sell lime to northern Nevada gold mining operations. Chemstar Lime also produced uncalcined dolomite for glass manufacturing in 1993. Min-Ad, Inc. and Nutritional Additives Corp., both located near Winnemucca, produced ground dolomite, mainly for agricultural use.

LITHIUM CARBONATE Cyprus Foote Mineral Co. produced about the same amount of lithium carbonate at its lithium brine operation at Silver Peak in 1993 as in 1992. However, prices for lithium carbonate continued to rise, as they have for several years, so proceeds were probably higher. AA-sized lithium batteries were introduced commercially in 1993; lithium was only used in specialty sized batteries prior to this. This should lead to increased demand for lithium in future years, but new South American producers may forestall significant future increases in production from Silver Peak.

MAGNESIA American Premier Corp. continued to produce magnesia from magnesite at Gabbs, Nye County. Annual production from this property, which has been relatively constant over the last ten years, is about one-third of that produced each year during the 1970s when it was owned by Basic, Inc.



Annual Nevada gypsum production, 1973-1993. Production figures are from U.S. Bureau of Mines (1973-1986), Nevada Bureau of Mines and Geology data (1987 and 1988), and Nevada Division of Minerals data (1989-1993).



Eagle-Picher Minerals, Inc. perlite processing plant at Colado. *Eagle-Picher Minerals, Inc. photos.*

PERLITE The Wilkin Mining and Trucking Co., which ships crude and expanded perlite from Caliente in Lincoln County, had slightly lower production in 1993 than in 1992. The company operates the Mackie underground mine about 35 miles west of Caliente and has a small popping plant in Caliente. Eagle-Picher Minerals, Inc. is building a perlite popping facility at its Colado diatomite plant, and plans to begin producing expanded perlite filtration products in the summer of 1994. The perlite will be mined from the Popcorn mine in Churchill County about 15 miles south of Fallon. Mine capacity will be 45,000 to 50,000 tons per year and maximum plant capacity about 15,000 tons per year.

SALT In 1993, production from the family-owned Huck Salt Co. of Fallon increased significantly over 1992. The increase is due to large volumes of road salt used during the hard winter of 1992-93.

SILICA Simplot Silica Products produced about 531,000 tons of silica sand in 1993 from its operation at Overton in Clark County, down slightly from 1992 and the fourth straight year of decline. This continued downturn is due to declines in California industrial markets and to competition from silica sand producers in California.

ZEOLITES American Resource Corp. processed small amounts of clinoptilolite at a plant in Amargosa Valley in Nye County. The feed comes from a nearby site in California. In late 1993, American Resource announced that the operation, which it purchased from East-West Minerals in 1991, is for sale. Clinoptilolite has uses in odor control, water purification, agricultural products, and absorbent products.

Directory of Mining and Milling Operations

by Lindsay G. Christensen and Stephen B. Castor

Compiled from information supplied by the Nevada Division of Mine Inspection, Nevada Division of Minerals, and U.S. Mine Safety and Health Administration. *Sand and gravel operations with less than 300,000 tons annual production are not listed.*

EX = exploration, HL = heap leach, ML = mill, OP = open-pit mine, OS = other surface, PL = placer, UG = underground mine.

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
CHURCHILL COUNTY							
Huck Salt	John Huckaby	S12,T16N,R31E	salt	OS	solar evaporation	3	John Huckaby and Sons 5033 Austin Highway Fallon, NV 89406
Moltan mine and plant	Moltan Co.	S28,29,32,33, T23N,R27E	diatomaceous earth	OP,ML	single bench crushing screening	50	W. M. Gurley P.O. Box 860 Fernley, NV 89408-0860
CLARK COUNTY							
Apex mine and plant	Chemstar, Inc.	S23,26,T18S,R63E	lime	OP,ML	multiple bench calcining hydrating	50	Art Reber P.O. Box 3598 North Las Vegas, NV 89036
Blue Diamond mine and mill	James Hardie Gypsum, Inc.	S20,29-31,32, T21S,R59E; S5,T22S,R59E S24-26,T21S,R58E	gypsum	OP	grinding calcining	130	Dave Kessner, Works Manager HCR 89033, Box 2900 Las Vegas, NV 89124
Bonanza Materials pit and plant	Bonanza Materials, Inc.	S9,16,T22S,R62E	sand gravel	OP,ML	single bench crushing screening	40	Dan Stewart, President 565 Lalif Road Henderson, NV 89015
Buffalo Road pit and mill	W.M.K. Transit Mix, Inc.	S21,T21S,R60E	sand gravel	OP,ML	single bench crushing screening	18	Joe Winiger, President P.O. Box 14697 Las Vegas, NV 89114
Durvada mine and mill	Durga Resources, Inc.	S27,T27S,R57E	gold silver	OP	multiple bench	17	Jasi Nikhanj, President P.O. Box 1184, HCR-31 Sandy Valley, NV 89019
Eldorado mine	Brookline Mining Co.	S2,T27S,R63E	precious metals	OP	single bench	8	C. Ray Kerby, Superintendent P.O. Box 61620 Las Vegas, NV 89160
Henderson plant	Chemstar, Inc.	S18,T22S,R63E	dolomitic lime	ML	calcining	43	Dave Johnson, President P.O. Box 127 Henderson, NV 89015
Hollywood pit and Henderson mill	Nevada Ready Mix Corp.	S32,T21S,R63E; S11,T21S,R62E	sand gravel	OP,ML	single bench crushing screening	24	Richard Thornton General Manager-Vice President P.O. Box 42755 Las Vegas, NV 89104
Las Vegas cement plant	Las Vegas Cement, Inc.	S10,T15S,R67E	cement	ML	construction	13	Aldo Dinardo, Owner and President P.O. Box 380 Logandale, NV 89021
Lone Mountain Community pit	Ron Williams Construction	S11,T20S,R59E	sand gravel	OP	single bench	8	Ron Williams, President 750 Fogg St. Las Vegas, NV 89110
Lone Mountain Mendenhall pit	Las Vegas Paving Corp.	S35,T19S,R59E	sand gravel	OP	single bench	7	Robert Mendenhall, Owner 1770 South Industrial Road Las Vegas, NV 89102
Lone Mountain Nevada Ready Mix pit	Nevada Ready Mix Corp.	S36,T19S,R59E	sand gravel	OP,ML	single bench crushing screening	32	Darrel Thornton, President P.O. Box 42755 Las Vegas, NV 89104
Lone Mountain Stocks pit	Southern Nevada Paving	S3,T20S,R59E	sand gravel	OP	single bench	35	Floyd Meldrum, President 3555 Polaris Avenue Las Vegas, NV 89102
Money pit	Southern Nevada Liteweight	S9,16,T25S,R61E	lightweight aggregate	OP	crushing screening	12	Spencer Apple 4675 Wynn Road Las Vegas, NV 89103

continued

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
CLARK COUNTY (continued)							
Nevada Gypsum pit	Nevada Gypsum, Inc.	S15,T21S,R63E	gypsum	OP,ML	drilling blasting crushing	4	Richard Thornton 928 S. Valley View Las Vegas, NV 89107
PABCO Gypsum-Apex pit and plant	Pacific Coast Building Products, Inc.	S7,8,17,18, T20S,R64E	gypsum	OP	single bench wash plant	78	Stanley L. Asbell 1973 N. Nellis Boulevard #328 Las Vegas, NV 89115
Rare Metals Corporation mill	Rare Metals Corp.	S33,T29S,R64E	gold	ML	cyanidation	8	Frank Snyder Sr., President P.O. Box 80 Searchlight, NV 89046
Salt Lake Highway pit	American Sand and Gravel	S25,T19S,R62E	sand gravel	OP	single bench	6	Art Melonas, Owner 5004 Stanley Avenue Las Vegas, NV 89115
Simplot Silica Products pit and mill	Simplot Industries	S30,T16S,R68E	silica sand	OP,ML	flotation multiple bench drying screening	41	Jack Olsen, Manager P.O. Box 308 Overton, NV 89040
Sloan quarry and mill	Chemstar, Inc.	S13,T23S,R60E	dolomite	OP	crushing sizing	59	Glen House P.O. Box 127 Henderson, NV 89015
Sloan rock pit	Frehner Construction Co.	S13,T23S,R60E	sand gravel	OS,ML	single bench crushing screening	11	Donald G. Groch, Vice President/ General Manager 124 West Brooks Avenue North Las Vegas, NV 89030
Spring Mountain pit and mill	Wells Cargo, Inc.	S15,T21S,R60E	sand gravel	OS,ML	single bench crushing screening	8	Howard Wells, General Manager P.O. Box 14037 Las Vegas, NV 89114
Treasure Hawk mine and mill	Eddie Bounsall	S34,T19S,R70E	gold silver	OP,ML	single bench gravity concentration cyanidation	8	Eddie and Billy Bounsall, Owners P.O. Box 357 Logandale, NV 89021
Wallboard plant	Georgia-Pacific Corp.	S34,T18S,R63E	gypsum	ML	calcining	11	Jean Wassenberg, Manager P.O. Box 30006 North Las Vegas, NV 89030
Weiser Ridge quarry	Georgia-Pacific Corp.	S14,T16S,R66E	gypsum	OP	single bench crushing	68	Tim Cook P.O. Box 30006 North Las Vegas, NV 89030
DOUGLAS COUNTY							
Buckskin leach plant	Sonora Mining Corp.	S13,T13N,R23E	gold silver	HL	cyanide	30	George Newell P.O. Box 546 Yerington, NV 89447
ELKO COUNTY							
Big Ledge mine	Circle A Construction	S26,35, T42N,R61E	barite	OP	multiple bench	4	Tom G. Schmidt Superintendent Star Route Jackpot, NV 89825
Big Springs mine and mill	Independence Mining Co.	S1-3,11,12 T42N,R53E	gold silver	OP,HL	cyanide fluid-bed roasting	37	Andrew Cole, Mill Manager HC31, Box 143 Elko, NV 89801
Dunphy mill	Baroid Drilling Fluids, Inc.	S26,T33N,R48E	barite	ML	grinding		Terrell Young P.O. Box 340 Battle Mountain, NV 89820
Dee mine	Rayrock Mines, Inc.	S34,T37N,R49E	gold silver	OP,HL, ML	cyanide	57	David S. Cook, General Shop Manager P.O. Box 1193 Elko, NV 89801
Hollister mine	Newmont Exploration Ltd.	S3,10,T37N,R48E	gold	OP	multiple bench heap leach	12	Paul Korpi, General Supervisor P.O. Box 979 Carlin, NV 89822
Jerritt Canyon joint venture	Independence Mining Co.	S33,T41N,R53E	gold	OP,ML, HL	cyanide grinding fluid bed roasting	800	Robert Zerga, CEO HC31, Box 78 Elko, NV 89801

