Minerals yearbook: Area reports: domestic 1974. Year 1974, Volume 2 1974

Bureau of Mines
Washington, D. C.: Bureau of Mines : United States Government Printing Office, 1974

Minerals Yearbook

1974

Volume II

AREA REPORTS: DOMESTIC

Prepared by staff of the

BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Cecil D. Andrus, Secretary

BUREAU OF MINES

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

U.S. GOVERNMENT PRINTING OFFICE

WASHINGTON : 1977

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

Stock No. 024-004-01916-6

Foreword

The Federal Government, through the medium of the Minerals Yearbook or its predecessor volumes, has for 92 years reported annually on mineral industry activities. This edition of the Minerals Yearbook presents the record on worldwide mineral industry performance during 1974. In addition to statistics, the volumes provide background information to help in interpreting the year's developments. The content of the individual volumes is as follows:

Volume I, Metals, Minerals, and Fuels, contains chapters on virtually all metallic, nonmetallic, and mineral fuel commodities important to the domestic economy. In addition, it includes a general review chapter on the mineral industries, a statistical summary, and a chapter on mining and quarrying trends.

Volume II, Area Reports: Domestic, contains chapters on the mineral industry of each of the 50 States, the U.S. island possessions in the Pacific Ocean and the Caribbean Sea, the Commonwealth of Puerto Rico, and the Canal Zone. This volume also has a statistical summary, identical to that in Volume I.

Volume III, Area Reports: International, contains the latest available mineral data on more than 130 foreign countries and discusses the importance of minerals to the economies of these nations. A separate chapter reviews minerals in general and their relationships to the world economy.

The Bureau of Mines continually strives to improve the value of the Yearbook for its users. Therefore, the constructive comments and suggestions of readers will be welcomed.

Director.

Acknowledgments

The chapters of this volume, for the most part, were written by the Bureau's State Liaison Officers, located throughout the country. Several of the chapters, however, were written by staff members of the Divisions of Coal, Interfuel Studies, Ferrous Metals, Nonmetallic Minerals, and Petroleum and Natural Gas of the Associate Directorate, Mineral and Materials Supply/Demand Analysis.

The Statistical Summary chapter and the tabular material covering total State mineral production, value of mineral production by county, and economic indicators were prepared in the Office of Technical Data Services. The Minerals Yearbook staff of that office reviewed the manuscripts upon which this volume was based, to insure statistical consistency among the tables, figures, and text between this volume and Volume I, and between this volume and those of former years.

Compilations contained in this volume were based largely on statistical data and other facts provided by the mineral industries. The Bureau gratefully acknowledges the willing contribution of these essential data by both companies and individuals.

In the collection of statistical and other mineral-industry information, the Bureau of Mines was also assisted by various State agencies through cooperative agreements. Many of the chapters in Volume II were reviewed by staff members of these agencies, and in some instances the staff members collaborated in preparing the chapters and are shown as coauthors. Our sincere appreciation for this assistance is extended to the following cooperating organizations:

Alabama: Geological Survey of Alabama.
Alaska: Alaska Department of Natural Resources.
Arizona: Arizona Bureau of Mines.
Arkansas: Arkansas Geological Commission.
California: Division of Mines and Geology, California Department of Conservation.
Colorado: Divison of Mines of the State of Colorado.
Connecticut: Connecticut Geological and Natural History Survey.
Delaware: Delaware Geological Survey.
Florida: Bureau of Geology, Florida Department of Natural Resources.
Georgia: Earth and Water Division, Georgia Department of Natural Resources.
Hawaii: Hawaii Department of Land and Natural Resources.
Idaho: Idaho Bureau of Mines and Geology.
Illinois: Illinois State Geological Survey.
Indiana: Geological Survey, Indiana Department of Natural Resources.
Iowa: Geological Survey of Iowa.
Kansas: State Geological Survey of Kansas.
Kentucky: Geological Survey of Kentucky.
Louisiana: Louisiana Geological Survey.
Maine: Bureau of Geology of Maine.
Maryland: Maryland Geological Survey.
Massachusetts: Department of Public Works, Commonwealth of Massachusetts.
Michigan: Geological Survey Division, Michigan Department of Natural Resources.

Minnesota: Minnesota Geological Survey.
Mississippi: Mississippi Geological, Economic, and Topographical Survey.
Missouri: Division of Geology and Land Survey, Department of Natural Resources.
Montana: Montana Bureau of Mines and Geology.
Nebraska: Conservation and Survey Division of the University of Nebraska (Nebraska Geological Survey).
Nevada: Nevada Bureau of Mines.
New Hampshire: New Hampshire Department of Resources and Economic Development.
New Jersey: Bureau of Geology and Topography, New Jersey Division of Natural Resources.
New York: New York State Museum and Science Service.
North Carolina: Office of Earth Resources, North Carolina Department of Natural and Economic Resources.
North Dakota: North Dakota Geological Survey.
Oklahoma: Oklahoma Geological Survey.
Oregon: Department of Geology and Mineral Industries of Oregon.
Pennsylvania: Pennsylvania Bureau of Topographic and Geologic Survey, Department of Environmental Resources.
Puerto Rico: Department of Natural Resources; Economic Development Administration.
South Carolina: South Carolina Division of Geology, State Development Board.
South Dakota: South Dakota Geological Survey.
Tennessee: Division of Geology, Tennessee Department of Conservation.
Texas: Bureau of Economic Geology, The University of Texas at Austin.
Utah: Utah Geological and Mineral Survey.
Vermont: Geological Survey of Vermont.
Virginia: Division of Mineral Resources, Department of Conservation and Economic Development.
Washington: Washington Division of Geology and Earth Resources.
West Virginia: West Virginia Geological and Economic Survey.
Wisconsin: Geological and Natural History Survey of Wisconsin.
Wyoming: Geological Survey of Wyoming.

ALBERT E. SCHRECK, *Editor-in-Chief.*

Contents

Statistical Summary

By Staff, Office of Technical Data Services

This chapter summarizes data on crude mineral production for the United States, its island possessions, and the Commonwealth of Puerto Rico. Included also are tables that show the principal mineral commodities exported from and imported into the United States, and that compare world and U.S. mineral production. The detailed data from which these tables were derived are contained in the individual commodity chapters of volume I and in the State chapters of volume II of this edition of the Minerals Yearbook.

Although crude mineral production may be measured at any of several stages of extraction and processing, the stage of measurement used in this chapter is what is normally termed "mine output." It usually refers to minerals or ores in the form in which they are first extracted from the ground, but customarily includes the product of auxiliary processing at or near the mines.

Because of inadequacies in the statistics available, some series deviate from the foregoing definition. In the cases of gold, silver, copper, lead, zinc and tin, the quantities are recorded on a mine basis (as the recoverable content of ore sold or treated). However the values assigned to these quantities are based on the average selling price of refined metal, not on the mine value. Mercury is measured as recovered metal and valued at the average New York price for the metal.

The weight or volume units shown are those customarily used in the particular industries producing the commodities. Values shown are in current dollars, with no adjustment made to compensate for changes in the purchasing power of the dollar.

Table 1.—Value of crude mineral production [1] in the United States, by mineral group
(Million dollars)

Year	Mineral fuels	Nonmetals except fuels	Metals	Total [2]
1970	20,152	5,712	3,928	29,792
1971	21,247	6,058	r 3,406	r 30,711
1972	22,061	6,482	3,642	32,185
1973	25,012	7,413	4,362	r 36,787
1974	40,937	8,682	5,552	55,172

r Revised.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Data may not add to totals shown because of independent rounding.

Table 2.—Mineral production [1] in the United States

Mineral	1971		1972		1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
MINERAL FUELS								
Asphalt and related bitumens, native: Bituminous limestone, sandstone, gilsonite ——— short tons	1,668,928	$8,291	1,995,374	$10,303	2,088,657	$8,464	2,021,165	$16,666
Carbon dioxide, natural ——— thousand cubic feet	1,271,995	216	1,228,741	165	1,134,986	259	966,118	237
Coal:								
Bituminous and lignite [2] —— thousand short tons	552,192	3,901,496	595,386	4,561,983	591,738	5,049,612	603,406	9,502,347
Pennsylvania anthracite ——— do	8,727	103,469	7,106	85,251	6,830	90,260	6,617	144,695
Helium:								
Crude ——— million cubic feet	3,988	47,856	3,467	41,604	2,558	30,696	184	2,208
High-purity ——— do	577	14,539	629	15,673	647	16,121	699	18,105
Natural gas ——— do	22,493,012	4,085,482	22,531,698	4,180,462	22,647,549	4,894,072	21,600,522	6,573,402
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels	200,181	616,657	193,480	604,423	187,390	668,784	168,152	1,107,158
LPG ——— do	417,634	769,397	444,736	847,810	447,033	1,188,289	447,946	1,980,769
Peat ——— thousand short tons	600	7,011	607	7,112	621	7,547	706	10,989
Petroleum (crude) ——— thousand 42-gallon barrels	3,453,914	11,692,998	3,455,368	11,706,510	3,360,903	13,057,905	3,202,585	21,580,549
Total mineral fuels ———	XX	21,247,000	XX	22,061,000	XX	25,012,000	XX	40,937,000
NONMETALS (EXCEPT FUELS)								
Abrasive stones [3] ——— short tons	2,349	563	3,241	670	3,466	667	3,134	717
Asbestos ——— do	130,882	12,174	131,663	13,408	150,036	16,288	109,091	13,393
Barite ——— thousand short tons	825	13,491	906	14,883	1,104	16,688	1,106	16,822
Boron minerals ——— do	1,047	89,856	1,121	95,882	1,225	113,648	1,185	128,306
Bromine ——— thousand pounds	355,946	61,750	386,864	63,689	418,250	67,131	432,094	117,715
Calcium-magnesium chloride ——— short tons	W	W	W	W	609,300	17,581	867,100	29,189
Cement:								
Portland ——— thousand short tons	75,881	1,421,388	77,973	1,588,290	82,718	1,810,292	75,983	1,992,695
Masonry ——— do	3,341	84,556	3,777	100,269	4,057	119,547	3,371	111,106
Clays ——— do	56,666	274,431	59,456	303,022	64,351	354,058	60,796	422,542
Diatomite ——— short tons	535,318	34,392	576,089	37,554	608,906	36,083	664,303	50,693
Emery ——— do	W	W	2,883	W	2,884	W	W	W
Feldspar ——— do	742,810	9,969	746,212	10,623	791,900	12,830	853,702	14,482
Fluorspar ——— do	272,071	17,263	250,347	17,315	248,601	r 17,381	201,116	14,297
Garnet (abrasive) ——— do	18,984	1,934	18,916	1,957	22,772	2,381	24,684	2,550
Gem stones [e] ———	NA	2,589	NA	2,728	NA	2,739	NA	4,583
Gypsum ——— thousand short tons	10,418	39,057	12,328	48,504	13,558	56,650	11,999	52,894
Lime ——— do	19,591	308,100	20,290	339,304	21,090	365,849	21,606	473,685
Magnesium compounds from seawater and brine (except for metal) ——— short tons, MgO equivalent	668,649	62,322	729,472	63,915	853,907	77,733	907,492	96,742

Mica:								
Scrap ---------- thousand short tons --	127	2,917	160	4,353	177	6,082	137	5,475
Sheet ---------- pounds --	17,005	7	14,280	7	--	--	15,000	15
Perlite ---------- short tons --	432,208	4,941	544,594	6,231	543,683	5,591	555,000	7,024
Phosphate rock ---------- thousand short tons --	38,886	203,828	40,831	207,910	42,137	238,667	45,686	501,429
Potassium salts thousand short tons, K_2O equivalent --	2,587	100,527	2,659	106,680	2,603	112,613	2,552	158,974
Pumice ---------- thousand short tons --	3,391	5,214	3,813	6,539	r 3,937	r 8,881	3,937	9,121
Pyrites ---------- thousand long tons --	808	7,137	741	6,652	559	4,961	424	4,238
Salt ---------- thousand short tons --	44,077	303,687	45,022	296,772	43,910	306,103	46,536	360,763
Sand and gravel ---------- do ----	919,593	1,148,969	914,324	1,200,701	983,629	1,359,370	978,754	1,451,071
Sodium carbonate (natural) ---------- do ----	2,878	60,774	3,218	71,689	3,722	94,385	4,059	137,486
Sodium sulfate (natural) ---------- do ----	688	11,008	701	11,396	672	11,597	684	16,411
Stone [4] ---------- do ----	876,123	1,594,065	920,423	1,672,293	1,060,124	1,990,463	1,043,542	2,186,155
Sulfur, Frasch process -------- thousand long tons --	6,738	117,894	7,613	132,385	7,438	138,578	7,898	241,066
Talc, soapstone, pyrophyllite ---------- short tons --	1,037,297	7,634	1,107,404	7,828	1,246,534	9,144	1,267,633	11,099
Tripoli ---------- do ----	75,134	569	87,864	797	101,519	930	86,000	3,665
Vermiculite ---------- thousand short tons --	301	7,198	337	8,092	365	9,464	341	10,120
Value of items that cannot be disclosed: Aplite, brucite (1971), natural and slag cement, graphite, iodine, kyanite, lithium minerals, magnesite, greensand marl, olivine, staurolite, wollastonite, and values of nonmetal items indicated by symbol W ----	XX	47,358	XX	39,730	XX	28,926	XX	35,763
Total nonmetals ----------	XX	6,058,000	XX	6,482,000	XX	7,413,000	XX	8,682,000
METALS								
Antimony ore and concentrate short tons, antimony content --	1,025	933	489	386	545	688	661	2,040
Bauxite ------ thousand long tons, dried equivalent --	1,988	28,543	1,812	23,238	1,879	26,635	1,949	25,663
Copper (recoverable content of ores, etc.) short tons --	1,522,183	1,583,071	1,664,840	1,704,796	1,717,940	2,044,346	1,597,002	2,468,964
Gold (recoverable content of ores, etc.) troy ounces --	1,495,108	61,673	1,449,943	84,967	1,175,750	115,000	1,126,886	180,009
Iron ore, usable (excluding byproduct iron sinter) thousand long tons, gross weight --	77,106	891,002	77,884	950,365	90,654	1,163,710	84,985	1,388,447
Lead (recoverable content of ores, etc.) short tons --	578,550	159,679	618,915	186,046	603,024	196,465	663,870	298,742
Manganese ore (35% or more Mn) short tons, gross weight --	142	W	578	W	239	W	--	--
Manganiferous ore (5% to 35% Mn) --------- do ----	198,334	W	147,161	W	203,055	W	272,908	2,323
Mercury ---------- 76-pound flasks --	17,883	5,229	7,333	1,601	2,171	621	2,189	617
Molybdenum (content of concentrate) thousand pounds --	97,882	164,917	102,197	170,530	135,097	217,701	118,163	234,658
Nickel (content of ore and concentrate) short tons --	17,036	W	16,864	W	18,272	W	16,618	W
Rare-earth metal concentrates ---------- do ----	17,194	7,538	19,520	8,479	31,278	13,780	35,218	15,966
Silver (recoverable content of ores, etc.) thousand troy ounces --	41,564	64,258	37,233	62,737	37,827	96,762	33,762	159,018
Tin ---------- long tons --	W	W	W	W	W	W	139	1,056

See footnotes at end of table.

Table 2.—Mineral production [1] in the United States—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
METALS—Continued								
Titanium concentrate:								
Ilmenite ---------- short tons, gross weight --	713,610	$15,936	739,801	$16,739	804,355	$19,829	755,299	$22,715
Rutile ---------- do ----	W	W	W	W	9,045	1,212	6,446	996
Tungsten ore and concentrate thousand pounds contained W --	6,827	20,184	7,045	18,104	7,059	19,154	7,836	37,413
Uranium (recoverable content U_3O_8) thousand pounds --	24,515	151,996	25,758	162,272	r 25,803	r 167,718	23,227	243,884
Vanadium (recoverable in ore and concentrate, short tons --	5,252	37,690	4,887	30,867	4,377	26,611	4,870	38,266
Zinc (recoverable content of ores, etc.) ------ do ----	r 502,543	r 161,820	478,318	169,803	478,850	197,861	499,872	358,908
Value of items that cannot be disclosed: Beryllium, cobalt (1971), magnesium chloride for magnesium metal, manganiferous residuum, platinum-group metals (crude), zircon concentrate, and values of metal items indicated by symbol W ----------	XX	51,690	XX	50,650	XX	r 54,004	XX	72,772
Total metals ----------	XX	r 3,406,000	XX	3,642,000	XX	4,362,000	XX	5,552,000
Grand total ----------	XX	r 30,711,000	XX	32,185,000	XX	r 36,787,000	XX	55,172,000

e Estimate. r Revised. NA Not available. XX Not applicable. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."

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

[2] Includes a small quantity of anthracite mined in States other than Pennsylvania. In 1971, value excluded that of Arizona, which is withheld to avoid disclosing individual company confidential data; value included with "Nonmetal items that cannot be disclosed."

[3] Grindstones, pulpstones, grinding pebbles, sharpening stones, and tube mill liners.

[4] Excludes abrasive stone, bituminous limestone, bituminous sandstone, and soapstone, all included elsewhere in table.

Table 3.—Minerals produced in the United States and principal producing States in 1974

Mineral	Principal producing States, in order of quantity	Other producing States
Antimony ore and concentrate	Idaho, Mont., Nev.	
Aplite	Va.	
Asbestos	Calif., Vt., Ariz., N.C.	
Asphalt (native)	Tex., Utah, Ala., Mo.	
Barite	Nev., Mo., Ga., Ark	Alaska, Calif., Idaho, Ill., Tenn.
Bauxite	Ark., Ala., Ga.	
Beryllium concentrate	Utah.	
Boron minerals	Calif.	
Bromine	Ark., Mich., Calif.	
Calcium-magnesium chloride	Mich. and Calif.	
Carbon dioxide (natural)	N. Mex., Calif., Colo., Utah.	
Cement	Calif., Tex., Pa., Mich	Ala., Ariz., Ark., Colo., Fla., Ga., Hawaii, Idaho, Ill., Ind., Iowa, Kans., Ky., La., Maine, Md., Minn., Miss., Mo., Mont., Nebr., Nev., N. Mex., N.Y., N.C., Ohio, Okla., Oreg., S.C., S. Dak., Tenn., Utah, Va., Wash., W. Va., Wis., Wyo.
Clays	Ga., Tex., Ohio, N.C	All other States except Alaska, R.I., Vt.
Coal	Ky., W. Va., Pa., Ill	Ala., Alaska, Ariz., Ark., Colo., Ind., Iowa, Kans., Md., Mo., Mont., N. Mex., N. Dak., Ohio, Okla., Tenn., Tex., Utah, Va., Wash., Wyo.
Copper (mine)	Ariz., Utah, N. Mex., Mont	Alaska, Calif., Colo., Idaho, Ill., Maine, Mich., Mo., Nev., Okla., Oreg., Tenn., Wash., Wis.
Diatomite	Calif., Nev., Wash	Kans. and Oreg.
Emery	N.Y.	
Feldspar	N.C., Conn., Ga., Calif	Ariz., Colo., Okla., S. Dak., Wyo.
Fluorspar	Ill., Mont., Tex., Nev	Colo., Ky., N. Mex., Utah.
Garnet, abrasive	Idaho and N.Y.	
Gold (mine)	S. Dak., Nev., Utah, Ariz	Alaska, Calif., Colo., Idaho, Mont., N. Mex., Oreg., Tenn., Wash.
Graphite	Tex.	
Gypsum	Calif., Mich., Tex., Iowa	Ariz., Ark., Colo., Idaho, Ind., Kans., La., Mont., Nev., N. Mex., N.Y., Ohio, Okla., S. Dak., Utah, Va., Wash., Wyo.
Helium	Kans., Tex., Okla., Ariz.	
Iodine	Mich.	
Iron ore	Minn., Mich., Calif., Wyo	Ala., Ariz., Ark., Colo., Ga., Idaho, Mo., Mont., Nev., N. Mex., N.Y., N.C., Pa., S. Dak., Tex., Utah, Wis.
Kyanite	Va., Ga., Fla.	
Lead (mine)	Mo., Idaho, Colo., Utah	Ariz., Calif., Ill., Maine, Mont., Nev., N. Mex., N.Y., Okla., Oreg., Wash., Wis.
Lime	Ohio, Pa., Mo., Tex	Ala., Ariz., Ark., Calif., Colo., Conn., Fla., Hawaii, Idaho, Ill., Ind., Iowa, Kans., Ky., La., Md., Mass., Mich., Minn., Miss., Mont., Nebr., Nev., N. Mex., N.Y., N. Dak., Okla., Oreg., S. Dak., Tenn., Utah, Va., Wash., W. Va., Wis., Wyo.
Lithium minerals	N.C., Nev., Calif.	
Magnesite	Nev.	
Magnesium chloride	Tex.	
Magnesium compounds	Mich., Calif., N.J., Fla	Del., Miss., Tex., Utah.
Manganiferous ore	Minn. and N. Mex.	
Manganiferous residuum	N.J.	
Marl, greensand	N.J.	
Mercury	Calif., N.Y., Nev., Alaska.	
Mica, scrap	N.C., Ala., Ga., S.C	Ariz., Conn., N. Mex., S. Dak.
Molybdenum	Colo., Ariz., N. Mex., Utah	Calif. and Nev.
Natural gas	Tex., La., Okla., N. Mex	Ala., Alaska, Ariz., Ark., Calif., Colo., Fla., Ill., Ind., Kans., Ky., Md., Mich., Miss., Mo., Mont., Nebr., N.Y., N. Dak., Ohio, Pa., Tenn., Utah, Va., W. Va., Wyo.
Natural gas liquids	Tex., La., Okla., N. Mex	Ala., Alaska, Ark., Calif., Colo., Fla., Ill., Kans., Ky., Mich., Miss., Mont., Nebr., N. Dak., Pa., S. Dak., Utah, W. Va., Wyo.
Nickel	Oreg.	
Olivine	Wash. and N.C.	

Table 3.—Minerals produced in the United States and principal producing States in 1974—Continued

Mineral	Principal producing States, in order of quantity	Other producing States
Peat	Mich., Ill., Ind., Fla	Calif., Colo., Ga., Iowa, Maine, Md., Mass., Minn., Mont., N.J., N. Mex., N.Y., N. Dak., Ohio, Pa., S.C., Vt., Wash., Wis.
Perlite	N. Mex., Ariz., Calif., Nev	Colo. and Idaho.
Petroleum, crude	Tex., La., Calif., Okla	Ala., Alaska, Ariz., Ark., Colo., Fla., Ill., Ind., Kans., Ky., Mich., Miss., Mo., Mont., Nebr., Nev., N. Mex., N.Y., N. Dak., Ohio, Pa., S. Dak., Tenn., Utah, Va., W. Va., Wyo.
Phosphate rock	Fla., Idaho, Tenn., N.C	Mo., Mont., Utah, Wyo.
Platinum-group metals	Alaska.	
Potassium salts	N. Mex., Utah, Calif.	
Pumice	Oreg., Calif., Ariz., N. Mex	Colo., Hawaii, Idaho, Kans., Nev., Okla., Utah, Wash.
Pyrites ore and concentrate	Tenn., Colo., Ariz.	
Rare-earth metal concentrate	Calif., Ga., Fla.	
Salt	La., Tex., N.Y., Ohio	Ala., Calif., Colo., Kans., Mich., Nev., N. Mex., N. Dak., Okla., Utah, W. Va.
Sand and gravel	Alaska, Calif., Mich., Ill., Tex	All other States.
Silver (mine)	Idaho, Ariz., Mont., Utah	Alaska, Calif., Colo., Ill., Maine, Mich., Mo., Nev., N. Mex., N.Y., Okla., Oreg., S. Dak., Tenn., Wash., Wis.
Sodium carbonate (natural)	Wyo. and Calif.	
Sodium sulfate (natural)	Calif., Colo., Nev	
Staurolite	Fla.	
Stone	Pa., Ill., Tex., Fla	All other States except Del.
Sulfur (Frasch)	Tex. and La.	
Talc, soapstone, pyrophyllite	N.Y., Mont., Vt., Tex	Ala., Ark., Calif., Ga., Md., Nev., N.C., Oreg., Pa., Va., Wash.
Tin	Colo., N. Mex., Alaska.	
Titanium concentrate	N.Y., Fla., N.J., Ga.	
Tripoli	Ill., Okla., Ark., Pa.	
Tungsten concentrate	Calif., Colo., Nev	Ariz., Idaho, Mont., Utah, Wash.
Uranium	N. Mex., Wyo., Colo., Utah	Tex. and Wash.
Vanadium	Ark., Colo., Idaho, Utah	N. Mex.
Vermiculite	Mont. and S.C.	
Wollastonite	N.Y.	
Zinc (mine)	N.Y., Mo., Tenn., Colo	Ariz., Calif., Idaho, Ill., Maine, Mont., Nev., N.J., N. Mex., Okla., Oreg., Pa., Utah, Va., Wash., Wis.
Zircon concentrate	Fla. and Ga.	

Table 4.—Value of mineral production in the United States and principal minerals produced in 1974

State	Value (thousands)	Rank	Percentage of U.S. total	Principal minerals, in order of value
Alabama	$764,746	19	1.39	Coal, petroleum, cement, stone.
Alaska	448,437	23	.81	Petroleum, sand and gravel, natural gas, stone.
Arizona	1,562,234	9	2.83	Copper, molybdenum, sand and gravel, cement.
Arkansas	406,821	26	.74	Petroleum, bromine, stone, natural gas.
California	2,797,080	3	5.07	Petroleum, cement, sand and gravel, natural gas.
Colorado	750,299	20	1.36	Petroleum, perlite, coal, sand and gravel.
Connecticut	35,362	47	.06	Stone, sand and gravel, feldspar, lime.
Delaware	[1] 3,793	50	([2])	Sand and gravel, magnesium compounds, clays, gem stones.
Florida	1,043,895	14	1.89	Phosphate rock, petroleum, stone, cement.
Georgia	363,100	29	.66	Clays, stone, cement, sand and gravel.
Hawaii	42,042	44	.08	Stone, cement, sand and gravel, pumice.
Idaho	208,558	31	.38	Silver, phosphate rock, zinc, sand and gravel.
Illinois	1,149,210	11	2.08	Coal, petroleum, stone, sand and gravel.
Indiana	440,690	24	.80	Coal, cement, stone, petroleum.
Iowa	176,720	32	.32	Cement, stone, sand and gravel, gypsum.
Kansas	889,398	18	1.61	Petroleum, natural gas, natural gas liquids, cement.
Kentucky	2,563,210	4	4.65	Coal, stone, petroleum, natural gas.
Louisiana	8,146,578	2	14.77	Petroleum, natural gas, natural gas liquids, sulfur.
Maine	36,348	45	.07	Cement, sand and gravel, zinc, stone.
Maryland	172,880	33	.31	Coal, stone, cement, sand and gravel.
Massachusetts	62,109	43	.11	Stone, sand and gravel, lime, clays.
Michigan	1,040,067	15	1.89	Iron ore, petroleum, cement, copper.
Minnesota	1,026,366	16	1.86	Iron ore, sand and gravel, stone, cement.
Mississippi	391,155	28	.71	Petroleum, natural gas, sand and gravel, cement.
Missouri	691,049	21	1.25	Lead, cement, stone, zinc.
Montana	574,801	22	1.04	Petroleum, copper, coal, cement.
Nebraska	98,634	42	.18	Petroleum, cement, sand and gravel, stone.
Nevada	257,876	30	.47	Copper, gold, sand and gravel, diatomite.
New Hampshire	13,691	48	.02	Sand and gravel, stone, clays, gem stones.
New Jersey	140,748	37	.26	Stone, sand and gravel, zinc, magnesium compounds.
New Mexico	1,941,544	8	3.52	Petroleum, natural gas, copper, natural gas liquids.
New York	440,573	25	.80	Cement, stone, zinc, salt.
North Carolina	155,869	35	.28	Stone, sand and gravel, cement, feldspar.
North Dakota	159,427	34	.29	Petroleum, coal, natural gas liquids, sand and gravel.
Ohio	1,107,670	12	2.01	Coal, stone, lime, cement.
Oklahoma	2,123,690	7	3.85	Petroleum, natural gas, natural gas liquids, cement.
Oregon	103,920	40	.19	Stone, sand and gravel, cement, nickel.
Pennsylvania	2,374,512	6	4.30	Coal, cement, stone, lime.
Rhode Island	5,982	49	.01	Stone, sand and gravel, gem stones.
South Carolina	105,171	39	.19	Cement, stone, clays, sand and gravel.
South Dakota	102,627	41	.19	Gold, cement, stone, sand and gravel.
Tennessee	395,608	27	.71	Coal, stone, zinc, cement.
Texas	13,711,144	1	24.85	Petroleum, natural gas, natural gas liquids, cement.
Utah	952,045	17	1.72	Copper, petroleum, coal, gold.
Vermont	35,453	46	.06	Stone, asbestos, sand and gravel, talc.
Virginia	1,058,207	13	1.92	Coal, stone, cement, sand and gravel.
Washington	143,916	36	.26	Cement, sand and gravel, stone, coal.
West Virginia	2,403,177	5	4.36	Coal, natural gas, stone, cement.
Wisconsin	114,763	38	.21	Stone, sand and gravel, iron ore, cement.
Wyoming	1,437,200	10	2.60	Petroleum, sodium compounds, coal, uranium.
Total	55,172,000	--	100.0	

[1] Incomplete total.
[2] Less than ½ percent.

Table 5.—Value of mineral production per capita and per square mile in 1974, by State

State	Area (square miles)	1970 population (thousands)	Value of mineral production				
			Total (thousands)	Per square mile		Per capita	
				Dollars	Rank	Dollars	Rank
Alabama	51,609	3,444	$764,746	$14,818	16	$222	19
Alaska	586,412	300	448,437	765	50	1,495	4
Arizona	113,909	1,771	1,562,234	13,715	18	882	8
Arkansas	53,104	1,923	406,821	7,660	27	212	20
California	158,693	19,953	2,797,080	17,626	13	140	26
Colorado	104,247	2,207	750,299	7,197	29	340	14
Connecticut	5,009	3,032	35,362	7,060	30	12	47
Delaware	2,057	548	[1]3,793	1,844	44	7	49
Florida	58,560	6,789	1,043,895	17,826	12	154	23
Georgia	58,876	4,590	363,100	6,167	32	79	33
Hawaii	6,450	769	42,042	6,518	31	55	36
Idaho	83,557	713	208,558	2,496	39	293	15
Illinois	56,400	11,114	1,149,210	20,376	9	103	29
Indiana	36,291	5,194	440,690	12,143	20	85	31
Iowa	56,290	2,824	176,720	3,139	37	63	35
Kansas	82,264	2,247	889,398	10,812	22	396	13
Kentucky	40,395	3,219	2,563,210	63,454	8	796	11
Louisiana	48,523	3,641	8,146,578	167,891	1	2,237	2
Maine	33,215	992	36,348	1,094	48	37	41
Maryland	10,577	3,922	172,880	16,345	14	44	38
Massachusetts	8,257	5,689	62,109	7,522	28	11	48
Michigan	58,216	8,875	1,040,067	17,866	11	117	27
Minnesota	84,068	3,805	1,026,366	12,209	19	270	16
Mississippi	47,716	2,217	391,155	8,198	26	176	22
Missouri	69,686	4,677	691,049	9,916	23	148	25
Montana	147,138	694	574,801	3,907	34	828	10
Nebraska	77,227	1,483	98,634	1,217	47	67	34
Nevada	110,540	489	257,876	2,333	40	527	12
New Hampshire	9,304	738	13,691	1,472	45	19	46
New Jersey	7,836	7,168	140,748	17,962	10	20	45
New Mexico	121,666	1,016	1,941,544	15,958	15	1,911	3
New York	49,576	18,237	440,573	8,887	25	24	44
North Carolina	52,586	5,082	155,869	2,964	38	31	42
North Dakota	70,665	618	159,427	2,256	41	258	17
Ohio	41,222	10,652	1,107,670	26,871	7	104	28
Oklahoma	69,919	2,559	2,123,690	30,374	6	830	9
Oregon	96,981	2,091	103,920	1,072	49	50	37
Pennsylvania	45,333	11,794	2,374,512	52,379	4	201	21
Rhode Island	1,214	947	5,982	4,928	33	6	50
South Carolina	31,055	2,591	105,171	3,387	36	41	40
South Dakota	77,047	666	102,627	1,332	46	154	24
Tennessee	42,244	3,924	395,608	9,365	24	101	30
Texas	267,338	11,197	13,711,144	51,288	5	1,225	6
Utah	84,916	1,059	952,045	11,212	21	899	7
Vermont	9,609	444	35,453	3,690	35	80	32
Virginia	40,817	4,648	1,058,207	25,926	8	228	18
Washington	68,192	3,409	143,916	2,110	42	42	39
West Virginia	24,181	1,744	2,403,177	99,383	2	1,378	5
Wisconsin	56,154	4,418	114,763	2,044	43	26	43
Wyoming	97,914	332	1,437,200	14,678	17	4,329	1
Total	3,615,055	202,455	55,172,000	15,262	--	273	--

[1] Incomplete total.