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
ELKO COUNTY (continued)							
Pilot Peak lime plant	Continental Lime, Inc.	S14,T34N,R68E	lime	OP	multiple bench roasting grinding rotary kiln	27	Jack McGuirk, Division Manager P.O. Box 2520 Wendover, NV 89883
St. Elmo mine	St. Elmo Mining Corp.	S2,3,T44N,R56E	gold	UG		5	Allan G. Provost, President 1208 Quail Street Lakewood, CO 80215
Rossi mine	Baroid Drilling Fluids, Inc.	S15,21,22, T37N,R49E	barite	OP,ML	multiple bench crushing gravity concentration	8	Terrell Young P.O. Box 340 Battle Mountain, NV 89820
ESMERALDA COUNTY							
Basalt mine and mill	Grefco, Inc.	S29,T2N,R34E	diatomaceous earth	OP,ML	grinding	12	Robert A. Poelvoorde, Plant Manager P.O. Box 288 Mina, NV 89422
Blanco mine	Vanderbilt Minerals Corp.	S22,T1N,R37E	clay	OP	grinding bagging	6	Jerry W. Lease 2320 Viking Road Las Vegas, NV 89109
Goldfield Project	American Resources Corp.	S35,35,T2S,R42E	gold	OP,HL	cyanide	20	Dave Lewis, General Manager P.O. Box 160 Goldfield, NV 89013
Silver Peak Operation	Cyprus Amax Minerals Co.	S22,T2S,R39E	lithium carbonate	OS	evaporation precipitation	64	Joel Christophersen, Operations Manager P.O. Box 98 Silver Peak, NV 89047
EUREKA COUNTY							
Buckhorn mine	Cominco American Resources Inc.	S30,31,T27N,R49E	gold silver	OP,HL	cyanide multiple bench Merrill Crowe	5	Warren R. Hood P.O. Box 847 Carlin, NV 89822
Gold Bar mine	Atlas Gold Mining, Inc.	S26,27,T22N,R49E	gold	OP,ML, HL	multiple bench crushing grinding cyanidation	157	Mike Doyle P.O. Box 282 Eureka, NV 89316
Goldstrike mine	Barrick Goldstrike Mines, Inc.	S12,20,29,30, T36N,R50E; S23-26,T36N,R49E	gold silver	OP,ML, HL	cyanide milling	2,020	Bob Smith, President P.O. Box 29 Elko, NV 89803
Newmont Gold operations	Newmont Gold Co.	T31-36N, R49-53E	gold silver	OP,ML, HL	carbon-in-leach carbon-in-pulp cyanide	2,775	Peter Phillips, CEO P.O. Box 669 Carlin, NV 89822-0669
HUMBOLDT COUNTY							
Bonanza opal mine	Lloyd H. Olds	S13,T45N,R25E	precious opal	OP	single bench	3	Lloyd H. Olds P.O. Box 13 Denio, NV 89404
Crofoot/Lewis mine	Hycroft Resources & Development, Inc.	S24?,T35N,R29E; S19,20?, T35N,R30E	gold silver	OP,HL	crushing cyanide	219	Paul Wright, General Manager P.O. Box 3030 Winnemucca, NV 89446
Disaster Peak clay mine	American Colloid Co.	S26,T47N,R34E	hectorite	OP	single bench		I. Edgar Odom 1500 West Shore Drive Arlington Heights, IL 60004
Getchell mine	FirstMiss Gold, Inc.	S3,4,T38N,R42E; S33,T39N,R42E	gold silver	OP,ML, HL	multiple bench fluid-bed roasting cyanide	300	Cecil Alvarez, President P.O. Box 220 Golconda, NV 89414
Kelley mine	C. George Hewitt	S30,T45N,R26E	precious opal	OP		1	C. George Hewitt, Owner P.O. Box 33 Denio, NV 89404
Lone Tree mine	Santa Fe Pacific Gold Corp.	S11,T34N,R42E	gold	OP	multiple bench cyanide	300	Ken Pavlich, Project Manager P.O. Box 388 Valmy, NV 89438

continued

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
HUMBOLDT COUNTY (continued)							
Marigold mine	Rayrock Mines, Inc.	S8,9,17-19, T33N,R43E	gold silver	OP,ML, HL	grinding multiple bench cyanide	115	Jerry Harrington, General Manager P.O. Box 9 Valmy, NV 89438
MIN-AD mine and mill	MIN-AD, Inc.	S25,T36N,R37E; S28,T35N,R38E	dolomite	OP	grinding	10	Charles Evans, Mill Superintendent 4210 W. Jungo Road Winnemucca, NV 89445
Pinson mine	Rayrock Mines, Inc.	S28,29,32,33, T38N,R42E	gold	OP,ML, HL	cyanide grinding	106	Terry L. Flagg, General Manager P.O. Box 129 Winnemucca, NV 89445
Rainbow Ridge opal mine	Rainbow Ridge Opal Mines, Inc.	S6,7,22,23, T45N,R26E	precious opal	OP,UG	multiple bench	1	G. Keith Hodson, Owner P.O. Box 97 Denio, NV 89404
Royal Peacock opal mine	Royal Peacock Opal Mines, Inc.	S19,20,T45N,R26E	precious opal	OP	hand digging	2	Walter Wilson 10 Virgin Valley Road P.O. Box 55 Denio, NV 89404
Sexton mill	Nutritional Additives Corp.	S20,T36N,R38E	dolomite	ML	crushing screening	3	Glen Sexton, General Manager P.O. Box 802 Winnemucca, NV 89445
Sleeper mine	Nevada Gold Mining Inc.	S16,17,20,21 T40N,R35E	gold silver	OP,ML, HL	multiple bench cyanide gravity grinding	205	David McIntosh, Interim General Manager 600 Sod House Road Winnemucca, NV 89445
Twin Creeks mine	Santa Fe Pacific Gold Corp.	S5-8,19,29,31, T39N,R43E	gold silver	OP,HL	carbon-in-leach multiple bench	644	Steve Lang, Project Manager P.O. Box 69 Golconda, NV 89414
LANDER COUNTY							
Argenta mine and mill	Baker Hughes INTEQ	S6,13,24,T32N,R46E	barite	OP	gravity grinding	22	Keith S. Olson P.O. Box 277 Battle Mountain, NV 89820
Battle Mountain grinding plant	M-I Drilling Fluids Co.	S18,T32N,R45E	barite	ML	gravity grinding	54	Gary Thielen P.O. Box 370 Battle Mountain, NV 89820
Clipper mine	M-I Drilling Fluids Co.	S31,32,T28N,R46E	barite	ML	gravity concentration crushing	15	Gary Thielen, Operations Manager P.O. Box 370 Battle Mountain, NV 89820
Cortez Gold Mines	Placer Dome U.S., Inc.	S13,21,24, T27N,R47E; S36,T28N,R46E	gold silver	OP,ML, HL	cyanide grinding	197	Quail Lusty, Mine Manager HC66-50 Beowawe, NV 89821-9708
Dean mine	St. George Metals, Inc.	S36,T30N,R45E	gold silver	UG,OP	exploration development	29	Frank Varseveld, President 1140 Chukar Lane Battle Mountain, NV 89820
Fortitude complex/ Copper Canyon mine	Battle Mountain Gold Co.	S21,22,T31N,R43E; S28,T32N,R44E	gold silver	OP,HL	cyanide flotation gravity grinding	123	Danny Robertson, Manager P.O. Box 1627 Battle Mountain, NV 89820
Greystone mine	M-I Drilling Fluids Co.	S16,T28N,R46E	barite	OP,ML	multiple bench gravity concentration crushing	5	Gary Thielen, Operations Manager P.O. Box 370 Battle Mountain, NV 89820
McCoy/Cove mine	Echo Bay Minerals Co.	S1,2,11,T28N,R42E; S36,T28N,R43E	gold silver	OP,ML, UG,HL	cyanide grinding	500	John VanDeBukin, Manager P.O. Box 1658 Battle Mountain, NV 89820
LINCOLN COUNTY							
Mackie perlite mine	Wilkin Mining & Trucking Co.	S34,T4S,R62E (mine); S5,T4S,R67E (plant)	perlite	UG,ML	room pillar crushing expansion	5	Joseph D. Wilkin, Owner P.O. Box 472 Panaca, NV 89042

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
LYON COUNTY							
Adams pit	Art Wilson Co.	S25,T16N,R20E	gypsum/ anhydrite	OP,ML	grinding	45	Art Wilson, President P.O. Box 1160 Carson City, NV 89702
Arimetco/Copper Tek	Arimetco Inc.	S16,T13N,R25E	copper	OP,HL	leaching electrowinning	68	Rick Havenstrite, General Manager 102 Burch Drive Yerington, NV 89447
Hazen pit	Eagle-Picher Minerals, Inc.	S8,17,T19N,R26E	diatomite	OP	crushing drying calcining	2	Wes Lee, President P.O. Box 10480 Reno, NV 89510
Limestone mine	Nevada Cement Co.	S3-6,19,25, T19N,R25E; S31-33,T20N,R25E	limestone	OP	multiple bench	12	Alan Speagall, President P.O. Box 840 Fernley, NV 89408
Nevada Cement plant	Nevada Cement Co.	S2,3,10,11, T20N,R24E	cement	OP	rotary kiln	135	Alan Speagall, President P.O. Box 840 Fernley, NV 89408
Section 8 mine and Fernley mill	CR Minerals Corp.	S8,17,T19N,R26E S11,T20N,R24E	diatomaceous earth	OP,ML	grinding	13	Chris Harris, Superintendent P.O. Box 455 Fernley, NV 89408
MINERAL COUNTY							
Aurora mine	Nevada Goldfields, Inc.	S17,18,T5N,R28E	gold silver	OP,UG, ML	multiple bench	55	Rick Dye, Project Manager P.O. Box 3070 Hawthorne, NV 89415
Aurora Partnership	Minerex Resources, Ltd.	S17,T5N,R28E	gold silver	OP,HL	multiple bench cyanide	59	John C. Devitt, President P.O. Box 1628 Hawthorne, NV 89415
Candelaria mine	Kinross Candelaria Mining Co.	S32-34,T4N,R35E; S3-5,T3N,R35E	silver gold	OP,HL	cyanide	89	Dean Warner, Manager P.O. Box 1240 Hawthorne, NV 89415
Denton-Rawhide mine	Kennecott Rawhide Mining Co.	S4,5,8,16,17, T13N,R32E	gold silver	OP,HL	development	160	Dennis Kerstiens, General Manager P.O. Box 2070 Fallon, NV 89407
Prospectus mine and mill	Nevada Goldfields, Inc.	S18,T5N,R28E	gold	OP	multiple bench crushing	60	Tom Rinaldi, Project Manager P.O. Box 3070 Hawthorne, NV 89415
Santa Fe mine	Corona Gold, Inc.	S6,T8N,R35E; S36,T9N,R34E; S31,T9N,R35E	gold silver	OP,HL	multiple bench cyanide	33	Bruce Thieking, Resident Manager P.O. Box 3220 Hawthorne, NV 89415
NYE COUNTY							
Amargosa Valley plant and pits	IMV Div. of Floridin Co.	S15,29,T17S,R49E; S6,21,T17S,R51E	clay minerals	OP	grinding drying	46	Joseph Wujcik, Plant Manager Route Box 549 Amargosa Valley, NV 89020
Ash Meadows plant	American Resource Corp.	S25,T18S,R50E	zeolite	ML	screening drying bagging	4	Dave Lewis State Route 15 P.O. Box 7006 Amargosa Valley, NV 89020
Bullfrog mine	LAC Minerals	S15,T12S,R46E	gold silver	OP,HL	multiple bench cyanide grinding	266	Jack Bingham, Project Manager P.O. Box 519 Beatty, NV 89003
Cinder Cone pit	Cind-R-Lite Co.	S36,T14S,R48E; S1,T15S,R48E	cinder	OP	gravity	2	H.D. Allen, President 3333 Cinder Lane Las Vegas, NV 89103
Crown mine/lone placer/ primary mill	Marshall Earth Resources	S28,34, T13N,R39E	gold silver	ML,OP	screening washing	15	Hugh Marshall, President Route 1, Box 29A Austin (lone), NV 89310
Gabbs mine and mill	Premier Services Corp.	S26,34,T12N,R36E	magnesite	OP,ML	calcining dead burning sizing separation	77	Don Pressey, Works Manager P.O. Box 177 Gabbs, NV 89409

continued

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
NYE COUNTY (continued)							
Lathrop mill	American Borate Co.	S36,T17S,R49E	calcium borate	ML	flotation calcination	9	Jim Sparks, President Star Route 15 Box 610 Amargosa Valley, NV 89020
Manhattan West Project	Manhattan West Ltd.	S21,T8N,R43E	gold	OP	single bench	10	Willie Umholtz, President P.O. Box 101 Manhattan, NV 89022
Nevada Neanderthal plant	Nevada Neanderthal Stone	S10,T11S,R47E	dimension stone	ML	stone cutting	6	Dave Spicer, President P.O. Box 897 Beatty, NV 89003
New Discovery mine and mill	Vanderbilt Minerals Corp.	S13-24,T12S,R46E; S18,19,T12S,R47E	clay	UG,ML	grinding bagging	6	Jerry W. Lease 2320 Viking Road Las Vegas, NV 89109
Paradise Peak mine	FMC Gold Co.	S7,12,13,24, T10N,R36E; S3-22,T10N,R35E	gold silver mercury	OP,ML, HL	grinding cyanide Merrill-Crowe retorting	54	Stephen R. Stine, General Manager P.O. Box 145 Gabbs, NV 89409
Round Mountain mine	Echo Bay Mines Ltd.	S19,20,29,30, T10N,R44E; S12,24,25,36, T10N,R43E	gold silver	OP,HL, ML	cyanide	500	Chet Diercks, General Manager P.O. Box 480 Round Mountain, NV 89045
Sterling mine	Saga Exploration Co.	S6,T13S,R48E	gold	UG,ML, HL	drifting cyanide	40	Greg Austin, President P.O. Box 6479 Reno, NV 89513
PERSHING COUNTY							
Buff mine	Vanderbilt Minerals Corp.	S2,T27N,R32E	clay	OP	grinding bagging	6	Jerry W. Lease 2320 Viking Road Las Vegas, NV 89109
Coeur Rochester mine	Coeur D'Alene Mines Corp.	S15,16,21,22, T28N,R34E	silver gold	OP,HL	cyanide	292	Robert Martinez, Vice President P.O. Box 1057 Lovelock, NV 89419
Colado mine and plant	Eagle-Picher Minerals, Inc.	S7,T28N,R29E; S6,T27N,R32E	diatomite	OP,ML	crushing drying classification grinding calcining	144	Jack P. Richards 150 Coal Canyon Rd. Lovelock, NV 89419
Empire mine	United States Gypsum Co.	S31,T31N,R24E	gypsum	OP	multiple bench	130	Mike Jones, Human Resources Manager P.O. Box 130 Empire, NV 89405
Florida Canyon mine	Florida Canyon Mining, Inc.	S1-3,10-12,37,38, T31N,R33E	gold silver	OP,HL	cyanide	186	John Rice, Manager P.O. Box 330 Imlay, NV 89418
Section 8 mine	American Colloid Co.	S8,T27N,R33E	clay	OP	single bench		I. Edgar Odom 1500 West Shore Drive Arlington Heights, IL 60004
Sexton mine and mill	Nutritional Additives Co.	S5,8,T34N,R38E	dolomite/ limestone	OP	grinding	5	W. Glen Sexton, General Manager 1230 S. Bridge Winnemucca, NV 89445
Willard project	Western States Minerals	S35,36,T28N,R32E	gold silver	OP,HL, ML	cyanide multiple bench	6	Charlie Suttles, Project Manager P.O. Box K Lovelock, NV 89419
STOREY COUNTY							
All-Lite pit and plant	All-Lite Aggregate Inc.	S34,T19N,R21E	lightweight aggregate sand gravel	ML	multiple-bench crushing	16	Bill Poulter, Manager P.O. Box 10865 Reno, NV 89510
Clark mine and mill	Eagle-Picher Minerals, Inc.	S28,33,34, T20N,R23E; S35,T20N,R22E	diatomite	OP,ML	crushing drying calcining	56	Wes Lee, President P.O. Box 10480 Reno, NV 89510

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
STOREY COUNTY (continued)							
Golden Eagle mine and mill	Miramar Mining Co. and American Eagle Resources, Inc.	S22,23,24,26,27, T17N,R22E	gold silver	OP,HL	cyanide	22	Bob Spengler, General Manager P.O. Box 859 Virginia City, NV 89440
Lower Naturalite pit and plant	Naturalite Aggregate Corp.	S16,T17N,R22E	lightweight aggregate	OS,ML	multiple bench crushing screening	6	Fritz Anthes, General Manager 2600 Boeing Way Carson City, NV 89701
Patrick pit	Granite Construction	S6,T19N,R22E	sand gravel	OP	single bench	11	Jim Roberts, Branch Manager P.O. Box 2087 Sparks, NV 89432
WASHOE COUNTY							
Clay mine	Art Wilson Co., *contractor for* Nevada Cement Co.	S13,T27N,R19E	clay	OP	single bench	5	Art Wilson, Operator P.O. Box 1160 Carson City, NV 89702
Empire mill	United States Gypsum Co.	S11,13,T31N,R23E	gypsum	ML	grinding calcination	15	Mark Cubbage, Mines Superintendent P.O. Box 130 Empire, NV 89405
Lockwood quarry	Granite Construction Co.	S17,T19N,R21E	aggregate	OP	single bench crushing screening	7	Jim Roberts, Branch Manager P.O. Box 2087 Sparks, NV 89432
102 Ranch pit	Robert L. Helms Construction Co.	S36,T20N,R22E	sand gravel	OS,ML	crushing screening	5	Robert L. Helms, President P.O. Drawer 608 Sparks, NV 89432
Paiute pit	Paiute Pit Aggregates, Inc.	S22,27,34, T21N,R24E	sand gravel	OP	single bench	7	Alex Karlshoet, Owner P.O. Box 159 Wadsworth, NV 89442
Rilite Aggregate	Rilite Aggregate Co.	S23,T18N,R20E	aggregate	OP	grinding crushing	8	Bruno Benna P.O. Box 11767 Reno, NV 89511
Sha-Neva pits	Sha-Neva Inc.	S24,T21N,R19E S17,T19N,R21E	aggregate	OP	screening	6	Pat Shane, President P.O. Drawer 669 Truckee, CA 95734
Sky Ranch pit	Rocky Ridge, Inc.	S15,T21N,R20E	sand gravel	OS,ML	multiple bench crushing screening	15	Pat Shane, President P.O. Box 2669 Truckee, CA 95737
Western Hog Ranch mine	Western Mining Corp. USA	S24,T38N,R22E	gold silver	OP,HL, ML	cyanide	32	C. A. Moore, Resident Manager P.O. Box 9 Gerlach, NV 89412
Wind Mountain mine	Amax Gold Inc.	S33,34,T30N,R23E	gold silver	OP,HL	cyanide	11	Barry Olson, General Manager P.O. Box 160 Empire, NV 89405
WHITE PINE COUNTY							
Bald Mountain mine (includes Alligator Ridge, Yankee Projects)	Placer Dome U.S., Inc.	S22-26,35,36, T22N,R57E; S24,T24N,R56E; S17,20,T24N,R57E; S25,T21N,R57E	gold	OP,HL	multiple bench cyanide	120	D. G. Bailey P.O. Box 2706 Elko, NV 89801
Casino mine	USMX, Inc.	S25,T24N,R58E	gold	OP	heap leach multiple bench	6	Jim Kentopp, Manager P.O. Box 809 Ely, NV 89301
Easy Junior Project	Alta Gold Co.	S9,T15N,R56E	gold	OP	multiple bench heap leach	45	Gary Cummings, General Manager P.O. Box 324 East Ely, NV 89315
Golden Butte mine	Alta Gold Co.	S2,3,T23N,R61E	gold silver	OP,HL	development cyanide multiple bench	6	Joseph A. Pescio, Mine Superintendent P.O. Box 324 East Ely, NV 89315

continued

DIRECTORY OF MINING AND MILLING OPERATIONS (continued)

Mine/plant name	Operator	Location	Commodity	Type	Process/ activity	Employees	Address
WHITE PINE COUNTY (continued)							
Green Springs mine	USMX, Inc.	S28,T15N,R57E	gold silver	OP,HL	multiple bench cyanide carbon absorption	3	Jim Kentopp P.O. Box 809 Ely, NV 89301
Robinson project	Magma Copper Co.	S10,11,15 T16N,R62E	gold silver copper	OP,ML, HL	CIL mill cyanide	34	Dan Turk, Operations Manager P.O. Box 382 Ruth, NV 89319
White Pine gold mine	Western States Minerals Corp.	S1,T24N,R57E; S6,T24N,R58E; S36,T25N,R57E; S31,T25N,R58E	gold silver	OP,HL	cyanide carbon recovery	11	Gaylan Cropper, Mine Manager P.O. Box 305 Ely, NV 89301

Stocks pit operation owned by Nevada Ready Mix Corp. and operated by Southern Nevada Paving, Lone Mountain, Clark County. *S. B. Castor photo.*

Oil and Gas

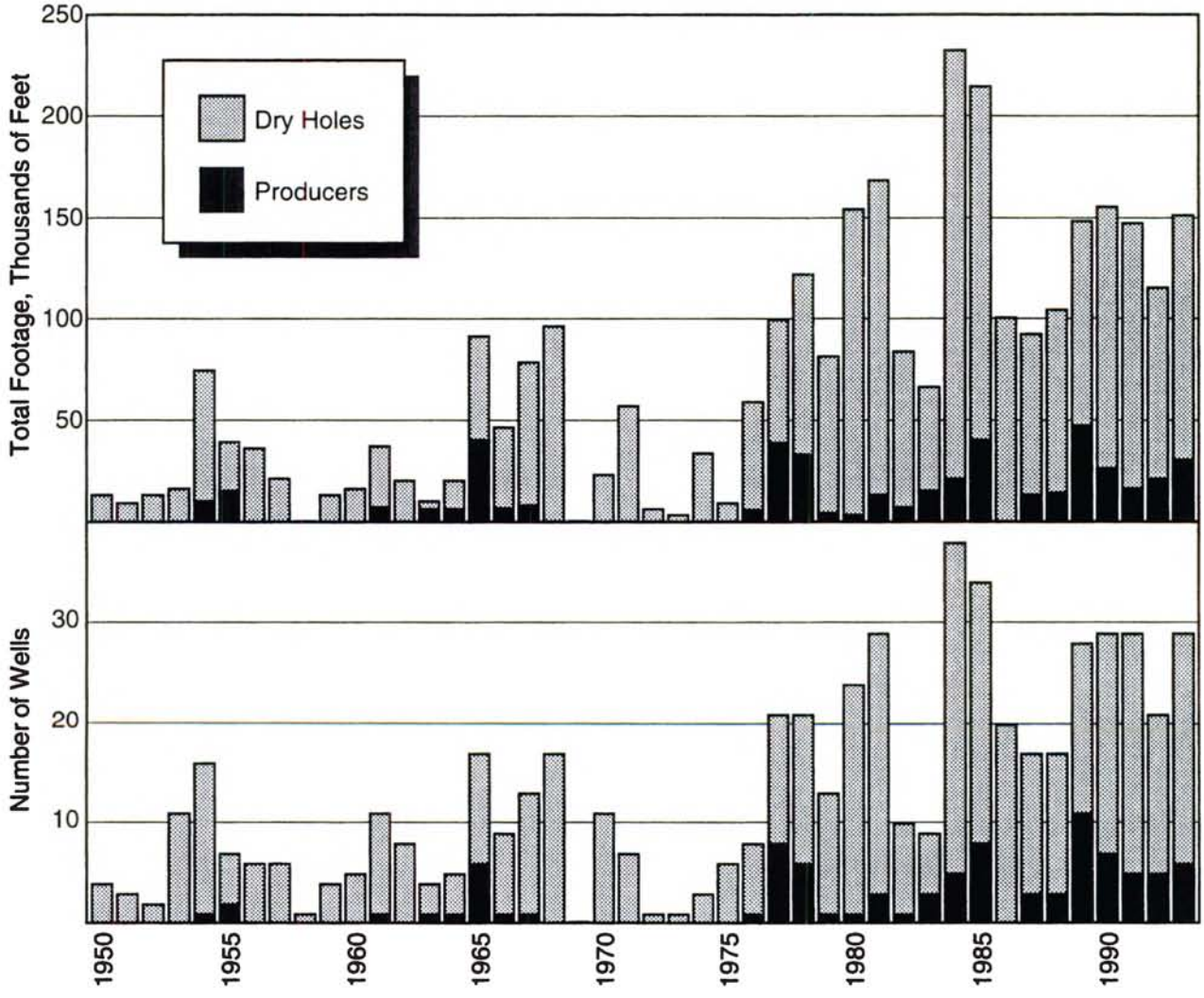
by Becky Weimer Purkey and David A. Davis

Exploration

Thirty-one wells were spudded for oil and gas in 1993, up from the 20 wells spudded in 1992. One of the wells was a re-entry and five new wells were put on production during the year. The new producers in Eureka County are Foreland Corp. North Willow Creek No. 6-27 and Trail Mountain, Inc. Three Bar Unit No. 5. The new producers in Nye County are Apache Corp. Grant Canyon No. 22-21, and the CENEX No. 5-14 and No. 12-14 in the new Sans Spring field, located 4 miles west-northwest of the Grant Canyon field and 3 miles west of the Bacon Flat field.