Table 6.—Mineral production [1] in the United States, by State

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
ALABAMA								
Cement: [2]								
Masonry ---- thousand short tons	349	$8,657	407	$11,221	425	$13,074	314	$11,322
Portland ---- do	2,284	42,281	2,360	48,577	2,396	55,820	2,190	61,990
Clays [3] ---- do	2,915	6,913	2,850	7,512	2,934	8,788	2,995	13,298
Coal (bituminous) ---- do	17,944	146,180	20,814	200,430	19,230	211,695	19,824	432,036
Iron ore (usable) -- thousand long tons, gross weight	415	2,773	327	1,912	271	1,408	W	W
Lime ---- thousand short tons	761	11,454	739	11,751	881	14,050	1,054	22,346
Natural gas ---- million cubic feet	355	54	3,644	1,282	11,271	4,307	27,865	20,704
Petroleum (crude) ---- thousand 42-gallon barrels	7,832	23,496	9,934	30,466	11,677	41,772	13,323	113,808
Sand and gravel ---- thousand short tons	6,674	7,513	6,352	8,530	9,805	13,870	12,454	19,120
Stone [4] ---- do	17,773	34,413	18,485	42,027	20,043	40,117	23,773	60,231
Value of items that cannot be disclosed: Asphalt (native), bauxite, cement (slag, 1971–73), clays (bentonite), mica (scrap), natural gas liquids, salt, stone (dimension), talc, and values indicated by symbol W	XX	7,758	XX	7,588	XX	8,155	XX	9,891
Total	XX	291,492	XX	371,241	XX	413,056	XX	764,746
ALASKA								
Barite ---- thousand short tons	102	1,075	W	W	W	W	20	401
Coal (bituminous) ---- do	698	5,710	668	W	694	W	700	W
Gem stones	NA	W	NA	57	NA	57	NA	57
Gold (recoverable content of ores, etc.) -- troy ounces	13,012	537	8,639	506	7,107	695	9,146	1,461
Lead (recoverable content of ores, etc.) -- short tons	--	--	--	--	6	2	--	--
Natural gas ---- million cubic feet	121,618	17,878	125,596	18,463	131,007	19,483	128,935	21,919
Petroleum (crude) ---- thousand 42-gallon barrels	79,494	257,562	72,893	235,444	72,323	261,877	70,603	347,408
Sand and gravel ---- thousand short tons	23,617	32,806	14,187	15,214	14,999	19,913	117,752	52,788
Silver (recoverable content of ores, etc.) thousand troy ounces	1	1	(5)	(5)	1	2	1	3
Stone ---- thousand short tons	2,658	5,066	652	3,012	5,967	12,741	5,484	12,947
Tin ---- long tons	17	47	W	W	5	12	W	W
Value of items that cannot be disclosed: Copper (1974), mercury, natural gas liquids, platinum-group metals, uranium (1971–73), and values indicated by symbol W	XX	2,141	XX	13,442	XX	r 14,156	XX	11,453
Total	XX	322,823	XX	286,138	XX	r 328,938	XX	448,437
ARIZONA								
Clays ---- thousand short tons	[3] 119	[3] 84	[3] 134	[3] 355	[3] 117	[3] 459	199	622
Coal (bituminous) ---- do	1,146	W	W	W	3,247	W	6,448	W
Copper ---- short tons	820,171	852,978	908,612	930,419	927,271	1,103,453	858,783	1,327,678
Gem stones	NA	160	NA	168	NA	170	NA	1,500
Gold (recoverable content of ores, etc.) -- troy ounces	94,038	3,879	102,996	6,036	102,848	10,060	90,586	14,470

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
ARIZONA—Continued								
Gypsum ____ thousand short tons	W	W	W	W	158	$669	141	$473
Helium, high-purity ____ million cubic feet	W	W	W	W	W	W	W	W
Iron ore (usable) ____ thousand long tons, gross weight	16	W	W	W	W	W	W	W
Lead (recoverable content of ores, etc.) ____ short tons	859	$237	1,763	$530	763	248	1,059	476
Lime ____ thousand short tons	296	4,474	356	6,024	365	7,019	422	9,071
Mica (scrap) ____ do	W	W	W	W	W	W	2	82
Molybdenum (content of concentrate) thousand pounds	22,684	39,872	27,216	46,791	37,657	59,372	28,346	57,067
Natural gas (marketed) ____ million cubic feet	868	153	442	80	125	23	224	45
Petroleum (crude) ____ thousand 42-gallon barrels	1,236	3,918	993	3,226	804	3,103	740	3,885
Pumice ____ thousand short tons	949	625	915	722	853	715	846	865
Sand and gravel ____ do	19,791	24,391	24,842	32,420	27,440	38,503	23,417	41,906
Silver (recoverable content of ores, etc.) thousand troy ounces	6,170	9,538	6,653	11,210	7,199	18,416	6,356	29,935
Stone ____ thousand short tons	2,873	5,848	4,638	8,018	4,265	9,469	4,932	11,479
Zinc (recoverable content of ores, etc.) ____ short tons	7,761	2,499	10,111	3,589	8,427	3,482	9,699	6,964
Value of items that cannot be disclosed: Asbestos, cement, clays (fire, 1971–73, bentonite), diatomite (1971–72), feldspar, fluorspar (1971–73), perlite, pyrites, tungsten, and values indicated by symbol W	XX	32,364	XX	41,416	XX	49,827	XX	55,716
Total	XX	981,020	XX	1,091,004	XX	1,304,988	XX	1,562,234
ARKANSAS								
Bauxite ____ thousand long tons, dried equivalent	1,781	24,979	1,634	21,010	1,686	23,884	1,731	23,597
Clays ____ thousand short tons	[3] 936	[3] 1,499	[3] 885	[3] 990	[3] 1,446	[3] 1,412	984	1,597
Coal (bituminous) ____ do	276	2,848	428	4,676	434	5,806	455	9,673
Gem stones	NA	30	NA	32	NA	50	NA	60
Iron ore ____ thousand long tons, gross weight	--	--	--	--	W	W	4	W
Lime ____ thousand short tons	157	2,313	150	2,456	177	2,742	187	3,189
Natural gas ____ million cubic feet	172,154	29,426	166,522	28,808	157,529	28,985	123,975	32,234
Natural gas liquids: Natural gasoline and cycle products thousand 42-gallon barrels	517	1,686	261	854	204	861	199	1,344
LP gases ____ do	1,035	2,650	546	1,420	449	1,688	418	2,491
Petroleum (crude) ____ do	18,263	56,805	18,519	58,335	18,016	70,618	16,527	122,817
Sand and gravel ____ thousand short tons	11,630	15,603	11,574	16,558	12,465	20,625	14,878	29,922
Stone ____ do	17,647	28,776	16,317	25,020	16,223	26,209	20,381	38,905
Value of items that cannot be disclosed: Abrasive stones, barite, bromine, cement, clays (kaolin, 1971–73), gypsum, mercury (1971), soapstone, tripoli, vanadium, and values indicated by symbol W	XX	79,703	XX	81,020	XX	90,825	XX	140,992
Total	XX	246,318	XX	241,179	XX	273,705	XX	406,821

CALIFORNIA								
Asbestos ---------- short tons --	87,144	7,806	90,967	8,673	105,663	10,886	58,331	5,697
Barite ---------- thousand short tons --	W	W	4	34	11	152	4	W
Boron minerals ---------- do ----	1,047	89,856	1,121	95,882	1,225	113,648	1,185	128,306
Cement ---------- do ----	9,117	169,921	9,086	182,308	9,395	201,892	8,264	210,520
Clays ---------- do ----	[3]2,822	[3]7,103	2,706	7,387	2,723	6,853	2,497	7,626
Copper (recoverable content of ores, etc.) - short tons --	515	536	598	612	369	440	194	300
Gem stones ----------	NA	205	NA	215	NA	220	NA	220
Gold (recoverable content of ores, etc.) - troy ounces --	2,966	122	3,974	233	3,647	357	5,049	807
Gypsum ---------- thousand short tons --	1,352	3,884	1,525	4,965	1,778	5,834	1,716	6,642
Lead (recoverable content of ores, etc.) -- short tons --	2,284	630	1,153	347	44	44	35	16
Lime ---------- thousand short tons --	630	10,846	608	13,059	632	13,602	600	14,877
Magnesium compounds from seawater and bitterns (partly estimated) ---- short tons, MgO equivalent --	152,918	16,836	175,654	18,421	184,105	19,233	163,847	18,356
Mercury ---------- 76-pound flasks --	13,489	3,944	5,835	1,274	1,219	349	1,311	370
Natural gas ---------- million cubic feet --	612,629	199,717	487,278	179,318	449,369	167,615	365,354	160,756
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels --	11,045	35,545	8,468	27,664	6,865	23,475	5,709	26,104
LP gases ---------- do ----	6,755	16,482	5,847	15,962	5,329	19,824	5,095	29,296
Peat ---------- thousand short tons --	12	W	29	620	21	373	14	322
Petroleum (crude) ------- thousand 42-gallon barrels --	358,484	975,076	347,022	940,430	336,075	1,045,193	323,003	1,710,350
Pumice ---------- thousand short tons --	699	1,179	731	1,507	768	3,237	909	3,219
Rare-earth metal concentrates ---------- short tons --	--	--	W	W	W	W	34,284	15,798
Salt ---------- thousand short tons --	1,887	21,142	1,621	14,860	1,507	15,533	W	W
Sand and gravel ---------- do ----	115,468	157,683	117,288	162,619	117,470	176,286	105,191	176,213
Silver (recoverable content of ores, etc.) thousand troy ounces --	444	686	175	296	56	143	42	197
Stone ---------- thousand short tons --	43,336	86,255	37,213	65,811	43,838	77,175	45,709	91,891
Talc, soapstone, pyrophyllite ---------- short tons --	153,227	2,084	155,155	1,186	179,191	1,501	161,154	1,682
Zinc (recoverable content of ores, etc.) --------- do ----	3,003	967	1,202	427	20	8	8	6
Value of items that cannot be disclosed: Bromine, calcium-magnesium chloride, carbon dioxide, cement (masonry 1971–73), coal (lignite, 1971–72), diatomite, feldspar, iron ore, lithium minerals, molybdenum, perlite, potassium salts, sodium carbonate and sulfate, tungsten concentrate, and values indicated by symbol W ----------	XX	112,218	XX	107,266	XX	137,843	XX	187,509
Total ----------	XX	1,920,723	XX	1,851,376	XX	2,041,686	XX	2,797,080
COLORADO								
Carbon dioxide ---------- thousand cubic feet --	W	W	W	W	W	W	123,106	W
Clays ---------- thousand short tons --	625	1,334	747	1,533	794	1,710	663	1,588
Coal (bituminous) ---------- do ----	5,337	33,813	5,522	35,637	6,233	46,190	6,896	64,677
Copper (recoverable content of ores, etc.) - short tons --	3,938	4,096	3,944	4,039	3,123	3,716	3,012	4,657
Feldspar ---------- do ----	571	4	W	W	W	W	W	W
Gem stones ----------	NA	125	NA	131	NA	131	NA	135
Gold (recoverable content of ores, etc.) -- troy ounces --	42,031	1,734	61,100	3,580	63,422	6,203	52,083	8,320
Gypsum ---------- thousand short tons --	W	W	W	W	151	568	191	800
Lead (recoverable content of ores, etc.) -- short tons --	25,746	7,106	31,346	9,423	28,112	9,159	24,609	11,074

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
COLORADO—Continued								
Lime thousand short tons	193	$3,039	187	$4,070	178	$3,371	198	$3,815
Mica, sheet pounds	8,300	4	14,280	7	--	--	--	--
Natural gas million cubic feet	108,537	16,932	116,949	19,297	137,725	24,304	144,629	28,926
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels	929	2,462	1,245	3,349	1,424	4,295	1,574	9,319
LP gases do	1,653	3,190	1,749	3,673	1,978	6,488	2,580	14,190
Peat thousand short tons	28	156	39	210	28	163	30	201
Petroleum (crude) thousand 42-gallon barrels	27,391	92,855	32,015	109,171	36,590	155,507	37,508	283,904
Pumice thousand short tons	62	W	59	W	W	W	W	W
Sand and gravel do	27,000	30,155	28,318	34,631	33,767	45,493	23,793	39,674
Silver (recoverable content of ores, etc.) thousand troy ounces	3,390	5,241	3,664	6,174	r 3,598	r 9,204	2,784	13,113
Stone thousand short tons	3,785	7,933	4,507	9,599	6,357	14,003	6,572	15,109
Uranium (recoverable content U_3O_8) thousand pounds	2,536	15,725	1,877	11,825	r 1,888	r 12,274	W	W
Zinc (recoverable content of ores, etc.) short tons	61,181	19,700	63,801	22,649	58,339	24,106	49,489	35,533
Value of items that cannot be disclosed: Beryllium concentrate (1971–72), cement, fluorspar, iron ore, mica (scrap 1971), molybdenum, perlite, pyrites, salt, tin, tungsten, vanadium and values indicated by symbol W	XX	147,117	XX	146,843	XX	164,806	XX	215,264
Total	XX	392,721	XX	425,841	XX	r 531,691	XX	750,299
CONNECTICUT								
Clays thousand short tons	174	322	157	292	162	320	156	363
Feldspar short tons	W	W	W	W	77,206	W	W	W
Gem stones	NA	15	NA	16	NA	16	NA	15
Lime thousand short tons	W	W	W	W	W	W	33	1,148
Mica scrap thousand short tons	3	W	2	W	3	W	2	W
Sand and gravel do	6,921	10,262	6,763	11,270	7,806	12,788	6,345	11,272
Stone do	7,193	15,649	8,719	19,695	9,682	21,305	8,457	21,134
Value of items that cannot be disclosed: Mica (sheet, 1974) and values indicated by symbol W	XX	1,713	XX	1,850	XX	2,375	XX	1,430
Total	XX	27,961	XX	33,123	XX	36,804	XX	35,362
DELAWARE								
Clays thousand short tons	14	8	15	9	15	9	14	8
Gem stones	NA	2	NA	W	NA	W	NA	2
Sand and gravel thousand short tons	2,205	2,231	2,257	2,660	3,408	3,678	2,396	3,783
Value of items that cannot be disclosed: Other nonmetals and values indicated by symbol W	--	--	XX	202	XX	202	XX	W
Total	XX	2,241	XX	2,871	XX	3,889	XX	e 3,793

FLORIDA								
Cement:								
Masonry — thousand short tons	180	4,877	213	6,901	256	8,706	235	4,737
Portland — do	2,177	48,970	2,425	59,773	2,725	72,666	2,562	75,133
Clays — do	[3]993	[3]12,834	[3]922	[3]10,336	1,139	13,718	[3]808	[3]14,261
Lime — do	159	2,958	180	3,527	187	4,026	185	5,315
Natural gas — million cubic feet	903	270	15,521	4,967	33,857	11,613	38,137	20,441
Peat — thousand short tons	57	412	45	362	44	384	67	616
Petroleum (crude) — thousand 42-gallon barrels	5,347	W	16,897	W	32,695	150,070	36,351	351,331
Sand and gravel — thousand short tons	23,228	18,836	22,363	17,009	20,167	21,415	24,372	33,400
Stone [4] — do	42,816	64,332	53,093	81,621	61,735	103,595	54,560	100,378
Titanium concentrates (rutile) — short tons	--	--	W	W	9,045	1,212	6,446	996
Value of items that cannot be disclosed: Clay (kaolin, except 1973), kyanite, magnesium compounds, natural gas liquids, phosphate, rock, rare-earth metal concentrate (1972–74), staurolite, stone (dimension), titanium concentrate (ilmenite), zircon concentrate, and values indicated by symbol W	XX	190,242	XX	242,136	XX	[r]213,695	XX	437,287
Total	XX	343,731	XX	426,632	XX	601,100	XX	1,043,895
GEORGIA								
Cement:								
Masonry — thousand short tons	63	1,470	68	1,569	67	2,126	40	1,304
Portland — do	1,214	22,470	1,260	27,286	1,201	28,124	1,150	31,585
Clays [3] — do	5,791	119,096	6,227	132,322	7,721	160,419	7,692	203,936
Feldspar — short tons	W	W	W	W	51,523	W	W	W
Peat — thousand short tons	1	13	W	W	(5)	4	1	6
Sand and gravel — do	3,697	5,310	3,816	4,729	4,976	6,781	4,989	9,639
Stone — do	30,669	69,897	37,074	82,484	40,841	97,506	40,321	105,582
Talc — short tons	53,000	334	45,842	338	38,000	114	33,850	102
Value of items that cannot be disclosed: Barite, bauxite, fire clay, kyanite, mica (scrap), rare-earth metal concentrate, titanium concentrate, zircon concentrate, and values indicated by symbol W	XX	10,895	XX	9,589	XX	10,405	XX	10,996
Total	XX	229,485	XX	258,317	XX	305,479	XX	363,100
HAWAII								
Cement:								
Masonry — thousand short tons	11	431	13	384	16	537	14	706
Portland — do	375	10,196	402	10,732	453	13,213	487	16,405
Gem stones	NA	54	NA	57	NA	W	NA	W
Lime — thousand short tons	8	228	7	266	6	238	6	221
Pumice, pumicite, volcanic ash — do	289	779	379	762	354	611	385	792
Sand and gravel — do	836	1,967	609	1,893	753	2,012	990	2,379
Stone — do	[4]6,056	[4]14,357	[4]5,005	[4]13,494	7,180	18,466	[4]7,638	[4]21,370
Value of items that cannot be disclosed: Clays, salt, stone (dimension, except 1973), and values indicated by symbol W	XX	95	XX	486	XX	70	XX	169
Total	XX	28,107	XX	28,074	XX	35,147	XX	42,042

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
IDAHO								
Antimony ore and concentrate short tons, antimony content	857	$817	345	$303	322	$406	445	W
Clays thousand short tons	W	W	57	415	42	227	[3] 9	[3] $10
Copper (recoverable content of ores, etc.) short tons	3,776	3,927	2,942	3,013	3,625	4,314	2,841	4,393
Gem stones	NA	100	NA	105	NA	110	NA	120
Gold (recoverable content of ores, etc.) troy ounces	3,596	148	2,884	169	2,696	264	2,898	463
Gypsum thousand short tons	--	--	--	--	W	W	W	W
Lead (recoverable content of ores, etc.) short tons	66,610	18,384	61,407	18,459	61,744	20,116	51,717	23,273
Mercury 76-pound flasks	1,057	309	161	35	--	--	--	--
Peat thousand short tons	W	W	--	--	--	--	--	--
Pumice do	W	W	W	W	80	110	108	182
Sand and gravel do	11,279	11,437	7,696	10,294	8,393	10,246	7,665	10,484
Silver (recoverable content of ores, etc.) thousand troy ounces	19,140	29,590	14,251	24,012	13,620	34,840	12,436	58,572
Stone thousand short tons	4,149	6,118	3,094	7,042	2,972	8,096	3,528	9,868
Tungsten concentrate thousand pounds contained W	[r] 24	66	W	W	W	W	W	W
Zinc (recoverable content of ores, etc.) short tons	45,078	14,515	38,647	13,720	46,107	19,052	39,469	28,339
Value of items that cannot be disclosed: Cement, clays, (fire clay and kaolin, 1971, 1974), fluorspar (1971), abrasive garnet, iron ore, lime, perlite, phosphate rock, vanadium, and values indicated by symbol W	XX	26,869	XX	28,639	XX	38,300	XX	72,854
Total	XX	112,280	XX	106,206	XX	136,081	XX	208,558
ILLINOIS								
Cement:								
Masonry thousand short tons	73	2,336	80	2,483	88	2,901	69	3,228
Portland do	1,425	25,975	1,571	33,124	1,572	36,064	1,460	41,023
Clays do	1,788	4,294	[3] 1,716	[3] 3,314	[3] 1,758	[3] 3,613	[3] 1,587	[3] 3,744
Coal (bituminous) do	58,402	318,878	65,523	402,481	61,572	413,309	58,215	582,010
Fluorspar short tons	138,051	9,883	132,405	9,961	160,305	11,871	153,698	12,247
Gem stones	NA	2	NA	2	NA	2	NA	2
Lead (recoverable content of ores, etc.) short tons	1,238	342	1,335	401	541	176	493	222
Natural gas million cubic feet	498	139	1,194	334	1,688	573	1,436	574
Peat thousand short tons	72	W	74	935	72	1,037	96	1,412
Petroleum (crude) thousand 42-gallon barrels	39,084	135,621	34,874	121,013	30,669	132,490	27,553	244,395
Sand and gravel thousand short tons	45,364	59,397	39,929	61,696	43,649	62,029	42,705	68,566
Stone do	[4] 61,991	[4] 106,084	[4] 56,260	[4] 94,225	66,653	114,068	63,231	121,763
Zinc (recoverable content of ores, etc.) short tons	12,706	4,091	11,378	4,039	5,250	2,169	4,104	2,947
Value of items that cannot be disclosed: Barite (1974), clay (fuller's earth, except 1971), copper (1974), lime, natural gas liquids, silver, stone (dimension, 1971–72), tripoli, and values indicated by symbol W	XX	33,828	XX	35,729	XX	45,306	XX	67,077
Total	XX	700,870	XX	769,737	XX	825,608	XX	1,149,210

INDIANA								
Clays ---- thousand short tons	[3]1,324	[3]2,308	[3]1,419	[3]2,465	1,436	2,568	1,092	1,947
Coal (bituminous) ---- do	21,396	110,796	25,949	144,688	25,253	153,136	23,726	198,410
Natural gas ---- million cubic feet	537	89	355	55	276	38	176	25
Peat ---- thousand short tons	50	W	45	478	51	475	71	946
Petroleum (crude) ---- thousand 42-gallon barrels	6,658	22,770	6,130	20,964	5,312	20,823	4,919	42,402
Sand and gravel ---- thousand short tons	24,982	29,094	27,978	33,290	27,731	35,015	26,077	35,656
Stone ---- do	26,233	48,218	27,511	50,919	[4]32,288	[4]57,652	[4]31,031	[4]64,106
Value of items that cannot be disclosed: Abrasive stone, cement, clay (fire, 1971–72), gypsum, lime, sandstone (1973–74), and values indicated by symbol W	XX	68,246	XX	69,749	XX	81,698	XX	97,198
Total	XX	281,521	XX	322,608	XX	351,405	XX	440,690
IOWA								
Cement:								
Masonry ---- thousand short tons	66	1,719	66	1,916	68	2,351	65	2,660
Portland ---- do	2,392	47,925	2,458	49,635	2,688	59,574	2,424	64,156
Clays ---- do	[3]1,028	[3]1,702	1,047	2,643	967	2,028	960	1,869
Coal (bituminous) ---- do	989	4,609	851	4,138	601	3,279	590	4,591
Gem stones	W	W	NA	1	NA	W	NA	W
Gypsum ---- thousand short tons	1,154	4,460	1,380	5,714	1,470	6,234	1,397	7,142
Sand and gravel ---- do	18,279	20,530	17,107	20,140	19,950	25,541	17,091	26,104
Stone ---- do	[4]25,389	[4]44,977	27,457	48,642	31,541	56,918	32,342	66,119
Value of items that cannot be disclosed: Clay (fire, 1971), lime, peat, stone (dimension, 1971), and values indicated by symbol W	XX	1,899	XX	1,667	XX	2,785	XX	4,079
Total	XX	127,821	XX	134,496	XX	158,800	XX	176,720
KANSAS								
Cement:								
Masonry ---- thousand short tons	50	1,232	59	1,452	73	2,068	64	2,203
Portland ---- do	1,731	29,961	1,889	35,432	2,026	42,172	1,940	46,940
Clays ---- do	879	1,151	1,170	1,457	1,169	1,490	1,311	1,785
Coal (bituminous) ---- do	1,151	6,579	1,227	7,835	1,086	7,979	718	5,463
Helium:								
Crude ---- million cubic feet	2,510	30,120	2,278	27,336	1,539	18,468	W	W
High-purity ---- do	342	7,182	384	8,064	416	8,736	499	11,477
Lime ---- thousand short tons	8	W	9	172	10	199	28	535
Natural gas ---- million cubic feet	885,144	127,267	889,268	127,859	893,118	138,521	886,782	147,206
Natural gas liquids:								
Natural gasoline ---- thousand 42-gallon barrels	5,387	12,253	5,505	13,170	5,993	17,685	6,630	24,810
LP gases ---- do	23,215	39,001	25,099	43,170	24,463	53,819	24,402	78,818
Petroleum (crude) ---- do	78,532	276,433	73,744	259,578	66,227	281,465	61,691	490,984
Salt [7] ---- thousand short tons	1,240	18,712	1,369	20,562	1,397	23,460	1,367	27,007
Sand and gravel ---- do	11,862	11,351	11,591	10,920	13,261	12,663	11,687	13,388
Stone ---- do	[4]14,908	23,697	[4]14,547	[4]23,849	[4]18,334	[4]33,601	[4]17,869	34,869
Value of items that cannot be disclosed: Gypsum, pumice, salt (brine), stone (dimension), and values indicated by symbol W	XX	4,505	XX	3,741	XX	3,973	XX	3,913
Total	XX	589,444	XX	584,597	XX	646,299	XX	889,398

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
KENTUCKY								
Clays [3] thousand short tons	956	$1,377	920	$1,406	1,083	$1,961	848	$1,477
Coal (bituminous) do	119,389	774,735	121,188	824,691	127,645	986,654	137,197	2,340,961
Natural gas million cubic feet	72,723	18,253	63,648	15,976	62,396	21,839	71,876	35,938
Petroleum (crude) thousand 42-gallon barrels	10,692	35,925	9,702	32,599	8,687	34,515	7,837	68,340
Sand and gravel thousand short tons	8,202	11,061	8,485	11,967	10,331	14,627	8,710	12,887
Stone do	[4] 32,514	[4] 52,296	[4] 34,279	[4] 59,690	[4] 38,205	[4] 70,912	34,542	66,632
Zinc (recoverable content of ores, etc.) short tons	5,268	1,696	1,780	632	278	113	--	--
Value of items that cannot be disclosed: Cement, clay (ball), fluorspar, lime, natural gas liquids, and stone (quartzite, 1971–73)	XX	30,542	XX	29,949	XX	34,141	XX	36,975
Total	XX	925,885	XX	976,910	XX	1,164,762	XX	2,563,210
LOUISIANA								
Clays thousand short tons	1,073	1,606	1,000	1,454	979	1,329	770	1,425
Lime do	960	17,625	908	19,614	897	16,801	796	17,665
Natural gas million cubic feet	8,081,907	1,632,545	7,972,678	1,626,426	8,242,423	1,846,303	7,753,631	2,380,365
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels	54,424	173,425	52,842	167,768	47,906	167,037	35,860	234,954
LP gases do	90,271	166,099	99,233	185,660	102,701	253,671	108,439	423,996
Petroleum (crude) do	935,243	3,359,710	891,827	3,201,659	831,524	3,327,702	737,324	4,811,772
Salt thousand short tons	13,352	67,950	13,514	67,464	13,152	66,211	13,543	76,960
Sand and gravel do	19,228	24,492	18,920	26,996	13,748	21,165	12,341	27,781
Stone [4] do	9,688	14,139	9,190	14,836	10,802	21,309	10,940	24,046
Sulfur (Frasch process) thousand long tons	3,646	W	3,765	W	3,329	W	W	W
Value of items that cannot be disclosed: Cement, gypsum, stone (miscellaneous), and values indicated by symbol W	XX	94,739	XX	99,666	XX	98,082	XX	147,614
Total	XX	5,552,330	XX	5,411,543	XX	5,819,610	XX	8,146,578
MAINE								
Clays thousand short tons	[3] 42	[3] 56	40	57	41	74	146	183
Copper short tons	2,510	2,610	1,220	1,249	1,107	1,317	1,522	2,353
Gem stones	NA	40	NA	W	NA	W	NA	W
Lead short tons	--	--	85	26	204	66	279	126
Peat thousand short tons	2	W	2	99	5	177	4	194
Sand and gravel do	8,292	5,881	11,818	7,535	13,583	10,304	8,755	10,673
Silver thousand troy ounces	41	64	16	27	W	W	W	W
Stone thousand short tons	1,133	2,913	1,078	2,996	1,212	3,329	1,491	4,255
Zinc (recoverable content of ore, etc.) short tons	5,850	1,884	5,820	2,066	19,640	8,115	10,425	7,485
Value of items that cannot be disclosed: Cement, clays (1971), and values indicated by symbol W	XX	8,540	XX	8,867	XX	10,111	XX	11,079
Total	XX	21,898	XX	22,922	XX	33,493	XX	36,348

MARYLAND								
Clays[3] thousand short tons	1,027	1,558	1,104	2,121	897	1,973	884	2,066
Coal (bituminous) do	1,644	10,274	1,640	8,961	1,789	18,644	2,337	48,630
Gem stones	NA	8	NA	8	NA	8	NA	8
Lime thousand short tons	W	W	W	W	W	W	23	527
Natural gas million cubic feet	214	43	244	51	298	69	133	32
Peat thousand short tons	3	39	3	29	2	29	3	45
Sand and gravel do	12,842	23,201	12,594	26,557	12,845	29,625	11,690	29,386
Stone do	15,912	34,770	19,431	41,973	18,585	46,732	18,072	47,630
Value of items that cannot be disclosed: Cement, clay (selected), lime (1971–73), greensand marl (1971), talc, soapstone, and values indicated by symbol W	XX	29,527	XX	35,801	XX	39,827	XX	44,556
Total	XX	99,420	XX	115,501	XX	131,907	XX	172,880
MASSACHUSETTS								
Clays thousand short tons	186	377	219	416	217	404	218	379
Gem stones	NA	5	NA	5	NA	5	NA	5
Lime thousand short tons	W	W	W	W	W	W	170	4,972
Peat do	2	32	W	W	2	78	3	85
Sand and gravel do	17,343	23,058	18,883	25,655	18,743	26,910	17,334	26,565
Stone do	7,816	23,582	7,990	23,500	8,580	28,738	8,103	30,103
Value of items that cannot be disclosed: Nonmetals and values indicated by symbol W (1971–73)	XX	3,145	XX	2,852	XX	3,547	XX	--
Total	XX	50,199	XX	52,428	XX	59,682	XX	62,109
MICHIGAN								
Cement:								
Masonry thousand short tons	239	5,872	250	5,959	247	6,185	217	6,309
Portland do	6,108	104,665	5,901	111,410	6,242	123,442	5,903	140,513
Clays do	2,458	3,366	2,514	3,715	2,151	3,304	2,161	4,074
Copper (recoverable content of ores, etc.) short tons	56,005	58,245	67,260	68,874	72,221	85,943	67,012	103,601
Gem stones	NA	8	NA	8	NA	8	NA	8
Gypsum thousand short tons	1,433	5,585	1,650	7,267	1,882	8,538	1,482	7,258
Iron ore (usable) thousand long tons, gross weight	11,833	159,854	12,692	177,461	12,389	180,194	11,602	213,598
Lime thousand short tons	1,444	20,549	1,509	22,753	1,545	26,055	1,528	30,036
Magnesium compounds from seawater and brine (except for metal) short tons, MgO equivalent	272,918	27,777	377,675	31,484	455,501	41,790	503,281	53,302
Natural gas million cubic feet	25,662	6,776	34,221	10,506	44,579	17,495	69,133	34,843
Natural gas liquids:								
Natural gasoline thousand 42-gallon barrels	553	1,513	395	1,097	372	1,189	466	3,089
LP gases do	975	2,623	833	2,274	691	2,529	849	5,383
Peat thousand short tons	202	2,497	219	2,190	232	2,172	244	3,811
Petroleum (crude) thousand 42-gallon barrels	11,893	38,859	12,990	41,556	14,614	59,413	18,021	154,746
Salt thousand short tons	4,458	49,007	4,358	50,761	4,818	53,732	4,445	62,055
Sand and gravel do	56,613	62,898	59,467	65,445	62,407	73,972	60,027	82,617
Silver (recoverable content of ores, etc.) thousand troy ounces	670	1,036	785	1,323	850	2,175	643	3,028
Stone thousand short tons	40,705	49,240	39,754	50,317	45,886	60,494	47,479	72,748
Value of items that cannot be disclosed: Bromine, calcium-magnesium chloride, and iodine	XX	40,266	XX	40,367	XX	40,392	XX	59,048
Total	XX	640,636	XX	694,767	XX	789,022	XX	1,040,067

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971		1972		1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
MINNESOTA								
Clays ---- thousand short tons	223	$335	[3] 167	[3] $251	[3] 156	[3] $233	W	W
Gem stones	NA	13	NA	14	NA	14	NA	$14
Iron ore (usable) -- thousand long tons, gross weight	49,054	547,607	50,595	601,869	62,614	782,197	59,422	949,678
Manganiferous ore (5% to 35% Mn) short tons, gross weight	169,732	W	119,324	W	170,971	W	225,560	W
Peat ---- thousand short tons	W	W	W	W	W	W	20	471
Sand and gravel ---- do	44,916	37,645	36,792	33,454	37,935	39,438	36,720	42,370
Stone ---- do	5,838	14,346	5,757	16,318	7,581	20,411	8,301	22,041
Value of items that cannot be disclosed: Abrasive stones, cement, clays (selected, 1972–74), lime, and values indicated by symbol W	XX	8,830	XX	7,763	XX	10,492	XX	11,792
Total	XX	608,776	XX	659,669	XX	852,785	XX	1,026,366
MISSISSIPPI								
Clays ---- thousand short tons	2,278	8,501	1,919	7,837	2,075	9,082	2,013	10,468
Lime ---- do	W	W	W	W	W	W	70	1,393
Natural gas ---- million cubic feet	118,805	24,830	103,989	22,670	99,706	22,846	78,787	23,242
Petroleum (crude) ---- thousand 42-gallon barrels	64,066	201,808	61,100	192,465	56,102	213,747	50,779	309,753
Sand and gravel ---- thousand short tons	11,289	13,526	13,419	16,133	14,251	17,383	14,939	19,487
Stone ---- do	726	709	1,135	1,199	[4] 760	[4] 809	1,719	2,572
Value of items that cannot be disclosed: Cement, magnesium compounds, natural gas liquids, limestone (1973), and values indicated by symbol W	XX	12,790	XX	14,970	XX	17,871	XX	24,240
Total	XX	262,164	XX	255,274	XX	281,738	XX	391,155
MISSOURI								
Barite ---- thousand short tons	232	3,606	213	3,637	196	3,395	177	3,386
Cement:								
Masonry ---- do	73	1,629	80	1,859	84	2,400	75	2,434
Portland ---- do	4,515	77,568	4,277	80,898	4,582	99,858	4,229	106,985
Clays ---- do	[3] 2,354	[3] 7,454	[3] 2,571	[3] 9,096	2,551	11,626	[3] 2,565	[3] 13,151
Coal (bituminous) ---- do	4,036	19,670	4,551	23,667	4,658	24,999	4,623	29,383
Copper (recoverable content of ores, etc.) -- short tons	8,445	8,783	11,509	11,785	10,273	12,224	12,665	19,580
Iron ore (usable) -- thousand long tons, gross weight	2,727	W	2,695	W	2,630	W	1,866	W
Lead (recoverable content of ores, etc.) -- short tons	429,634	118,579	489,397	147,113	487,143	158,711	562,097	252,944
Lime ---- thousand short tons	W	W	W	W	1,626	23,534	1,901	36,369
Natural gas ---- million cubic feet	22	5	9	2	33	8	33	10
Petroleum (crude) ---- thousand 42-gallon barrels	66	W	60	W	60	W	56	W
Phosphate rock ---- thousand short tons	--	--	--	--	42	W	35	W
Sand and gravel ---- do	10,327	15,109	10,082	14,806	10,879	16,950	10,933	19,462
Silver (recoverable content of ores, etc.) thousand troy ounces	1,661	2,568	1,972	3,322	2,058	5,264	2,387	11,244
Stone ---- thousand short tons	41,099	[4] 64,772	42,473	[4] 63,219	49,304	79,921	50,626	90,204
Zinc (recoverable content of ores, etc.) -- short tons	48,215	15,525	61,923	21,983	82,350	34,027	91,987	66,047
Value of items that connot be disclosed: Asphalt (native), clays (selected, except 1973), and values indicated by symbol W	XX	64,821	XX	70,430	XX	39,717	XX	39,850
Total	XX	400,089	XX	451,817	XX	512,634	XX	691,049