Apache recompleted the Grant Canyon No. 7 well in April to a new depth of 5,405 feet (1,665 feet deeper) in the Guilmette Formation in search of better oil production. It produced for about 6 months during 1993 and was averaging about 20 barrels of oil per day cut with nearly 50% water.

Balcron Oil also recompleted its Bacon Flat No. 23-17 well originally completed in August 1992 and flowing at a rate of 5,400 barrels of 26 gravity oil per day. The recompleted No. 23-17A well taps the structure 225 feet higher than the original well and flows 13,000 barrels of oil per day. Balcron plans to produce the well at a rate of 1,000 barrels per day to protect the equipment and maximize water-free oil recovery.



Number and total footage of Nevada oil wells completed as producers or plugged and abandoned, 1950–1993.

OIL WELL DRILLING ACTIVITY IN NEVADA IN 1993

Company	Well	Permit no.	Location	Spud date	Depth (feet)	Status (31 Dec 93)
ELKO COUNTY						
J.R. Bacon Drilling, Inc.	Ferdelford Canyon No. 34-1	682	SE¼ NW¼ NW¼ S34,T31N,R52E	Oct 93	3,386	P&A
EUREKA COUNTY						
Foreland Corp.	North Willow Creek No. 5-27	646	SE¼ NW¼ S27,T29N,R52E	May 93	W	TA
Foreland Corp.	North Willow Creek No. 6-27	648	NE¼ SW¼ S27,T29N,R52E	Aug 93	6,550	Producer
Trail Mountain, Inc.	Three Bar Unit No. 25-7D	655	SE¼ SW¼ NE¼ S25,T28N,R51E	July 92	W	SI
Alpine, Inc.	Pony Express Fed. No. 1-3	678	SW¼ SE¼ SE¼ S3,T23N,R53E	May 93	W	TA
Trail Mountain, Inc.	Three Bar Unit No. 5	679	NE¼ SE¼ NE¼ S25,T28N,R51E	June 93	4,892	Producer
Foreland Corp.	Hay Ranch No. 1-17	683	NW¼ SE¼ S17,T29N,R52E	June 93	W	TA
Foreland Corp.	Little Smoky No. 1-24	692	NW¼ SW¼ S24,T16N,R53E	Aug 93	1,850	P&A
J.R. Bacon Drilling, Inc.	Tomera Ranch South No. 9-1	708	SE¼ SW¼ NW¼ S9,T30N,R52E	Oct 93	4,225	P&A
LINCOLN COUNTY						
Apache Corp.	Apache/Frontier Exploration	687	SE¼ SE¼ NW¼ S13,T6N,R66E	July 93	6,115	P&A
NYE COUNTY						
Apache Corp.	Grant Canyon No. 7	625	NW¼ NW¼ S21,T7N,R57E	Apr 93	1,665	Producer
CENEX	Federal No. 5-14	635	SW¼ NW¼ S14,T7N,R56E	Jan 93	8,463	Producer
Skippy Oil Operating Inc./ Arco Oil & Gas Co.	Wood Canyon Unit No. 1-30	651	SW¼ NW¼ S30,T9N,R54E	June 92	9,473	P&A
Arco Oil & Gas Co.	Squaw Hills No. 1-15	661	NE¼ SE¼ S15,T10N,R52E	Nov 92	3,230	P&A
Pioneer Oil and Gas/ Young Resources, Inc.	West Grand Canyon Fed. No. 21-31	664	NW¼ NE¼ S21,T7N,R56E	Jan 93	6,826	P&A
Makoil, Inc.	Big Wash No. 35-41	665	NE¼ NE¼ S35,T10N,R57E	Jan 93	4,586	P&A
Antelope Production Co.	Carl Hanks No. 1	668	NE¼ SE¼ S27,T8N,R57E	Jan 93	4,693	P&A
Apache Corp.	Eagle Springs No. 11-35	670	SE¼ NW¼ NW¼ S35,T9N,R57E	Mar 93	7,312	P&A
CENEX	Federal No. 8-15	671	SE¼ NE¼ S15,T7N,R56E	Mar 93	8,712	P&A
CENEX	Federal No. 12-14	673	NW¼ SW¼ S14,T7N,R56E	May 93	5,870	Producer
Pioneer Oil and Gas/ Young Resources, Inc.	West Grand Canyon Fed. No. 22-1	677	C NW¼S22,T7N,R56E	May 93	5,954	P&A
Skippy Oil Operating, Inc.	Cove Unit No. 1-18	681	NE¼ SE¼ S18,T10N,R61E	Aug 93	7,118	P&A
CENEX	Federal No. 11-33	702	NE¼ SW¼ S33,T10N,R57E	NA	W	Drilling
Pioneer Oil and Gas/ Young Resources, Inc.	Railroad Valley Fed. No. 32-43	703	SE¼ NE¼ SE¼ S32,T7N,R56E	Oct 93	5,988	P&A
The Arschutz Corp.	Christian Springs Fed. No. 11-3	704	N½ NE¼ SW¼ S3,T6N,R56E	Oct 93	6,635	P&A
Apache Corp.	Grant Canyon No. 22-21	705	SE¼ NW¼ S21,T7N,R57E	Dec 93	4,065	Producer
Apache Corp.	Grant Canyon No. 10	706	NW¼ NW¼ S21,T7N,R57E	Oct 93	6,150	P&A
Byrd Operating Co.	Big Corral No. 1	711	NW¼ SE¼ S1,T8N,R55E	Oct 93	3,669	P&A
Lone Mountain Production Co.	North Grant Canyon Fed. No. 1-9	713	SE¼ NE¼ S9,T7N,R57E	Nov 93	5,850	P&A
Pioneer Oil and Gas	Bacon Springs Fed. No. 3-1	723	SW¼ SW¼ S3,T7N,R57E	Jun 93	4,450	P&A
WHITE PINE COUNTY						
David M. Evans	Cunningham Fed. No. 1	685	NE¼ NW¼ SE¼ S10,T22N,R58E	Jun 93	3,900	P&A
J.R. Bacon Drilling, Inc.	Baker Creek No. 12-1	686	SE¼ NE¼ NW¼ S12,T13N,R70E	July 93	4,787	P&A
Frontier Exploration Co.	Buck Station Fed. No. 7-A	700	SE¼ SE¼ S7,T23N,R56E	Dec 93	3,024	P&A
Anadarko Petroleum Corp.	Overland Pass Fed. No. 29-14	717	NE¼ SE¼ S29,T25N,R56E	Nov 93	2,530	P&A
Chevron U.S.A. Production Co.	Bonanza Fed. No. 1-32	719	NE¼ NE¼ S32,T20N,R61E	Dec 93	NA	Drilling

W: Depth information withheld in accordance with company requests and Nevada regulations.
P&A: Plugged and abandoned.
TA: Temporarily abandoned.
Drilling: Drilling not finished in 1993.
NA: Not available.
SI: Shut in.

Drilling was completed on 29 holes totaling 151,968 feet during 1993. At year end, drilling was in progress on two wells and four were temporarily abandoned or shut-in. An average of two drilling rigs were active at any given time during the first half of 1993, with the rig count reaching as high as seven from September through December.

Nevada currently produces oil and gas from 11 fields in Nye and Eureka Counties. The Currant field was permanently shut-in during 1983. The Blackburn field was Nevada's major producer in 1993, followed by the Grant Canyon field. In 1992, Apache Corp. Grant Canyon No. 9 well replaced the Grant Canyon No. 7 well as the most productive free-flowing vertical onshore oil well in the conterminous United States. Beginning in April 1992, the No. 9 produced almost a third more oil than the No. 7 well from two intervals in Devonian rocks. January 1993 production for the No. 9 well totaled 106,757 barrels of 26 gravity oil with no water. February oil production dropped to 28,564 barrels. March through December production averaged about 30,000 barrels per month.

The combined oil production from the No. 7 and No. 9 wells dropped from about 8,000 to 1,500 barrels per day in the first two months of 1993 while the water cut increased. Apache Corp. conducted seismic surveys in the spring to help determine future plans for the field. As of January 1994, the Grant Canyon No. 9 well was producing about 800 to 900 barrels of oil per day. Both wells are producing considerable amounts of water.

Four unit agreements were approved and three development contracts were in effect with the Bureau of Land Management in Nevada during fiscal year 1993, compared with five unit agreements and four development contracts in fiscal 1992. There were 5,931,892.54 acres under federal oil and gas leases in fiscal year 1993, a decrease of 246,761.52 acres from fiscal 1992.

The deepest well drilled was the Skippy Oil Operating, Inc./Arco Oil and Gas Co. Wood Canyon Unit No. 1-30 well in Nye County, drilled to a depth of 9,473 feet. No shows were reported.

Oil shows were reported for seven dry holes drilled in Nye County during the year. Apache Corp. reported spotty staining with black gilsonite, heavy oil, and small amounts of gas in Tertiary tuffs between 6,985 and 7,050 feet in the Eagle Springs No. 11-35 well.

CENEX reported brown oil stains and minor gas in dolomite between 5,545 and 5,580 feet in the Federal No. 8-15 well, and scattered brown and black oil stains in the Federal No. 11-33 well between 4,890 and 4,920 feet in limestone of the Mississippian Chainman Formation.

Spotty hydrocarbon fluorescence and a small amount of methane were reported in the Lone Mountain Petroleum Co.'s Federal No. 1-9 well in valley fill between 5,150 and 5,275 feet. Free tarry oil, oil stains, and gas were reported again in valley fill between 5,420 and 5,510 feet.

Pioneer Oil and Gas/Young Resources reported a dark brown to black residue in valley fill between

FEDERAL OIL AND GAS LEASES IN EFFECT IN FISCAL YEARS 1992 AND 1993[1]

County	NUMBER OF LEASES						ACREAGE					
	Competitive		Noncompetitive		Simultaneous[2]		Competitive		Noncompetitive		Simultaneous	
	FY92	FY93	FY92	FY93	FY92	FY93	FY92	FY93	FY92	FY93	FY92	FY93
Carson City	0	0	0	0	0	0	0	0	0	0	0	0
Churchill	0	0	3	3	2	2	0	0	5,085	5,085	5,278	5,278
Clark	0	0	12	6	9	7	0	0	10,683	3,743	10,913	8,041
Douglas	0	0	0	0	0	0	0	0	0	0	0	0
Elko	27	27	199	209	72	63	37,879	40,883	371,708	378,886	223,963	194,274
Esmeralda	0	0	0	5	0	0	0	0	0	8,949	0	0
Eureka	84	92	191	187	151	136	124,903	139,947	364,892	345,580	546,948	485,732
Humboldt	0	0	1	1	0	0	0	0	679	679	0	0
Lander	2	0	7	77	2	1	0	0	11,263	7,557	12,025	10,185
Lincoln	37	51	230	235	50	44	66,400	87,958	524,249	506,359	186,404	167,714
Lyon	0	0	0	0	0	0	0	0	0	0	0	0
Mineral	0	0	0	0	0	0	0	0	0	0	0	0
Nye	248	302	422	464	391	347	239,232	266,231	904,585	962,677	738,696	673,096
Pershing	0	0	5	3	0	0	0	0	8,046	5,085	0	0
Storey	0	0	0	0	0	0	0	0	0	0	0	0
Washoe	0	0	2	2	0	0	0	0	1,713	1,713	0	0
White Pine	161	169	316	324	257	196	243,511	247,847	746,290	737,365	793,309	641,029
TOTAL	557	641	1,388	1,516	934	796	711,925	782,866	2,949,193	2,963,678	2,517,536	2,185,349

[1]Data from the U.S. Bureau of Land Management FY92 = Oct. 1991-Sept. 1992; FY93 = Oct. 1992-Sept. 1993

[2]These are the remaining leases that were issued under the simultaneous leasing program that was terminated by the December 22, 1987 amendment to the 1920 Mineral Leasing Act.

PRODUCTION OF NEVADA'S OIL FIELDS (barrels)

Compiled from Producer's Reports filed with the Nevada Division of Minerals

Field (year discovered)	Thru 1987	1988	1989	1990	1991	1992	1993	TOTAL
Eagle Springs (1954)	3,854,869	43,451	47,272	41,609	42,043	49,767	7,075	4,086,086
Trap Spring (1976)	7,224,727	441,832	629,281	939,792	690,257	554,410	427,150	10,907,449
Currant (1979)	641	0	0	0	0	0	0	641
Bacon Flat (1981)	293,805	20,855	0	0	0	178,845	102,030	595,535
Blackburn (1982)	1,281,803	351,582	272,119	238,240	203,023	231,719	599,857	3,178,343
Grant Canyon (1983)	7,482,073	2,280,323	2,076,272	2,345,858	2,124,021	2,499,831	495,934	19,304,312
Kate Spring (1986)	7,015	75,725	188,408	434,349	339,310	203,274	150,309	1,398,390
Tomera Ranch 1987)	1,032	5,221	225	2,605	3,067	2,295	2,140	16,585
N. Willow Creek (1988)		9,457	4,036	3,169	2,365	4,491	3,928	27,446
Three Bar (1990)				3,601	17,684	362	1,961	23,608
Duckwater Creek (1990)				3,095	4,190	2,764	2,256	12,305
Sans Spring (1993)							69,478	69,478
TOTAL	20,145,965	3,228,446	3,217,613	4,012,318	3,425,960	3,727,758	1,862,118	39,620,178
Change from previous year		4%	0%	25%	-15%	9%	-50%	

1,000 and 1,015 feet in the West Grant Canyon Fed. No. 22-1 well. Also reported were slight oil stains, and small amounts of gas in Tertiary volcanic tuff between 5,140 and 5,168 feet. In the West Grant Canyon Fed. No. 22-31 well, Pioneer/Young reported a minor gas show in the Devonian Simonson Dolomite between 6,744 and 6,756 feet.

During drilling of the Cove Unit No. 1-18, Skippy Oil/Arco Oil and Gas Co. reported brown oil stains and traces of gas in various interbedded sedimentary rocks of the Mississippian Chainman Formation at numerous intervals between 3,980 and 4,870 feet. More staining was reported in the Mississippian Joana Limestone from 5,990 to 6,320 feet, and in limestone and dolomite of the Devonian Guilmette Formation from 6,370 to 6,440 feet and from 6,690 and 6,960 feet, respectively.

Oil shows were reported for two nonproducing wells in White Pine County drilled in 1993. In the Overland Pass Fed. No. 29-14 well, Anadarko Petroleum Corp. reported traces of gas between 1,600 and 1,990 feet in various sedimentary facies of the Mississippian Diamond Peak Formation. Minor stains and traces of gas were also reported from 2,460 and 2,470 feet and from 2,520 and 2,527 feet in the Mississippian Joana Limestone.

J. R. Bacon Drilling Co. reported bitumen and small amounts of gas from various intervals in valley fill between 2,120 and 2,340 feet, and again at 3,000 feet from the Baker Creek No. 1-12 well.

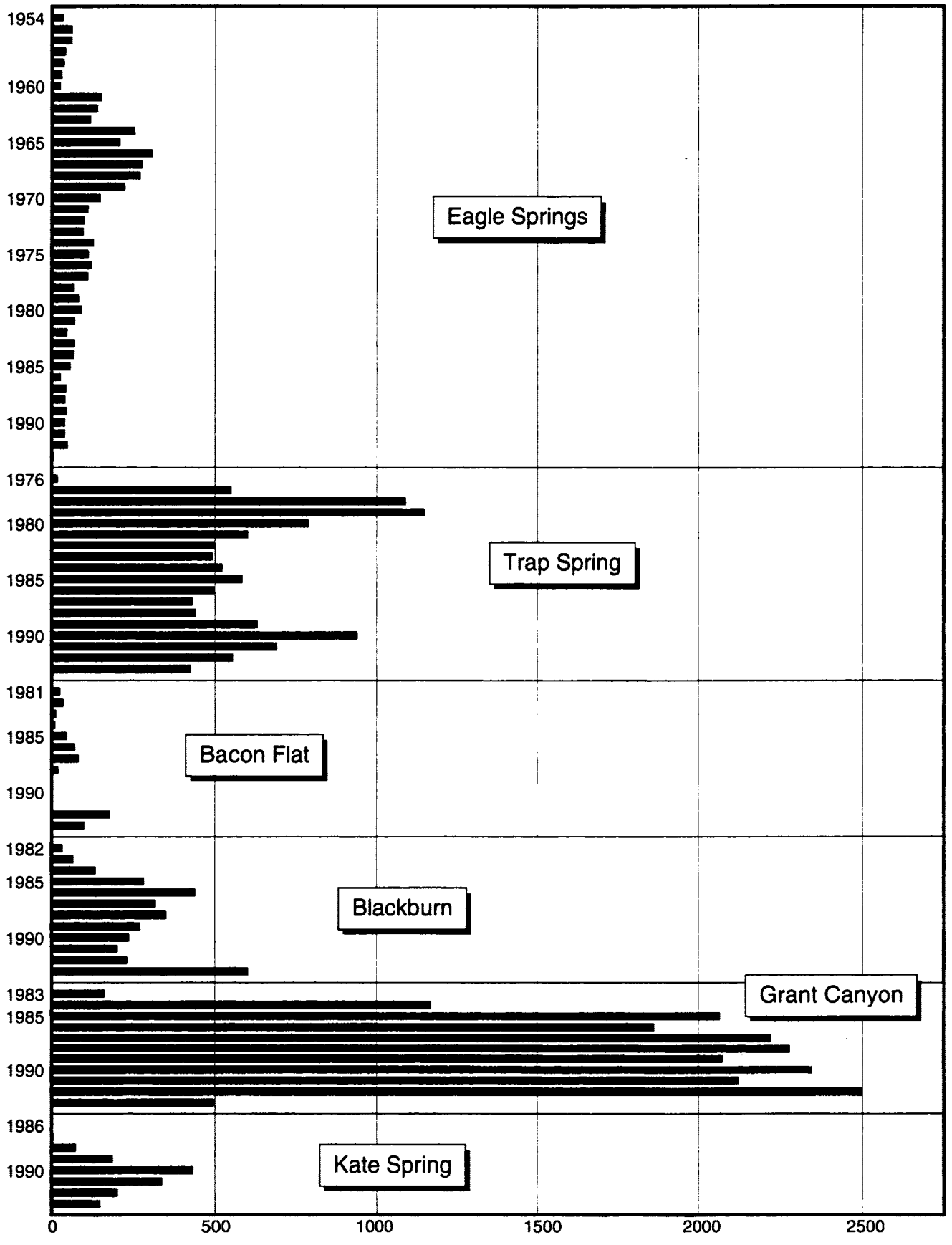
New Producers

There are two new producing wells in Eureka County. Foreland Corp. North Willow Creek No. 6-27 is the new producer in the Willow Creek field. Production began in September from the 6,290 to 6,470-foot interval in the Mississippian Chainman Shale and was producing an average of 33 barrels of oil per day by the end of 1993. This well is an offset to the field discovery, the now inactive Dixie Operating Co. Foreland-S.P. Land Co. No. 1-27 well. Another Foreland well, the No. 5-27, is expected to be the next producer in this field when it is completed by May 1994.

Trail Mountain, Inc. has a new producer in the Three Bar field, the Three Bar Unit No. 5. First production was in July from intervals between 4,620 and 4,892 feet in lithic sands and Tertiary Indian Wells volcanics. It was producing about 5 barrels of oil (with abundant water) per day by year end. This well is a southeast offset to the field discovery well, the Gary Williams Three Bar No. 25-A.

Three new wells were put into production in Nye County in 1993. Apache Corp. Grant Canyon No. 22-21 well was drilled as an offset to the Grant Canyon No. 7 well. Production began in December 1993 and is at about 115 barrels of 25.7 gravity oil daily with no water from an interval from 4,039 to 4,042 feet in the Devonian Guilmette Formation. The well is the southeasternmost in the Grant Canyon field and, according to Apache geologists, is separated from the Grant Canyon pool by a fault.

CENEX added two new producing wells, both located in the new Sans Springs field, a few miles north and west of the Grant Canyon and Bacon Flat fields. The CENEX No. 5-14 well was completed in February and began production in March. The well initially flowed 1,464 barrels of 28 gravity oil per day from perforations at 5,716 to 5,766 feet in Oligocene Garrett Ranch volcanics (Munger OILogram, 215-93


1954
1960
1965
1970
1975
1980
1985
1990
Eagle Springs
1976
1980
1985
1990
Trap Spring
1981
1985
1990
Bacon Flat
1982
1985
1990
Blackburn
1983
1985
1990
Grant Canyon
1986
1990
Kate Spring
0
500
1000
1500
2000
2500
Oil Production, in Thousands of Barrels

and 9-10-93). The CENEX No. 12-14 well is a south offset to the No. 514 well and is also producing from the Garrett Ranch volcanics from an interval from 5,830 to 5,845 feet. It produced 304 barrels of oil cut with 50% water in its first 12 hours of production. After being put on production in August, it produced an average of 135 barrels of oil per day for the first few days.

Oil and Gas Production

Nevada oil production decreased by 50% in 1993 compared to the previous year. The declining production is due to the watering out of the two high-volume producers in the Grant Canyon field, the Apache No. 7 and No. 9 wells, early in the year. New 1993 producing wells have not completely offset the loss at the Grant Canyon field, but Nevada experts agree that the decline in state oil production won't be permanent. The Grant Canyon field had accounted for about two-thirds of Nevada's oil production since going on line in September 1983.

The total net oil production in 1993 was 1,862,118 barrels from 11 fields, according to the Producer's Monthly Reports filed with the Nevada Division of Minerals. Net sales of oil in 1993 was $22.3 million according to the Nevada Division of Minerals. A total of 20,872 thousand cubic feet (mcf) of gas was produced from the Kate Spring field in 1993 and was used to operate production and related equipment at the lease sites of Apache Corp. and Western General, Inc.