MONTANA								
Antimony ---------- short tons --	135	81	W	W	W	W	W	W
Clays [3] ---------- thousand short tons --	264	1,712	304	1,590	219	1,298	298	2,189
Coal (bituminous and lignite) ---------- do ----	7,064	12,817	8,221	16,690	10,725	30,238	14,106	54,961
Copper (recoverable content of ores, etc.) - short tons --	88,581	92,125	123,110	126,064	132,466	157,634	131,131	202,728
Gem stones ----------	NA	114	NA	120	NA	150	NA	400
Gold (recoverable content of ores, etc.) - troy ounces --	15,613	644	23,725	1,390	27,806	2,720	28,268	4,516
Iron ore (usable) -- thousand long tons, gross weight --	14	W	9	W	13	W	30	W
Lead (recoverable content of ores, etc.) -- short tons --	615	169	287	86	176	57	154	69
Lime ---------- thousand short tons --	199	2,416	242	3,003	210	3,028	226	3,364
Manganese ore and concentrate (35% or more Mn) short tons, gross weight --	142	W	578	W	239	W	--	--
Natural gas ---------- million cubic feet --	32,720	3,959	33,474	4,117	56,175	13,240	54,873	13,883
Peat ---------- thousand short tons --	W	W	1	W	1	W	W	W
Petroleum (crude) ------ thousand 42-gallon barrels --	34,599	104,128	33,904	103,924	34,620	115,423	34,554	229,802
Sand and gravel ---------- thousand short tons --	15,781	25,207	10,116	17,149	11,694	13,819	4,242	6,126
Silver (recoverable content of ores, etc.) thousand troy ounces --	2,748	4,248	3,325	5,603	4,350	11,127	3,512	16,542
Stone ---------- thousand short tons --	W	W	4,074	5,627	5,054	9,559	[4]3,115	[4]6,242
Zinc (recoverable content of ores, etc.) -- short tons --	361	116	12	4	73	30	136	98
Value of items that cannot be disclosed: Cement, clays (selected), fluorspar, gypsum, natural gas liquids, phosphate rock, stone (1971, dimension 1974), talc, tungsten ore and concentrate, vermiculite and values indicated by symbol W ----------	XX	37,337	XX	22,309	XX	26,962	XX	33,881
Total ----------	XX	285,073	XX	307,676	XX	385,285	XX	574,801
NEBRASKA								
Clays ---------- thousand short tons --	69	82	115	143	158	286	182	414
Gem stones ----------	NA	10	NA	11	NA	11	NA	11
Lime ---------- thousand short tons --	29	W	34	685	31	651	36	591
Liquefied petroleum gases - thousand 42-gallon barrels --	W	W	W	W	W	W	W	W
Natural gas (marketed) ---------- million cubic feet --	3,496	612	3,478	619	3,836	698	2,538	863
Petroleum (crude) ------- thousand 42-gallon barrels --	10,062	34,010	8,705	29,423	7,240	28,035	6,611	45,167
Sand and gravel ----------	13,224	13,626	13,720	15,063	15,906	18,366	13,231	17,727
Stone ---------- do ----	4,174	7,892	4,251	7,645	5,368	10,958	4,630	10,364
Value of items that cannot be disclosed: Cement, natural gasoline, pumice (1971–72), and values indicated by symbol W ----------	XX	17,847	XX	20,086	XX	21,816	XX	23,497
Total ----------	XX	74,079	XX	73,675	XX	80,821	XX	98,634
NEVADA								
Barite ---------- thousand short tons --	192	1,490	317	2,659	549	4,691	761	8,115
Clays ---------- do ----	W	W	40	183	36	176	39	218
Copper (recoverable content of ores, etc.) - short tons --	96,928	100,806	101,119	103,545	93,702	111,505	84,101	130,021
Gem stones ----------	NA	105	NA	110	NA	142	NA	400
Gold (recoverable content of ores, etc.) -- troy ounces --	374,878	15,464	419,748	24,597	260,437	25,473	298,754	47,723
Gypsum ---------- thousand short tons --	695	2,372	860	2,871	1,154	3,662	843	2,959
Iron ore (usable) -- thousand long tons, gross weight --	W	W	W	W	119	W	139	W
Lead (recoverable content of ores, etc.) -- short tons --	111	30	(5)	(5)	--	--	1,785	803

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
NEVADA—Continued								
Mercury ---- 76-pound flasks --	1,589	$465	810	$177	698	$200	W	W
Perlite ---- short tons --	9,600	114	W	W	W	W	W	W
Petroleum (crude) ---- thousand 42-gallon barrels --	113	W	100	W	96	W	129	W
Pumice ---- thousand short tons --	112	232	W	W	W	W	W	W
Sand and gravel ---- do ----	9,379	12,225	10,081	12,636	12,448	14,614	8,736	$14,515
Silver (recoverable content of ores, etc.) thousand troy ounces --	601	930	595	1,003	624	1,595	872	4,108
Stone ---- thousand short tons--	2,531	3,800	3,329	5,926	3,595	5,429	2,186	4,203
Tungsten ore and concentrate thousand pounds contained W --	r 31	88	r 157	W	150	377	132	537
Zinc (recoverable content of ores, etc.) -- short tons --	71	23	--	--	--	--	3,405	2,445
Value of items that cannot be disclosed: Antimony, brucite (1971), cement, diatomite, fluorspar, lime, lithium minerals, magnesite, molybdenum, pyrites, (1971), salt, talc (1972–74), and values indicated by symbol W ----	XX	26,630	XX	27,995	XX	33,949	XX	41,829
Total ----	XX	164,774	XX	181,702	XX	201,813	XX	257,876
NEW HAMPSHIRE								
Clays ---- thousand short tons --	37	34	51	70	43	64	34	55
Gem stones ----	NA	40	NA	42	NA	42	NA	42
Sand and gravel ---- thousand short tons --	8,404	6,777	6,020	6,256	7,795	8,597	6,126	8,223
Stone ---- do ----	429	3,433	528	3,743	1,836	5,416	590	5,371
Total ----	XX	10,284	XX	10,111	XX	14,119	XX	13,691
NEW JERSEY								
Clays ---- thousand short tons --	201	864	212	856	183	666	104	524
Gem stones ----	NA	15	NA	16	NA	16	NA	16
Peat ---- thousand short tons --	46	526	W	W	44	514	31	603
Sand and gravel ---- do ----	18,511	38,279	17,679	38,020	19,040	43,098	17,924	47,292
Stone [4] ---- do ----	13,469	36,057	15,223	42,044	15,902	45,585	15,749	52,456
Zinc (recoverable content of ores, etc.) -- short tons --	29,977	9,653	38,096	13,524	33,027	13,647	32,848	23,585
Value of items that cannot be disclosed: Lime (1971–73), magnesium compounds, manganiferous residuum, greensand marl, stone (dimension), titanium concentrate, and values indicated by symbol W ----	XX	8,178	XX	8,261	XX	10,490	XX	16,272
Total ----	XX	93,572	XX	102,721	XX	114,016	XX	140,748
NEW MEXICO								
Clays [3] ---- thousand short tons --	76	114	65	108	88	169	55	317
Coal (bituminous) ---- do ----	8,175	26,657	8,248	29,794	9,069	31,862	9,392	W
Copper (recoverable content of ores, etc.) - short tons --	157,419	163,716	168,034	172,067	204,742	243,643	196,585	303,920
Gem stones ----	NA	65	NA	68	NA	70	NA	200
Gold (recoverable content of ores, etc.) -- troy ounces --	10,681	441	14,897	873	13,864	1,356	15,427	2,464

Gypsum ---------- thousand short tons --	W	W	W	W	255	1,220	157	532
Helium (high purity) ---------- million cubic feet --	W	W	--	--	--	--	--	--
Iron ore (usable) -- thousand long tons, gross weight --	W	W	W	W	5	114	6	135
Lead (recoverable content of ores, etc.) -- short tons --	2,971	820	3,582	1,077	2,556	833	2,364	1,064
Lime ---------- thousand short tons --	35	W	28	W	44	793	58	1,679
Manganiferous ore (5% to 35% Mn) short tons, gross weight --	28,490	W	27,837	W	32,084	W	47,348	W
Mica, scrap ---------- thousand short tons --	W	W	14	W	10	82	12	60
Natural gas ---------- million cubic feet --	1,167,577	175,137	1,216,061	225,420	1,218,749	287,889	1,744,779	390,861
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels --	9,952	28,465	10,338	29,970	9,848	32,449	9,713	53,545
LP gases ---------- do ----	27,082	43,331	27,859	45,689	29,652	74,427	30,271	120,781
Peat ---------- thousand short tons --	1	W	2	46	3	50	4	111
Perlite ---------- do ----	386	4,559	476	5,698	478	5,024	480	6,306
Petroleum (crude) ------- thousand 42-gallon barrels --	118,412	402,602	110,525	376,778	100,986	414,041	98,695	712,578
Potassium salts - thousand short tons, K_2O equivalent --	2,291	86,689	2,296	91,115	2,168	91,996	2,102	128,588
Pumice ---------- thousand short tons --	287	601	311	809	339	1,001	471	1,466
Salt ---------- do ----	146	1,130	W	W	W	W	167	W
Sand and gravel ---------- do ----	8,869	7,975	7,600	8,553	10,641	15,753	7,413	10,605
Silver (recoverable content of ores, etc.) thousand troy ounces --	782	1,210	1,017	1,713	1,111	2,843	1,195	5,628
Stone ---------- thousand short tons ----	[4]2,913	[4]5,337	2,768	5,499	2,830	5,894	[4]3,531	[4]8,359
Tin ---------- long tons ----	--	--	--	--	W	W	W	W
Uranium (recoverable content U_3O_8) thousand pounds --	10,567	65,517	10,808	68,091	[r]9,286	[r]60,356	9,971	104,693
Zinc (recoverable content of ores, etc.) -- short tons --	13,959	4,495	12,735	4,521	12,327	5,094	13,784	9,897
Value of items that cannot be disclosed: Carbon dioxide, cement, clay (fire), fluorspar (except 1973), molybdenum, stone (dimension, 1972, 1974), vanadium, and values indicated by symbol W ----------	XX	27,424	XX	29,403	XX	29,631	XX	77,755
Total ----------	XX	1,046,285	XX	1,097,292	XX	[r]1,306,590	XX	1,941,544
NEW YORK								
Clays ---------- thousand short tons	[3]1,588	[3]1,742	[3]1,601	[3]1,919	[3]1,799	[3]2,146	[3]1,451	[3]2,348
Emery ---------- short tons --	1,585	W	2,883	W	2,883	W	W	W
Gem stones ----------	NA	15	NA	16	NA	16	NA	16
Gypsum ---------- thousand short tons --	415	2,376	486	3,079	525	3,369	364	2,942
Lead (recoverable content of ores, etc.) -- short tons --	877	242	1,089	327	2,304	751	3,076	1,384
Mercury ---------- 76-pound flasks --	W	W	W	W	--	--	W	W
Natural gas ---------- million cubic feet --	2,202	661	3,679	1,199	4,539	1,590	4,990	2,745
Peat ---------- thousand short tons --	15	196	15	200	11	166	18	181
Petroleum (crude) ------- thousand 42-gallon barrels --	1,126	5,292	1,018	4,897	967	5,412	896	9,538
Salt ---------- thousand short tons --	5,303	43,601	5,604	43,866	5,202	42,364	6,464	57,705
Sand and gravel ---------- do ----	23,221	28,328	26,722	36,952	29,544	41,396	30,614	46,652
Silver (recoverable content of ores, etc.) thousand troy ounces --	18	28	25	42	54	139	64	304
Stone ---------- thousand short tons --	37,778	73,418	38,138	77,825	44,393	94,693	38,207	87,724
Zinc (recoverable content of ores, etc.) -- short tons --	63,420	20,421	60,749	21,566	81,455	33,657	93,077	66,829
Value of items that cannot be disclosed: Cement, clay (ball), garnet (abrasive), iron ore, lime, talc, titanium concentrate, wollastonite, and values indicated by symbol W ----------	XX	122,963	XX	128,566	XX	150,167	XX	162,205
Total ----------	XX	299,283	XX	320,454	XX	375,866	XX	440,573

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
NORTH CAROLINA								
Clays [3] ---- thousand short tons	3,503	$3,802	3,862	$4,473	4,109	$5,057	3,422	$4,648
Feldspar ---- short tons	393,811	4,681	439,838	6,030	523,595	8,820	650,684	11,147
Gem stones	NA	30	NA	32	NA	40	NA	50
Mica:								
Scrap ---- thousand short tons	67	1,770	91	2,942	106	4,423	76	3,679
Sheet ---- pounds	8,705	3	--	--	--	--	W	W
Sand and gravel ---- thousand short tons	14,240	14,690	12,823	13,812	15,897	19,327	12,784	20,844
Stone ---- do	30,917	58,026	32,297	62,741	38,782	80,065	34,762	75,142
Talc and pyrophyllite ---- short tons	85,289	522	89,334	594	95,833	1,094	110,978	993
Value of items that cannot be disclosed: Asbestos, cement, clay (kaolin), copper (1971), gold (1971), iron ore, lead (1971), lithium minerals, olivine, phosphate rock, silver (1971), tungsten (1971), zinc (1971), and values indicated by symbol W	XX	25,996	XX	24,896	XX	28,104	XX	39,366
Total	XX	109,520	XX	115,520	XX	146,930	XX	155,869
NORTH DAKOTA								
Coal (lignite) ---- thousand short tons	6,075	11,580	6,632	13,416	6,906	14,328	7,463	16,351
Gem stones	NA	2	NA	2	NA	2	NA	2
Natural gas ---- million cubic feet	33,864	5,655	32,472	5,455	27,703	5,457	31,206	6,210
Peat ---- short tons	W	W	--	--	--	--	240	W
Petroleum (crude) ---- thousand 42-gallon barrels	21,653	70,805	20,624	67,647	20,285	78,916	19,697	119,022
Sand and gravel ---- thousand short tons	8,196	6,210	6,681	5,757	6,011	6,021	4,991	6,211
Stone ---- do	W	W	--	--	W	W	35	115
Value of items that cannot be disclosed: Clays, lime, natural gas liquids, pumice (1972), salt, and values indicated by symbol W	XX	5,649	XX	5,809	XX	7,129	XX	11,516
Total	XX	99,901	XX	98,086	XX	111,853	XX	159,427
OHIO								
Cement:								
Masonry ---- thousand short tons	142	3,811	161	4,684	176	5,641	158	5,227
Portland ---- do	2,897	54,338	2,968	57,953	3,456	73,362	2,884	73,815
Clays ---- do	3,973	11,380	4,125	11,273	4,732	12,456	4,325	13,488
Coal (bituminous) ---- do	51,431	269,601	50,967	303,819	45,783	338,792	45,409	559,519
Gem stones	NA	8	NA	8	NA	8	NA	8
Lime ---- thousand short tons	4,007	65,258	4,413	75,569	4,389	77,028	4,171	93,695
Natural gas ---- million cubic feet	79,903	27,007	89,995	35,271	93,610	39,786	97,055	44,371
Peat ---- thousand short tons	6	84	4	67	4	64	5	74
Petroleum (crude) ---- thousand 42-gallon barrels	8,286	29,801	9,358	35,179	8,796	44,690	9,088	89,348
Salt ---- thousand short tons	5,709	46,651	6,147	47,710	4,657	41,643	5,029	49,089
Sand and gravel ---- do	40,797	54,044	43,506	59,932	48,987	69,982	41,353	68,258
Stone ---- do	46,891	88,372	48,498	90,821	[4]55,107	[4]98,009	[4]51,709	[4]105,098
Value of items that cannot be disclosed: Abrasive stone, gypsum, and stone (dimension, 1973–74)	XX	1,796	XX	2,462	XX	5,518	XX	5,680
Total	XX	652,151	XX	724,748	XX	806,979	XX	1,107,670

OKLAHOMA								
Clay ---------- thousand short tons --	[3]845	[3]1,255	[3]938	[3]1,398	[3]1,298	[3]1,871	1,289	2,105
Coal (bituminous) ---------- do ----	2,234	15,004	2,624	19,112	2,183	16,779	2,356	24,759
Gypsum ---------- do ----	1,022	3,073	1,196	3,888	1,429	5,796	1,225	5,622
Helium:								
High-purity ---------- million cubic feet --	123	4,305	176	6,160	181	6,335	169	5,915
Crude ---------- do ----	270	3,240	163	1,956	115	1,380	134	1,608
Lead (recoverable content of ores, etc.) -- short tons --	--	--	--	--	--	--	W	W
Natural gas ---------- million cubic feet --	1,684,260	273,945	1,806,887	294,523	1,770,980	334,110	1,638,942	458,904
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels --	14,197	40,856	14,559	42,709	14,674	49,070	12,581	84,638
LP gases ---------- do ----	27,540	56,732	27,148	57,011	29,044	95,264	31,231	166,461
Petroleum (crude) ---------- do ----	213,313	725,611	207,633	709,033	191,204	723,273	177,785	1,277,076
Pumice ---------- thousand short tons --	W	W	W	W	1	W	W	W
Salt ---------- do ----	W	W	W	W	5	36	W	W
Sand and gravel ---------- do ----	5,713	8,259	7,901	11,138	12,154	14,941	8,708	13,772
Stone ---------- do ----	19,449	27,125	19,448	26,574	22,316	34,999	22,228	36,599
Zinc (recoverable content of ores, etc.) -- short tons --	[5]	[5]	W	W	--	--	--	--
Value of items that cannot be disclosed: Cement, clay (bentonite, 1971–73), copper, feldspar (1974), lime, silver, tripoli, and values indicated by symbol W ----------	XX	30,111	XX	37,296	XX	39,772	XX	46,231
Total ----------	XX	1,189,516	XX	1,210,798	XX	1,328,626	XX	2,123,690
OREGON								
Clays ---------- thousand short tons --	157	255	151	238	168	291	140	243
Copper ---------- short tons --	3	3	W	W	W	W	W	W
Diatomite ---------- do ----	70	1	W	W	W	W	W	W
Gem stones ----------	NA	755	NA	793	NA	700	NA	500
Gold (recoverable content of ores, etc.) - troy ounces --	244	10	W	W	W	W	W	W
Lead ---------- short tons --	--	--	--	--	--	--	W	W
Lime ---------- thousand short tons --	106	1,989	96	2,129	106	2,552	98	2,818
Mercury ---------- 76-pound flasks --	W	W	--	--	W	W	--	--
Nickel (content of ore and concentrate) -- short tons --	17,036	W	16,864	W	18,272	W	16,618	W
Pumice ---------- thousand short tons --	943	1,389	W	W	[r]1,171	[r]2,013	915	1,887
Sand and gravel ---------- do ----	20,230	28,707	24,489	34,981	22,802	32,751	18,558	30,948
Silver (recoverable content of ores, etc.) thousand troy ounces --	4	6	2	4	1	3	9	42
Stone ---------- thousand short tons --	13,794	26,708	10,915	18,380	13,411	21,843	23,353	43,406
Value of items that cannot be disclosed: Cement, talc and soapstone, tungsten (1971–72), and values indicated by symbol W ----------	XX	18,212	XX	19,991	XX	21,424	XX	24,076
Total ----------	XX	78,035	XX	76,516	XX	[r]81,577	XX	103,920
PENNSYLVANIA								
Cement:								
Masonry ---------- thousand short tons --	559	11,247	451	12,401	490	14,443	404	14,642
Portland ---------- do ----	7,850	140,460	8,214	156,008	8,563	171,653	7,448	191,594
Clays ---------- do ----	[3]2,325	[3]8,940	2,682	15,829	[3]2,975	[3]16,664	[3]2,732	[3]16,496
Coal:								
Anthracite ---------- do ----	8,727	103,469	7,106	85,251	6,830	90,260	6,617	144,695

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
PENNSYLVANIA—Continued								
Coal—Continued								
Bituminous thousand short tons	73,835	$620,196	75,939	$694,267	76,403	$786,792	80,462	$1,687,394
Copper (recoverable content of ores, etc.) short tons	3,349	3,483	2,611	2,673	1,845	2,195	--	--
Gem stones	NA	9	NA	9	NA	9	NA	9
Lime thousand short tons	1,760	30,008	1,891	33,802	2,260	40,949	2,080	50,147
Mica, scrap do	W	W	W	W	--	--	--	--
Natural gas million cubic feet	76,451	20,770	73,958	22,389	78,514	32,976	82,637	36,360
Peat thousand short tons	38	461	22	320	28	411	30	515
Petroleum (crude) thousand 42-gallon barrels	3,798	17,699	3,441	16,414	3,282	18,440	3,478	36,220
Sand and gravel thousand short tons	19,668	36,162	18,757	36,804	20,576	42,830	18,071	45,181
Stone do	64,467	118,469	67,307	124,340	78,564	150,346	73,092	159,615
Zinc (recoverable content of ores, etc.) short tons	27,438	8,835	18,344	6,512	18,857	7,792	20,288	14,567
Value of items that cannot be disclosed: Clay (kaolin except 1972), cobalt (1971), gold (1971), iron ore, natural gas liquids, pyrites (1971), silver (1971), tripoli, and values indicated by symbol W	XX	28,899	XX	24,466	XX	26,140	XX	27,077
Total	XX	1,149,107	XX	1,231,485	XX	1,401,900	XX	2,374,512
RHODE ISLAND								
Sand and gravel thousand short tons	2,252	3,052	2,079	3,336	2,429	3,095	2,784	4,605
Stone do	3	422	[4]329	[4]23	W	W	W	W
Value of items that cannot be disclosed: Other nonmetals and values indicated by symbol W	XX	825	XX	932	XX	1,245	XX	1,377
Total	XX	4,299	XX	4,291	XX	4,340	XX	5,982
SOUTH CAROLINA								
Clays thousand short tons	[3]2,049	[3]10,201	2,221	11,268	[3]2,250	[3]12,877	[3]2,297	[3]13,765
Gem stones	--	--	--	--	NA	5	NA	5
Mica (scrap) thousand short tons	W	W	W	W	W	W	W	252
Peat do	W	W	W	W	14	W	18	W
Sand and gravel do	6,438	9,119	7,916	12,121	8,179	12,628	7,380	13,054
Stone do	11,047	17,852	12,482	21,819	14,985	24,280	12,242	21,719
Value of items that cannot be disclosed: Cement, clays (selected, except 1972), feldspar (1971–72) vermiculite, and values indicated by symbol W	XX	29,716	XX	37,105	XX	38,571	XX	56,376
Total	XX	66,888	XX	82,313	XX	88,361	XX	105,171
SOUTH DAKOTA								
Clays [3] thousand short tons	150	128	185	156	201	181	190	202
Feldspar short tons	24,640	539	25,000	400	W	W	W	W
Gem stones	NA	40	NA	42	NA	42	NA	42
Gold (recoverable content of ores, etc.) troy ounces	513,427	21,179	407,430	23,875	375,575	34,974	343,723	54,906
Gypsum thousand short tons	21	83	24	43	W	W	32	135
Lime do	W	W	W	W	63	1,206	94	2,059
Mica (scrap) do	W	W	W	W	--	--	W	W

Petroleum (crude) ——— thousand 42-gallon barrels	233	604	219	574	275	988	494	3,283
Sand and gravel ——— thousand short tons	16,727	18,392	12,748	14,793	13,963	16,587	9,028	9,720
Silver (recoverable content of ores, etc.) thousand troy ounces	107	165	100	168	72	184	62	294
Stone ——— thousand short tons	2,199	8,874	2,665	10,864	2,745	11,607	2,968	14,231
Value of items that cannot be disclosed: Beryllium concentrate (1971–72), cement, clays (bentonite), uranium (1971–72), vanadium (1972), and values indicated by symbol W ———	XX	12,984	XX	14,535	XX	15,370	XX	17,755
Total ———	XX	62,988	XX	65,450	XX	81,139	XX	102,627
TENNESSEE								
Barite ——— thousand short tons	21	342	W	W	W	W	W	W
Cement:								
Masonry ——— do	159	3,649	176	4,104	201	7,908	154	4,706
Portland ——— do	1,713	33,733	1,695	37,176	1,711	42,402	1,525	43,339
Clays [3] ——— do	1,537	6,595	1,718	7,719	1,719	9,083	1,638	9,776
Coal (bituminous) ——— do	9,271	59,368	11,260	81,386	8,219	66,827	7,541	135,874
Copper (recoverable content of ores, etc.) ——— short tons	13,916	14,473	11,310	11,581	8,500	10,115	6,304	9,745
Gold (recoverable content of ores, etc.) ——— troy ounces	192	8	176	10	68	7	18	3
Lime ——— thousand short tons	W	W	W	W	W	W	136	3,449
Natural gas ——— million cubic feet	89	20	25	8	20	6	17	6
Petroleum (crude) ——— thousand 42-gallon barrels	398	W	198	W	201	W	769	7,256
Phosphate rock ——— thousand short tons	2,571	12,151	2,154	10,732	2,512	12,799	2,411	18,465
Sand and gravel ——— do	8,018	11,845	10,839	15,328	12,010	20,145	10,702	19,476
Silver (recoverable content of ores, etc.) thousand troy ounces	131	203	83	141	73	187	20	94
Stone ——— thousand short tons	32,369	48,665	35,942	55,512	42,742	71,116	41,720	75,547
Zinc (recoverable content of ores, etc.) ——— short tons	119,295	38,413	101,722	36,111	64,172	26,516	85,671	61,512
Value of items that cannot be disclosed: Clay (fuller's earth), pyrites, and values indicated by symbol W ———	XX	10,197	XX	10,006	XX	8,579	XX	6,360
Total ———	XX	239,662	XX	269,814	XX	275,690	XX	395,608
TEXAS								
Cement:								
Masonry ——— thousand short tons	169	4,514	217	5,812	234	6,606	195	6,438
Portland ——— do	7,198	140,206	7,813	171,642	8,320	189,368	7,739	207,706
Clays ——— do	4,615	10,432	5,175	11,554	5,667	13,115	5,315	13,677
Coal (lignite) ——— do	W	W	4,045	W	6,944	W	7,684	W
Gem stones	NA	155	NA	163	NA	163	NA	160
Gypsum ——— thousand short tons	1,303	4,806	1,542	5,284	1,616	6,469	1,365	5,276
Helium:								
Crude ——— million cubic feet	1,208	14,496	1,026	12,312	904	10,848	35	420
High-purity ——— do	50	1,750	--	--	--	--	--	--
Lime ——— thousand short tons	1,612	24,583	1,631	22,181	1,677	26,887	1,835	39,644
Natural gas ——— million cubic feet	8,550,705	1,376,664	8,657,840	1,419,886	8,513,850	1,735,221	8,170,798	2,541,118
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels	96,286	299,981	92,437	294,163	92,743	347,393	88,316	629,529
LP gases ——— do	210,435	380,887	226,624	428,319	221,686	589,685	213,756	1,004,653

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
TEXAS—Continued								
Perlite ---------- short tons	--	--	2,391	$24	602	W		
Petroleum (crude) ---------- thousand 42-gallon barrels	1,222,926	$4,261,775	1,301,685	4,536,077	1,294,671	$5,157,623	1,262,126	$8,773,003
Pumice ---------- thousand short tons	4	4	W	W	--	--	--	--
Salt ---------- do	9,217	40,838	9,744	35,544	10,354	45,350	11,379	51,296
Sand and gravel ---------- do	32,788	51,814	35,151	56,328	38,546	60,706	42,466	81,364
Stone ---------- do	41,168	[4] 62,144	49,314	[4] 66,573	62,574	91,379	[4] 63,074	[4] 109,758
Sulfur (Frasch process) ---------- thousand long tons	3,092	W	3,847	W	4,109	W	W	W
Talc and soapstone ---------- short tons	193,830	1,024	221,022	1,262	232,514	1,246	188,262	1,310
Value of items that cannot be disclosed: Asphalt (native), fluorspar (1972–74), graphite, iron ore, magnesium chloride (for metal), magnesium compounds (except for metal), mercury, sodium sulfate, stone (dimension, except 1973), uranium, and values indicated by symbol W ----------	XX	132,210	XX	143,427	XX	160,435	XX	245,792
Total ----------	XX	6,808,283	XX	7,211,551	XX	8,442,494	XX	13,711,144
UTAH								
Carbon dioxide, natural ---------- thousand cubic feet	55,178	4	61,103	4	80,490	6	93,751	6
Clays ---------- thousand short tons	198	1,064	[3] 266	[3] 790	[3] 243	[3] 771	232	953
Coal (bituminous) ---------- do	4,626	34,082	4,802	42,868	5,500	61,566	5,858	71,699
Copper (recoverable content of ores, etc.) - short tons	263,451	273,989	259,507	265,735	256,589	305,341	230,593	356,497
Fluorspar ---------- do	10,947	341	2,977	84	4,778	144	2,967	98
Gem stones ----------	NA	90	NA	95	NA	95	NA	100
Gold (recoverable content of ores, etc.) -- troy ounces	368,996	15,221	362,413	21,237	307,080	30,035	254,909	40,719
Gypsum ---------- thousand short tons	W	W	W	W	231	1,134	248	1,076
Iron ore (usable) - thousand long tons, gross weight	1,681	11,886	1,788	W	1,986	13,581	1,808	14,016
Lead (recoverable content of ores, etc.) - short tons	38,270	10,562	20,706	6,224	13,733	4,474	10,510	4,729
Lime ---------- thousand short tons	172	3,569	171	4,216	185	3,804	176	4,911
Manganiferous ore (5% to 35% Mn) ---- short tons	112	W						
Natural gas ---------- million cubic feet	42,418	7,084	39,474	6,711	42,715	8,159	50,522	20,815
Natural gas liquids:								
Natural gasoline and cycle products thousand 42-gallon barrels	W	W	458	1,406	W	W	W	W
LP gases ---------- do	W	W	1,742	2,787	W	W	W	W
Petroleum (crude) ---------- do	23,630	71,886	26,570	80,773	32,656	117,743	39,363	279,858
Pumice ---------- thousand short tons	6	10	14	29	42	57	15	19
Salt ---------- do	614	5,213	660	4,955	717	6,913	771	7,321
Sand and gravel ---------- do	10,505	10,190	14,619	17,071	15,410	15,986	11,578	12,985
Silver (recoverable content of ores, etc.) thousand troy ounces	5,294	8,185	4,300	7,245	3,619	9,257	3,208	15,109
Stone ---------- thousand short tons	2,556	5,335	3,384	6,005	2,848	6,318	2,869	6,410
Uranium (recoverable content (U_3O_8) thousand pounds	1,445	8,959	1,496	9,425	[r] 1,961	[r] 12,745	W	W
Vanadium (recoverable in ore and concentrate) short tons	226	W	188	W	142	W	W	W

Zinc (recoverable content of ores, etc.) ------- do ----	25,701	8,276	21,853	7,758	16,800	6,942	12,619	9,060
Value of items that cannot be disclosed: Asphalt (gilsonite), beryl concentrate, cement, clays (kaolin, 1972–73), magnesium chloride (1972–73), magnesium compounds, molybdenum, phosphate rock, potassium salts, sodium sulfate, tungsten, and values indicated by symbol W ----------	XX	49,754	XX	57,391	XX	70,408	XX	105,664
Total ----------	XX	525,700	XX	542,809	XX	r 675,479	XX	952,045
VERMONT								
Peat ---------- thousand short tons --	W	W	(5)	1	(5)	2	(5)	4
Sand and gravel ---------- do ----	3,761	3,518	3,302	3,214	4,041	3,581	2,394	3,588
Stone ---------- do ----	2,496	27,940	3,300	26,170	1,871	19,523	1,932	21,630
Talc ---------- short tons --	W	W	180,239	1,326	251,087	1,497	W	W
Value of items that cannot be disclosed: Asbestos, clays, gem stones, and values indicated by symbol W -------	XX	4,631	XX	4,157	XX	4,763	XX	10,231
Total ----------	XX	36,089	XX	34,868	XX	29,366	XX	35,453
VIRGINIA								
Clays ---------- thousand short tons --	1,710	1,800	1,634	1,783	1,646	1,886	1,957	2,614
Coal (bituminous) ---------- do ----	30,628	254,870	34,028	344,061	33,961	377,679	34,326	856,099
Gem stones ----------	NA	12	NA	13	NA	13	NA	13
Lead (recoverable content of ores, etc.) -- short tons --	3,386	934	3,441	1,034	2,637	859	3,106	1,398
Lime ---------- thousand short tons --	759	11,049	758	11,739	782	12,205	895	18,929
Natural gas ---------- million cubic feet --	2,619	822	2,787	892	5,101	1,688	7,096	3,619
Petroleum (crude) ------- thousand 42-gallon barrels --	1	W	(5)	(5)	--	--	3	W
Sand and gravel ---------- thousand short tons --	12,796	20,201	14,085	21,696	14,511	26,246	14,314	29,270
Soapstone ---------- short tons --	3,704	8	W	W	4,600	12	W	W
Stone ---------- thousand short tons --	34,643	63,482	39,986	74,090	43,895	82,719	44,176	95,988
Zinc (recoverable content of ores, etc.) -- short tons --	16,829	5,419	16,789	5,960	16,683	6,894	17,195	12,346
Value of items that cannot be disclosed: Aplite, cement, feldspar (1971), gypsum, kyanite, salt (1971-72), titanium concentrate (1971), and values indicated by symbol W ----------	XX	26,564	XX	28,523	XX	r 35,201	XX	37,931
Total ----------	XX	385,161	XX	489,791	XX	r 545,402	XX	1,058,207
WASHINGTON								
Cement:								
Masonry ---------- thousand short tons --	5	145	6	170	6	169	6	193
Portland ---------- do ----	1,149	23,735	1,239	26,848	1,194	26,651	1,377	36,347
Clays [3] ---------- do ----	255	549	264	584	287	664	269	698
Coal (bituminous) ---------- do ----	1,134	7,614	2,635	17,424	3,270	21,440	W	W
Gem stones ----------	NA	155	NA	163	NA	160	NA	160
Gypsum ---------- thousand short tons --	W	W	5	13	W	W	W	W
Lead (recoverable content of ores, etc.) -- short tons --	5,117	1,429	2,567	772	2,217	722	1,299	585
Peat ---------- thousand short tons --	17	72	18	89	21	110	14	85
Pumice ---------- do ----	W	W	W	W	1	1	(5)	1
Sand and gravel ---------- do ----	22,702	26,658	23,065	26,069	27,935	30,132	22,842	35,030
Silver (recoverable content of ores, etc.) thousand troy ounces --	W	W	221	372	W	W	W	W

See footnotes at end of table.

Table 6.—Mineral production [1] in the United States, by State—Continued

Mineral	1971 Quantity	1971 Value (thousands)	1972 Quantity	1972 Value (thousands)	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
WASHINGTON—Continued								
Stone ---- thousand short tons	12,436	$20,489	14,712	[4] $23,764	11,384	$19,284	15,095	$24,483
Zinc (recoverable content of ores, etc.) ---- short tons	5,782	1,862	6,483	2,301	6,378	2,635	6,909	4,960
Values of items that cannot be disclosed: Abrasives (1971), clays (fire), copper, diatomite, gold, lime, olivine, stone (dimension, 1972–74), talc, tungsten (1972–74), uranium, and values indicated by symbol W ----	XX	11,893	XX	11,237	XX	r 12,695	XX	41,374
Total ----	XX	94,601	XX	109,806	XX	r 114,663	XX	143,916
WEST VIRGINIA								
Clays [3] ---- thousand short tons	232	336	274	403	348	516	339	520
Coal (bituminous) ---- do	118,258	1,128,282	123,743	1,275,813	115,448	1,340,338	102,462	2,218,418
Gem stones ----	NA	2	NA	2	NA	2	NA	2
Lime ---- thousand short tons	197	3,073	W	W	W	W	128	2,315
Natural gas ---- million cubic feet	234,027	60,613	214,951	64,485	208,676	64,481	202,306	66,356
Petroleum (crude) ---- thousand 42-gallon barrels	2,969	11,609	2,677	12,047	2,385	11,965	2,665	27,058
Salt ---- thousand short tons	1,174	4,778	1,232	5,963	1,217	6,082	1,201	6,296
Sand and gravel ---- do	7,107	16,756	5,765	15,031	5,893	16,257	5,382	16,018
Stone ---- do	[4] 9,880	[4] 18,066	[4] 11,649	[4] 21,293	[4] 11,732	[4] 22,821	10,954	22,308
Value of items that cannot be disclosed: Cement, clays (fire), natural gas liquids, stone (dimension, 1971–73), and values indicated by symbol W ----	XX	30,445	XX	35,595	XX	40,583	XX	43,836
Total ----	XX	1,273,960	XX	1,430,632	XX	1,503,045	XX	2,403,177
WISCONSIN								
Clays ---- thousand short tons	4	8	4	7	2	3	2	4
Gem stones ----	NA	W	NA	1	NA	1	NA	1
Iron ore (usable) ---- thousand long tons, gross weight	824	W	887	W	956	W	899	W
Lead (recoverable content of ores, etc.) ---- short tons	752	207	757	228	844	275	1,285	578
Lime ---- thousand short tons	246	4,570	263	5,009	310	6,004	311	6,764
Peat ---- do	2	153	2	179	2	208	6	290
Sand and gravel ---- do	38,561	32,748	36,430	31,324	40,250	43,647	28,850	34,577
Stone ---- do	15,568	25,105	19,394	29,681	23,818	36,917	22,443	40,912
Zinc (recoverable content of ores, etc.) ---- short tons	10,645	3,428	6,873	2,440	8,672	3,583	8,737	6,273
Value of items that cannot be disclosed: Abrasive stones, cement, copper (1974), and values indicated by symbol W ----	XX	17,817	XX	20,484	XX	23,701	XX	25,364
Total ----	XX	84,036	XX	89,353	XX	114,339	XX	114,763
WYOMING								
Clays ---- thousand short tons	1,798	17,378	1,873	18,509	2,343	24,043	2,511	29,339
Coal (bituminous) ---- do	8,052	27,335	10,928	40,898	14,886	60,939	20,703	103,915
Feldspar ---- short tons	W	W	W	W	2,588	56	W	W
Gem stones ----	NA	135	NA	142	NA	142	NA	140
Gypsum ---- thousand short tons	232	918	W	W	312	1,348	315	960

Iron ore (usable) -- thousand long tons, gross weight --	1,808	W	2,030	W	2,070	W	2,105	W
Lime ---------- thousand short tons --	27	W	W	W	30	548	29	464
Natural gas ---------- million cubic feet --	380,105	58,156	375,059	60,760	357,731	64,749	326,657	80,031
Natural gas liquids:								
Natural gasoline ----- thousand 42-gallon barrels --	2,514	7,415	3,015	8,951	3,351	10,647	2,933	18,577
LP gases ---------- do ----	5,474	10,127	7,691	15,536	7,237	22,507	6,804	31,707
Petroleum (crude) ---------- do ----	148,114	459,079	140,011	432,071	141,914	541,820	139,997	914,360
Sand and gravel ---------- thousand short tons --	9,820	8,750	9,098	14,916	6,201	11,635	5,532	9,508
Stone ---------- do ----	2,894	4,789	3,549	5,768	3,191	6,716	2,384	[4]5,989
Uranium (recoverable content U_3O_8) thousand pounds --	6,986	43,311	8,544	53,827	[r] 10,134	[r] 65,868	7,449	78,213
Value of items that cannot be disclosed: Cement, phosphate rock, pumice (1972–73), sodium carbonate, and values indicated by symbol W ----------	XX	80,544	XX	95,365	XX	117,565	XX	163,997
Total ----------	XX	717,937	XX	746,743	XX	[r] 928,583	XX	1,437,200

[r] Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes certain cement, included with "Value of items that cannot be disclosed."
[3] Excludes certain clays, included with "Value of items that cannot be disclosed."
[4] Excludes certain stones, included with "Value of items that cannot be disclosed."
[6] Total of items listed.
[7] Excludes salt in brine, included with "Value of items that cannot be disclosed."

Table 7.—Mineral production [1] in the islands administered by the United States

Area and mineral	1971		1972		1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
American Samoa:								
Pumice thousand short tons	10	$35	--	--	37	$214	27	$183
Stone do	33	30	49	$414	63	152	50	122
Total	XX	65	XX	414	XX	366	XX	305
Guam: Stone thousand short tons	718	1,705	831	1,983	1,246	3,139	798	1,444
Virgin Islands:								
Stone do	543	W	726	2,255	664	2,860	638	3,869
Wake: Stone do	3	16	--	--	--	--	--	--

XX Not applicable.
W Withheld to avoid disclosing individual company confidential data.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 8.—Mineral production [1] in the Commonwealth of Puerto Rico

(Thousand short tons and thousand dollars)

Mineral	1971		1972		1973		1974	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Cement	2,001	38,413	1,946	31,756	2,062	41,203	1,881	70,277
Clays	342	358	361	382	464	473	291	332
Lime	44	W	42	1,776	42	2,215	39	2,923
Salt	29	570	29	580	29	580	29	624
Sand and gravel	12,998	34,980	7,478	21,237	7,480	21,243	NA	NA
Stone	12,130	29,847	13,504	32,793	15,647	41,857	14,362	41,640
Total	XX	[2]104,168	XX	88,524	XX	107,571	XX	[2]115,796

NA Not available. W Withheld to avoid disclosing individual company confidential data.
XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Total does not include value of items withheld or not available.

Table 9.—U.S. exports of principal minerals and products [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
METALS				
Aluminum:				
Ingots, slabs, crude ---------- short tons --	229,578	$121,951	207,834	$155,817
Scrap ---------- do ----	115,120	39,936	80,159	33,043
Plates, sheets, bars, etc ---------- do ----	202,371	178,482	216,030	247,976
Castings and forgings ---------- do ----	5,277	14,613	5,933	19,623
Aluminum sulfate ---------- do ----	21,134	642	41,875	1,807
Other aluminum compounds ---------- do ----	836,659	92,643	816,293	109,063
Antimony, metals and alloys, crude ---- do ----	515	469	871	1,572
Bauxite, including bauxite concentrates thousand long tons --	12	811	16	1,218
Beryllium ---------- pounds --	109,199	1,220	143,628	1,107
Bismuth, metals and alloys ---------- do ----	151,053	446	329,926	1,520
Boron:				
Boric acid ---------- short tons --	41,407	6,862	35,740	8,774
Sodium borates, refined ---------- do ----	168,826	19,354	218,107	33,836
Cadmium ---------- thousands pounds --	305	598	62	238
Calcium:				
Carbonite ---------- short tons --	11,445	1,088	11,073	1,541
Chloride ---------- do ----	96,897	2,225	30,866	1,700
Dicalcium phosphate ---------- do ----	35,969	4,753	29,196	6,864
Chrome:				
Ore and concentrates:				
Exports ------- thousand short tons --	21	789	18	1,430
Reexports ---------- do ----	34	989	99	3,101
Ferrochrome ---------- do ----	15	5,091	7	3,765
Cobalt ---------- thousand pounds --	3,890	8,932	3,679	10,979
Columbium metals, alloys, other forms - do ----	96	790	33	563
Copper:				
Ore, concentrate, composition metal and unrefined (copper content) -- short tons --	45,957	r 48,512	30,216	28,819
Scrap ---------- do ----	42,286	38,675	41,342	46,413
Refined copper and semimanufactures do ----	242,856	386,993	202,203	448,584
Other copper manufactures ------- do ----	7,481	12,160	8,332	17,583
Copper sulfate or blue vitriol ----- do ----	1,716	2,043	1,815	2,138
Copper-base alloys ---------- do ----	149,888	205,249	169,521	284,839
Ferroalloys:				
Ferrosilicon ---------- do ----	15,984	4,051	6,575	3,338
Ferrophosphorus ---------- do ----	19,030	773	3,677	408
Gold:				
Ore and base bullion ------ troy ounces --	334,255	26,692	308,081	49,410
Bullion, refined ---------- do ----	2,650,962	116,273	3,555,193	179,070
Iron ore ---------- thousand long tons --	2,747	37,922	2,323	35,148
Iron and steel:				
Pig iron ---------- short tons --	15,160	882	100,582	6,743
Iron and steel products (major):				
Semimanufactures ---------- do ----	3,317,118	713,292	4,757,828	1,373,496
Manufactured steel mill products do ----	1,644,412	867,594	2,230,287	1,636,698
Iron and steel scrap: Ferrous scrap, including rerolling materials thousand short tons --	11,412	606,556	9,023	881,885
Lead:				
Pigs, bars, anodes, sheets, etc. short tons --	66,576	27,097	61,982	32,685
Scrap ---------- do ----	r 59,851	r 12,222	59,366	16,813
Magnesium, metal and alloys, scrap, semimanufactured forms, n.e.c ---------- do ----	39,585	28,242	46,398	48,511
Manganese:				
Ore and concentrate ---------- do ----	57,448	4,535	223,088	13,656
Ferromanganese ---------- do ----	8,574	2,137	7,011	2,204
Metal ---------- do ----	4,660	3,109	2,318	2,119
Mercury, exports ---------- 76-pound flasks --	342	170	466	270
Molybdenum:				
Ore and concentrates (molybdenum content) ---------- thousand pounds --	73,958	120,387	78,660	151,075
Metals and alloys, crude and scrap ---------- do ----	148	252	105	256
Wire ---------- do ----	357	3,105	415	4,210
Semifabricated forms, n.e.c ------ do ----	209	1,216	251	1,670
Powder ---------- do ----	195	672	203	728
Ferromolybdenum ---------- do ----	2,224	3,151	4,094	7,094

See footnotes at end of table.

Table 9.—U.S. exports of principal minerals and products [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
METALS—Continued				
Nickel:				
Alloys and scrap (including Monel metal), ingots, bars, sheets, etc ___ short tons	16,545	$50,712	22,355	$94,980
Catalysts ___ do	2,478	6,584	3,477	9,143
Nickel-chrome electric resistance wire ___ do	697	3,818	1,117	6,056
Semifabricated forms, n.e.c ___ do	2,350	14,689	3,493	23,319
Platinum:				
Ore, concentrate, metal and alloys in ingots, bars, sheets, anodes, other forms, including scrap ___ troy ounces	439,452	61,379	474,494	78,142
Palladium, rhodium, iridium, osmiridium, ruthenium, and osmium (metal and alloys including scrap) ___ do	188,074	16,246	361,260	39,279
Platinum-group manufactures, except jewelry ___	NA	4,282	NA	3,753
Rare-earth metals, including cerium ore, metal, alloys, lighter flints ___ pounds	109,766	286	192,144	503
Silicon:				
Ferrosilicon ___ short tons	15,984	4,051	6,575	3,338
Silicon carbide, crude and in grains ___ do	7,723	3,413	14,112	5,813
Silver:				
Ore, concentrates, waste, sweepings ___ thousand troy ounces	3,007	7,322	12,699	53,956
Bullion, refined ___ do	8,208	20,316	5,691	27,695
Tantalum:				
Ore, metal, other forms ___ thousand pounds	360	3,962	704	6,813
Powder ___ do	202	5,312	233	7,008
Tin:				
Ingots, pigs, bars, etc.:				
Exports ___ long tons	2,540	12,099	5,908	47,774
Reexports ___ do	866	3,236	2,507	15,700
Tin scrap and other tin-bearing material except tinplate scrap ___ do	4,862	3,262	7,325	5,950
Titanium:				
Ore and concentrate ___ short tons	1,494	353	3,264	727
Sponge (including iodide titanium and scrap) ___ do	4,142	3,601	4,730	9,288
Intermediate mill shapes and mill products, n.e.c ___ do	745	8,748	1,719	19,600
Dioxide and pigments ___ do	20,769	14,021	30,540	24,696
Tungsten, ore and concentrates:				
Exports ___ thousand pounds	90	239	1,187	4,835
Reexports ___ do	--	--	88	292
Uranium:				
Ores and concentrates (U_3O_8 content) ___ pounds	109,934	737	--	--
Metal ___ do	14,737	270	20,496	322
Compounds ___ do	4,028,095	26,107	4,682,926	30,855
Isotopes (stable) and their compounds	NA	17,041	NA	2,786
Radioactive materials ___ thousand curies	15,615,135	12,303	25,431,262	16,571
Special nuclear materials ___	NA	223,516	NA	158,267
Vanadium: Ore and concentrate, pentoxide, etc. (vanadium content) ___ pounds	464,399	1,157	406,235	1,327
Ferrovanadium ___ do	2,832,762	8,734	2,670,321	7,863
Zinc:				
Slabs, pigs, or blocks ___ short tons	14,566	8,259	19,062	16,511
Sheets, plates, strips, other forms n.e.c ___ do	2,480	2,100	3,487	3,842
Waste, scrap, and dust (zinc content) ___ do	7,032	2,717	12,088	6,280
Semifabricated forms, n.e.c ___ do	15,077	10,565	28,456	27,343
Zirconium:				
Ore and concentrate ___ pounds	57,842,328	2,288	42,973,250	3,323
Metals, alloys, other forms ___ do	1,016,437	12,425	1,650,695	18,195

See footnotes at end of table.

Table 9.—U.S. exports of principal minerals and products [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
NONMETALS				
Abrasives:				
Dust and powder of precious or semi-precious stones, including diamond dust and powder ---------- thousand carats --	9,928	$25,071	14,005	$34,822
Crushing bort ---------- do ----	40	138	11	25
Industrial diamonds ---------- do ----	516	4,208	981	5,460
Diamond grinding wheels ---------- do ----	746	4,223	894	5,574
Other natural and artificial metallic abrasives and products ----------	NA	49,329	NA	69,627
Asbestos:				
Exports:				
Unmanufactured ---------- short tons --	65,900	9,251	55,114	8,643
Products ---------- do ----	NA	40,705	NA	60,256
Reexports:				
Unmanufactured ---------- do ----	542	91	6,609	549
Products ---------- do ----	NA	72	NA	140
Barite:				
Natural barium sulfate ---------- do ----	68,086	2,884	61,245	2,518
Lithopone ---------- do ----	986	357	1,185	967
Boron: Boric acid, and borates, crude and refined ---------- do ----	210,233	26,216	253,847	42,610
Cement ---------- do ----	324,740	8,980	289,844	14,860
Clays:				
Kaolin or china clay ---------- do ----	731,798	30,528	848,878	42,080
Fire clay ---------- do ----	196,337	3,820	224,110	5,983
Other clays ---------- do ----	1,168,495	45,426	1,376,888	66,148
Feldspar, leucite, nepheline, nepheline syenite ---------- thousand pounds --	19,107	466	36,638	662
Fluorspar ---------- short tons --	r 2,428	r 171	5,847	316
Gem stones:				
Diamonds ---------- thousand carats --	259	314,172	284	404,639
Pearls ----------	NA	473	NA	817
Other ----------	NA	21,770	NA	19,625
Graphite ---------- short tons --	7,953	992	12,189	1,693
Gypsum:				
Crude, crushed or calcined thousand short tons --	63	3,135	132	3,910
Manufactures, n.e.c ----------	NA	4,225	NA	6,934
Lithium hydroxide ---------- thousand pounds --	1,043	605	1,198	1,118
Kyanite and allied minerals ----- short tons --	93,714	5,552	135,982	8,205
Lime ---------- do ----	36,914	1,208	31,639	1,516
Magnesium compounds:				
Magnesite, dead-burned thousand pounds --	101,520	6,104	102,533	7,749
Magnesite, crude, caustic calcined, lump, or ground ---------- do ----	18,608	4,196	21,465	5,088
Mica sheet, waste and scrap, and ground ---------- pounds --	14,588,464	2,201	16,842,858	3,085
Mica, manufactured ---------- do ----	1,155,852	3,064	1,053,980	3,430
Mineral-earth pigments, iron oxide, natural and manufactured ---------- short tons --	14,363	6,702	15,585	9,437
Nitrogen compounds (major) thousand short tons --	r 4,539	r 317,591	3,751	565,649
Phosphate rock ---------- do ----	13,932	113,295	14,174	256,697
Phosphatic fertilizers:				
Superphosphates ---------- do ----	967	70,990	1,179	222,711
Ammonium phosphates ---------- do ----	2,235	189,064	1,992	358,807
Elemental phosphorus ---------- do ----	26,679	12,256	33,653	20,075
Mixed chemical fertilizer ---------- do ----	375	34,084	474	53,476
Pigments and compounds (lead and zinc):				
Lead pigments ---------- short tons --	2,240	1,025	3,395	1,926
Zinc pigments ---------- do ----	r 8,062	r 2,440	13,430	7,405
Potash:				
Fertilizer ---------- do ----	1,578,716	57,997	1,414,598	66,175
Chemical ---------- do ----	39,229	10,660	38,290	14,712
Pumice and pumicite ----- thousand pounds --	6,190	765	5,821	1,211
Quartz, natural, quartzite, cryolite, chiolite ---------- do ----	724	134	3,002	808
Salt:				
Crude and refined -- thousand short tons --	609	4,400	521	4,276
Shipments to noncontiguous territories ---------- do ----	r 20	r 1,820	19	1,793

See footnotes at end of table.

Table 9.—U.S. exports of principal minerals and products [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
NONMETALS—Continued				
Sand and gravel:				
Sand:				
Construction ---------- short tons	422,483	$793	658,801	$1,132
Industrial ---------- do	845,359	7,136	1,123,954	9,864
Gravel ---------- do	475,894	667	472,896	668
Sodium and sodium compounds:				
Sodium sulfate ---------- do	45	2,049	51	3,250
Sodium carbonate ---------- do	425	16,064	564	34,156
Stone:				
Dolomite, block ---------- do	59	652	86	1,559
Limestone, crushed, ground broken do	2,316	5,400	2,793	7,753
Marble and other building and monumental ---------- thousand cubic feet	NA	1,244	NA	1,920
Stone, crushed, ground, broken thousand short tons	765	4,819	625	4,850
Manufactures of stone ----------	NA	948	NA	2,077
Sulfur:				
Crude ---------- thousand long tons	1,771	34,330	2,580	95,516
Crushed, ground, flowers ---------- do	r 5	1,461	21	1,829
Talc, crude and ground ---------- short tons	180,102	6,618	182,706	6,711
MINERAL FUELS				
Carbon black ---------- thousand pounds	192,665	24,056	201,737	32,947
Coal:				
Anthracite -------- thousand short tons	717	11,240	735	16,577
Bituminous ---------- do	r 52,870	1,002,457	59,926	2,420,334
Briquets ---------- do	92	5,107	113	6,729
Coke ---------- do	1,395	33,138	1,278	43,564
Natural gas ---------- thousand cubic feet	84,805,211	43,152	107,873,053	68,676
Petroleum:				
Crude ---------- thousand barrels	697	2,620	1,072	13,565
Gasoline ---------- do	1,692	20,737	655	12,105
Jet fuel ---------- do	824	4,087	655	7,637
Naphtha ---------- do	1,561	19,671	1,293	27,211
Kerosine ---------- do	81	811	33	525
Distillate fuel oil ---------- do	2,526	25,680	307	5,518
Residual fuel oil ---------- do	8,388	23,578	4,261	41,232
Lubricating oil ---------- do	10,728	173,546	11,297	321,951
Asphalt ---------- do	338	3,262	341	5,238
Liquefied petroleum gases -------- do	9,927	57,191	9,033	94,464
Wax ---------- do	942	24,176	862	34,464
Coke ---------- do	34,668	127,182	40,790	181,171
Petrochemical feedstocks ---------- do	6,815	32,500	5,558	65,712
Miscellaneous ---------- do	1,168	27,886	1,194	44,433
Total ----------	XX	7,539,909	XX	12,733,090

r Revised. NA Not available. XX Not applicable.

[1] Due to additions of commodities and changes in classifications, data not strictly comparable to earlier years.

Table 10.—U.S. imports for consumption of principal minerals and products [1]

Mineral		1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
METALS					
Aluminum:					
Metal	short tons	r 508,184	r $225,545	508,643	$312,479
Scrap	do	r 46,824	r 16,754	74,743	42,569
Plates, sheets, bars, etc	do	r 58,794	r 43,255	46,081	47,489
Aluminum oxide (alumina)	do	r 3,406,689	r 211,288	3,627,024	270,617
Antimony:					
Ore (antimony content)	do	16,679	10,903	14,655	20,866
Needle or liquated	do	51	73	86	271
Metal	do	692	745	2,203	7,550
Oxide	do	4,651	6,095	6,269	15,580
Arsenic:					
White (As_2O_3 content)	do	r 13,496	r 2,045	13,742	2,449
Metallic	do	643	2,630	707	3,651
Bauxite, crude	thousand long tons	r [2] 12,778	NA	[2] 14,308	NA
Beryllium ore	short tons	1,586	481	1,368	414
Bismuth	pounds	r 2,683,671	r 9,688	1,893,744	15,606
Boron:					
Carbide	do	322,236	395	75,429	265
Boric acid	do	20,161	3	844,811	149
Calcium borate, crude	do	36,431,521	568	42,427,527	852
Cadmium:					
Metal	short tons	r 1,948	r 12,963	1,985	14,674
Flue dust (cadmium content)	do	r 174	r 611	166	603
Calcium:					
Metal	pounds	110,407	78	109,252	121
Chloride	short tons	7,357	317	3,599	156
Chromate:					
Ore and concentrates (Cr_2O_3 content)	thousand short tons	412	21,028	481	28,532
Ferrochrome	do	r 105	r 37,198	102	55,261
Metal	do	3	6,080	2	5,388
Cobalt:					
Metal	thousand pounds	r 18,398	r 53,772	14,791	49,661
Oxide (gross weight)	do	1,150	2,714	1,509	4,514
Salts and compounds (gross weight)	do	62	51	2	12
Columbium ore	do	2,826	2,201	3,129	3,207
Copper (copper content):					
Ore and concentrates	short tons	19,582	16,029	84,981	130,269
Regulus, black, coarse	do	139	106	2,426	12,033
Unrefined, black, blister	do	128,166	159,922	200,607	383,491
Refined in ingots, etc	do	r 207,739	r 264,967	313,349	551,442
Old and scrap	do	r 18,981	r 23,540	31,109	50,640
Ferroalloys, n.e.c	do	62,520	21,297	81,663	37,848
Gallium	kilograms	11,124	6,073	6,536	4,107
Gold:					
Ore and base bullion	troy ounces	r 234,694	19,388	329,357	45,974
Bullion	do	3,610,073	336,762	2,321,981	350,706
Indium	do	811,527	986	492,978	1,906
Iron ore	thousand long tons	43,296	533,488	48,029	696,298
Iron and steel:					
Pig iron	short tons	445,626	28,925	342,348	41,038
Iron and steel products (major):					
Iron products	do	38,043	19,113	49,524	29,328
Steel products	do	r 15,569,833	3,026,099	16,696,508	5,553,379
Scrap	do	336,693	18,716	188,480	26,166
Tinplate	do	11,940	384	12,645	861
Lead:					
Ore, flue dust, matte (lead content)	do	r 94,299	r 17,382	62,691	15,180
Base bullion (lead content)	do	4	1	831	331
Pigs and bars (lead content)	do	r 178,116	r 52,937	118,367	57,693
Reclaimed scrap, etc. (lead content)	do	r 3,116	r 588	1,236	834
Sheet, pipe and shot	do	r 772	r 303	196	138
Magnesium:					
Metallic and scrap	do	r 2,916	r 1,437	4,815	3,518
Alloys (magnesium content)	do	389	1,104	440	1,573
Sheets, tubing, ribbons, wire, other forms (magnesium content)	do	20	129	50	135
Manganese:					
Ore (35% or more manganese)	do	722,635	37,403	592,818	45,091
Ferromanganese (manganese content)	do	r 303,885	r 53,337	327,874	88,426
Metal	do	2,452	1,100	2,506	1,379

See footnotes at end of table.

Table 10.—U.S. imports for consumption of principal minerals and products [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
METALS—Continued				
Mercury:				
Compounds ---------- pounds --	3,543	$30	62,807	$153
Metal ---------- 76-pound flasks --	46,026	12,151	52,180	13,948
Minor metals, selenium and salts --- pounds --	590,173	6,023	841,259	10,611
Molybdenum:				
Ore (metal content) ---------- do ----	458,315	963	155,125	217
Waste and scrap ---------- do ----	94,961	197	100,159	218
Metal ---------- do ----	34,626	366	53,947	574
Compounds ---------- do ----	2,270,433	2,083	1,456,055	1,515
Nickel:				
Pigs, ingots, shot, cathodes -- short tons --	120,083	343,494	137,314	450,342
Plates, bars, etc ---------- do ----	1,628	7,708	1,310	7,446
Slurry ---------- do ----	38,749	81,851	42,999	96,959
Scrap ---------- do ----	2,642	3,906	3,699	8,545
Powder and flakes ---------- do ----	7,291	23,067	9,371	33,545
Ferronickel ---------- do ----	89,780	70,532	102,430	87,255
Oxide ---------- do ----	6,301	13,466	6,449	15,081
Platinum-group metals:				
Unwrought:				
Grains and nuggets (platinum) troy ounces --	19,146	2,396	71,154	13,626
Sponge (platinum) ---------- do ----	499,271	73,108	833,122	150,563
Sweepings, waste and scrap -- do ----	84,534	10,229	129,320	18,116
Iridium ---------- do ----	19,701	4,816	28,980	9,432
Palladium ---------- do ----	496,065	36,613	588,014	74,433
Rhodium ---------- do ----	72,856	15,587	97,058	39,957
Ruthenium ---------- do ----	67,218	3,375	63,884	3,678
Other platinum-group metals -- do ----	243,584	33,877	234,789	45,337
Semimanufactured:				
Platinum ---------- do ----	155,715	22,949	199,355	35,388
Palladium ---------- do ----	658,240	43,500	750,073	75,553
Rhodium ---------- do ----	20,355	1,761	1,549	898
Other platinum-group metals -- do ----	3,806	621	7,821	1,335
Radium: Radioactive substitutes ----------	NA	r 5,603	NA	7,565
Rare-earth metals, ferrocerium and other cerium alloys ---------- pounds --	38,206	127	57,519	238
Silicon (silicon content):				
Metal ---------- short tons --	8,302	11,955	5,914	16,700
Ferrosilicon ---------- do ----	r 63,724	r 21,316	92,951	66,350
Silver (general imports):				
Ore and base bullion thousand troy ounces --	33,990	74,927	34,568	150,284
Bullion ---------- do ----	r 81,373	r 215,897	89,963	432,868
Sweepings, waste, dore ---------- do ----	15,472	39,832	8,864	40,642
Tantalum ore ---------- thousand pounds --	1,097	2,858	1,897	7,169
Tin:				
Ore (tin content) ---------- long tons --	r 4,798	r 18,511	5,877	35,999
Blocks, pigs, grains, etc ---------- do ----	45,845	195,246	39,602	289,592
Dross, skimmings, scrap, residues and alloys, n.s.p.f ---------- do ----	1,281	1,322	1,761	1,186
Tin foil, powder, flitters, etc ----------	NA	6,956	NA	9,331
Titanium:				
Ilmenite [2] ---------- short tons --	r [3] 306,939	r [3] 11,856	[3] 318,720	[3] 13,715
Rutile ---------- do ----	[2] 208,808	[2] 27,158	[2] 235,507	[2] 37,445
Metal ---------- pounds --	13,648,385	11,389	20,090,390	19,546
Ferrotitanium ---------- do ----	512,547	178	4,592,316	3,122
Compounds and mixtures ---------- do ----	121,789,426	28,057	70,866,757	25,216
Tungsten (tungsten content):				
Ore and concentrates -- thousand pounds --	r 10,834	r 23,725	11,096	40,696
Waste and scrap ---------- do ----	102	309	179	711
Other alloys ---------- do ----	1,433	4,947	2,462	9,368
Ferrotungsten ---------- do ----	1,107	3,105	808	3,029
Uranium and other uranium-bearing and nuclear materials:				
Oxide U_3O_8 ---------- pounds --	11,210,066	61,442	3,670,678	30,284
Compounds, n.e.c ---------- do ----	10,914,684	82,860	12,866,822	90,921
Isotopes (stable) and their compounds ----	NA	808	NA	1,007
Radio isotopes, elements, etc. thousand curies --	34,672,001	5,537	24,246,498	7,565
Vanadium (content):				
Ore ---------- thousand pounds --	57	37	--	--
Ferrovanadium ---------- do ----	393	1,174	288	1,142
Vanadium-bearing materials (vanadium pentoxide content) [4] ----------	XX	XX	7,744	5,566

See footnotes at end of table.

Table 10.—U.S. imports for consumption of principal minerals and products [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
METALS—Continued				
Zinc:				
Ore (zinc content) ---------- short tons	r 154,174	r $24,708	133,733	$31,430
Blocks, pigs, slabs ---------- do	r 590,751	r 273,623	543,806	431,250
Sheets, etc ---------- do	236	159	640	568
Old, dross, skimmings ---------- do	r 2,328	r 506	3,863	1,786
Dust, powder, flakes ---------- do	4,873	2,468	9,131	9,799
Manufactures ----------	NA	r 608	NA	563
Zirconium:				
Ore, including zirconium sand ---- do	98,023	5,415	62,504	6,398
Wrought, scrap, compounds ------ do	2,137	3,394	2,702	4,365
NONMETALS				
Abrasives:				
Diamonds (industrial) - thousand carats	r 19,166	r 65,713	18,418	62,920
Other abrasives ----------	NA	70,942	NA	80,054
Asbestos ---------- short tons	792,473	98,914	766,164	123,822
Barite:				
Crude and ground ---------- do	r 724,807	7,767	764,625	9,155
Witherite ---------- do	4,611	716	3,435	710
Chemicals ---------- do	32,780	6,719	43,383	13,033
Cement ---------- thousand short tons	r 6,686	r 104,128	5,732	101,734
Clays:				
Raw ---------- short tons	46,044	1,303	37,012	1,778
Manufactured ---------- do	r 6,905	r 677	5,806	415
Cryolite ---------- do	[2] 19,789	[2] 5,052	21,216	6,969
Feldspar:				
Crude ----------long tons	264	22	30	(5)
Ground and crushed ---------- do	103	4	62	3
Fluorspar ---------- short tons	1,212,347	52,620	1,336,389	60,988
Gem stones:				
Diamond ---------- thousand carats	[2] 5,181	r [2] 821,185	4,533	760,040
Emeralds ---------- do	r 750	r 32,865	871	34,046
Other ----------	NA	83,968	NA	88,234
Graphite ---------- short tons	r 77,431	r 4,494	82,636	5,677
Gypsum:				
Crude, ground, calcined thousand short tons	7,663	17,695	7,426	17,709
Manufactures ----------	NA	4,242	NA	4,180
Iodine, crude ---------- thousand pounds	r 6,149	r 10,585	7,970	14,849
Kyanite ---------- short tons	221	13	194	12
Lime:				
Hydrated ---------- do	47,309	941	48,284	1,311
Other ---------- do	286,703	4,302	367,917	6,368
Lithium:				
Ore ---------- do	6,073	432	3,165	323
Compounds ---------- do	11	82	84	249
Magnesium compounds:				
Crude magnesite ---------- short tons	--	--	19	1
Lump, ground, caustic calcined magnesia ---------- do	10,967	734	8,990	692
Refractory magnesia, dead-burned fused magnesite, dead-burned dolomite - do	r 158,224	r 13,911	156,401	18,455
Compounds ---------- do	57,029	1,880	32,064	2,107
Mica:				
Uncut sheet and punch thousand pounds	1,169	1,269	794	947
Scrap ---------- do	5,072	116	6,634	193
Manufactures ---------- do	4,785	4,325	6,555	4,928
Mineral-earth pigments, iron oxide pigments:				
Ocher, crude and refined ---- short tons	66	9	53	10
Siennas, crude and refined ---------- do	1,192	205	1,309	264
Umber, crude and refined ---------- do	9,665	569	7,790	565
Vandyke brown ---------- do	966	144	958	183
Natural, other ---------- do	1,858	378	2,162	376
Synthetic ---------- do	37,436	10,700	41,943	14,969
Nepheline syenite:				
Crude ---------- do	258	4	4,605	79
Ground, crushed, etc ---------- do	473,838	6,022	505,028	7,558
Nitrogen compounds (major), including urea ---------- thousand short tons	r 2,842	r 146,667	3,374	345,230
Phosphate, crude ---------- do	[2] 65	[2] 1,288	[2] 182	[2] 8,999
Phosphatic fertilizers ---------- do	r 182	r 11,889	202	32,512

See footnotes at end of table.

Table 10.—U.S. imports for consumption of principal minerals and products [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
NONMETALS—Continued				
Pigments and salts:				
Lead pigments and compounds short tons	20,515	$8,602	14,384	$10,001
Zinc pigments and compounds do	r 36,802	14,071	39,436	26,048
Potash do	r 6,064,312	r 157,057	7,265,222	256,082
Pumice:				
Crude or unmanufactured do	5,026	95	8,415	228
Wholly or partly manufactured do	305,400	1,038	284,505	1,214
Manufactures, n.s.p.f	NA	19	NA	80
Quartz crystal (Brazilian pebble) pounds	1,064,774	364	1,731,913	624
Salt thousand short tons	r 3,207	r 12,554	3,358	14,428
Sand and gravel:				
Glass sand do	48	340	51	486
Other sand and gravel do	752	1,236	343	352
Sodium sulfate do	320	5,658	375	10,382
Stone and whiting	NA	48,678	NA	51,631
Strontium: Mineral short tons	27,040	657	38,431	1,145
Compounds do	5,822	1,724	8,547	3,095
Sulfur and compounds, ore and other forms, n.e.s thousand long tons	1,222	r 14,871	2,150	51,124
Talc: Unmanufactured short tons	22,993	1,658	30,252	2,233
MINERAL FUELS				
Carbon black:				
Acetylene pounds	7,268,499	2,030	7,749,624	2,814
Gas black and carbon black do	8,669,196	991	29,615,297	4,329
Coal:				
Bituminous, slack, culm, lignite short tons	126,641	1,607	2,080,407	57,731
Briquets do	7,425	123	48,233	888
Coke do	1,077,737	39,263	3,540,326	193,165
Natural gas, ethane, methane, and mixtures thereof thousand cubic feet	r 1,015,524,232	r 346,197	967,116,135	503,277
Peat:				
Fertilizer grade short tons	317,639	18,390	323,263	22,316
Poultry and stable grade do	5,862	372	3,267	266
Petroleum:				
Crude petroleum thousand barrels	r 1,297,616	r 4,240,225	1,362,453	15,252,724
Distillate fuel oil do	r 191,364	r 726,845	33,033	995,549
Residual fuel oil do	r 557,015	r 1,707,459	499,914	5,037,761
Unfinished oils do	r 3,270	r 35,385	13,866	172,189
Gasoline do	17,330	139,528	33,903	570,829
Jet fuel do	r 78,089	r 325,549	56,667	649,685
Motor fuels, n.e.s do	r 1,335	r 7,852	955	10,907
Kerosine do	1,078	6,946	1,023	20,354
Lubricants do	r 129	r 2,204	411	6,983
Wax do	r 382	r 8,993	352	11,257
Naphtha do	r 99,311	r 341,407	88,275	1,131,872
Liquefied petroleum gases do	r 48,076	r 152,547	45,091	365,028
Asphalt do	r 8,943	r 21,147	12,209	64,144
Miscellaneous do	r 13,394	r 51,923	19,353	159,768
Total	XX	17,332,775	XX	39,556,497

r Revised. NA Not available. XX Not applicable.