The average net wellhead price for Nevada crude in 1993 was $11.96 (John Snow, Bureau of Land Management, Nevada State Office). Nevada crude oil is transported by tank trucks to several refineries: the Petro Source Refining Corp. 8,000 barrel/day refinery and asphalt storage plant at Currant in Railroad Valley; the Petro Source Refining Partners' asphalt storage facility and refinery (used only a few days a month for refining) at Tonopah; the Petro Source Refinery in Salt Lake City, Utah; and Crysen Refining, Inc. at Woods Cross, Utah (presently refining only Pine Valley crude oil). Most Nevada oil is used to make such products as diesel fuel, kerosene, stove oil, and asphalt.

Closures

Of the 78 wells capable of producing, 25 were shut-in for 6 months or more during 1993. Several operators continued to suspend production on their wells in various fields in Railroad Valley. Under a 1986 policy authorized by the Mineral Leasing Act of 1920, any oil and gas leaseholder with wells on federal land may opt to suspend production temporarily, rather than prematurely abandon the lease because of low domestic oil prices. This policy is meant to conserve domestic oil and gas reserves and provide for the collection of royalties and taxes on these leases in the future.

In Nye County, Apache Corp. suspended production on the Bacon Flat No. I well all year. Balcron Oil Co., a division of Equitable Resources Energy Co., took over operation of the well in August.

In the Trap Spring field, Makoil, Inc. suspended production all year on the Zuspann Nos. 24-1 and 24-3, the Britton 13-21, and the Munson Ranch 12-23 and produced only several months in 1993 on the rest of its wells. J.R. Bacon Drilling suspended production for most of the year on the Munson Ranch No. 13-46 and the No. 14-49X wells for 6 months or more during the year. David M. Evans suspended production on the Trap Spring No. 12-13 all year.

In the Eagle Springs field, Draycutt Corp. suspended production on all of its wells from February through October, at which time Eagle Springs Production, Ltd., a wholly-owned subsidiary of Foreland Corp., took over as the new operator and began production in November.

Apache Corp. suspended production on the Grant Canyon No. 3 well all year and on the Grant Canyon No. 7 well for six months in 1993. In the Kate Spring field, Western General, Inc. suspended production on the Taylor Federal No. 2 well for six months.

In Eureka County, J.R. Bacon suspended production on the Tomera Ranch No. 331 well for 10 months in 1993, and in the Three Bar field Trail Mountain, Inc. suspended production on the Three Bar No. 25-A well all year.

U.S. Oil Production and Consumption

According to the American Petroleum Institute, petroleum imports accounted for 49.5% of U.S. consumption in 1993, surpassing the previous annual peak of 47.7% in 1977 (Petroleum Information, 1-19-94). While dependence on imports reached a new high, domestic crude oil production dropped to its lowest level since 1958. U.S. crude oil production averaged 6,860,000 barrels per day in 1993, a decline of 4.3% from the 1992 average of 7,171,000 barrels per day. With the marginal increase in domestic consumption in 1993 (only 0.4%), the largest single factor behind the increase in imports is the declining U.S. oil production, according to the American Petroleum Institute.

Compared with petroleum, growth rates in 1993 for all other major energy sources were stronger. For the seventh year in a row, natural gas consumption increased more (or declined less) than petroleum. This was due mainly to a continued growth in the industrial use of natural gas. Over the past five years, industrial use of natural gas has increased about 20%, according to the American Petroleum Institute.

Geothermal Energy

by Ronald H. Hess and Larry J. Garside

Nevada is well endowed with both high- and low-temperature geothermal resources. Over 40% of the state is believed to have potential for the discovery of high-temperature (>200°F) geothermal resources, and another 50% has potential for low- to moderate-temperature (<200°F) resources. Surface and subsurface indications of these resources are the more than 1,000 thermal springs and wells in the state. Realistically, this number of individual springs and wells represents several hundred resource areas.

Geothermal reservoirs in the northwestern part of the state have generally higher temperatures; these reservoirs are usually interpreted as being related to circulation of ground water to deep levels along faults in a region of higher-than-average heat flow. In east-central and southern Nevada, the low- to moderate-temperature geothermal resources are generally believed to be related to regional groundwater circulation in fractured carbonate-rock aquifers. Discharge areas (for example, warm springs) may be up to 200 miles from the area of recharge, and the waters may have circulated for dozens to hundreds of years to depths of several miles. Temperatures attained during this journey could be 212°F or higher, but spring temperatures at discharge points are generally less than 150°F.

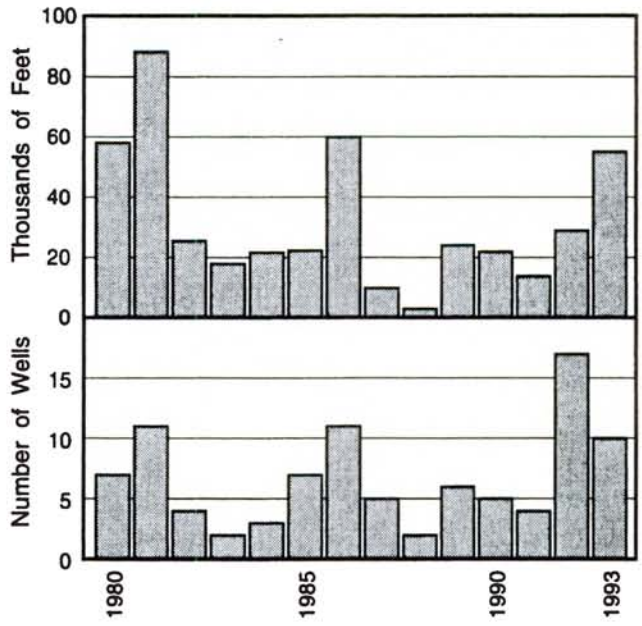
Exploration and Development

Two hundred and eighteen geothermal well permits were issued from 1988 through 1993 by the Nevada Division of Minerals: they include 58 industrial class wells, 30 domestic class, 88 observation or gradient wells, 10 commercial class, and 25 injection wells. During this same period 109 geothermal wells were reported to have been drilled totalling about 284,500 feet. Forty-five of the wells drilled were industrial wells totalling about 147,000 feet. The 18 non-domestic wells drilled in 1993 are listed on page 55.

GEOTHERMAL WELLS DRILLED 1988–1993

Year	Industrial Class		All Classes	
	number	depth (ft)	number	depth (ft)
1988	3	3,000	11	14,000
1989	6	24,000	15	48,600
1990	5	22,000	12	37,700
1991	4	14,000	14	41,200
1992	17	29,000	36	59,000
1993	10	55,000	21	84,000
TOTAL	45	147,000	109	284,500

Industrial class wells are wells used to produce electrical power.



Industrial-class (power generating) wells drilled in Nevada, 1980–1993.

From 1989 through 1992 noncompetitive and competitive federal geothermal leases in Nevada generated $1,699,282 in rental fees, $849,641 of which was returned to the State of Nevada. Federal production royalties, during the same period, generated $7,485,000 of which $3,742,500 was returned to the State. Geothermal lease returns ($849,641) and royalty returns ($3,742,500) to Nevada totaled $4,592,141. By regulation, half of all funds collected by the Bureau of Land Management from federal geothermal leases and production royalties are returned to the State.

Geothermal Electric Power Generation

Electric power is generated using geothermal resources at 10 plants in northern Nevada. The state's total installed geothermal generating capacity is second only to California.

In 1993 the statewide peak power demand was 3,755 megawatts (MW); the total installed generating capacity of Nevada's two major utilities (who supply most of the state's customers) is nearly 2,600 MW (Public Service Commission of Nevada). Thus,

geothermal energy provides about 7% of the total electricity generated within Nevada (although only about 3% of the peak load). About 40% of Nevada's geothermal electric power is exported to California.

Total Nevada geothermal electrical production from both federal and fee lands combined in 1993 was 1,629,546 megawatt-hours gross; net production was 1,348,858 megawatt-hours with an approximate sales value of $108,000,000. Production capacity from the currently developed geothermal resources at ten existing geothermal power plants in Nevada is 208.6 megawatts. These values represent a 15% increase in sales value of the power sold and an increase in installed power production capacity of 9% over 1992.

Total Nevada geothermal electrical production during 1989 through 1993 was 5,706,162 megawatt-hours with an approximate sales value of $405,410,000. Production capacity in 1988 from eight geothermal power plants was 115.8 MW gross while current power production from ten existing geothermal power plants in Nevada is 208.6 MW gross. An increase of 80% in installed gross power production capacity took place between 1988 and the end of 1993.

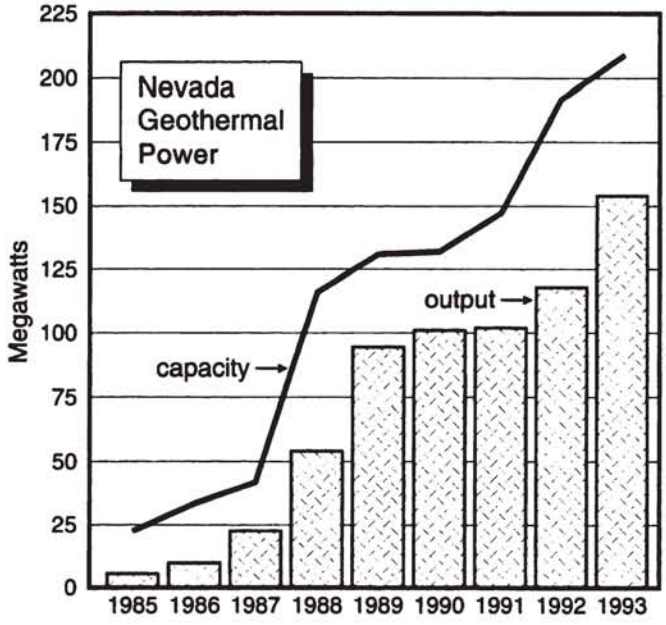
It is important to note that in 1988 Nevada had nearly a threefold increase over 1987 in the amount of on-line geothermal generating capacity. The primary reason for this increase was the Dixie Valley 60-MW Oxbow Geothermal plant being put on line. The OESI plants at Empire (4.8 MW) and Soda Lake No. 1 (3.6 MW) were also brought on line during this period.

According to a 1991 U.S. Department of Energy estimate, under stable market conditions and with continuing technologic advancements in the geothermal industry, Nevada's projected electrical production capacity from known geothermal resources by the year 2010 should be at least 600 MW (Energy Information Administration, 1991). It is estimated, for

NEVADA GEOTHERMAL POWER PLANTS

Plant name (year on line)	Production capacity[1] (MW)	1993 Production (MWh)		Location	Operator
		Gross	Net (sales)		
Beowawe (1985)	16.0	136,612	102,769	S13,T31N,R47E	Oxbow/Beowawe Geothermal Power Co. P.O. Box 6 Beowawe, NV 89821
Bradys Hot Springs (1992)	21.1	182,829	141,155	S12,T22N,R26E	Oxbow Power Services, Inc. P.O. Box 649 Fernley, NV 89408
Desert Peak (1985)	8.7	79,361	71,256	S21,T22N,R27E	Western States Geothermal Co. P.O. Box 2627 Sparks, NV 89432-2627
Dixie Valley[2] (1988)	66.0	532,880	480,988	S7,T24N,R37E S33,T25N,R37E	Oxbow Geothermal Corp. 5250 South Virginia St. Suite 304 Reno, NV 89502
Empire (1987)	3.6	16,857	11,480	S21,T29N,R23E	Nevada Operations, Inc. P.O. Box 1650 Fallon, NV 89407
Soda Lake No. 1 (1987) and Soda Lake No. 2 (1991)	16.6	108,132	86,698	S33,T20N,R28E	Nevada Operations, Inc. P.O. Box 1650 Fallon, NV 89407
Steamboat I, I-A (1986) and Steamboat II, III (1992)	48	392,090	292,418	S29,T18N,R20E	S.B. Geo, Inc. P.O. Box 18087 Reno, NV 89511
Stillwater (1989)	13.0	94,236	85,368	S1,T19N,R30E S6,T19N,R31E	Nevada Operations, Inc. P.O. Box 1650 Fallon, NV 89407
Wabuska (1984)	1.2	4,447	2,142	S15,16,T15N, R25E	Tad's 10 Julian Lane Yerington, NV 89447
Yankee Caithness (1988)	14.4	82,102	74,584	S5,6,T17N,R20E	Yankee Caithness J.V.L.P. P.O. Box 18160 Reno, NV 89511
TOTAL	208.6	1,629,546	1,348,858		

[1]Production capacity from currently developed geothermal resources.
[2]Gross output of the Dixie Valley plant occasionally exceeds 66 MW.
Sources: Nevada Division of Minerals, plant operators, and NBMG files.