[1] Due to additions of commodities and changes in classifications, data are not strictly comparable to earlier years.

[2] Data adjusted by the Bureau of Mines.

[3] Includes titanium slag averaging about 70% TiO.

[4] Classification established Jan. 1, 1974.

[5] Less than ½ unit.

Table 11.—Comparison of world and U.S. production of principal mineral commodities

(Thousand short tons unless otherwise specified)

Minerals	1973			1974 p		
	World production [1]	U.S. production	U.S. percent of world production	World production [1]	U.S. production	U.S. percent of world production
MINERAL FUELS						
Carbon black ---------- million pounds	7,819	3,500	45	7,916	3,390	43
Coal:						
Bituminous	[2]2,305,572	577,574	25	[2]2,327,860	587,928	25
Lignite	903,852	14,164	2	918,099	15,478	2
Pennsylvania anthracite	194,404	6,830	4	206,258	6,617	3
Coke (excluding breeze):						
Gashouse [3]	9,183	--	--	8,964	--	--
Oven and beehive	400,742	64,325	16	408,741	61,581	15
Natural gas (marketable) ---------- million cubic feet	46,139,070	22,647,549	49	47,137,672	21,600,522	46
Peat	230,172	635	[4]	220,344	731	[4]
Petroleum (crude) ---------- thousand barrels	20,367,981	3,360,903	17	20,537,727	3,202,585	16
NONMETALS						
Asbestos	4,512	150	3	4,536	113	3
Barite	4,673	1,104	24	4,789	1,106	23
Cement	733,061	[5]87,573	11	776,210	[5]82,888	11
Clay, china	16,886	[6]5,993	36	17,715	[6]6,393	36
Corundum	9	--	--	9	--	--
Diamond ---------- thousand carats	43,140	--	--	44,085	--	--
Diatomite	1,790	609	34	1,876	664	35
Feldspar	2,993	792	27	3,174	854	27
Fluorspar	5,044	249	5	5,082	201	4
Graphite	409	W	NA	432	W	NA
Gypsum	67,858	13,558	20	66,109	11,999	18
Lime (sold or used)	118,197	[5]21,132	18	121,640	[5]21,645	18
Magnesite	9,994	W	NA	10,195	W	NA
Mica (including scrap) ---------- thousand pounds	546,284	306,684	56	520,946	273,932	53
Nitrogen, agricultural [7]	41,802	[5]9,296	22	45,037	[5]10,088	22
Phosphate rock	108,858	42,137	39	121,601	45,686	38
Potash (K_2O equivalent)	24,298	2,603	11	26,068	2,552	10
Pumice [8]	16,396	3,974	24	14,422	3,964	28
Pyrites ---------- thousand long tons	23,190	559	2	23,368	424	2
Salt	166,611	[5]43,940	26	172,228	[5]46,423	27
Strontium [8]	103	--	--	108	--	--
Sulfur, elemental ---------- thousand long tons	48,410	10,921	23	50,861	11,419	22
Talc, pyrophyllite, soapstone	5,808	1,247	21	6,023	1,268	21
Vermiculite [8]	549	365	67	554	341	62
METALS, MINE BASIS						
Antimony (content of ore and concentrate) ---------- short tons	76,744	545	1	77,751	661	1
Arsenic, white ---------- do	50,978	W	NA	54,764	W	NA
Bauxite ---------- thousand long tons	68,821	[9]1,879	3	76,989	[9]1,949	3
Beryl ---------- short tons	3,963	W	NA	3,977	W	NA
Bismuth ---------- thousand pounds	8,296	W	NA	8,556	W	NA
Chromite	7,414	--	--	7,931	--	--
Cobalt (contained) ---------- short tons	29,268	--	--	33,504	--	--

See footnotes at end of table.

Table 11.—Comparison of world and U.S. production of principal mineral commodities—Continued

(Thousand short tons unless otherwise specified)

Minerals	1973			1974 [p]		
	World production [1]	U.S. production	U.S. percent of world production	World production [1]	U.S. production	U.S. percent of world production
METALS, MINE BASIS—Continued						
Columbium-tantalum concentrate [8] ____ thousand pounds __	53,799	--	--	53,103	--	--
Copper (content of ore and concentrate) ____	7,848	[10] 1,718	22	8,105	[10] 1,594	20
Gold ____ thousand troy ounces __	42,998	1,176	3	39,780	1,127	3
Iron ore ____ thousand long tons __	836,442	[11] 87,669	10	879,414	[11] 84,355	10
Lead (content of ore and concentrate) ____	3,878	[10] 603	16	3,845	[10] 664	17
Manganese ore (35% or more Mn) ____	24,568	([4])	([4])	24,175	--	--
Mercury ____ thousand 76-pound flasks __	268	2	1	262	2	1
Molybdenum (content of ore and concentrate) _ thousand pounds __	184,122	155,859	63	188,274	112,011	60
Nickel (content of ore and concentrate) ____	757	18	2	826	17	2
Platinum-group metals ____ thousand troy ounces __	5,239,781	19,980	([4])	5,759,822	12,657	([4])
Silver ____ do ____	308,584	37,484	12	295,562	33,762	11
Tin (content of ore and concentrate) ____ long tons __	232,358	W	NA	227,642	W	NA
Titanium concentrates:						
Ilmenite [8] ____	2,978	776	26	3,149	745	24
Rutile [8] ____	374	9	2	369	6	2
Tungsten concentrate (contained tungsten) __ thousand pounds __	84,150	7,575	9	82,357	7,381	9
Uranium oxide (U_3O_8) [8] ____ short tons __	25,635	13,235	52	24,176	11,528	48
Vanadium (content of ore and concentrate) ____ do ____	21,633	4,377	20	22,149	4,870	22
Zinc (content of ore and concentrate) ____	6,297	479	8	6,384	500	8
METALS, SMELTER BASIS						
Aluminum ____	13,393	4,529	34	14,517	4,903	34
Cadmium ____ short tons __	18,884	[12] 3,751	20	18,780	[12] 3,333	18
Copper ____	7,932	[13] 1,744	22	8,148	[13] 1,570	19
Iron, pig ____	552,157	101,317	18	566,534	95,477	17
Lead ____	3,796	[14] 688	18	3,821	[14] 684	18
Magnesium ____	266	122	46	W	W	NA
Selenium [8] ____ thousand pounds __	2,626	796	30	2,621	644	25
Steel ingots and castings ____	766,839	[15] 150,799	20	779,349	[15] 145,720	19
Tellurium [8] ____ thousand pounds __	446	241	54	362	191	53
Tin ____ long tons __	228,336	[10] 4,800	2	225,501	[16] 6,000	3
Zinc ____	5,848	583	10	5,968	555	9

[p] Preliminary. NA Not available.

W Withheld to avoid disclosing individual company confidential data.

[1] May not represent total world production because confidential U.S. data are excluded for some commodities. World totals include reported figures and reasonable estimates; however, for some commodities where data were not available, no reasonable estimates could be made and none have been included.

[2] Includes small quantities of lignite for People's Republic of China and Pakistan, and anthracite for Colombia.

[3] Includes low- and medium-temperature and gashouse coke.

[4] Less than ½ unit.

[5] Includes Puerto Rico.

[6] Kaolin sold or used by producers.

[7] Year ended June 30 of year stated (United Nations).

[8] World total exclusive of the U.S.S.R.

[9] Dry bauxite equivalent of crude ore.

[10] Recoverable.

[11] Includes byproduct ore.

[12] Includes secondary.

[13] Smelter output from domestic and foreign ores, exclusive of scrap.

[14] Lead refined from domestic and foreign ores; excludes lead refined from imported base bullion.

[15] Data from American Iron and Steel Institute. Excludes production of castings by companies that do not produce steel ingot.

[16] Includes tin content of alloys made directly from ore.

The Mineral Industry of Alabama

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey of Alabama for collecting information on all minerals except fuels.

By James R. Boyle [1] and T. L. Neathery [2]

The value of mineral production increased over 85% in 1974. The increase in value, although generally across the board, was most dramatic in the fossil fuels sector and particularly for natural gas reflecting the increased value of all forms of energy. Some nonmetallics and iron ore decreased in production, while total fossil fuels production increased. It is worth noting that of all commodities, only the unit value of iron ore remained relatively constant while most other minerals increased in unit value, some substantially. Approximately 95% of the increase in total mineral value can be attributed to increased values in fossil fuels. Alabama ranked second in the Nation in the production of bauxite and scrap mica and third in kaolin. Coal, petroleum, cement, and stone accounted for most of the value of mineral production.

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[2] Chief Geologist, Mineral Resources, Geological Survey of Alabama, Tuscaloosa, Ala.

Table 1.—Mineral production in Alabama [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:[2]				
Masonry thousand short tons	425	$13,074	314	$11,822
Portland do	2,396	55,820	2,190	61,990
Clays [3] do	2,934	8,788	2,995	13,298
Coal (bituminous) do	19,230	211,695	19,824	432,036
Iron ore thousand long tons	271	1,408	W	W
Lime thousand short tons	881	14,050	1,054	22,346
Natural gas million cubic feet	11,271	4,307	27,865	20,704
Petroleum (crude) thousand 42-gallon barrels	11,677	41,772	13,323	113,808
Sand and gravel thousand short tons	9,805	13,870	12,454	19,120
Stone [4] do	20,043	40,117	23,773	60,231
Value of items that cannot be disclosed: Asphalt (native), bauxite, cement (slag, 1973), clay (bentonite), mica (scrap), natural gas liquids, salt, stone (dimension), talc, and items indicated by symbol W	XX	8,155	XX	9,891
Total	XX	413,056	XX	764,746
Total 1967 constant dollars	XX	302,811	XX	p 365,702

p Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes slag cement (1973); included with "Value of items that cannot be disclosed." No slag cement production was reported in 1974.

[3] Excludes bentonite; included with "Value of items that cannot be disclosed."

[4] Excludes dimension stone; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Alabama, by county [1] [2]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Autauga	W	W	Sand and gravel.
Baldwin	W	W	Clays.
Barbour	$1,568	$1,777	Bauxite, clays, sand and gravel.
Bibb	6,168	5,228	Coal, stone, clays, sand and gravel.
Blount	W	W	Coal, cement, stone.
Calhoun	W	W	Clays, stone, sand and gravel.
Cherokee	--	48	Sand and gravel, coal.
Chilton	46	636	Sand and gravel, clays.
Choctaw	W	29,813	Petroleum, natural gas.
Clarke	W	W	Sand and gravel, petroleum.
Clay	--	([3])	Sand and gravel.
Coffee	74	96	Do.
Colbert	W	W	Stone, native asphalt, sand and gravel.
Conecuh	W	W	Sand and gravel.
Crenshaw	W	W	Do.
Cullman	5,362	15,383	Coal.
Dale	41	W	Sand and gravel.
Dallas	W	W	Sand and gravel, clays.
DeKalb	W	W	Coal, stone.
Elmore	1,625	1,896	Sand and gravel.
Escambia	13,881	W	Petroleum, natural gas, sand and gravel, clays.
Etowah	W	W	Stone, sand and gravel.
Fayette	W	W	Coal, sand and gravel, natural gas.
Franklin	3,245	3,048	Stone, iron ore, sand and gravel, clays.
Geneva	W	W	Sand and gravel.
Hale	W	W	Do.
Henry	W	W	Clays, bauxite.
Houston	W	W	Sand and gravel.
Jackson	W	W	Coal, stone.
Jefferson	136,829	221,957	Coal, cement, stone, clays, sand and gravel.
Lamar	W	928	Natural gas, petroleum.
Lawrence	--	15	Sand and gravel.
Lee	W	W	Stone.
Lowndes	W	W	Clays, sand and gravel.
Macon	1,296	1,681	Sand and gravel.
Madison	W	W	Stone, sand and gravel, clays.
Marengo	W	W	Cement, stone.
Marion	2,818	W	Coal, clays, sand and gravel.
Marshall	W	W	Stone, clays.
Mobile	36,764	63,034	Petroleum, cement, stone, sand and gravel, natural gas liquids, natural gas, clays.
Monroe	699	1,342	Petroleum, natural gas, sand and gravel.
Montgomery	3,017	5,452	Sand and gravel, clays.
Morgan	W	W	Stone.
Randolph	W	W	Mica.
Russell	W	W	Clays, sand and gravel.
St. Clair	W	W	Cement, clays, stone.
Shelby	36,892	58,612	Lime, cement, stone, coal, clays.
Sumter	W	W	Clays, sand and gravel.
Talladega	W	W	Stone, talc.
Tallapoosa	32	32	Clays.
Tuscaloosa	14,524	31,718	Coal, sand and gravel.
Walker	W	W	Coal, sand and gravel, clays.
Washington	W	14,960	Petroleum, natural gas, stone, natural gas liquids, salt, sand and gravel.
Winston	1,726	14,673	Coal.
Undistributed [4]	146,445	292,417	
Total [5]	413,056	764,746	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Bullock, Butler, Chambers, Covington, Cleburne, Coosa, Greene, Lauderdale, Limestone, Perry, Pickens, Pike, and Wilcox.

[2] Values for petroleum and natural gas were based on an average price per barrel for the State.

[3] Less than ½ unit.

[4] Includes some sand and gravel (1973) and some petroleum (1973) which cannot be assigned to specific counties and values indicated by symbol W.

[5] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Alabama business activity

		1973	1974 p	Change, percent
Monthly average employment:				
Total, nonagricultural	thousands	1,135.6	1,164.1	+2.5
Manufacturing	do	347.3	351.1	+1.1
Nonmanufacturing	do	788.3	813.0	+3.1
Mining	do	8.6	9.2	+7.0
Contract construction	do	66.4	71.3	+7.4
Services	do	157.1	162.8	+3.6
Government	do	225	231.1	+2.4
Personal income:				
Total	millions	$13,700	$15,016	+9.6
Per capita		$3,864	$4,198	+8.6
Construction activity:				
Highway construction contracts awarded	millions	$102	$120	+17.6
New housing units authorized		20,390	13,964	−31.5
Value of nonresidential construction	millions	$260.6	$318.6	+22.3
Farm marketing, cash receipts	do	$1,313.3	NA	NA
Mineral production vaule	do	$413	$765	+85.2

p Preliminary. NA Not available.

Sources: Alabama Business, Center for Business and Economic Research, University of Alabama; Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Roads and Streets; and U.S. Bureau of Mines.

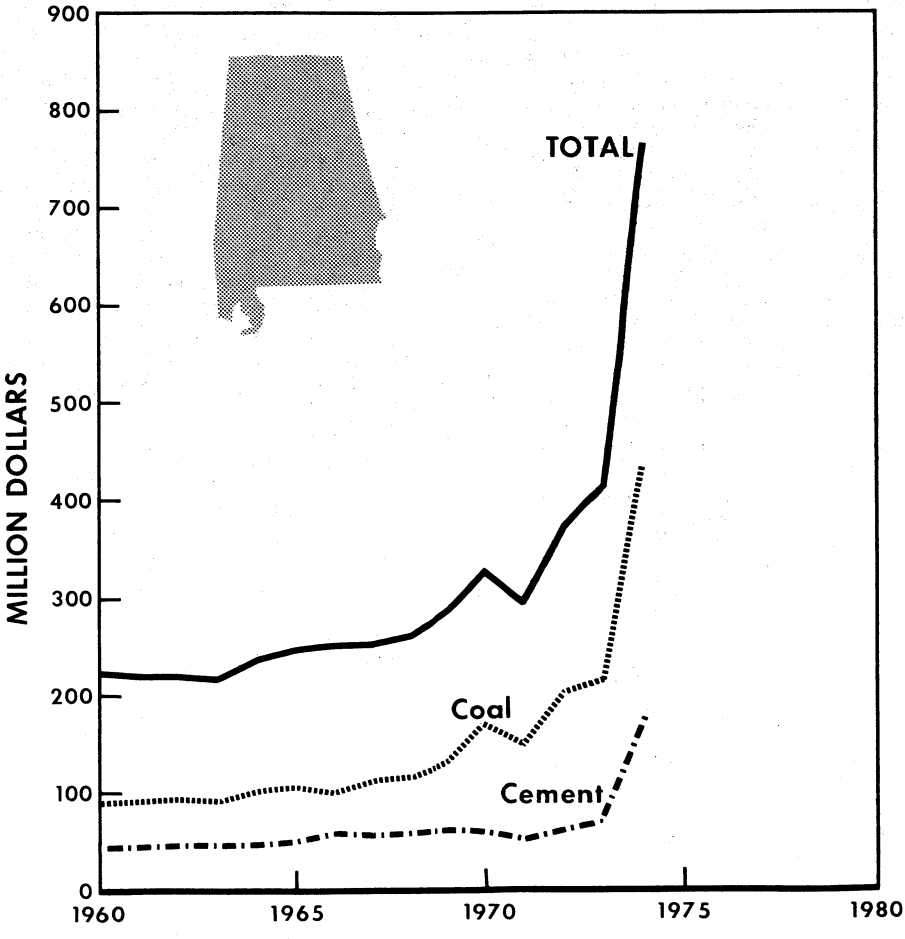

Figure 1.—Value of coal, cement, and total value of mineral production in Alabama.

International Trade.—The international trade passing through the Mobile Customs District was valued at $1,623 million in 1974, up 32% from the previous year. Of the total value of trade passing through the District in 1974, 79% of the imports and 46% of the exports was handled through the port at Mobile. Value of imports and exports handled at the State Docks in Mobile increased 36% over the previous year. The $16 million bulk coal-handling facility of the Alabama State Docks at McDuffie Terminal was essentially completed during the year, with initial exports of coal scheduled for early 1975. The facility has a capacity to handle 10 million tons of coal annually. In 1974, coal exports amounted to 1,606,000 short tons; valued at $35.4 million, an increase in tonnage of 43% above the previous year. Nearly 36,000 tons of low-sulfur coal, valued at $670,000 was imported for use in steam plants in Florida. Slightly more than 6 million tons of iron ore and concentrate, valued at nearly $62 million, and 2.2 million tons of bauxite and calcined materials, valued at $31.3 million, was imported through the Mobile Docks for use in Alabama plants.

Trends and Developments.—U.S. Pipe and Foundry Co.'s first of five new underground coal mines is scheduled to be in full production in 1975; the second one by 1976. The five mines will have a planned production of 10 million tons of coal by the 1980's. Most of the output of the first two mines is committed to Alabama Power Co. In addition, 3 million tons per year for 15 years will be exported to Nippon Steel Corporation and five other Japanese steel companies. Exports are planned to begin in 1978.

The Alabama State Dock's new $16 million export coal facility at McDuffie is near completion; initial exports of coal are expected early in 1975. A stocker-reclaimer, capable of handling up to 4,000 tons per hour, will be used to stockpile and reclaim the coal for direct loading into ships. Coal can also be loaded directly without stockpiling, and facilities are available for receipt of coal by barge or rail.

United States Steel Corp., Fairfield Works, with two new Q-BOP steelmaking furnaces coming on-stream during the year, announced plans for a third Q-BOP plus a new blast furnace. Capacity in 1973 was around 1 million tons and will rise to around 5 million tons when the third Q-BOP is completed in 1976. Republic Steel Corp. at Gadsden, announced its operations will undergo a major expansion program starting in 1975.

Revere Copper & Brass, Inc., signed an agreement with Nippon Light Metal Co., Ltd., and five other Japanese firms for joint expansion of its primary aluminum reduction plant near Scottsboro. Reportedly, the agreement provides for construction of a 132,000 short-ton-per-year smelter within Revere's complex on Goose Pond Island, with Japan receiving the entire output of primary metal from the added capacity. Revere's Goose Pond Island complex includes sheet, plate, and coil facilities on its 2,129-acre site. Present primary capacity is 112,000 tons per year, but Revere indicated this could eventually be expanded to 336,000 tons per year.

The Globe Metallurgical Division, Beverly, Ohio, which produces silicon metal for the aluminum and chemical industries as well as ferroalloys, will expand its Selma plant's silicon metal capacity by 112% as a result of the installation of an additional furnace. The division produced 87,900 tons of silicon metal and ferroalloys last year; shipments reached 100,817 tons because surplus inventories were on hand at the beginning of the year.

Ohio Ferro-Alloys Corp., Canton, Ohio, plans to construct a $20 million ferroalloy plant near Montgomery. Plans call for placing the first of three electric arc furnaces in operation by late 1975, with the other units to follow shortly. Capacity will be 35,000 tons of silicon metal per year.

Kerr-McGee Chemical Company plans to build a $100 million chemical plant complex near Mobile. The company will build two plants on the site—one which will convert ilmenite ore imported from Australia into rutile and the other which will process the rutile into titanium dioxide. The primary plant will also produce synthetic rutile for the company's plant at Hamilton, Miss. The Hamilton plant has been importing 250,000 tons of raw material from Australia through the Port of Mobile for several years. This quantity will be doubled.

Diamond Shamrock Corp. will add a silicate plant to its chloralkali complex at Mobile. The plant, to be completed early

in 1976, will have a rated capacity of 50,000 tons per year, and will burn hydrogen, a byproduct of the plant, as a fuel.

At yearend, Alabama Power Co.'s (APC) Unit No. 1 of the Joseph M. Farley Nuclear Plant in Houston County was 80% completed. The unit, with a generating capacity of 860,000 kilowatts, is scheduled for operation in mid-1976. Unit No. 2, 42% completed, is scheduled for operation in 1977. During 1974, APC purchased 3.7 million tons of coal under short-term contracts from the spot market at an average cost of $29.86 per ton. Average cost of coal produced by suppliers from reserves of the power company was $15.45 per ton, and coal produced under long-term contracts was $13.54 per ton. During the year, Alabama By-Products Corporation assumed ownership and operation of Southern Electric Generating Co.'s coal mine near Parrish.

APC plans to build a nuclear electric gnerating plant on a 2,800-acre site in Chilton and Elmore Counties, near Verbena and Clanton, to cost $2.9 billion. The plant will be the company's second nuclear plant. The first two units scheduled to go into operation in 1982 and 1983, will be in Chilton County. The third and fourth units, in Elmore County, would begin service in 1984 and 1985. Each unit will have an installed capacity of 1.2 million kilowatts.

Construction continued on APC's James H. Miller, Jr., steam plant, 18 miles northwest of Birmingham. The plant will have three 660,000-kilowatt units scheduled for service in 1978, 1979, and 1980. A fourth unit can be added when needed.

The Tennessee Valley Authority (TVA) received a limited work authorization for preliminary onsite construction at the proposed Bellefonte Nuclear Plant near Hollywood. Work will begin immediately on the site for the two-unit 2,664,000-kilowatt nuclear plants. TVA plans to have the first unit in commercial operation in December 1979, and the second unit in September 1980.

Legislation and Government Programs.—The Alabama Water Improvement Commission issued regulations pertaining to surface mining operations in order to protect, maintain, and improve the quality of waters of the State and to provide for the prevention, abatement, and control of new or existing water pollution associated with mining operations. Every operation is required to have a permit which is issued after acceptance of a pollution abatement and/or prevention plan.

The Geological Survey of Alabama printed 34 publications on various subjects during the year. The general subjects covered in these publications included: Coal resources, liquid industrial waste disposal, environmental geology, ERTS-1 space data, general geology, gravity surveys, water availability, oil and gas rules and regulations, sinkhole problems, and rocks and minerals.

The Alabama Energy Management Board published the four documents during the year: (1) "Coal in Alabama;" (2) "Natural Gas in Alabama;" (3) "Electricity in Alabama;" and (4) "Petroleum in Alabama."

The Governors of Alabama and Mississippi signed letters of intent with SPPLITT, Ltd., a New Orleans company, for a $189 million monoport off the coast of Mississippi-Alabama. Upon signing the letter, Mississippi's governor stated that Mississippi and Alabama would be full and complete partners in the project. The monoport system will allow giant tankers to unload crude oil in 120 feet of water, about 28 miles off the Mississippi-Alabama coast. The products would be pumped into tank farms which would be located both in Alabama and Mississippi. Officials estimated a federal permit could be obtained by mid-1975, making 1978 the earliest possible date that the superport would be operational.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Mineral fuels accounted for about 74% of the total value of mineral production, with the bituminous coal value alone accounting for 56.5% of the total.

Coal (Bituminous).—The coal strike in the latter part of 1974 caused little problems because of the large inventories on hand by industrial users. After the strike, to increase inventories, spot market purchases increased substantially resulting in numerous small operators going into

the surface mining business. Exploration continued throughout the State, with increased leasing of coal lands.

Coal production in 1974 increased only 3.1%, while the value increased 104.1%. The increase in production was limited by the coal strike late in the year, while the substantial increase in value reflected the rising energy costs prevalent in the Nation.

Surface mines accounted for 64% of production, compared with 60% in 1973. Surface mine production increased 1.2 million tons, while the number of operating mines increased from 83 in 1973 to 116 in 1974.

Underground production decreased 565,000 tons reflecting the decline in underground operating mines from 21 in 1973 to 19 in 1974. Production from underground mines is expected to increase with the development of several new mines now underway, and plans for more in the future.

Jefferson, Walker, and Tuscaloosa Counties continued to be the main producing counties. Production in Jefferson County decreased 6%; while that in Walker and Tuscaloosa Counties increased 2% and 29.5%, respectively.

Natural Gas.—In the northwestern part of the State, discoveries were made in Lamar, Fayette, and Walker Counties. Approximately eight new gas areas are indicated, and the region is showing promise of becoming a major gas-producer. Two other major discoveries were the Chunchula field in Mobile County, by Union Oil Co., and the Fanny Church field in Escambia County, by Tesoro Petroleum Co. The increase of natural gas resulted from cleaning plant operations commencing in the Big Escambia Creek field in Escambia County and the Chatom field in Washington County.

Petroleum.—Crude petroleum production increased 14.1% in 1974 to over 13 million barrels. The value increased 172.5%, reflecting increased energy costs. Tax revenues from oil and gas have increased from $1.2 million to $5.4 million. Bonuses, rentals, and royalties from State-owned lands reached $550,000, while mineral owners received approximately $12 million in royalties. Expenditures for exploration, leasing, and bonuses to landowners are estimated to have been in excess of $150 million.

During the year, the State Oil and Gas Board issued 119 permits for drilling exploratory and field development wells. Seventy-five of these permits were for southwest Alabama and 44 for northwest Alabama. Seventy-one were wildcats, and the remainder were development wells. Drilling resulted in three new oilfields and gasfields in southwest Alabama, and eight new gas-producing areas in northwest Alabama. From 1964 to 1974, the number of oilfields and gasfields increased from five to 35.

Getty Oil Co., at the end of the year, brought in what is reportedly one of the most significant discoveries in the Southeast in 20 years near Creola. Test results were promising from two formations in the well. Confirmation wells to determine the extent and productivity of the new field will be drilled early in 1975.

Mallard Exploration completed expansion of its processing plant in the Big Escambia near Atmore. The plant will produce some 4,000 barrels of distillate per day from sour crude. In addition, some 65 million cubic feet of natural gas and minor amounts of butane, propane, and ethane will be produced daily.

Phillips Petroleum completed its gas refinery west of Chatom. Daily production is expected at 25 million cubic feet of hydrogen sulfide and gas. From 6,000 barrels of sour crude per day, production of 5,800 barrels of sweet crude, 187 long tons of sulfur, and 80,000 gallons of LPG are expected.

Louisiana Land & Exploration Co. announced plans for a $17 million refinery near Mobile. The plant will process about 30,000 barrels per day from the Jay, Florida, and Little Escambia Creek field in Alabama.

NONMETALS

Nonmetals accounted for about 25% of the State's total mineral production value.

Cement.—Martin Marietta Corp.'s Southern Division plant at Ragland is scheduled for a major expansion in 1975 to increase production from 526,000 to 670,000 tons per year. Alpha Portland Cement Co., Birmingham, is planning an expansion program which will include a new quarry. Citadel Cement Corp.'s Birmingham plant completed an improvement program that included four silos, a bulk loading system, and two precipitators. Citadel is also contemplating a $50 million plant at Demopolis which will have a reported capacity of 750,000 tons per year. Universal Atlas Cement Division, United States Steel

Corp., expects to have its new 60,000-ton-per-year dry-process plant at Leeds in operation by mid-1975.

Portland cement was produced at seven plants in the State; three plants in Jefferson County and one plant each in Shelby, Mobile, St. Clair, and Marengo Counties. Four plants produced both portland and masonry cement while three plants produced only masonry cement.

Portland cement shipments in 1974 totaled 2,189,639 tons—a decrease of 8.6%. Portland cement shipments were valued at $61,989,750, an increase of 11.1%. Unit value increased from $23.29 to $28.31 per ton. Stocks of portland cement at 1974 yearend were 204,830 tons.

Shipments of masonry cement during 1974 were 313,516 tons, a decrease of 26%, while value declined slightly to $11,322,409 or 13%.

The end uses for portland cement were as follows: ready-mix concrete, 60%; concret products, 18%; building materials, 7%; highway contractors, 5%; and other uses, 10%.

Raw materials used in making portland cement included 1,024,549 tons of limestone, 1,844,633 tons of cement rock, 205,006 tons of sand, 116,138 tons of gypsum, 52,746 tons of iron ore, and some oyster shells, clay, shale, slag, and sandstone.

Ideal Basic Industries, Inc., plans to construct a $140 million cement plant in Mobile. It will reportedly be the largest dry-process plant in the Nation, producing 1.5 million tons of cement per year.

The Société des Ciments Vicat, of Grenoble, France, acquired National Cement Co. from the Mead Corporation and plans to expand and modernize its Ragland plant. Capacity will be increased from 360,000 tons per year to 1,000,000 tons per year over a 3-year period.

Table 4.—Alabama: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	7	7
Production	2,403,806	2,321,831
Shipments from mills:		
Quantity	2,396,347	2,189,639
Value	$55,820,066	$61,989,750
Stocks at mills, Dec. 31	99,727	204,830

Table 5.—Alabama: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	7	7
Production	416,309	322,716
Shipments from mills:		
Quantity	425,336	313,516
Value	$13,073,602	$11,322,409
Stocks at mills, Dec. 31	17,332	26,509

Clays.—Companies producing siliceous fire clay, used for furnace repairs, have had reduction in demand because of the conversion from open-hearth furnaces to BOF's.

Brick companies were adversely affected by economic conditions, and a trend appeared underway toward utilization of natural brick coloration rather than various stains and coatings.

Production of common clay and shale, kaolin, and fire clay increased only 2%, while the value increased 51%.

Common clay and shale was mined by 18 companies at 26 pits in 16 counties. Leading counties in terms of production were Jefferson, Sumter, Montgomery, and Shelby. Major uses were in the manufacture of building bricks, other heavy clay products, lightweight aggregates, and cement.

Table 6.—Alabama: Lime sold or used by producers, by use

Use	1973		1974	
	Quantity (Short tons)	Value	Quantity (Short tons)	Value
Paper and pulp	317,200	$4,785,000	381,900	$8,121,000
Steel, BOF	109,700	1,654,000	W	W
Water purification	113,300	1,710,000	101,500	2,158,000
Sewage treatment	66,140	997,400	73,320	1,559,000
Steel, electric	34,380	518,500	48,390	1,029,000
Mason's lime	W	W	28,230	583,200
Soil stabilization	30,880	604,600	23,460	484,600
Aluminum and bauxite	11,300	170,400	9,207	195,800
Miscellaneous chemicals	7,114	107,300	8,660	184,200
Sugar refining	5,682	85,680	6,116	130,100
Food and food products	W	W	2,156	45,850
Other uses [1]	184,700	3,417,000	371,100	7,855,000
Total [2]	880,500	14,050,000	1,054,000	22,346,000

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes open hearth steel furnaces, magnesium (1973), other metallurgy, alkalies, ore concentration petrochemicals (1973), tanning, calcium carbide, chrome (1973), agriculture, silica brick, oil well drilling, paint, petroleum refining, glass (1973), sand-lime brick (1974), finishing lime, and uses indicated by symbol W.
[2] Data may not add to totals shown because of independent rounding.

Fire clay was mined by 8 companies at 10 open pits in Calhoun, St. Clair, Shelby, Henry, Franklin, and Walker Counties.

Kaolin was mined by three companies from six pits in three counties. Producing counties were Henry, Baldwin, and Marion.

Lime.—Five companies produced a record 1,054,000 tons of lime in Shelby County for paper manufacture, BOF steel furnaces, water purification, and other uses. Leading companies were Martin Marietta Cement, Allied Products Co., and S.I. Lime Co. Output expanded 20% above the 1973 record and exceeded 1 million tons for the first time. The lime was used in Alabama, Georgia, Tennessee, and other destinations. Consumption of lime in Alabama was 457,400 tons.

Mica.—United States Gypsum Co. produced scrap mica at its Heflin operations from material mined in Randolph County. Alabama ranked second in the Nation in the production of scrap mica.

Mullite.—Harbison-Walker Refractories manufactured synthetic mullite at its Eufaula operations from material mined in Henry County.

Salt.—The Olin Corporation produced salt from well brines in Washington County for use in chemical manufacture.

Sand and Gravel.—Sand and gravel production increased 27.0%, while value increased 37.9% over that of 1973. Sand and gravel was produced at 84 operations in 36 counties. Nearly all the sand and gravel was used in construction, with only 4% being used for industrial purposes. Of the total production, 70.5% was sold or used commercially, with the balance being sold or used for publicly funded projects.

Exploration activity for high-silica gravel for industrial and chemical needs increased. The demand was related to increased demand for ferro-silicon, which resulted in an expansion of the plant at Selma and a new plant at Montgomery. Increased land acquisition occurred in Montgomery, Dallas, and Conecuh Counties.

Table 7.—Alabama: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	9,439	13,061	3,862	5,217
Gravel			5,742	11,034
Unprocessed: Sand and gravel			2,347	1,314
Industrial:				
Sand	366	809	503	1,395
Gravel			W	W
Total	9,805	13,870	12,454	18,960

W Withheld to avoid disclosing individual company confidential data; included with "Industrial sand."

[1] Value data may not be directly comparable to that in tables 1, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand and gravel.

Table 8.—Alabama: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction	8,580	12,256	2,397	3,863
Highway and bridge construction			195	339
Other uses (dams, waterworks, airports, etc.)			327	586
Concrete products (cement blocks, bricks, pipe, etc.)			1,730	3,015
Bituminous paving (asphalt and tar paving)			906	1,710
Roadbase and subbase			937	1,118
Unprocessed aggregate			955	882
Fill	389	252	49	62
Other uses[2]	463	543	784	1,674
Industrial sand and gravel	366	809	503	1,395
Total	9,798	13,860	8,783	14,644

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes miscellaneous (1973).

Table 9.—Alabama: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction	7	10	47	137
Highway and bridge construction			1,006	1,928
Other uses (dams, waterworks, airports, etc.)			62	W
Concrete products (cement blocks, bricks, pipe, etc.)			W	W
Bituminous paving (asphalt and tar paving)			847	1,484
Roadbase and subbase			318	496
Unprocessed aggregate			1,391	430
Fill			--	--
Other			W	W
Total	7	10	3,671	4,475

W Withheld to avoid disclosing individual company confidential data; included with "Bituminous paving."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Production of stone in Alabama rose to 23,772,773 short tons valued at $60.2 million in 1974. While production increased 18.6%, value increased 50.1% over the previous year. Limestone and dolomite were quarried and crushed at 42 quarries in 17 counties. Major uses of crushed limestone and dolomite were in cement manufacture and concrete aggregate. Shelby and Jefferson Counties continued to be the major producers, with 54.3% of the tonnage.

Dimension limestone was quarried by one company; dimension sandstone by one company; and dimension marble by two companies. Four companies produced crushed and ground marble, and three companies produced crushed sandstone. Oystershell from ancient oyster beds was dredged from Mobile Bay by one company at two operations.

The marble industry suffered a general setback during the last quarter of the year, as a result of adverse economic conditions.

Exploration for aglime resources was conducted in Demopolis chalk in Marengo County.

Table 10.—Alabama: Crushed limestone and dolomite sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value
Colbert	4	W	1,476	4	1,179	2,108
Jefferson	7	3,946	6,441	7	4,961	8,582
Shelby	10	5,525	9,106	9	6,713	12,967
Talladega	1	W	406	1	106	212
Undistributed [1]	24	8,495	10,058	21	8,559	13,830
Total [2]	46	17,966	27,485	42	21,518	37,698

W Withheld to avoid disclosing indivdiual company confidential data; included with "Undistributed."
[1] Includes Bibb, Calhoun, DeKalb, Etowah, Franklin, Jackson, Lee, Madison, Marengo, Marshall, Morgan, St. Clair, and Washington Counties.
[2] Data may not add to totals shown because of independent rounding.

Table 11.—Alabama: Crushed limestone and dolomite sold or used by producers by uses
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	1,614	2,299	1,599	2,769
Concrete aggregate	3,845	5,178	3,052	4,731
Dense graded roadbase stone	2,311	3,368	2,205	3,573
Surface treatment aggregate	1,276	1,867	1,104	1,788
Unspecified construction aggregate and roadstone	1,026	1,846	1,612	2,432
Agricultural limestone	728	1,317	647	1,658
Cement manufacture	3,122	3,866	3,832	5,797
Flux stone	656	1,264	2,244	4,284
Lime manufacture	2,025	3,679	1,739	3,839
Other uses [1]	1,363	2,801	3,485	6,827
Total	17,966	27,485	[2]21,518	37,698

[1] Includes stone used in macadam aggregate, refractory and chemical stone, railroad ballast, riprap and jetty stone. manufactured fine aggregate, asphalt and other filler, filter stone, dead-burned, dolomite, and mine dusting (1974), and uses not specified. 1973 data also include stone used in acid neutralization, terrazzo and exposed aggregate.
[2] Data do not add to total shown because of independent rounding.

Sulfur.—Three companies recovered sulfur from sour crude oil at processing plants in Escambia and Washington Counties. Exxon Company, Mallard Exploration, Inc., and Phillips Petroleum Co. recovered nearly 116,000 long tons valued at slightly more than $3.5 million. Exxon Company was the only reported plant recovering sulfur in 1973.

Talc.—The American Talc Co., Inc., operated an open pit talc mine in Talladega County near Winterboro. The talc was ground for export and for use in toilet preparations. Current production has declined because known deposits of high-grade material are nearly depleted.

METALS

Aluminum.—Aluminum production increased 4%; the value was 58% above that of 1973.

Bauxite.—Alabama ranks second in the Nation in bauxite production. Three companies mined bauxite in Barbour and Henry Counties. Production decreased nearly 7%, and total value decreased nearly 34% from 1973. National Lead Co. is initiating an exploration drilling program with location of new reserves becoming more difficult and expensive. A fourth company is being organized in the Eufaula bauxite district but is still in the initial stages of formation.

Iron Ore.—Brown iron ore was mined by U.S. Pipe & Foundry Co. in Franklin County.

Table 12.—Principal producers

Commodity and company	Address	Type of activity	County
Alumina: Aluminum Company of America.	1501 Alcoa Bldg. Pittsburgh, Pa. 15219	Plant	Mobile.
Aluminum smelters:			
Revere Copper & Brass, Inc.	Box 191 Rome, N.Y. 13440	do	Jackson.
Reynolds Metals Co	Reynolds Metals Bldg. Richmond, Va. 23218	do	Colbert.
Bauxite:			
Eufaula Bauxite Milling Co.	Box 556 Eufaula, Ala. 36027	Mine and plant	Barbour.
United States Gypsum Co.[1]	Mexico, Mo. 65265	do	Do.
Wilson-Snead Mining Co	Box 568 Eufala, Ala. 36027	do	Barbour and Henry.
Cement:			
Alpha Portland Industries, Inc.	15 S. Third St. Easton, Pa. 18042	Plant	Jefferson.
Citadel Cement Corp	2625 Cumberland Pkwy., N.W. Atlanta, Ga. 30339	do	Do.
Ideal Basic Industries, Inc.[2]	821 17th St. Denver, Colo. 80202	do	Mobile.
Lone Star Industries, Inc.[3]	One Greenwich Plaza Greenwich, Conn. 06830	Plants	Marengo.
Martin Marietta Corp.[4]	277 Park Ave. New York, N.Y. 10017	do	Jefferson and Shelby.
National Cement Co	Box 3358 Birmingham. Ala. 35205	Plant	St. Clair.
Clays:			
American Colloid Co	5100 Suffield Ct. Skokie, Ill. 60076	Mine	Lowndes.
Dixie Clay Co	Box 361 Anniston, Ala. 36202	Mine and plant	Calhoun.
Donoho Clay Co	Box 843 Anniston, Ala. 36202	do	Do.
Dresser Industries	2 Gateway Center Pittsburgh. Pa. 15222	do	Henry and Walker.
Riverside Clay Co	P.O. Box 551 Pell City, Ala. 35125	Mine	St. Clair.
Coal:			
Alabama By-Products Corp.[5]	Box 354 Birmington, Ala. 35210	Underground mines, strip mine, and plant.	Jefferson.
Arch Minerals Corp	400 Mansion House Ctr. St. Louis, Mo. 63100	Strip mine	Jackson.
Peabody Coal Co	301 N. Memorial Dr. St. Louis, Mo. 63102	Strip mines and plant.	Tuscaloosa.
Southern Electric Generating Co	600 N. 18th St. Birmingham, Ala 35203	Underground mine and plant.	Walker.

See footnotes at end of table.

Table 12.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Coke: Empire Coke Co	2201 First Ave., North Birmingham, Ala. 35203	Plant	Tuscaloosa.
Ferroalloys:			
Airco Alloys and Carbide	P.O. Box 368 Niagara Falls, N.Y. 14302	do	Mobile.
Alabama Metallurgical Corp.	Box 348 Selma, Ala. 36701	do	Selma.
Tennessee Alloys Corp	818 National Bank Bldg. Chattanooga, Tenn. 37402	do	Jackson.
Tennessee Valley Authority	Muscle Shoals, Ala. 35660	do	Colbert.
Union Carbide Corp	Box 176 Marietta, Ohio 45750	Plants	Colbert and Jefferson.
Woodward Co.[6]	Woodward, Ala. 35189	Plant	Jefferson.
Iron Ore: U.S. Pipe & Foundry Co.[7]	3300 First Ave. North Birmingham, Ala. 35202	Mine and plant	Franklin.
Lime:			
Alabaster Lime Co	Siluria, Ala. 35144	Plant	Shelby.
Allied Products Co	Drawer 1 Montevallo, Ala. 35115	do	Do.
Cheney Lime & Cement Co.[8]	Algood, Ala. 35013	do	Do.
S.I. Lime Co	500 Southland Dr. Birmingham, Ala. 35226	do	Do.
Natural gas: Black Warrior Petroleum Co., Inc.	Box 1642 Mobile, Ala. 36601	Gasfield	Escambia.
Natural gas liquids:			
Cities Service Oil Co	Box 300 Tulsa, Okla. 74102	Plant	Mobile.
Petroleum (crude):			
Ancora Corp	1 Jackson Place, Suite 620 San Francisco, Calif. 94111	Wells	Do.
E. L. Erickson	1235 Petroleum Bldg. Jackson, Miss. 39201	do	Choctaw.
Humble Oil & Refining Co.	Box 2180 Houston, Tex. 77001	do	Escambia.
Louisiana Land & Exploration Co.	Box 60350 New Orleans, La. 70160	Wells	Escambia.
Patrick Petroleum	744 Michigan Ave. Jackson, Mich. 49201	do	Clarke and Baldwin.
Pruett & Hughes Co	390 Petroleum Bldg. Jackson, Miss. 39201	do	Choctaw.
Sun Oil Co	Box 2880 Dallas, Texas 75221	do	Mobile.
Petroleum refineries:			
Alabama Refining Co	Mobile, Ala. 36600	Plant	Do.
Hunt Oil Co	Tuscaloosa, Ala. 35401	do	Tuscaloosa.
Vulcan Asphalt Refining Co.	Cordova, Ala 35550	Plant	Walker.
Warrior Asphalt Co	Tuscaloosa, Ala 35401	do	Tusaloosa.
Pig Iron:			
Republic Steel Corp.[5]	1629 Republic Bldg. Cleveland, Ohio 44115	Blast furnaces and mills.	Etowah and Jefferson.
United States Steel Corp.[9]	Box 599 Fairfield, Ala. 25064	do	Jefferson.
Salt: Olin Corp	120 Long Ridge Rd. Stanford, Conn. 06904	Brine wells	Washington.
Sand and Gravel:			
Dixie Sand & Gravel	Box 1128 Montgomery, Ala. 36102	Dredge and plant	Montgomery.
Radcliff Materials, Inc.[10]	Mobile, Ala. 36601	Dredge	Mobile.
W. T. Ratliff Co., Inc	Box 1111 Knoxville, Tenn. 37901	Surface mine and plant.	Clarke.
Southern Industries, Inc	61 St. Joseph Mobile, Ala. 36602	Pit and dredge	Elmore and Montgomery.
Stone:			
Southern Stone Co., Inc	2111 8th Ave., South Birmingham, Ala. 35233	Quarry	Bibb, Colbert, Jefferson, Lee, and Shelby.
Trinity Stone Co., Inc	Drawer E Decatur, Ala. 35601	do	Morgan.

See footnotes at end of table.

Table 12.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Vulcan Materials Co[11]	Box 7324–A Birmingham, Ala. 35223	Quarries	Calhoun, Colbert, Etowah, Franklin, and Shelby.
Wade Sand and Gravel Co., Inc.	P.O. Box 39048 Birmingham, Ala. 35208	Quarry	Jefferson.
Talc: American Talc Co., Inc	Alpine, Ala. 35014	Surface mine and plant.	Talladega.

[1] Also clay and scrap mica.
[2] Also clay.
[3] Also stone.
[4] Also lime, stone, and clay.
[5] Also coke.
[6] Also coal, coke, and pig iron.
[7] Also coke, pig iron, and stone.
[8] Also cement.
[9] Also cement, coal, coke, and stone.
[10] Also clay and shell.
[11] Also clay and sand and gravel.

The Mineral Industry of Alaska

By Alfred L. Service,[1] Donald P. Blasko,[2] and Robert S. Warfield [3]

Alyeska Pipeline Service Company received the necessary Federal and State permits for construction of the trans-Alaska pipeline and by April 29, 1974, had authorized its contractors to proceed with construction. Prime contractors for the huge construction job are Bechtel, Inc., of San Francisco, Calif., and Fluor, Inc., of Los Angeles, Calif. The estimated cost of the 48-inch pipe, 12 pump stations, Prudhoe Bay facilities, Valdez terminal and microwave repeaters and terminals has escalated from $3 billion to more than $6 billion. The first priority on the project was construction of 360 miles of gravel surface road from the Yukon River north to Prudhoe Bay. Preliminary work also was started on the bridge crossing the Yukon River. The predicted completion date of the massive 800-mile project is fall 1977 when oil is supposed to be moving through Valdez to west coast ports of the United States.

El Paso Natural Gas Co. and Alaskan Arctic Gas Co. were preparing impact statements to support their proposed routings for a natural gas pipeline from Prudhoe Bay to markets in the "Lower 48." El Paso proposed to construct a gas pipeline paralleling the oil pipeline from Prudhoe Bay to Prince William Sound. The company has selected Point Gravina, southeast of Valdez, as the terminus. A liquefaction plant will be constructed and the liquid natural gas will be loaded on container ships for transport to west coast ports of the United States. Alaskan Arctic Gas, a consortium of several companies, is proposing a pipeline east from Prudhoe Bay to the Canadian border then southeast to the Midwest of the United States. The company proposed that this pipeline also will pick up additional gas from the Mackenzie Delta for eventual distribution to the "Lower 48."

Interest in minerals in Alaska is on the increase. Rising metal prices and rising gold prices have stimulated exploration and production activity throughout the State. Massive withdrawals of Federal lands from all entry has tended to retard mining for the past 2 years but activity on State owned and private land is increasing. Offshore prospecting permit activity showed a substantial increase during 1974. The total area under permit increased from 828,848 acres to 1,178,569 acres. Approximately 111,256 acres were covered under 13 work affidavits claiming rental credit of about $460,000. Several exploration programs were done on permits covering 34,000 acres in the Grantley Harbor area near Teller, 38,000 acres in the Golovin Bay area, and 3,400 acres in the Nome area all in the Cape Nome mining district.[4]

There were 578 active mining prospecting permits covering 1.2 million acres and 11 mining leases covering 25,677 acres issued in 1974 compared with 428 permits and 9 leases in 1973.[5]

UV Industries, Inc., formerly United States Smelting, Refining and Mining Co., were resuming gold placer activities in the Nome area. The company was thawing frozen gravels on the Nome Plain and reconditioning dredge numbers 5 and 6. Mining is expected to begin by June or July 1975.

[1] Mining engineer, Liaison Officer—Alaska.
[2] Petroleum engineer, Alaska Field Operation Center.
[3] Supervisory mining engineer, Alaska Field Operation Center.
[4] State of Alaska, Department of Natural Resources, Alaska Division of Lands. 1974 Annual Report. P. 9.
[5] State of Alaska, Department of Natural Resources, Alaska Division of Lands. 1974 Annual Report. P. S–15.

The copper rush in the Bornite area was continuing and several large companies were actively involved in exploration in the area. Several thousand claims have been filed on State owned land near Kobuk in the Ambler District. Exploration activity also was evident in the Kennicott-Green Butte area in the Wrangell Mountains.

The total value of mineral production in 1974 was $448.4 million, an increase of $119.5 million or 36.3% over that of 1973. Crude petroleum increased in value from $261.9 million in 1973 to $347.4 million in 1974, although volume decreased slightly. Sand and gravel and stone increased from $32.7 million to $65.7 million over the same period. Coal, gold, and natural gas also showed marked increases, barite production decreased. Petroleum accounted for 77.5% of the total value of mineral production in the State.

Table 1.—Mineral production in Alaska [1]

Mineral	1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Barite ---- thousand short tons	W	W	20	$401
Coal (bituminous) ---- do	694	W	700	W
Gem stones	NA	$57	NA	57
Gold (recoverable content of ores, etc.) troy ounces	7,107	695	9,146	1,461
Lead (recoverable content of ores, etc.) - short tons	6	2	--	--
Natural gas ---- million cubic feet	131,007	19,483	128,935	21,919
Petroleum (crude) ---- thousand 42-gallon barrels	72,323	261,877	70,603	347,408
Sand and gravel ---- thousand short tons	14,999	19,913	117,752	52,788
Stone ---- do	5,967	12,741	5,484	12,947
Silver (recoverable content of ores, etc.) thousand troy ounces	1	2	1	3
Tin ---- long tons	5	12	W	W
Value of items that cannot be disclosed: Copper (1974), mercury, natural gas liquids, platinum-group metals, uranium (1973), and values indicated by symbol W	XX	r 14,156	XX	11,453
Total	XX	r 328,938	XX	448,437
Total 1967 constant dollars	XX	241,144	XX	p 214,443

p Preliminary. r Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

Table 2.—Value of mineral production in Alaska, by region [1 2]

(Thousands)

Region	1973	1974 [3]	Minerals produced in 1974, in order of value
Alaska Peninsula	$990	W	Stone, sand and gravel.
Bristol Bay	91	$3,515	Sand and gravel.
Cook Inlet-Susitna	246,774	6,030	Sand and gravel, stone, gold.
Copper River	W	1,640	Sand and gravel, stone, copper, silver.
Kenai Peninsula	40,051	W	Natural gas, natural gas liquids, sand and gravel.
Kodiak	W	W	Stone, sand and gravel.
Kuskokwim	1,537	1,452	Sand and gravel, platinum-group metals, mercury, gold.
Northern Alaska	W	--	
Northwestern Alaska	2,553	W	Sand and gravel, stone.
Seward Peninsula	W	W	Gold, tin, stone, sand and gravel.
Southeastern Alaska	r 14,029	11,174	Stone, sand and gravel, barite.
Yukon River	20,640	36,658	Sand and gravel, coal, gold, stone, silver.
Undistributed [4]	2,271	387,969	
Total [5]	r 328,938	448,437	

r Revised.

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] No production was reported in the Aleutian Islands and Bering Sea Regions.

[2] Value of petroleum (1973) is based on an average price per barrel for the State.

[3] Petroleum values for 1974 are not available by region; included with "Undistributed."

[4] Includes gem stones, some sand and gravel (1974), and petroleum (1974) that cannot be assigned to specific regions.

[5] Data may not add to totals shown because of independent rounding.

Legislation and Government Programs.—The Joint Federal-State Land Use Planning Commission for Alaska, created by the Alaska Native Claims Settlement Act of 1971 (Public Law 92–203), has been active in several different land planning areas within the State of Alaska. Data accumulated by the Commission's Resource Planning Team was compiled into a "Resource Inventory for Alaska," which consists of the following three publications: Alaska Resources Inventory; Resources of Alaska, A Regional Summary; and Alaska Regional Profiles.

The Commission conducted background studies on lands withdrawn under Section 17(d)(2) of the Alaska Native Claims Settlement Act. These studies of public interest lands were made to provide information relevant to future U.S. Congressional consideration of pending legislation. The group will continue to provide input related to these "(d)(2)" lands as long as it is needed. The Commission was involved in State land classifications, review of Federal withdrawals, identification of local easements and land planning and management assistance to regional and village corporations.

During 1974 the Commission was involved in three major activities related to hardrock mineral development in Alaska. Staff personnel studied information concerning policy considerations which should govern hardrock mineral activity, weaknesses in the Federal Mining Law, and possible improvements in the Law. This work and data from a mining seminar held in December 1973 will be used to frame legislation seeking to improve on the 1872 Federal Mining Law. The Commission submitted a detailed series of recommendations to the U.S. Forest Service concerning proposed regulations governing prospecting, mining, and certain other activities conducted within units of the National Forest System. The Commissioner of the Alaska Department of Natural Resources requested the Commission to prepare an analysis of Section 22(c) of the Alaska Native Claims Settlement Act dealing with unpatented mining claims located on lands selected by Native villages and regional corporations. Commission counsel prepared an analysis focusing on options available to Native corporations and to holders of unpatented mining claims located on Native selected lands. The study was later distributed as an information circular by the Alaska Division of Geological and Geophysical Surveys.

All Native villages have completed their land selections as specified by the Alaska Native Claims Settlement Act. No action has been taken in regional selections as specified under Section 12 of the Act.

The Native corporations are inventorying their lands in an effort to determine areas that have the greatest resource potential. The corporations are forming land planning organizations and are retaining consultants to advise them on the best approach to land selection in areas with the greatest potential. Several of the regional Native corporations have signed agreements with major oil companies permitting exploration for oil on Native land selections. The corporations will use these data to assist them in determining the land areas they will ultimately select. The corporations usually give the oil companies preferential rights to obtaining leases on Native lands for further exploration. A list of regional Native corporations and the companies having exploration agreements follows:

Regional Native corporation—	Agreement with—
Bristol Bay Regional Corp.	Phillips Petroleum Co.
Calista Corporation	Shell Oil Co.
Arctic Slope Regional Corp.	Standard Oil of California
Arctic Slope Regional Corp.	Texaco, Inc.
Arctic Slope Regional Corp.	Union Oil Co. of California
Arctic Slope Regional Corp.	Amoco Production Co.
NANA Regional Corp.	Standard Oil of California
Ahtna, Inc.	Amoco Production Co.
Koniag, Inc.	Standard Oil of California

Section 2(c) of the Alaska Native Claims Settlement Act authorized the Secretary of the Interior and other Federal agencies to study all Federal programs designed to benefit the Native people. Reports were required to permit the Secretary to report to the U.S. Congress with his recommendations. The 2(c) study was started in 1973 and completed late in 1974. The report consists of four separate publications: (1) Introduction and Summary; (2) An

Analysis of Alaska Natives' Well-Being; (3) Federal Programs for Alaska Natives' Benefit and (4) A Survey of Natives' Views. The first report presents a socio-economic profile of Alaska Natives, the second identifies and describes 15 to 20 major Federal programs designed primarily for the benefit of Natives and the third report discusses the findings of a survey of Natives' views. Bilingual interviewers visited 61 communities and talked with 1,472 respondents for the third study.

The U.S. Department of the Interior appealed the U.S. District Court ruling that the Lower Cook Inlet lands belong to the State of Alaska because of historic use. A decision is not expected until 1975 and any State oil lease sale in the Lower Cook Inlet will have to be postponed until a higher court ruling is obtained.

The boundaries of proposed withdrawal areas under the Native Claims Settlement Act have been determined and the various management agencies are evaluating these areas in order to provide input to the Secretary of the Interior for his report to Congress. There are a total of 83.47 million acres of land withdrawn and proposed for one of the four systems. The National Park System has 32.26 million acres proposed for 11 additions; National Wildlife Refuge System has 31.59 million acres for nine additions; National Forest System has 18.80 million acres for four additions; and National Wild and Scenic Rivers System has 9.82 million acres for four additions.

Transportation.—The Alaska Railroad started construction on the Valdez terminal expansion in 1974, completed a 10-mile spur to the Fairbanks airport, extended several sidings to 100-car capacity, completed tunnel modifications near Healy and constructed a new marine way for its riverboat operations at Nenana. The volume of freight shipped by rail is expected to increase rapidly as construction on the pipeline continues.

Sea-Land Service, Inc., added a fifth container ship to its fleet in 1974 and increased container capacity by 50%. The fleet has the capacity to haul 15,000 tons of cargo per week. The Sea-Land trucking service serves more than 400 Alaskan communities including Deadhorse and Prudhoe Bay.

Airline traffic volume increased substantially in 1974 both for passenger service and freight. Wien Air Alaska is the only certified jet carrier operating between Fairbanks and the North Slope to serve the pipeline camps. Fairbanks is the staging area for all activity north of the Yukon River and Wien Air Alaska has scheduled flights to all camps. Alaska Airlines has discontinued all flights to Kotzebue and Nome, and Wien Air Alaska is the only scheduled air carrier to these villages. Alaska Airlines has exclusive rights to Juneau. Western Airlines with Continental Airlines provide direct passage from Anchorage to Dallas and Houston, Tex. Alaska Airlines with Braniff Airlines provide service from Fairbanks to Dallas and Houston on the "pipeline express". Reeve Aleutian Airways is the only air carrier serving the Aleutian Chain. Independent bush operators, both fixed wing and helicopters, are working 24 hours per day to provide support to the pipeline construction companies and camps along the right-of-way.

The Alaska Railroad, operating along the railbelt between the coast and Fairbanks, has shown an increase in freight and passenger service that is comparable to other transportation services. The greatest volume is from pipeline-related freight, which includes pipes, motor vehicles, construction equipment, and construction materials. Truck haulage also is showing marked increases over previous years. Sea-Land Service, Inc., provides scheduled container ship freight passage from Seattle to Anchorage. Container freight offloaded in Anchorage is trucked throughout the State. Alaska Hydro Train provides scheduled barge service between Seattle and Whittier. Railroad freight cars offloaded at Whittier provide service for the railbelt area.

Trans-Alaska Pipeline.—Alyeska Pipeline Service Co. received the necessary Federal and State permits and by April 29, 1974, the company authorized contractors to proceed with construction of a support road from the Yukon River 360 miles north to Prudhoe Bay. This highway segment may become part of the State system after the Yukon River bridge is constructed and pipeline activity slows to a normal pace. It took five contractors, building separate segments, 5 months to complete the initial gravel overlay. By mid-November the road surface was completed to meet Alaska State Highway secondary road specifications. Aircraft hauled more than 160,000 tons of supplies

and materials and more than 8 million gallons of fuel. A fleet of more than 60 aircraft, helicopters and fixed wing, flew more than 127,000 flights to landing strips along the route. The end product of this massive effort was a 360-mile gravel pad 28 feet wide stretching from Prudhoe Bay to the Yukon River. There were 20 permanent bridges spanning distances of 90 feet crossing major streams constructed along the route. These structures have a maximum length of 420 feet and a width of 24 feet. Bearing capacity is maintained at 30 tons. Contractor's crews moved more than 32 million cubic yards of gravel to construct the 28-foot-wide roadbed.

There were 12 construction camps activated to house the workers on the project. These camps also will be used to house pipeline construction workers. Construction contractors were Green Associated Pipeline; Morrison-Knudsen Company; General-Alaska-Stewart; and Burgess Construction Company. Bechtel, Inc., is the construction management contractor for Alyeska Pipeline Service Co.

Pipeline construction activity began in the fall of 1974, involving surveying, stockpiling gravel material, right-of-way clearing, and construction of access roads. A 150-foot above-ground section of pipe and a mainline block valve were fabricated north of Fairbanks to determine operation characteristics under severe climatic and operational conditions.

More than 800 miles of 48-inch pipe has been stored at Prudhoe Bay, Fairbanks, and Valdez since its 1971 delivery. The 40-foot lengths of pipe at Fairfanks and Valdez will be welded into 80-foot lengths and moved by truck and rail to points along the right-of-way. Pipe in Valdez will be loaded on rail flat cars, placed on barges, and carried to Whittier where the Alaska Railroad terminal is located. The pipe will then move by rail to Fairbanks where special trucks will distribute it along the right-of-way.

Alyeska had built seven construction camps along the pipeline route north of the Yukon River. These camps were idle during almost 5 years of national debate on the project. Alyeska resupplied these camps, during the winter of 1973–74, built four new camps, and leased one more on the North Slope. Construction equipment, fuel, and supplies were transported to the camps over an ice and snow road and by C–130 Hercules aircraft.

The camps north of the Yukon River had an initial bed capacity of 300 people per camp. Following completion of the road the camps will be expanded to accommodate the pipeline work force. South of the Yukon River, seven construction camps are being built, including a mobilization camp located at Fort Wainwright Army Post in Fairbanks. Full operational capacity for the camps is expected by early spring of 1975. Camps are being built at nine pump station sites and at the marine terminal at Valdez. One station camp opened in November, and the others are expected to be opening on a limited basis in January 1975. The camp at the Valdez marine terminal is the largest construction camp on the project and will house about 3,000 workers. In all, 29 construction camps are being built for the pipeline project providing for a total occupancy of about 20,000 people.

Gravel surfaced airfields or landing strips were built at most of the camps. Seven airfields north of the Yukon River are being equipped with beacons and a navigational aid for instrument approach. Following completion of the project, three of the airfields will become permanent State facilities.

Virtually every mode of transportation was used to transport workers, equipment, and material on the pipeline project. During the winter mobilization early in 1974, 33,000 tons of material were moved to the camps north of the Yukon River. Two-thirds of the material was moved by truck over the Yukon River ice bridge and a winter trail of ice and snow. The rest of the material was flown to the camps by C–130 Hercules aircraft. More than 1 million tons of material were transported for the pipeline project during 1974. Freight was shipped to Alaska from the "Lower 48" by truck, barge, ship, and air; then it was transported within Alaska by rail, truck, and air. A major logistical effort involved moving workers to and from the work site. More than 16,000 construction workers were hired during 1974, although the peak work force at any one time never exceeded 6,500.

Prudhoe Bay Gas Pipeline.—Verbal sparring continued between two competing companies seeking Federal Power Commission (FPC) approval to deliver North Slope gas to the continental United States. El Paso Natural Gas Co. proposes to construct a gas pipeline from Prudhoe Bay

to Prince William Sound. The pipeline will parallel the trans-Alaska oil pipeline to a point just north of Valdez where it then passes southeast to Point Gravina where a liquefaction plant will be built. Liquefied gas will be shipped to the west coast by liquefied natural gas (LNG) container ships. El Paso proposes a 42-inch line which will have a capacity of 3,000 million cubic feet per day. There are six ships under construction in the United States each with a capacity of 165,000 cubic feet. The proposal calls for a fleet of 11 tankers. El Paso estimates a construction time for the entire project of 3 years. This will include the 809-mile-long pipeline, tanker fleet, liquefaction plant, and loading facilities at Point Gravina and a gasification plant on the west coast of the United States.

Alaskan Arctic Gas Co. proposes construction of a 48-inch gas pipeline from Prudhoe Bay southeast through Canada to the midwestern United States where the gas would be introduced into the existing pipeline system. Total capacity of the line would be 4,500 million cubic feet per day. Total length of the line from Prudhoe Bay to the United States border is about 6,200 miles.

The State administration has gone on record as favoring the all-Alaska route because of benefits which would accrue. An all-Alaska route would provide additional employment of approximately 300 permanent workers for the pipeline and an additional 300 at the terminal, it would permit gas to be tapped from the line at any point and the construction time would be shortened.

Economy.—The Alaska Departments of Labor and Economic Development predicted a State gross product of $2,801.9 million which is a 16.5% increase over that of 1973. Total wages and salaries are expected to reach $1,788.9 million, an increase of 15.7%. Total employment is expected to rise 12.9% and unemployment may reach 18.1% which will reflect people coming to the State expecting pipeline employment and seasonal workers who will stay in the State during the slack season to gain priority for pipeline jobs.

The Alaska Bankers Association reported that during the first half of 1974 construction and pipeline activity caused a 22.1% increase in demand deposits. Comparative figures from June 20, 1973, to June 30, 1974, show that total deposits rose $152 million, demand deposits were up to $84 million, time deposits increased $68 million, public deposits (government) rose $30 million, total deposits increased $125 million, and loans rose $79 million.

The total civilian industrial labor force during May 1974 was 138,000, an increase of 10,300 over that of May 1973. Nonagricultural wage and salary employees totaled 8,700 more in May 1974 than that of the previous year. The strongest growth was in the fields of construction, transportation-communications and utilities, trade and State employment, all of which are most immediately affected by pipeline activity.

Table 3.—Indicators of Alaska business activity

		1973	1974 [p]	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	129.6	NA	NA
Unemployment	do	13.9	NA	NA
Employment:				
Construction	do	8.0	10.4	+30.0
Mining	do	2.0	3.0	+50.0
Transportation and public utilities	do	10.4	11.9	+14.4
Wholesale and retail trade	do	18.3	19.6	+7.1
Manufacturing	do	9.4	9.5	+1.1
Services	do	16.2	17.7	+9.3
Government	do	42.0	42.9	+2.1
Finance, insurance, and real estate	do	4.3	4.9	+14.0
Personal income:				
Total	millions	$1,958	$2,367	+20.9
Per capita		$5,926	$7,023	+18.5
Construction activity:				
Value of authorized nonresidential construction	millions	$57.9	$50.6	−12.6
Number of authorized, new housing units		1,699	1,938	+14.1
Highway construction contracts awarded	millions	$50.9	$80	+57.2
Mineral production value	do	[r] $328.9	$448.4	+36.3

[p] Preliminary. [r] Revised. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; and Bureau of Mines.

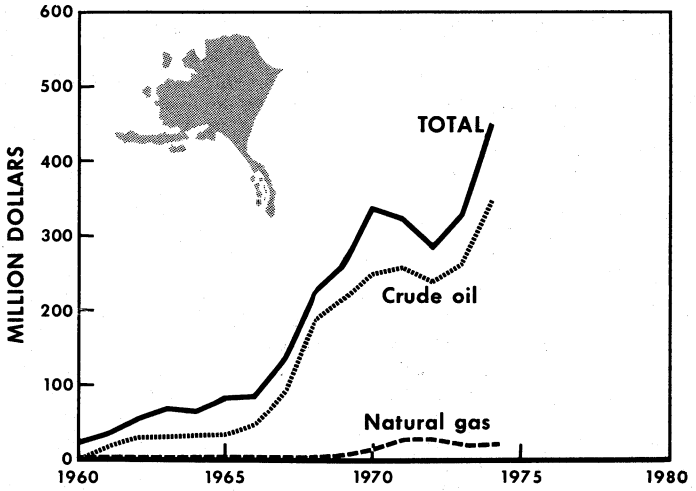

Figure 1.—Value of crude oil, natural gas, and total value of mineral production in Alaska.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Bituminous).—Production of coal increased 1% from the 1973 level of 694,000 tons to 700,000 tons in 1974. Source of the coal was the Usibelli coal mine near Healy, operating in the Nenana coalfield and supplying low-sulfur, subbituminous coal to military bases north of the Alaska Range, electric generating plants in the Fairbanks area, and a mine-mouth generating plant near Healy. The mine-mouth supplements power in the Fairbanks area and serves Nenana. One of the notable features of the Usibelli operation is their reclamation and seeding program which has created a popular pasture and lambing site for Alaskan Dall Sheep. A spokesman for Usibelli said the company has been approached by Japanese firms and may soon be selling 3 to 5 million tons of coal yearly to Japan. The company also may sell to United States west coast markets. Known coal reserves in the area exceed 130 million tons.

Late in 1973 or early in 1974, a trial shipment of Usibelli coal was burned in the electric generating plant at Fort Richardson, northeast of Anchorage. This military complex retained coal burning equipment when a switch was made in 1968 to natural gas from Matanuska field coal.