Rated capacity and average net output of Nevada geothermal plants, 1985–1993. Average net output is annual sales in megawatt-hours divided by the number of hours in a year (8,760). No commercial geothermal power was produced in Nevada before 1985.

the Basin and Range province as a whole, that aggressive exploration activity and continued rapid geothermal technologic advancements could add up to 2,000 MW of production capacity from known resources and new discoveries over the next 10 to 20 years (Wright, 1992). These relatively optimistic future scenarios should be tempered by today's reality of low-priced natural gas, increases in efficiency of fossil fuel generating equipment, and anticipated changes in power sales contracts. The future is bright for Nevada's high-temperature resources, but the pace of development will depend on many factors not related to the viability of the geothermal resource.

Beowawe

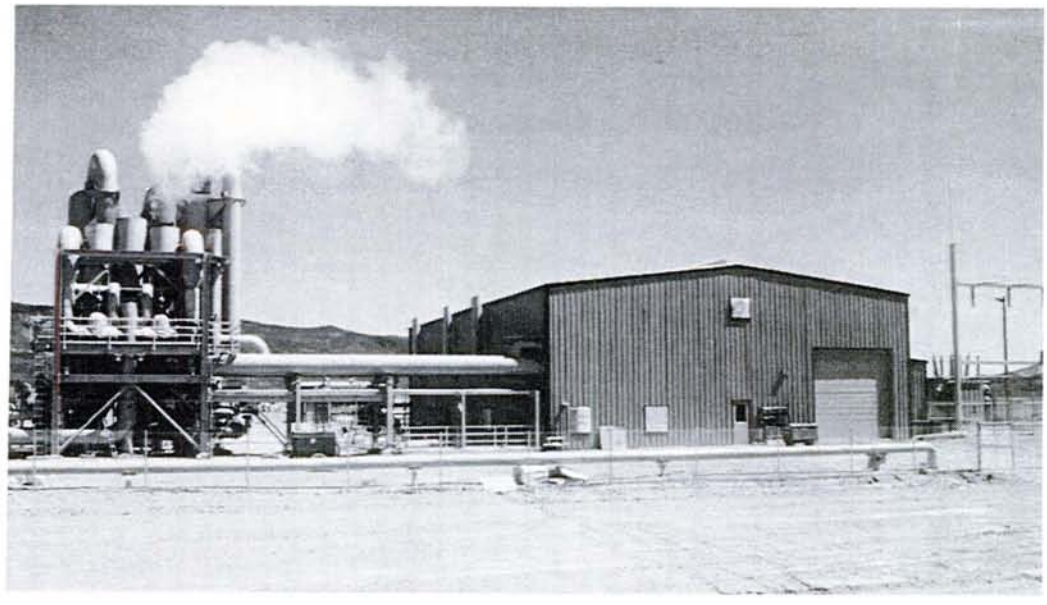
The Oxbow/Beowawe Geothermal Power Co., Beowawe plant came on line in 1988. It is a 16-MW (gross), dual-flash plant, which uses geothermal fluids from three wells with a resource temperature of 430°F.

Bradys Hot Springs

The Bradys Hot Springs geothermal power plant came on line in July 1992. Plant operation and maintenance is being performed by Oxbow Power Services, Inc. The plant uses 5.4 million pounds of brine per hour produced from six of eight production wells. The production zone is 1,000 to 1,400 feet deep with a resource temperature of between 342°F and 360°F. The wells supply two high pressure turbines and one low pressure turbine in a two-stage system that produces 21.1 MW gross output. Geothermal fluids are injected into three of five available injection wells. (Ettinger and Brugman, 1992; Geothermal Hot Line, v. 21, no.1)

Desert Peak

The Western States Geothermal Co. Desert Peak plant went on line in 1985. It was designed by Phillips Petroleum Co. and uses a biphase turbine built by TransAmerica Corp. Production capacity from the currently developed resource is 8.7 MW. The resource temperature is about 400°F and well-head temperature is 330°F.



Steam separators and power house at Bradys Hot Springs plant (Brady Power Partners), Churchill County. *Larry Green photo.*

Dixie Valley

The largest single geothermal power plant in Nevada, Oxbow Geothermal Corp. Dixie Valley plant, came on line in 1988 producing 55 to 59 MW (net). The power is produced in a double-flash turbine generator and is purchased by Southern California Edison Co. Oxbow estimates a geothermal energy reserve in Dixie Valley sufficient to supply 200 MW for 30 to 60 years. (GRC Bulletin, June 1987; Reno Gazette-Journal, August 6, 1988)

Empire/San Emidio Desert

The OESI/AMOR II Empire plant came on line in 1987 and consists of four Ormat Energy Converter Modules with a gross output of 3.6 MW from currently developed geothermal resources. Production is from a liquid-dominated geothermal source at 264°F to 279°F. San Emidio Resources continued their geothermal program in the San Emidio Desert near Gerlach, Nevada. Early in 1991 San Emidio Resources signed a 5-MW, 30-year geothermal power supply contract, effective 1992, and a 20-MW, 30-year geothermal power supply contract, effective 1995, both with Sierra Pacific Power Co. (GRC Bulletin, February 1991) The initial price paid for produced electricity under the long-term contracts is reported to be about 5 cents per kilowatt-hour. At that time plans called for construction of a 6.5-MW binary plant to be on line by November 1992. Since then San Emidio Resources requested and was granted a suspension of the 5-MW project in order for Sierra Pacific Power Co. and San Emidio Resources to determine the feasibility of combining the 5-MW and 20-MW projects into one project. In July 1993, Sierra Pacific Power Co. executed an amendment to the long-term power purchase agreement with San Emidio Resources. The agreement now calls for a 30-MW geothermal power plant to be on line by November 1, 1995 (Public Service Commission of Nevada).

Fallon

In early 1992 the U.S. Navy issued a request for proposal to construct an 80- to 90-MW geothermal power plant at the Fallon Naval Air Station. If this plant is constructed it will be phase I of the Navy's geothermal program. Phase II will consist of a second 80- to 90-MW facility to be constructed within 10 years of completion of the phase I project. The Navy estimates that the potential geothermal resource in the area will be able to produce 300 to 500 MW. The exploration drilling and reservoir testing performed during the initial phase of this project will be used to better define the geothermal potential of this area. Based on previous exploration information it is expected that the resource will be in the 347°F to 401°F range.

Fish Lake Valley

Fish Lake Power Co. continued their extensive drilling efforts to develop a geothermal resource in the Fish Lake Valley area of Esmeralda County. If a geothermal generating facility is built, the electricity would be delivered to California under a Standard Offer No. 4 Contract.

Hot Sulfur Springs

Earth Power Energy and Minerals has requested an avoided-cost purchase contract agreement with Idaho Power Co. If a contract were obtained, a 9.9-MW geothermal power plant could be constructed at Hot Sulfur Springs, Elko County, Nevada. (Reno Gazette-Journal, October 10, 1993)

Rye Patch

The Rye Patch Limited Partnership (OESI) is currently nearing completion of a 12.5-MW binary generating plant at their site near Rye Patch Reservoir. The company has a signed purchase agreement with Sierra Pacific Power Co. which had an anticipated plant on-line date of November 30, 1993. This has been delayed while the Rye Patch Limited partnership company continues to develop a sufficient and continuous geothermal resource that is required to fuel the plant.

Soda Lake

On August 19, 1991 the 13-MW OESI/AMOR III Soda Lake No. 2 geothermal power plant completed commercial operations testing and went on line. This plant is adjacent to the 3.6 MW OESI Soda Lake No. 1 plant that came on line during 1987 (GRC Bulletin, October 1991). Both plants are producing from a liquid-dominated geothermal source at 320°F.

Steamboat Springs

Two 18-MW, air-cooled, binary geothermal power plants, Steamboat II and III, operated by S.B. Geo, Inc., were brought on line in December 1992 adding 36-MW of production to the existing 12-MW S.B. Geo Steamboat plant for a combined gross production capacity of 48 MW.

The geothermal fluid cycle at the new plants is completely contained and the fluids are injected back into the ground (closed binary-cycle system). The existing resource is expected to last 30 years or more and can support an additional 36 MW of production capacity. Based on this, plans are currently being formulated to determine the feasibility of installing an additional 24-MW facility in the near future. In December 1993 S.B.Geo, Inc. received a $7.2 million

grant from the U.S. Department of Energy to develop a pilot project known as the Kalina pilot plant. The purpose of the project is to increase the efficiency of extracting heat from hot geothermal fluids.

Yankee Caithness J.V.L.P. operates a 14.4-MW (gross) flash turbine system producing from a 338°F resource. The Yankee Caithness Steamboat plant came on line in 1988 and the produced power is purchased by Sierra Pacific Power Co. on a 30-year contract.

Stillwater

OESI/AMOR IV, Stillwater Geothermal plant came on line in April 1989. Total project cost was $36 million. The air-cooled plant consists of 14 Ormat Energy Converters that have a combined gross generating capacity of 13 MW. The plant uses a liquid-dominated geothermal source ranging in temperature from 311°F to 338°F. The plant operates on a closed system; all geothermal liquids are reinjected. (Ormat Fact Sheet, 1989; Geo-Heat Center, Fall 1989)

Wabuska

Tad's Wabuska plant came on line in 1984. Current production capacity is 1.2 MW produced from two Ormat Energy Converter modules. The plant operates on fluids at 225°F produced from a depth of 350 feet. (GRC Bulletin, July 1987).

Non-Electric Low- and Moderate-Temperature Applications

The majority of Nevada's population is concentrated in two areas, Reno-Carson City and Las Vegas. Many of the state's geothermal resources are remote from any population centers, thus limiting some potential applications. Although 50 or more small to large communities are located within 5 miles of geothermal resources, only a few of these areas have been able to use these resources effectively. The reasons for this underutilization are varied. Although some reasons relate to technical and engineering problems (resource size and temperature, heat loss during transport, etc.), many more are economic (high capital outlays, long payout, under-capitalization of projects) and perceptual (unconventional vs. conventional technology, short vs. long term cost evaluations, uncertainties about long-term economic risks).

There have been attempts to use Nevada's low- and moderate-temperature geothermal resources at more than 20 areas, mainly in the past 5 to 10 years. Economic and/or technical appraisals of a number of areas have been conducted but for a variety of reasons projects were not completed.

Moana Geothermal Area

Moana Hot Springs, located in the southwestern part of Reno, have not flowed at the surface for at least 15 years. The springs were the discharge point for an area of thermal groundwater that has been used for a spa, swimming pool, and home heating for nearly 100 years. Recent use for home space heating began in the 1960s. The area today is predominantly residential. We estimate that the area of thermal groundwater encompasses at least 2,000 acres. In this area there are more than 300 homes that use geothermal fluids for space heating. One hundred and thirty of these homes are part of a district heating system, while most of the rest use down-hole heat exchangers in individual wells. A smaller district heating system has retrofitted 12 homes for geothermal heat, and plans to add another four in the spring of 1994. A large hotel, a motel, about three apartment or townhouse complexes, five churches, and a swimming pool also use the resource. The Veterans Administration Hospital, located about 1.2 miles northeast of the geothermal area, drilled a deep well several years ago, but encountered only about 109°F water. The well was plugged and abandoned.