K-Ar and fission-track radiometric dating of ash parting samples from late Tertiary coals of the Kenai Peninsula demonstrated the value of such partings for radiometric dating and stratigraphic correlation of terrestrial coal-bearing sequences. These Tertiary rocks have yielded essentially all oil and natural gas so far produced in Alaska and contain coal seams of possible economic value. The work was performed by scientists from the University of Alaska and the U.S. Geological Survey. Tests will be continued in 1975 with Bureau of Mines financial assistance.

Under terms of the Alaska Native Claims Settlement Act, the Arctic Slope Regional Corporation in November filed applications with the Bureau of Land Management for more than 1,117,000 acres of land on the North Slope of Alaska. Some of these selections are within the northern coalfield and include a great deal of the coal lands west of Naval Petroleum Reserve No. 4 (NPR–4) that have been under investigation for a number of years by the Bureau of Mines, U.S. Geological Survey, and several private companies. If such selections are approved, Alaskan coal lands will, for the first time, come into private ownership.

An attempt is being made by Native regional corporations and others throughout Alaska, where nearby alternate sources of energy such as coal exist, to persuade Native communities to use these local

sources at least for space heating in lieu of more expensive petroleum fuel.

A growing boom in coal exploration was reflected by the number of prospecting permits issued by the Division of Lands. There were 204 permits issued in 1974, more than twice the number issued in the previous 3 years. The area of greatest interest is the Beluga-Chuitna area, across Cook Inlet west of Anchorage. Placer Amex, Inc., Starkey A. Wilson, and AMAX Coal are the principal lease and permit holders. All three lessees have completed extensive exploration. Placer Amex reports proven reserves of surface minable coal in excess of 500 million tons, and at least that much more at greater depths. Adjacent lessees and permit holders probably have reserves of similar magnitude. Beluga coals are subbituminous in rank; they are relatively high in ash and moisture but are very low (0.2 to 0.3%) in sulfur. Several seams are 20 to 30 feet in thickness with one as much as 55 feet in thickness. Portland General Electric received prospecting permits for more than 45,000 acres of land about 100 miles north of Anchorage. This location is within the same coalfield as the Beluga-Chuitna coals. Portland General Electric is exploring the feasibility of utilizing these coals in a 500-megawatt, coal-fired generating plant tentatively scheduled for construction at Boardman, Oreg. AMAX Coal also had a drilling program in the Marguerite Creek area north of Healy.

An economic feasibility study by Stanford Research Institute under an Office of Coal Research contract showed that Beluga-Chuitna coals can be converted to a "solvent refined coal" and competitively transported to California or Japan, on a cost per Btu basis with petroleum at $11.00 per barrel. The solvent refined coal process can be designed to produce a light liquid product and a solid or liquid solvent refined coal. Process development is currently at the pilot plant stage. Solvent refined coal is described as a product with less than 0.1% ash, less than 0.8% sulfur with a heating value of about 16,000 Btu per pound regardless of the quality of the feedstock coal.

The Bureau of Mines, in cooperation with the U.S. Geological Survey, continued investigations in the northern coalfield. Field work started during June and continued into July on a sampling program to verify the continuity of a 20-foot-thick coking coal seam on the Kukpowruk River. A light auger drill mounted on a Rolligon all-terrain vehicle was used in an unsuccessful attempt to trace the seam. The drill, using the bits on hand, could not penetrate the frozen overburden except at select locations. The one sample collected representing an extension of the 20-foot-thick seam was nonagglomerating.

The U.S. Geological Survey continued evaluating the coal resources of the Bering River coalfield.

Petroleum and Natural Gas.—Geophysical activity in the Cook Inlet area took a marked upturn during 1974. Although eight drilling permits were issued by the State, only four wildcat wells were actually drilled, or were in the process of being drilled in the Cook Inlet area. The wildcat well, Ninilchik No. 1 on the Kenai Peninsula, was drilled to a total depth of 13,082 feet before being plugged and abandoned. For the first time in many years an exploratory well was drilled in offshore Cook Inlet waters. The Cape Kasilof No. 1 was at a depth of 14,015 feet at the end of the year and plans were underway to plug and abandon the well as a dry hole. The well was drilled from a jackup rig.

Exploration activity that never actually took place held State and industry interest throughout much of 1974. In December of 1973, the State of Alaska obtained $24.8 million in oil lease bonuses from bids on over 100,000 submerged acres in Cook Inlet, including Kachemak Bay. Early in 1974, Standard Oil Company of California announced plans to begin offshore drilling from a temporary-type offshore platform and rig in Kachemak Bay about 13 miles west of Homer. Commercial fishermen and other residents of Homer and the Kachemak Bay area opposed the proposed drilling on grounds it would destroy king crab fisheries. The group demanded that the leases be declared invalid because a public hearing had not been held before the 1973 lease sale. Due to the lack of a suitable offshore drilling rig, Standard Oil Company of California delayed applying to the State for a drilling permit. However, Shell Oil Co. made arrangements to obtain a rig and forward a plan of operation to the State indicating drilling would commence during August. Necessary permits from the State were

not received until late November. In the meantime, Shell leased their intended rig to another company to drill an offshore exploratory well in Cook Inlet. The rig was still in use at the end of the year and no drilling was done in Kachemak Bay. Standard Oil Company of California also applied for a drilling permit, setting off new opposition from fishing groups, citizens groups, environmental and conservation organizations.

No exploratory drilling was done on the west side of Cook Inlet. In the Susitna Valley basin, one exploratory well was plugged and abandoned and one well was in the process of being drilled at yearend.

Development drilling in the Cook Inlet area increased in terms of the number of wells permitted and number of wells actually drilled. Of particular note was development drilling in the Swanson River oilfield, the first in 4 years. During the year, six new oil wells were completed and one was in the drilling stage in the Soldotna Creek unit. The only other significant development drilling took place in the McArthur River field (Trading Bay unit) where seven additional oil wells were drilled and two more were being drilled. Shell Oil Co. added three new oil wells at their Middle Ground Shoal field.

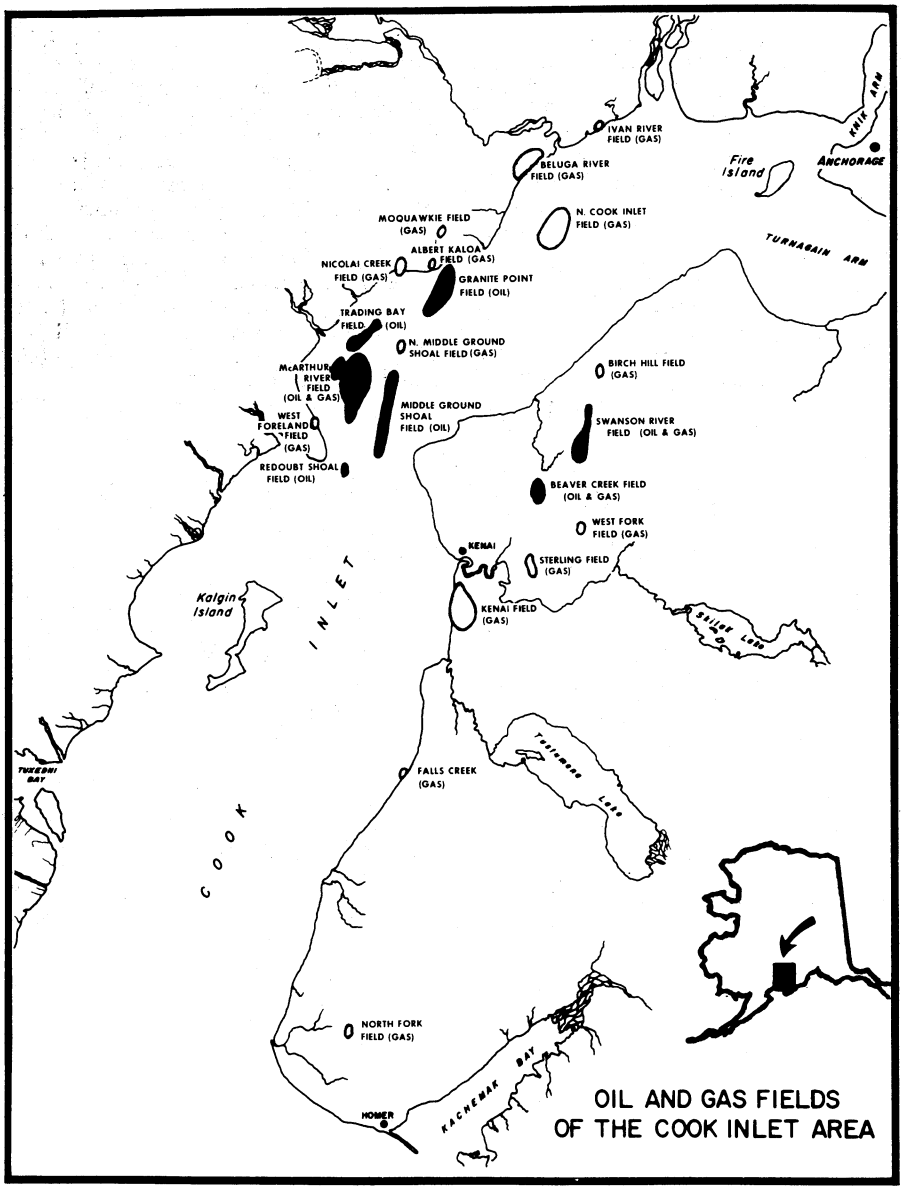

Figure 2.—Cook Inlet oilfields and gasfields.

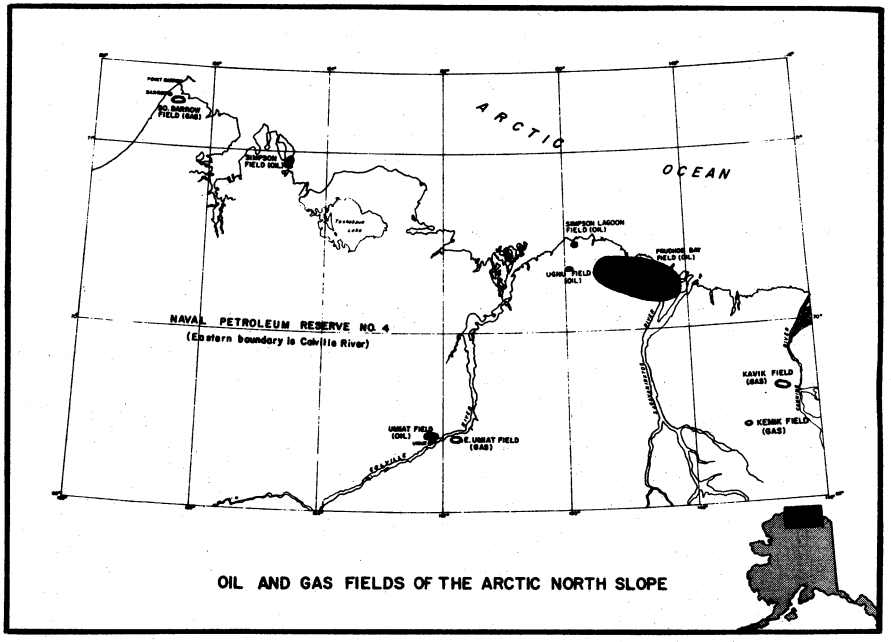

Figure 3.—Oilfields and gasfields of the Arctic North Slope.

Surprisingly, the energy crisis or fuel shortage did not precipitate a rash of development drilling at proven gasfields in the Cook Inlet area and only two dry-gas wells were drilled. Considering the fact that various west coast utility firms have shown an increased interest in Alaskan natural gas, the oil industry made no attempt to define the areal extent of the 12 undeveloped and shut-in gasfields in the Cook Inlet area. Additional compression units and gas transmission lines were installed in the Swanson River field to bolster the reservoir repressurization program. Although the repressurization capability was increased, the gas injection rate throughout the field has fallen off from the previous year, but water injection rates were increased.

There were 61 drilling permits approved by the State in 1974, nearly twice the 1973 total. There were 12 exploration wells and 34 development wells spudded in 1974. A total of 20 oil wells and 5 gas wells were completed; 8 wells were abandoned. The average daily oil production in 1974 was 197,927 barrels, slightly less over that of 1973.

Collier Carbon and Chemical Corp. (a subsidiary of Union Oil Company of California) announced a $165 million expansion project to double production of prilled urea and anhydrous ammonia from its plant on the Kenai Peninsula north of Kenai. The plant presently produces 1,500 tons per day of anhydrous ammonia and 1,200 tons per day of prilled urea. Natural gas feedstock for the plant is produced in the Cook Inlet area. The bulk of the product will be shipped to west coast agricultural markets but prilled urea will continue to be sold in Alaska to the Air Force and the State of Alaska for use on aircraft runways in lieu of salt or sand during the winter.

A problem facing the Collier expansion was not one of market but one of transportation. Construction in the United States of special barges to handle the ammonia was prohibitive in cost, and available foreign-built barges were prohibited by the Jones Act from carrying the product between two American ports. To make matters worse, the only barge owned directly by Collier sunk with 14,000 tons of fertilizer near Sitka, Alaska. The President of the United States temporarily waived the Jones Act to permit anhydrous am-

monia shipments to the fertilizer-short farmers of the Pacific Northwest.

During 1974, Phillips Petroleum Co. and Marathon Oil Co., operators of the Phillips-Marathon LNG plant on the Kenai Peninsula announced that contracts had been signed to supply $100 million worth of LNG to Northwest Natural Gas Co. Northwest plans to construct a cryogenic tanker for transport and a regasification plant at Newport, Oregon. Pacific Alaska LNG Co. (a subsidiary of Pacific Lighting Corp. of Los Angeles) filed an application with the FPC to build a plant on the Kenai Peninsula to liquefy Alaskan gas for shipment to California. The company planned to undertake a drilling program to develop additional gas reserves in the Cook Inlet basin. However, in an effort to assure that Alaskan consumers will not be forced to pay higher prices for gas they now use, the Alaska Public Utilities Commission filed a notice of intervention with the FPC protesting the plan.

Tesoro Alaskan Petroleum Corporation began construction of a new $11 million catalytic reformer at its refinery on the Kenai Peninsula. The project is scheduled to be completed in 1976, and the company reports the unit will provide all the gasoline needs of the State. Tesoro currently refines about 38,000 barrels per day of oil purchased from the State of Alaska. About 24,000 barrels is royalty "in-kind" in lieu of cash payments from producers in Cook Inlet and the remaining 4,000 barrels is purchased from others. Tesoro has to import gasoline additives from the west coast to blend with its product.

Ownership of lands in the Lower Cook Inlet continues to be an issue. The District Court of Alaska ruled in 1973 that the lands were owned by the State. The United States Government filed another appeal with the Circuit Court the same year. In 1974, the State and the United States Government attempted to reach a compromise whereby a lease sale could be held in Lower Cook Inlet and the money either split 50/50 or held in escrow pending final court settlement. The effort failed.

The State of Alaska received $1,041 million from bonus bids at the 29th competitive oil and gas sale. The offshore Cook Inlet lands leased for oil and gas exploration totaled nearly 280,000 acres. Before the sale two tracts near Chisik Island were withdrawn at the request of the Fish and Wildlife Service because of their proximity to a bird sanctuary. The lands leased are adjacent to and on the west side of offshore lands in Lower Cook Inlet which are under State-Federal dispute.

The amount of acreage under State competitive lease was increased from 2,468,599.25 to 2,624,991.32 acres. The State received patent and tentative approval to large selected areas between the Colville and Canning Rivers on the North Slope. A total of 226 Federal leases covering 531,400 acres will be transferred in the near future. The area under noncompetitive lease increased from 1.7 million acres to 2.3 million acres. Federal lease activity declined from 4.5 million to 3.9 million acres.[6]

Continuing interest in the Gulf of Alaska's outer continental shelf (OCS) lands has resulted in the U.S. Department of the Interior issuing a call for nominations on tracts the industry is interested in exploring. The U.S. Geological Survey requested the Gulf of Alaska Operators Committee to shoot a 20,000-mile shallow profile in the Gulf and turn the results over to them to be used in preparing an environmental impact statement for the proposed sale. A group shot was not undertaken, but individual companies continued to conduct various nondrilling exploration activities.

Anticipating a 1975 lease sale, Shell Oil Co., Atlantic Richfield Co., and Mobil Oil Corp. (SAM) have ordered construction of a semisubmersible drilling rig which they will lease for drilling in the Gulf.

The State of Alaska put out a call to oil companies to submit proposals for use of the State's royalty oil and gas to be produced at Prudhoe Bay. It is expected that more than one refinery will be required to process the projected 150,000 barrels per day.

The State's royalty share is 150,000 barrels per day at the 1,200,000 barrels-per-day pipeline rate and 250,000 barrels per day at the 2,000,000 barrels-per-ady pipeline rate. Construction of tanker facilities at the Jackson Point terminal site in Valdez began in 1974.

Amoco Production Co. drilled the Ca-

[6] State of Alaska, Department of Natural Resources, Alaska Division of Lands. 1974 Annual Report. P. 9.

thedral River unit No. 1 wildcat well to a depth of 14,300 feet at a cost of $10.8 million, the most ever spent on an onshore well in Amoco's history. The well was started in July 1973 and finally plugged as a dry-hole in August 1974.

The first wildcat well to be drilled north of the Alaska Range and south of the Brooks Range since 1960 was spudded in November and plugged and abandoned as a dry-hole in December. Nimiuk Point No. 1, located about 17 miles southeast of Kotzebue was drilled to a total depth of 6,311 feet. It was the first of a three well program to be carried out by Standard Oil Co. of California under an agreement with the NANA Regional Native Corporation. Site preparation was underway at the proposed second drilling location near Cape Espenberg by the end of the year.

Approval of construction of the trans-Alaska pipeline prompted Earth Resources Co. to announce that its subsidiary, Energy Company of Alaska (ECA), has reactivated plans to build a crude oil refinery and power generating complex near Fairbanks. The project was started in 1969 and expected to cost about $40 million. However, the delay of pipeline construction meant that the crude oil which ECA planned to use for refinery feedstock and power generation would not be available and the project was shelved. Reactivation of the project included plans for a larger complex than originally proposed and costs have escalated to an estimated $65 million.

Several proposals concerning the management and utilization of NPR–4 were noted throughout 1974. A member of Alaska's congressional delegation suggested that NPR–4 be turned over to the U.S. Department of the Interior for leasing to private industry as a means of relieving the energy crisis. The Federal Energy Administration agreed leasing was advisable but the Navy department is maintaining control of the reserve. The Navy requested funding for a 10-year, $200 million exploration project, as well as a 10-year, $2.4 billion development program and called for bids from the oil industry to conduct a 5-year exploration program in NPR–4 designed to explore, drill, develop, produce, operate, conserve, and protect the reserve. The Navy Deparment also announced site locations of two wells it proposed to be drilled during the winter of 1974–75.

Two new gas wells (numbers 11 and 12) were drilled at the south Barrow gasfield within NPR–4. The wells will be used to supply an increasing demand for natural gas to the village of Barrow and the Naval Arctic Research Laboratory (NARL) facilities. Of particular interest was that one of the wells had a notable content (3.73%) of helium.

For the first time since it began supplying natural gas to Barrow Utilities, Inc. (BUI), in 1964, the Navy instituted a price increase. The increase from 50 cents per thousand cubic feet was angrily opposed by the Native community. The natural gas distribution system in the village of Barrow was declared in a bad state of disrepair and determined to be unsafe. BUI did not have the estimated $2 million to restore the system and several alternative proposals are being considered.

The State Oil and Gas Conservation Committee approved Atlantic Richfield Corporation's request to increase throughput of crude oil at its topping plant located at Prudhoe Bay. Atlantic Richfield testified that increased demand for diesel fuel and naphtha caused by startup of pipeline construction activity resulted in a greater demand for products.

One successful gas well was drilled in the Kavik gasfield which was discovered in 1969.

METALS

Antimony.—A small amount of antimony production was reported from the Fairbanks district in 1974. A considerable amount of prospecting was being carried on for gold-silver-lead-antimony on Eldorado and Caribou Creeks in the Kantishna area, Mount McKinley recording district. The total amount of antimony produced in Alaska from 1928 to 1973 totaled 4,390 short tons.

Copper.—The most active metal on the Alaskan scene in 1974 was copper. Total expenditures for exploration in the State exceeded $6 million. About $2 million of this was applied to exploration of copper-lead-zinc ore bodies in the Ambler district of Kobuk in the southwestern Brooks Range. An evaluation of one copper deposit in this area exceeded $2 billion and others in this same mineralized trend may double this estimate. Heavy claim-staking activity was evident as Sunshine Mining Co. and Watts, Griffis and McOuat, Inc.,

worked intensively in the area in 1974. Detailed field work and diamond drilling also was carried on by Sunshine Mining. Bear Creek Mining Co. continued development diamond drilling on its property in the same area.

Inspiration Development Co. was continuing an exploratory diamond drilling program on a large low-grade porphyry copper deposit at Bond Creek, near Nabesna. Ranchers Exploration and Development Co. was diamond drilling for copper and associated metals in the Golden Zone area near Cantwell. Activity continued in the Kennicott-McCarthy area in the Wrangell Mountains in south-central Alaska. Nearly $3 million was spent in exploration in southeastern Alaska, most of it on copper. At least eight different firms were conducting drilling or geologic reconnaisance programs for hard metals. Phelps-Dodge Corp. was diamond drilling for copper on Coronation Island, U.S. Borax was drilling on Prince of Wales Island, and El Paso Natural Gas Co. was drilling near Wrangell. More than 690,000 tons of copper has been produced in Alaska from 1880 to 1973.

Gold.—The lode and placer mines in Alaska have produced more than 30 million troy ounces of gold from 1880 to 1973. A minor percentage of this came as byproduct gold from other metal mining operations. During 1974 Noranda Mines, Ltd., was driving an exploration drift at the Little Squaw Lode gold mine near Chandalar. Several other companies also were exploring for gold in the Arctic region of the State.

UV Industries, Inc., started reactivating dredges 5 and 6, on the Nome Plain. The company is drilling thaw holes in two areas to prepare for mining in 1975. Crews are working to restore the dredges to operational condition and the company expects to have three dredges working in the Nome area by 1976. UV Industries also operated the gold dredge on the Hogatza River in northcentral Alaska. American Smelting and Refining Co. continued evaluation of gold placers on the beach just west of Nome. A dredge is also reported to be working in the Candle area on the Kiwalik River on Kotzebue Sound.

Klondike Placer Gold, Inc., continued activities in the Livengood area where about $800,000 was spent to evaluate the area for a dredging operation. If the program is successful the company expects to invest up to $4 million in the operation. Several small placer operations were operating in the Circle-Central area and production was about 1,500 troy ounces.

Rioamex, Amoco Production and several other companies were exploring gold placer deposits in the Fortymile area and a dredge was started up on Coal Creek. Ranchers Development Company, Gulf Oil Company, United States Steel, Rio Tinto, Canadian Explorations, and Resource Associates all were active in the area during 1974.

Sernco was evaluating a number of claims covering about 2,600 acres of gold property southwest of Mount McKinley Park. There was also activity in the Talkeetna area east of the new Anchorage-Fairbanks Highway. About $200,000 was spent in southcentral and southwestern Alaska for exploration work in 1974.

Renewed interest in the Alaska-Juneau gold mine has been shown by several major mining companies. Inquiries concerning ownership and reserves have been made.

Table 4.—Alaska: Placer production of gold

Year	Mines producing	Material[1] treated (thousand cubic yards)	Gold recovered		
			Troy ounces	Value (thousands)	Average value per cubic yard
1970	23	999	34,776	$1,265	$1.266
1971	27	1,060	12,327	508	.480
1972	25	902	8,639	506	.561
1973	23	972	7,107	695	.715
1974	21	975	9,146	1,461	1.499

[1] Excludes material treated primarily for the recovery of platinum.

Iron Ore.—The proposed iron ore development at Klukwan, 25 miles northwest of Haines, appears to have been abandoned. Mitsubishi of Japan dropped its option to develop this huge low-grade magnetite deposit for a number of reasons. The economics of development, processing, and transportation combined with a lack of local fuel, and environmental protests against the development were probably the major causes.

Mercury.—The White Mountain Mercury Mine, southeast of McGrath produced cinnabar concentrate for most of the season. The high-grade concentrate was shipped to Oregon for retorting during the winter months. Bob Lyman, owner of the mine, was killed in an accident on the property and there is some question about future operations. This is the only operating mercury mine in the State.

Nickel.—Exploration of the controversial Nunitak copper-nickel deposit by Newmont Mining Corp. is still being questioned by the National Park Service and environmentalists. The deposit is located under Brady Glacier in Glacier Bay National Monument. Final decisions on whether mining and processing will be allowed within National monument boundaries are still pending. This may prove to be the largest nickel deposit in the United States. Newmont Mining, Cities Service Corp., and Union Pacific Minerals Corp. are joint owners of the patented mining claims.

Platinum.—The Goodnews Bay Mining Co. continued dredge mining at about the same level as 1973. The platinum placer operation is in the Salmon River which empties into Kuskokwim Bay in southwest Alaska.

Silver.—Several companies were actively exploring for lead-silver deposits in the Chandalar area, Fairbanks recording district. Rhinehart Berg continued drilling on an underground lead-silver prospect near Hannum Creek in the Kougarok area, Cape Nome district. Exploration for gold-silver-lead also continued in the Kantishna area, Mount McKinley district. Phelps-Dodge Corp. continued exploring for lead-silver on Coronation Island west of Prince of Wales Island in the Ketchikan district and El Paso Natural Gas Co. was working near Wrangell in the Wrangell district.

Tin.—A small amount of tin was produced in Alaska in 1974. Diamond drilling continued on the Purkey property southwest of Mount McKinley, in the Mount McKinley district. The target for this exploration is lode tin deposits. The total tin produced in Alaska from 1902 to 1973 is 2,464 tons.

NONMETALS

Barite.—Alaska Barite Co., subsidiary of Inlet Oil Co. continued operating its offshore barite mine during 1974. The deposit is in Duncan Canal, Kupreanof Island, in southeastern Alaska. Ore is mined in a water depth of 80 feet. Mining operations are carried on from a specially designed barge containing both drilling and excavation equipment. A grinding plant was relocated from Kenai to the mine site. A 50-ton-per-hour heavy-media plant has been installed to process low-grade ores. Production in 1974 was about 20,000 tons.

Fluorite.—The Lost River Mining Corp. continued exploration drilling at a reduced rate during 1974. Development of the fluorite-tin-tungsten deposit was curtailed temporarily pending results of an environmental impact statement. The operators conducted a soil-sampling program at Point Jackson, the proposed dock site. Several companies have expressed an interest in a partnership venture.

Sand and Gravel.—Production of sand and gravel showed a marked increase over that of 1973. The greatest increase in consumption was directly related to pipeline activity and oil production and exploration. The pipeline support road from Prudhoe Bay to the Yukon River was completed in November 1974. The 360 miles of 28-foot-wide gravel roadway pad, pipe storage sites, and other related gravel pads required more than 32 million cubic yards of construction material. Considerable amounts of gravel also were used in construction of production well pads, and other related facilities. State highway construction also was a major user of sand and gravel. There were 14,999,000 tons of sand and gravel produced in 1973 compared with 117,752,000 tons in 1974. This was an increase of nearly eightfold in 1 year which reflected the huge amounts of construction materials used in support of the oil and gas production at Prudhoe Bay.

Table 5.—Alaska: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	14,999	19,913	3,369	5,886
Gravel			9,875	16,965
Unprocessed: Sand and gravel			104,508	29,930
Industrial:				
Sand	(2)	(2)	--	--
Gravel			--	--
Total	14,999	19,913	117,752	52,781

[1] Value data may not be directly comparable to that in tables 1, 6, and 7 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.
[2] Less than ½ unit.

Table 6.—Alaska: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	2,386	4,813	167	568
Highway and bridge construction			49	138
Other uses (dams, waterworks, airports, etc.)			50	139
Concrete products (cement blocks, bricks, pipe, etc.)			108	291
Bituminous paving (asphalt and tar paving)			130	259
Roadbase and subbase			137	278
Unprocessed aggregate			100,748	24,499
Fill	1,564	1,438	116	575
Other uses [2]	447	769	281	W
Industrial sand and gravel	(3)	(3)	--	--
Total	4,397	7,020	101,786	26,747

W Withheld to avoid disclosing individual company confidential data; included with "Fill."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast, miscellaneous (1973).
[3] Less than ½ unit.

Table 7.—Alaska: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	10,260	12,735	W	W
Highway and bridge construction			9	35
Other uses (dams, waterworks, airports, etc.)			227	1,115
Concrete products (cement blocks, bricks, pipe, etc.)			--	--
Bituminous paving (asphalt and tar paving)			5,494	9,113
Roadbase and subbase			6,156	10,124
Unprocessed aggregate			3,760	5,431
Fill	63	56	--	--
Other	279	102	320	222
Total	10,602	12,893	15,966	26,040

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Production of stone in Alaska remained at about the same level as that of 1973. The largest consumers of stone during 1974 were contractors working on the pipeline support road.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	Region
Barite: Alaska Barite Co	Box 1313 Kenai, Alaska 99611	Open pit	Southeastern Alaska.
Coal: Usibelli Coal Co	Box 3018 Fairbanks, Alaska 99701	---- do	Yukon River.
Gold: UV Industries, Inc	505 30th St. Silver City, NM 88061	Bucket line dredge.	Do.
Mercury: Lyman Mining Co	340 SW 5th Corvallis, Oregon 97330	Mine and plant	Kuskokwim.
Natural Gas:			
Phillips Petroleum Co	Anchorage, Alaska 99501	Gas production	Offshore Cook Inlet.
Standard Oil Co. of California.	---- do	---- do	Westside Cook Inlet.
Texaco, Inc	---- do	---- do	Do.
Union Oil Co. of California.	---- do	---- do	Offshore Cook Inlet, Kenai Peninsula.
Petroleum-crude:			
Amoco Production Co	---- do	Oil production	Offshore Cook Inlet.
Atlantic Richfield Co	---- do	---- do	Kenai Peninsula, Offshore Cook Inlet, North Slope.
BP Alaska, Inc	---- do	---- do	North Slope.
Marathon Oil Co	---- do	---- do	Kenai Peninsula.
Mobil Oil Corp	---- do	---- do	Offshore Cook Inlet.
Shell Oil Co	---- do	---- do	Do.
Texaco, Inc	---- do	---- do	Do.
Standard Oil Co. of California.	---- do	---- do	Kenai Peninsula.
Union Oil Co. of California.	---- do	---- do	Offshore Cook Inlet.
Petroleum refining:			
Atlantic Richfield Co	Prudhoe Bay, Alaska	Refinery	North Slope.
Standard Oil Co. of California.	Nikiski, Alaska	---- do	Kenai Peninsula.
Tesoro-Alaskan Petroleum Corporation.	---- do	---- do	Do.
Union Oil Co. of California.	Anchorage, Alaska	Refinery (asphalt).	Anchorage.
Platinum-group metals:			
Goodnews Bay Mining Co	1411 4th Ave. Bldg., Room 720 Seattle, Wash. 98101	Dredge	Kuskokwim.
Sand and gravel:			
Central Construction Co., Inc.[1]	428-117 2nd Ave. Bldg., Seattle, Wash. 98101	Pit	Northwestern Alaska.
Green Associated	Pouch 85 Fairbanks, Alaska 99707	Pit	Southeastern Alaska.
Rogers and Babler Inc	4607 E. Tudor Rd. Anchorage, Alaska 99507	Pit	Cook Inlet.
Vast Construction Co. Inc	P.O. Box 4-GG Anchorage, Alaska 99509	Pit	Do.
Stone:			
Burgess Construction Co	394 Hamilton Fairbanks, Alaska 99707	Quarry	Southeastern Alaska, Yukon River.
Ketchikan Pulp Co	P.O. Box 1619 Ketchikan, Alaska 99901	---- do	Southeastern Alaska.
LOG Logging Co	Cape Pole Ketchikan, Alaska 99901	---- do	Do.
Moore Construction Co. Inc.	Ketchikan, Alaska 99901	Quarry	Southeastern Alaska.
Wayne Construction Co	4100 Tongass Ave Ketchkian, Alaska 99901	---- do	Do.
Welborn Construction Inc	Box 634 Kodiak, Alaska 99615	---- do	Kodiak.
Tin: Lee Bros. Dredging Co., Inc.	Box 816 Nome, Alaska 99762	Dredge	Seward Peninsula.

[1] Also stone.

The Mineral Industry of Arizona

By Floyd D. Everett [1]

The value of mineral production in Arizona established another high, reaching $1.6 billion, 19.7% above the $1.3 billion of 1973. Arizona ranked ninth among the states in value of minerals produced in 1974.

Copper accounted for $1.3 billlion or 85% of the value of all minerals produced. Although the value increased, the quantity of copper produced decreased 7.4% from that of 1973. Arizona continued as the leading copper-producing State, accounting for 54% of the Nation's production. The State ranked second in molybdenum and silver output, and was fourth in gold.

Of the major commodities produced, decreases were registered in outputs of copper, gold, gypsum, molybdenum, petroleum, pumice, and sand and gravel; increases were made in clay, coal, gemstones, lead, natural gas, stone, and zinc output. The value of metals in 1974 increased $241.9 million to a total of $1.44 billion; nonmetals increased $5.7 million to a total of $101.8 million; and the value of fuels increased $9.6 million to $23.4 million.

[1] Former State Liaison Officer, Bureau of Mines, Phoenix, Ariz.