Steamboat Hot Springs

The Steamboat geothermal area consists of a deep, high-temperature (420-464°F) geothermal system, a shallower, moderate-temperature (320-356°F) system, and a number of shallow, low-temperature (86-176°F) subsystems (Goranson and others, 1991). The higher temperature systems are used for electric-power generation (see the preceding section). A number of low-temperature thermal groundwater anomalies are in an area of about 20 square miles centered on the hot spring area (Goranson and others, 1991), but these thermal areas are not well known and are little used. A few homes in the Steamboat area have used low-temperature fluids for over 40 years, and one or more spas have been active in the springs area since the 1860s. Presently probably less than a dozen homes use the low-temperature geothermal fluids for space heating or domestic hot water (including swimming pools). An average of about one domestic geothermal well permit has been issued per year over the last 5 to 7 years.

Bower's Hot Springs

A large outdoor swimming pool and smaller children's pool at the Washoe County Park at Bower's Mansion (located between Reno and Carson City) are supplied with warm water from a geothermal well located near the spring.

Vegetable-dehydration plant under construction in the San Emidio Desert. *Larry Green photo.*

Carson City Area

Water from a well at the site of Carson Hot Springs in northern Carson City is used directly in a swimming pool. In southeast Carson City, thermal groundwater is found in the State Prison/Pinyon Hills area. In the past, there have been a few attempts to use the thermal groundwater from domestic wells in that area for space heating. Geothermal space heating has been considered but not implemented in at least two schools in the area.

Saratoga Hot Springs

A California company, Lobsters West, has proposed to raise lobsters near the warm springs about 10 miles southeast of Carson City. The geothermal fluids would be used to heat tanks in which the lobsters would grow to full size. The experimental study is proposed to last four years; live lobsters would be shipped twice a month to local markets (Reno Gazette-Journal, November 4, 1993).

Hobo Hot Springs

These hot springs, located about 10 miles south of Carson City, were used to raise tropical fish and Malaysian prawns in the late 1980s. Lobster raising was also considered. The water temperature is slightly over 104°F. The site is presently inactive.

Walley's Hot Springs

Walley's Hot Springs, located near Genoa, about 12 miles south of Carson City, was the site of a large spa in the late 1800s and early 1900s (Garside and Schilling, 1979). A modern spa was built on the site in the early 1980s. In addition to use of the geothermal fluids for bathing and domestic hot water, the buildings are heated with geothermal energy (Lienau and others, 1988).

Gerlach

Hot springs located just west of the town of Gerlach (Great Boiling Springs) have been used for bathing for many years. The Gerlach General Improvement District built a bath house to use the hot springs water in 1989. The facility was planned for use by tourists and local residents. The facility has been unable to obtain a permit from the health department because of plugging of water filters by sediment from the well. Future plans are for a geothermal heat exchanger system to heat city water for the spa. Geothermal ground water apparently extends under at least part of the town, as at least two Gerlach homes use geothermal wells for space heating. The water in one well is reported to be 95-97°F (Nevada Division of Minerals, unpubl. data).

San Emidio Desert

A vegetable dehydration plant is under construction in the San Emidio Desert area southwest of Gerlach. The plant is a few kilometers north of the Empire (OESI/AMOR II) electric-power plant. Integrated Ingredients (Spice Islands, Fleischmann's, and other brands), part of international food manufacturer Burns Philp, is contracting for the construction of the facility, which will employ about 25 persons when completed in early 1994. The number of employees

may increase to about 65 after 18 months. Onions and garlic will be dehydrated and stored at the plant (Reno Gazette-Journal, August 31, 1993). The plant will use about 300°F geothermal fluid.

Bradys Hot Springs

A geothermal vegetable dehydration plant has been operated at this site, about 50 miles northeast of Reno, since 1978. The facility uses a moderate-temperature (270°F) geothermal well on site. Since 1993, additional geothermal fluid has been supplied by the nearby Brady Power Partners electric power generation plant operated by Oxbow Power Services, Inc.

Wabuska Hot Springs

In addition to the rather low-temperature electric-power generation plant operated at Wabuska by Tad's Enterprises, several non-electric applications have been located at the area, but none are active today. A hydroponic geothermal greenhouse operation (tomatoes, cucumbers, etc.) was built on the site in the early 1970s, but few vegetables were grown. Tad's Enterprises has in the past operated a geothermal ethanol facility, a plant to grow algae (*Spirulina*) for human consumption, and facilities to raise Malaysian prawns, catfish, and tropical aquarium fish. Some of these were pilot facilities, rather than actual production facilities.

Rye Patch Geothermal Area

Florida Canyon Mining Co. operates a large open-pit gold mine and heap-leach gold recovery facility about 30 miles northeast of Lovelock and 4 miles north of the area presently under development by Rye Patch Limited Partnership for geothermal electric power production. A 590-foot well produces fluids at about 212°F; these fluids provide make-up water for the cyanide extraction solutions. Heat is also extracted via a heat exchanger to heat the solutions. The heating of cyanide solutions aids extraction during cold weather, and may enhance total gold recovery.

Darrough's Hot Springs Area

Round Mountain Gold Corp. operates a large open-pit gold mine and heap-leach gold recovery facility near the Darrough's Hot Springs geothermal area in Nye County. Geothermal fluids from shallow (about 1000-foot) wells are used in a heat exchanger to transfer heat to cyanide heap-leach solutions (Trexler and others, 1990). The heated cyanide solutions increase gold extraction during periods of freezing or near freezing weather; additionally, the heating of solutions may enhance total gold recovery.

Carlin

Carlin Hot Springs, located near the Humboldt River southwest of the town of Carlin, have a reported

NONDOMESTIC GEOTHERMAL WELLS REPORTED AS DRILLED OR COMPLETED IN NEVADA DURING 1993

Area	Company	Well name	Permit no.	Proposed depth (ft)	Location	Type
Churchill County						
Bradys Hot Springs	Brady Power Partners	#18-1	342	6,000	SW¼ SW¼ S1,T22N,R26E	Injection
Dixie Valley	Oxbow Geothermal	Re-entry Well #76-7	343	±10,000	NE¼ SE¼ S7,T24N,R37E	Production
Desert Peak	Western States Geo.	#34-13	347	4,900	SE¼ NW¼ S13,T22N,R27E	Temperature gradient
Bradys Hot Springs	Brady Power Partners	#18A-1	355	6,000	SW¼ SW¼ S1,T22N,R26E	Injection
Soda Lake	Soda Lake Resources Partnership	#32-33	369	±5,000	NE¼ NW¼ S33,T20N,R28E	Production/Injection
Esmeralda County						
Fish Lake Valley	Fish Lake Power Co.	#31-13	344	10,000	NE¼ NW¼ S13,T1S,R35E	Production
Fish Lake Valley	Fish Lake Power Co.	#54-14	349	10,000	SW¼ NE¼ S14,T1S,R35E	Production
Fish Lake Valley	Fish Lake Power Co.	#81-13	362	10,000	NE¼ NE¼ S13,T1S,R35E	Production
Pershing County						
Rye Patch	Rye Patch Limited Partnership	#46-28	345	4,000	NE¼ SW¼ S28,T31N,R33E	Production
Rye Patch	Rye Patch Limited Partnership	#62-28	346	4,000	NW¼ SE¼ S28,T31N,R33E	Production
Rye Patch	Rye Patch Limited Partnership	#63-28	351	4,000	SW¼ NE¼ S28,T31N,R33E	Production
Rye Patch	Rye Patch Limited Partnership	#51-21	352	5,000	NW¼ NE¼ S21,T31N,R33E	Production
Rye Patch	Rye Patch Limited Partnership	#42-28	354	4,000	NE¼ SW¼ S28,T31N,R33E	Production
Washoe County						
Gerlach	San Emidio Resources, Inc.	#38-10	331	3,000	SE¼ SW¼ S10,T32N,R23E	Observation
Steamboat	Yankee Caithness JVLP	#13-5	340	3,100	SE¼ NE¼ S5,T17N,R20E	Production
Gerlach	San Emidio Resources, Inc.	Gerlach #76-9	350	3,000	NE¼ SE¼ S9,T32N,R23E	Observation
San Emidio Desert	Empire Farms	#65C-16	360	<2,000	NW¼ SE¼ S16,T29N,R23E	Production
Steamboat	Far West Capital	SNLG #87-29	363	±4,000	SE¼ SE¼ S29,T18N,R20E	Observation

temperature of 176°F (Trexler and others, 1982). The Carlin High School used 88°F geothermal fluid from 918 foot well from 1986 to 1992 in a closed-loop space heating system. The well was abandoned in 1992, apparently in part because of scaling problems with iron and manganese.

Elko Area

Hot springs south of the town of Elko were first used in a bath house in the 1860s (Garside and Schilling, 1979). Thermal groundwater was known to exist to the north of the springs under a part of the town, but no use was made of it until the Elko Heat Co. began supplying geothermal fluid for space heating to several downtown buildings in 1982 (Rafferty, 1988). The company has continued to grow; in 1993 it served 16 commercial customers and two residential customers (Mike Lattin, oral commun., 1994).

The Elko County School District, in conjunction with the Elko General Hospital, developed a district geothermal heating system in 1986. The system supplies heat to eight buildings (two schools, a municipal swimming pool complex, a gym, a convention center, a hospital, a city hall, and a school administration building). In 1988 the estimated combined savings to all users over conventional heating methods was $300,000 per year (Rafferty, 1988; Richard Harris, oral commun., 1994).

Jackpot Area

Water from two wells drilled in 1988 at the Y3 Ranch about 4 miles southeast of Jackpot was used for raising catfish. The maximum reported well temperature was 104°F (Lund and others, 1990). The catfish-raising operation was not active in late 1993, reportedly due to insufficient geothermal fluid.

Wells Area

Warm springs about 1 mile north of the present town of Wells were referred to by travelers on the emigrant trail in the 1850s as Humboldt Wells (from which the town name is derived). Thermal (90°–93°F) groundwater is used by an elementary school and the Wells Rural Electric Co. in heat pump applications for space heating.

Duckwater (Big Warm) Springs

A geothermal catfish-growing facility has been operated at this site since 1982. The facility was purchased in 1992 by Robert and Jeff King (Valley Fish) of Preston, Idaho. The facility, located about 68 miles west of Ely, produces over 300,000 pounds of prime 8-ounce catfish filets per year (Geo-Heat Center Quarterly Bulletin, December 1992) that are shipped to Idaho for sale.

Caliente Hot Springs

The town of Caliente in Lincoln County derives its name from the local hot springs. A number of wells in the area have reported temperatures from 104 to 176°F (Garside and Schilling, 1979; Lienau and others, 1988). A motel supplies geothermal water from a well to bathing pools and individual room whirlpool baths, and a trailer park supplies hot water to individual mobile homes. The Lincoln County Hospital (20 beds) was heated using 102°F water from a well on the site, but reduced temperatures (to 82°F) forced reliance on electric heating. The hospital plans to use the lower-temperature fluids from its well for heating and cooling using heat-pump technology. The city swimming pool used geothermal heat in the past, but was damaged during the winter of 1992 and will probably be replaced. The City of Caliente has a grant from the Rural Development Administration to use the local geothermal resources. A nearby perlite processing plant may be the first user, for plant process heat. If more funding is found, the city plans to provide heat to the hospital, swimming pool, and eventually an elementary school and youth training facility (Glen Van Roekel, oral commun., 1994).

Ash Springs

Thermal waters (88°–97°F) at Ash Springs, located about 6 miles north of Alamo, in Lincoln County, have been used in the past at a spa on the site. The facility was closed when visited in 1993.

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