Table 1.—Mineral production in Arizona [1]

Mineral	1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---- thousand short tons --	[2]117	[2]$459	199	$622
Coal (bituminous) ---- do ----	3,247	W	6,448	W
Copper (recoverable content of ores, etc.) short tons --	927,271	1,103,453	858,783	1,327,678
Gem stones ----	NA	170	NA	1,500
Gold (recoverable content of ores, etc.) troy ounces --	102,848	10,060	90,586	14,470
Gypsum ---- thousand short tons --	158	669	141	478
Lead (recoverable content of ores, etc.) short tons --	763	248	1,059	476
Lime ---- thousand short tons --	365	7,019	422	9,071
Mica, scrap ---- do ----	W	W	2	82
Molybdenum (content of concentrate) thousand pounds --	37,657	59,372	28,346	57,067
Natural gas ---- million cubic feet --	125	23	224	45
Petroleum (crude) -- thousand 42-gallon barrels --	804	3,103	740	3,885
Pumice ---- thousand short tons --	853	715	846	865
Sand and gravel ---- do ----	27,440	38,503	23,417	41,906
Silver (recoverable content of ores, etc.) thousand troy ounces --	7,199	18,416	6,356	29,935
Stone ---- thousand short tons --	4,265	9,469	4,932	11,479
Zinc (recoverable content of ores, etc.) short tons --	8,427	8,482	9,699	6,964
Value of items that cannot be disclosed: Asbestos, cement, fire clay (1973), feldspar, fluorspar (1973), helium, iron ore, perlite, pyrites, tungsten, and values indicated by symbol W --	XX	49,827	XX	55,716
Total ----	XX	1,304,988	XX	1,562,234
Total 1967 constant dollars ----	XX	958,122	XX	[p]747,060

[p] Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes fire clay; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Arizona, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Apache	W	$5,557	Petroleum, helium, clays, pumice, stone, sand and gravel, natural gas.
Cochise	$57,396	50,608	Copper, lime, gold, silver, sand and gravel, stone.
Coconino	1,424	2,482	Sand and gravel, pumice, stone.
Gila	122,989	154,955	Copper, silver, sand and gravel, lime, gold, asbestos, stone, molybdenum, clays.
Graham	824	866	Copper, sand and gravel, pumice.
Greenlee	145,467	179,599	Copper, lime, silver, gold, stone, sand and gravel.
Maricopa	r 21,159	23,694	Sand and gravel, stone, lime, mica, clays.
Mohave	r 39,285	39,861	Copper, molybdenum, sand and gravel, silver, feldspar, zinc, gold, stone, lead, pumice.
Navajo	W	W	Coal, sand and gravel, iron ore, pumice, stone.
Pima	511,173	603,005	Copper, molybdenum, cement, silver, sand and gravel, stone, gold, lime, lead, clays, zinc, mica.
Pinal	331,140	413,867	Copper, molybdenum, silver, gold, sand and gravel, stone, lime, perlite, gypsum, pyrites, clays.
Santa Cruz	W	W	Zinc, sand and gravel, lead, silver, stone.
Yavapai	56,782	63,669	Copper, cement, zinc, sand and gravel, stone, molybdenum, silver, lime, gypsum, clays, gold, lead, pumice.
Yuma	W	W	Sand and gravel, stone, lead, silver, zinc, tungsten, copper, gold.
Undistributed [2]	r 17,348	24,063	
Total [3]	1,304,988	1,562,234	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Value of petroleum is based on an average price per barrel for the State.

[2] Includes value of mineral production that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Arizona business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total nonagricultural employment	thousands	715.1	741	+3.6
Services and miscellaneous	do	124.2	130.4	+5.0
Trade	do	167	172.1	+3.1
Mining	do	24.6	26.7	+8.5
Construction	do	64.4	57.8	−10.2
Manufacturing	do	109.3	112.1	+2.6
Government	do	147.6	160.0	+8.4
All other	do	78.1	81.9	+4.9
Personal income:				
Total	millions	$9,655	$10,742	+11.2
Per capita		$4,657	$4,989	+7.1
Construction activity:				
New housing units authorized		44,994	34,108	−24.2
Value of nonresidential construction	millions	$377	$321.5	−14.7
Highway construction contracts awarded	do	$61	$70	−14.8
Portland cement shipments to and within Arizona	thousand short tons	1,711	1,385	−19.1
Farm marketing receipts	millions	$836	NA	NA
Mineral production value	do	$1,305	$1,562	+19.7

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and the U.S. Bureau of Mines.

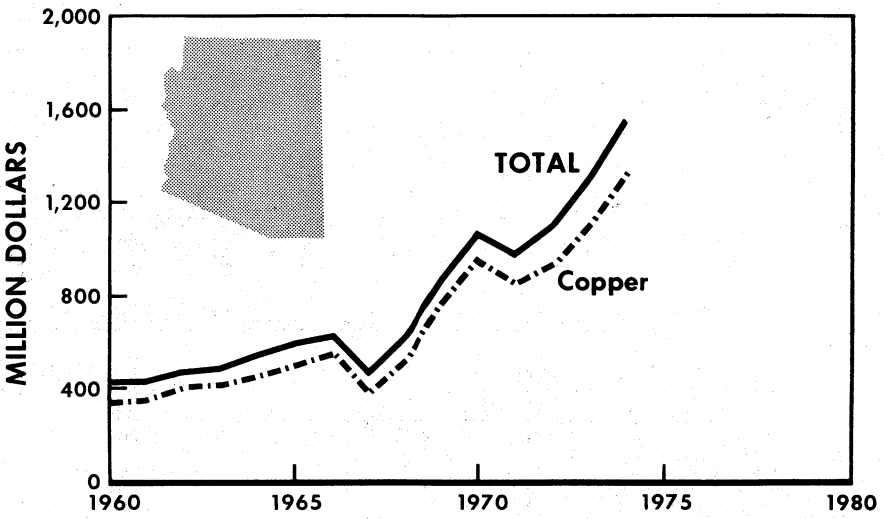

Figure 1.—Value of mine production of copper and total value of mineral production in Arizona.

Table 4.—Major sources of income in Arizona [1]
(Millions)

Source of income	1973	1974	Change, percent
Manufacturing (value added)	$2,160	$2,270	+5
Mining [2]	1,305	1,562	+19
Tourism	690	680	−1
Livestock	r 672	629	−6
Crops	r 425	603	+42

r Revised.
[1] Valley National Bank Research Department, Phoenix, Ariz.
[2] U.S. Bureau of Mines.

Table 5.—Valuation on centrally assessed groups of property in Arizona [1]
(Millions)

Group	1973	1974	Change, percent
Utilities	$1,821.3	$2,293.9	+26
Mines	r 907.4	863.3	−5
Pipelines	367.6	356.7	−3
Railroads	181.3	172.8	−5
Airlines	29.4	35.6	+21
Oil and gas	2.9	2.7	−7

r Revised.
[1] Pay Dirt. No. 408, June 25, 1973, p. 9.

Employment and Injuries.—Final statistics for 1973 on employment and injuries in the mineral industries, excluding petroleum and natural gas operations, and preliminary data for 1974 compiled by the Mining Enforcement and Safety Administration, are given in table 6.

Table 6.—Arizona: Worktime and injury experience in the mineral industries [1]

Year and industry	Men employed	Man-hours worked	Fatal injuries	Fatal frequency rate [2]	Nonfatal disabling injuries	Nonfatal disabling frequency rate [2]
1973:						
Copper:						
Underground	4,786	9,302,112	6	0.65	634	68.05
Surface	7,662	15,136,107	4	.26	299	19.49
Mill	5,273	10,030,331	--	--	152	13.76
Total	17,721	34,468,550	10	.29	1,085	30.93
Other metals:						
Mine	40	35,379	--	--	1	28.26
Mill	1	245	--	--	--	--
Sand and gravel:						
Surface	707	1,085,700	3	2.76	34	31.32
Other nonmetals: [3]						
Surface [4]	250	328,967	--	--	26	--
Mill	542	789,463	--	--	5	--
Coal:						
Surface	152	387,703	--	--	4	10.32
Mill	41	16,680	--	--	--	--
State totals:						
Underground	4,837	9,351,660	6	.64	635	67.90
Surface	8,760	16,924,308	7	.41	363	21.44
Mill	5,857	10,836,719	--	--	157	14.48
Total	19,454	37,112,687	13	.35	1,155	31.12
1974:						
Copper:						
Underground	5,479	10,586,813	10	0.94	703	66.03
Surface	7,993	15,174,100	2	.13	395	24.19
Mill	5,803	10,463,171	--	--	119	8.89
Total	19,274	36,224,084	12	.33	1,217	32.00
Other metals:						
Underground	34	15,940	--	--	--	--
Surface	5	216	--	--	--	--
Mill	1	175	--	--	--	--
Sand and gravel:						
Surface	817	1,119,946	--	--	18	14.29
Other nonmetals: [3]						
Underground	3	30	1	33,333.33	--	--
Surface [4]	274	374,576	--	--	6	16.02
Mill	412	754,027	--	--	33	43.76
Coal:						
Surface	255	580,891	1	1.72	13	22.38
Mill	35	66,466	--	--	1	15.05
State totals:						
Underground	5,516	10,602,783	11	1.04	703	65.93
Surface	9,344	17,249,729	3	.17	432	25.04
Mill	6,250	11,283,339	--	--	153	13.55
Total	21,110	39,136,351	14	.35	1,288	32.91

[1] Mining Enforcement and Safety Administration (MESA) began accumulating and analyzing worktime and injury experience in 1973 and data became available in 1974. All data must be considered preliminary.
[2] Frequency rate is per million man-hours.
[3] Includes cement, lime, limestone, granite, marble, sandstone, miscellaneous stone, clay, feldspar, fluorspar, gypsum, mica, pumice, and miscellaneous nonmetals.
[4] Includes underground mining of fluorspar for which no fatalities or injuries were recorded.

Legislation and Government Programs.—Arizona passed legislation that increased the sales tax from 3 to 4% and increased a special education excise tax on products from the mining industry by ½ of 1%. This new tax, combined with the existing sales privilege tax, makes a total tax of 2½% on the sales of mining products.

The property tax rate for 1974 was established by the legislature at $1.50 per $100 of assessed valuation. The mining industry pays property tax on 60% of assessed property valuation.

The State Department of Health Services retained previously adopted standards for air pollution. The Department assigned the Air Pollution Control Division the responsibility of setting quantities for sulfur emissions at each smelter. The Division used a formula based on quality of the air in the vicinity of the smelter in determining how much sulfur could be emitted

without violating Federal quality standards. The percent of sulfur dioxide that must be removed from smelter input in order to obtain an unconditional operating permit are as follows:

Company	Smelter location	Sulfur oxide removal, percent
ASARCO	Hayden	64.8
Kennecott Copper Corp., Ray Mines Division	do	64.8
Inspiration Consolidated Copper Corp	Miami	90.0
Magma Copper Company	San Manuel	52.9
Phelps Dodge Corp	Morenci	48.0
	Ajo	90.0
	Douglas	42.0

Kennecott Copper Corp., Ray Mines Division, received the first unconditional smelter-operation permit, granted by the Air Pollution Control Division, as a result of removing more than 90% of the particulates and sulfur oxide emissions at its smelter. A computer control system of intermittent production curtailment or "closed-loop control" to monitor ambient air quality and to warn of malfunctions or air inversions in the Hayden area was jointly owned and operated by ASARCO and Kennecott. Both companies operate smelters at Hayden. Other copper-smelting companies received 1-year compliance permits early in 1974 and at the end of the year were requesting additional 6-month to 1-year extensions.

National Wildlife Refuge status, which would eliminate mineral resource development, was proposed to the Congress for 940,000 acres in the Cabeza Prieta area of Pima and Yuma Counties, and 747,000 acre Kofa Game Range in Yuma County. Before enactment, however, mineral resource surveys will be made of both areas by the Federal Geological Survey and the Bureau of Mines. In 1974 mineral surveys continued in the Galiuro proposed wilderness area in the Coronado National Forest.

REVIEW BY MINERAL COMMODITIES

METALS

Metals provided 92% of the value of Arizona mineral production with copper comprising 85%, molybdenum 3.7%, silver 1.9%, and gold 0.9%. Forty-eight mines yielded 179 million tons of ore from which 3.1 million tons of concentrate were processed. Output from 27 mines was predominantly copper ore, two properties yielded cathode copper from electrowinning, one produced cement copper from heap leaching and two from vat leaching. Other metal production came from one copper-zinc mine, two lead, two lead-zinc, three gold, two silver, and one from gold-silver tailings.

Air pollution from smelters remained an issue with conditional operating permits from the State to expire near the turn of the year. Companies operating smelters experienced considerable technological difficulties in efforts to control sulfur oxide emissions.

Copper.—Mines in Arizona yielded 858,783 short tons of copper, a decrease of 7.4% from that of 1973. Because of higher prices, however, the value of production was 20% greater. The State output was 53.8% of the Nation's primary production. Properties were operated at capacity for the first 7 months of the year. Labor strikes over contract negotiations idled some mines during July and August, while other properties were not affected. Production decreases were quite evident in November and December, caused by a decline in copper prices.

Pima County continued to lead all others in tons of copper output (333,725) followed by Pinal (248,962), Greenlee (111,091), Gila (96,720), Cochise (26,274), Yavapai (22,496), Mohave (19,118), and Graham (397).

Seventeen open pits and three underground mines yielded 78% and 22%, respectively, of the copper produced. About 86.7% of the copper was from copper concentrate. Leaching operations yielded 12.8% of the copper; 6.3% was copper precipitates from waste dump leaching, 3.4% from copper ore leaching and electrowinning, and 3.1% as precipitates from heap or vat leaching. The remainder came from direct shipping ore (0.4%) and from gold, silver, zinc, or lead, ores or concentrates (0.4%).

Table 7.—Arizona: Total value of mineral production in Arizona, and production and value of copper in Arizona and the United States

Year	Arizona			United States		Arizona	
	Total value mineral production (thousands)	Copper production		Copper production		Percent of U.S. copper production	Percent of world copper production
		Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)		
1970	$1,166,767	917,918	$1,059,277	1,719,657	$1,984,484	53.4	14.1
1971	981,020	820,171	852,978	1,522,188	1,583,071	53.9	12.3
1972	1,091,004	908,612	930,419	1,664,840	1,704,796	54.6	12.4
1973	1,304,988	927,271	1,103,453	1,717,940	2,044,346	54.0	11.8
1974	1,562,234	858,783	1,327,678	1,597,002	2,468,964	53.8	19.7

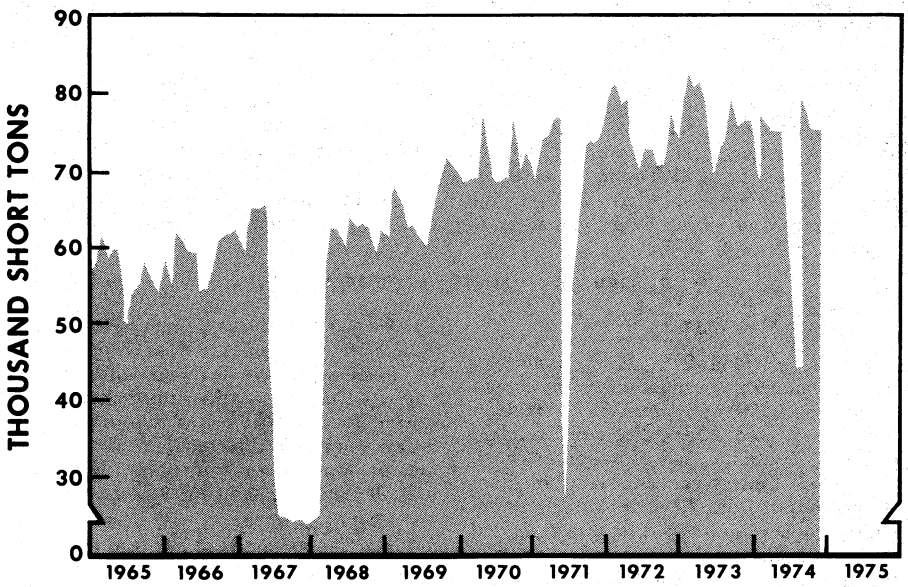

Figure 2.—Mine production of copper in Arizona, by month, in terms of recoverable metal.

Table 8.—Arizona: Fifteen leading copper-producing mines, in order of output

Rank in 1974	Rank in 1973	Mine	County	Operator	Source of copper in 1974
1	1	San Manuel	Pinal	Magma Copper Co	Copper ore.
2	2	Morenci	Greenlee	Phelps Dodge Corp	Copper ore and copper precipitates.
3	3	Ray	Pinal	Kennecott Copper Corp	Do.
4	4	Pima	Pima	Cyprus Pima Mining Co	Copper ore.
5	5	Sierrita	do	Duval Sierrita Corp	Do.
6	8	Inspiration	Gila	Inspiration Consolidated Copper Co.	Copper ore and copper precipitates.
7	6	Twin Buttes	Pima	Anamax Mining Co	Copper ore.
8	7	New Cornelia	do	Phelps Dodge Corp	Copper and gold ores.
9	9	Mission	do	American Smelting and Refining Company.	Copper ore.
10	13	Magma	Pinal	Magma Copper Co	Do.
11	10	Silver Bell	Pima	American Smelting and Refining Company.	Copper ore and copper precipitates.
12	12	Mineral Park	Mohave	Duval Corp	Do.
13	17	Esperanza	Pima	do	Do.
14	16	Bagdad	Yavapai	Cyprus Bagdad Copper Co	Copper ore.
15	11	Copper Cities	Gila	Cities Service Co	Copper ore and copper precipitates.

Table 9.—Arizona: Material handled and copper produced at fifteen leading copper mines

Mine	Ore mined (thousand short tons)		Waste material removed [1] (thousand short tons)		Material placed in leach dumps (thousand short tons)		Total copper produced [2] (short tons)	
	1973	1974	1973	1974	1973	1974	1973	1974
OPEN PIT								
Morenci	18,361	16,786	19,445	15,029	17,618	15,377	122,633	115,718
Ray	10,457	11,221	--	--	27,393	33,731	102,534	90,951
Pima	20,208	20,018	33,088	55,825	--	--	88,140	85,225
Sierrita	30,597	30,497	34,539	51,209	11,613	1,388	75,595	79,594
Twin Buttes	15,076	11,766	115,232	126,722	--	--	64,150	45,458
Inspiration	8,722	8,453	9,456	8,600	7,453	9,929	[3] 48,588	[3] 45,100
New Cornelia	10,343	9,039	19,774	13,845	--	--	54,499	44,138
Mission	8,783	7,539	21,532	17,122	--	--	46,558	40,332
Silver Bell	3,866	3,848	9,975	10,506	3,598	2,472	23,765	23,475
Mineral Park	8,394	6,380	3,806	3,214	1,638	2,589	23,676	19,707
Esperanza	6,454	6,406	3,129	5,815	6,736	3,792	18,957	19,272
Bagdad	2,088	2,171	10,943	9,876	--	--	19,151	19,113
Copper Cities	5,223	3,698	167	--	3,865	1,207	24,075	17,996
UNDERGROUND								
San Manuel	21,900	19,624	91	67	--	--	139,829	124,423
Magma	520	733	--	--	--	--	22,891	30,469

[1] Excluding material placed in leach dumps.
[2] Gross metal content.
[3] Recoverable content.

Table 10.—Arizona: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county

County	Mines producing [1]		Material sold or treated [2] (short tons)	Gold		Silver	
	Lode	Placer		Troy ounces	Value	Troy ounces	Value
1972, total	39	1	166,111,254	102,996	$6,035,570	6,652,800	$11,209,970
1973, total	40	1	181,506,076	102,848	10,059,561	7,199,251	18,415,683
1974:							
Cochise	4	--	4,019,965	15,722	2,511,432	407,009	1,917,012
Gila	9	--	25,750,950	4,655	743,589	262,633	1,237,002
Graham	1	--	607	--	--	--	--
Greenlee	2	--	16,802,064	11,465	1,831,420	433,499	2,041,780
Mohave	4	--	6,252,648	160	25,559	315,334	1,485,223
Pima	10	--	89,656,231	16,808	2,684,910	3,379,909	15,919,370
Pinal	10	--	34,339,043	41,134	6,570,745	1,429,040	6,730,780
Yavapai	5	--	2,268,684	641	102,393	110,106	518,599
Undistributed [3]	3	--	5,565	1	160	17,998	84,771
Total	48	--	179,095,757	90,586	14,470,208	6,355,528	29,934,537

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1972, total	908,612	$930,418,872	1,763	$530,083	10,111	$3,589,447	$951,783,942
1973, total	927,271	1,103,452,687	763	248,480	8,427	3,482,017	1,135,658,428
1974:							
Cochise	26,274	40,619,737	--	--	--	--	45,048,181
Gila	96,720	149,528,846	--	--	--	--	151,509,437
Graham	397	613,269	--	--	--	--	613,269
Greenlee	111,091	171,746,013	--	--	--	--	175,619,213
Mohave	19,118	29,557,092	3	1,196	51	36,687	31,105,757
Pima	333,725	515,939,044	447	201,064	19	13,707	534,758,095
Pinal	248,962	384,894,687	--	--	--	--	398,196,212
Yavapai	22,496	34,779,125	35	15,843	8,691	6,239,944	41,655,904
Undistributed [3]	(4)	487	574	258,350	939	673,885	1,017,653
Total	858,783	1,327,678,300	1,059	476,453	[5] 9,699	6,964,223	1,379,523,721

[1] Operations at miscellaneous cleanups not counted as mines.
[2] Does not include gravel washed.
[3] Includes Santa Cruz and Yuma Counties, combined to avoid disclosing individual company confidential data.
[4] Less than ½ unit.
[5] Data do not add to total shown because of independent rounding.

Table 11.—Arizona: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by class of ore or other source material

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Gold	3	17,453	43	424	80	--	--
Silver	3	16,790	7	4,940	1	--	--
Total	6	34,243	50	5,364	81	--	--
Copper	31	178,820,476	89,765	6,266,783	801,680	447	19
Copper-zinc	1	92,820	441	41,938	3,224	35	8,691
Lead, lead-zinc, and zinc [2]	5	6,282	26	19,580	2	577	990
Total [3]	37	178,919,578	90,232	6,328,301	804,906	1,059	9,699
Other lode material:							
Tailings	1	67,249	304	21,863	74	--	--
Copper cleanup	(4)	97	--	--	30	--	--
Copper precipitates	15	74,590	--	--	53,693	--	--
Total [3]	16	141,936	304	21,863	53,796	--	--
Grand total	48	179,095,757	90,586	6,355,528	858,783	1,059	9,699

[1] Detail will not necessarily add to totals because some mines produce more than one class of material.
[2] Combined to avoid disclosing individual company confidential data.
[3] Data may not add to totals shown because of independent rounding.
[4] From properties not classed as mines.

Table 12.—Arizona: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by type of material processed and method of recovery

Type of material processed and method of recovery	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Cyanidation	--	2,240	--	--	--
Acid leaching (vat, tank, heap) [1]	--	--	56,310	--	--
Smelting of concentrates	88,323	6,257,810	744,951	1,056	9,699
Direct smelting of—					
Ore	1,959	73,615	3,726	3	1
Precipitates	--	--	53,693	--	--
Cleanup	--	--	30	--	--
Tailings	304	21,863	74	--	--
Total [2]	2,263	95,478	57,522	3	1
Grand total [2]	90,586	6,355,528	858,783	1,059	9,699

[1] Includes copper recovered by electrowinning process.
[2] Data may not add to totals shown because of independent rounding.

Magma Copper Co.'s San Manuel underground operation was the State's largest producing property, followed by open pit operations at Phelps Dodge Corp.'s Morenci mine, Cyprus Pima Mining Co.'s Pima mine, Duval Corp.'s Sierrita mine, and Kennecott Copper Corp.'s Ray mine. Seven smelters were active, three by Phelps Dodge (Morenci, Douglas, and Ajo), ASARCO and Kennecott at Hayden (one smelter each), Inspiration Consolidated Copper Co. at Miami, and Magma at San Manuel. Electrolytic refineries and rod casting plants were part of the operations of Inspiration at Miami and of Magma at San Manuel.

Phelps Dodge was the leading copper producing company in Arizona with operating mines at Morenci, Ajo, and Bisbee. About 74 million tons of ore and waste were mined, which yielded 186,129 tons of copper or 21.7% of the copper production in the State. The Morenci copper production from Greenlee County was 6,915 tons

less than for 1973; the decrease was due to a 5-week labor strike and a reduced operating schedule in the last quarter of the year. Ores mined and concentrated averaged 0.86% copper, or 9.2 pounds per ton. Ore processed by electrowinning averaged 6.7 pounds of copper per ton, heap leaching copper ores 5.1 pounds per ton, and vat leaching copper ore 6.5 pounds per ton.

The Morenci smelter was operated on a permit by the Air Pollution Control Board, which was extended through 1975. Air quality control expenditures assigned to the smelter for the year were $29.5 million; bringing the total to $82.3 million for the program that began in 1970. The unavailability of equipment and lack of skilled labor hampered installation of the emission control system. As a means of disposing of most of the acid produced in the smelting operation, tailings at both the Morenci and Metcalf concentrators will be treated by countercurrent leaching with solutions of sulfuric acid. The first unit of the tailing treating facilities, designed to recover copper precipitates from the Morenci mill was completed and began operating in November. The second unit is planned for completion in 1975; both units were estimated to cost $44 million.

The Metcalf mine, which adjoins the Morenci property, will begin operations in January 1975. The mine has been under development since 1969. The mine and concentrator have an annual capacity to produce 60,000 tons of copper in concentrates. The cost of the project was estimated to be more than $200 million.

The New Cornelia operation at Ajo in Pima County produced about 10,000 tons less than in 1973. Problems plagued the smelter emission control system. An additional $3.6 million was spent on modifications of the acid recovery section, bringing total costs to $31.3 million. The modifications included two additional mist precipitators for the acid plant, in addition to other changes. The smelter conditional operating permit was extended through 1975. About 57,000 tons of sulfuric acid, produced as a byproduct from the Ajo smelter operation, was sold in 1974 to consumers in Arizona and California.

The Lavender pit and Bisbee concentrator in Cochise County were closed on December 14. Underground mining at Bisbee was still active at yearend, but expectations were that copper mining at Bisbee would be terminated early in 1975. A small operation in the Lavender pit for turquoise gemstone will continue for an indefinite period, as will the leaching of mill tailings.

The Douglas smelter, in Cochise County, operated near capacity throughout the year, except during the 5-week labor strike. Air quality control equipment expenditures were $12.2 million in 1974, bringing the total spent since 1971 to $15.3 million. Plans for air pollution control included installing particulate precipitators and, when indicated by an air monitoring system, the curtailment of production in the smelter. The conditional operating permit was extended to August 1975. This smelter operates on ore from Phelps Dodge Bisbee properties and on ores and concentrates from other companies.

Phelps Dodge continued development at its deep ore body near Safford in Graham County. In February, a $30 million development program was announced, which was in addition to the nearly $15 million previously expended. Total investment to the end of the year was $21 million. Under the program, the No. 1 shaft has been sunk 270 feet to a depth of 2,150 feet and the sinking of No. 2 shaft has started; other underground development work was in progress. The ore body contained an estimated 400 million tons of ore with an average grade of 0.72% copper, which will be mined by a block-caving system.

Magma Copper Co., a wholly owned subsidiary of Newmont Mining Corp., operated the San Manuel and Magma properties. The San Manuel operation, in Pinal County, was the leading copper producer in the State. The operation can be rated the second largest in the United States and the largest producing underground mine in the Nation, hoisting about 62,500 tons a day. Production was 15,000 tons less in 1974 because of a 5-week labor strike in July and August, and a reduced demand for copper in November and December. At the end of the year, mine production had been reduced 25%, compared to the first 6 months' average rate. Two new hoisting shafts were completed at the mine to service production from deeper levels and to enable development of the adjacent downfaulted block extension of the San Manuel ore body. A new computer-controlled anode casting system was installed at the smelter, replacing manual casting. A new sulfuric acid plant was started up in the

fourth quarter. Although most of the acid will probably be sold, an auxiliary alkali plant was constructed to neutralize any acid produced in excess of sales. The previously announced expansion of the mine and mill and doubling of the capacity of the continuous cast copper rod facility were deferred because of reduced demand for copper.

Production increased by 6,000 tons of copper per year at Magma's mine at Superior in Pinal County. Ore from this underground mine, containing about 4% copper, was milled at Superior and the concentrate shipped by railroad to San Manuel for smelting, electrolytic refining, and casting into copper rod.

Duval Corp., a subsidiary of Penzoil Co., operated three open pit copper mines in Arizona in 1974, producing 118,573 tons of copper, a slight increase over that of 1973. The company was the second leading producer of molybdenum in the Nation. Duval's Arizona operations were closed less than 1 week during union labor negotiations. Mines produced at capacity most of the year, although some buildup of concentrates occurred because of labor strikes at smelters processing Duval's concentrates.

Duval developed and operated the Sierrita property in Pima County under a Defense Production Act contract with the Government, through the General Services Administration (GSA). Payback to GSA has been with copper at the rate of 38 cents per pound; at yearend, deliveries to the account of GSA amounted to 40% of the total contract. Production increased during the year at the Esperanza property, which is adjacent to the Sierrita line, mainly because of improvements made in the processing system. Production of copper concentrate, precipitate copper, and molybdenum sulfide concentrate at the Mineral Park mine in Mohave County decreased slightly in 1974.

Duval began constructing a hydrometallurgical plant at the Sierrita property using the CLEAR process (copper, leach, electrowinning, and regeneration). The facility will enable the company to produce copper crystals equivalent to high-grade blister copper from concentrates and precipitates. The plant, designed to create no solid, liquid, or gaseous pollution, should be ready for operation early in 1976.

The Ray Mines Division of Kennecott Copper Corp. produced 11,600 tons less copper than in 1973 from its mine in Pinal County, from ore averaging 0.929% copper. Smelter throughput was reduced because of difficulties with the roaster and reverberatory furnace and problems associated with startup of the new air pollution control equipment. New copper flotation equipment was installed during the year, resulting in higher copper recoveries. Expansion of silicate-copper leaching capacity by 50% was underway and was to be completed in 1975. The Hayden smelter received the first unconditional operating permit from the Arizona Air Pollution Control Board.

Investigations continued at the Kennecott porphyry copper deposit near Safford. This deposit lies beneath thick layers of barren volcanic rock and much of the copper occurs as a mixture of oxide and sulfide minerals. Mining investigation plans include some form of insitu leaching.

Cyprus Mines Corp. operated Bagdad, Bruce, Johnson Camp, and Pima properties producing 106,830 tons of copper, about 3% less than in 1973.

Production at Cyprus Bagdad in Yavapai County, was about the same as for 1973. In addition to copper from copper concentrates, the company produced almost 5,000 tons of cathode copper from solvent extraction and electrowinning processes. Molybdenum and silver were also produced. An expansion plan for Cyprus Bagdad provided for a new concentrator to process 40,000 tons of ore a day and new facilities for water supply, tailings disposal, warehouses, offices, and a greatly enlarged town for employees. Full scale construction will begin in 1975 with anticipated completion in 1977. The project was estimated to cost $200 million.

The Cyprus Pima operation south of Tucson in Pima County was owned by Cyprus Mines Corp., with minority interests held by Union Oil Co. of Calif. and Utah International, Inc. The mine and mill operated at a slightly lower rate in 1974, and approximately 15,000 tons of concentrates had accumulated by December, because of strikes at smelters during the year. The operation also yielded molybdenum and silver.

Cyprus also operated the Cyprus Bruce underground high-grade zinc and copper mine and concentrator near Bagdad in Yavapai County. In 1974 nearly 93,000 tons of ore was mined, having an average grade of 3.86% copper and 16.6% zinc.

A total of 1,092 tons of copper was sold at an average price of 78.0 cents a pound. Proven ore reserves estimated at the end of the year were more than 300,000 tons.

Development at the Cyprus Johnson property, between Benson and Wilcox in Cochise County, proceeded through 1974. Stripping of overburden and mining of ore was in progress and construction of the solvent extraction-electrowinning plant was on schedule. The oxide ore will be mined, hauled, dumped in heaps, and leached with acid solution. The operation, as planned, will produce 25,000 to 27,000 pounds of electrowon copper per day from about 4,000 tons of ore with an average grade of 0.8% copper. The operation should be on-stream in February 1975.

Cyprus Metallurgical Processes Corp., a research arm of Cyprus, was developing the Cymet process and testing a pilot plant south of Tucson. A new concept of the process will be directed toward producing pure copper in wirebar form.

Anamax Mining Co., partnership between The Anaconda Co. and AMAX, Inc., operated the Twin Buttes property south of Tucson in Pima County, producing at 70% of the 1973 rate. During the year, a potential slide area in the pit, resulting from heavy rains, was stabilized without serious trouble. Seven million tons of waste was removed and several holes drilled to relieve the hydrostatic pressure. Expansion of the 10,000-ton-per-day oxide plant proceeded throughout the year with completion planned in 1975. The operation was not seriously affected by labor strikes, as the mine was closed for only a few days during union contract negotiations. The company announced plans to increase the sulfide concentrator from 32,000 to 40,000 tons per day with completion scheduled for late 1975.

Anamax Mining Co. purchased the historic 35,000-acre Empire Ranch in December. The ranch was obtained as a potential source of groundwater for possible future use in mining the Helvetia property in eastern Pima County, across the Santa Cruz Valley from Twin Buttes mine. The ranch is south and east of the Helvetia property. Additional development of the Helvetia property has not been scheduled.

Output from the Thornton, Live Oak, and Red Hill pits of Inspiration Consolidated Copper Co. in Gila County was 7% less than in 1973. The decrease was due mainly to the labor strike, which occurred between July 14 and August 23. The Christmas mine production decreased from 9,500 tons in 1973 to 6,700 tons in 1974. The Ox Hide mine precipitate copper production increased from 4,300 tons to 4,840 tons. Inspiration also recovered silver, gold, and selenium. The byproduct molybdenum recovery plant, which was placed on standby in September 1973, did not operate in 1974. Production of continuous-cast copper rod from the fabricating plant increased from 78.5 million pounds in 1973 to 82.3 million pounds in 1974. The smelter processed 73,000 tons less copper than in 1973; this decrease was caused by startup problems at the acid plant and pollution control facilities for the newly constructed smelter. One wall in the new electric furnace developed a leak and had to be reconstructed. The labor strike caused another 40-day delay. Operation of the smelter and acid plant improved, but was not at capacity at yearend. Toll and custom material from other producer's mines accounted for 45% of the tonnage treated in the smelting plant in 1974, compared to 52% in 1973. The Arizona Air Pollution Control Board extended the conditional operating permit to June 30, 1975.

ASARCO, Inc. (formerly American Smelting and Refining Company) operated four open pit properties and a smelter in Arizona. Production for the Mission and Silver Bell mines in Pima County is listed in table 9. The output at the Mission mine declined due primarily to a labor strike. A new 3-year labor contract was negotiated at the Silver Bell mine without a labor strike. Output at the San Xavier oxide ore mine near the Mission property was 5,900 tons of copper in copper precipitate, compared to 2,700 tons in 1973. Most operating problems encountered in bringing the new operation into production in 1973 and early 1974 were resolved. Stripping of overburden from the second oxide copper deposit at San Xavier started during the year. The new $41.5 million Sacaton mine and concentrating mill, 6 miles northwest of Casa Grande in Pinal County, was dedicated in March and reached the full 9,000 tons of ore per day late in the year. According to the company's annual report, production for 1974 was 9,500 tons of copper in flotation concentrates.

Construction was completed on the new 1,000-foot stack at the ASARCO smelter at Hayden. Installation of highly sophisti-

ticated ambient air monitoring and meteorological measurement system was in progress. The smelter was operated with a conditional permit from the State Air Pollution Control Board, expiring in March 1975. In addition to smelting concentrates and precipitates from company operations, the Hayden smelter treated products from other companies. The air problems at Hayden are compounded because two large smelters operated by different companies contribute to the pollution. As ASARCO depends on custom materials, it receives variable type feed requiring the materials handling equipment and smelting process to be flexible. The company joined with the Ray Mines Division of Kennecott in a monitoring system combining computerized sulfur oxide detecting stations and weather analysis. The system will allow one or both of the smelters to cut back production to prevent excessive pollution.

Cities Service Co. produced from open pits at Copper Cities and its new Pinto Valley project in Gila County. Development continued at the underground project of Miami East. The Copper Cities open pit was almost depleted of ore and was scheduled for closure in 1975. Production for 1974 decreased from that of 1973. The first division of the Pinto Valley concentrator began operating in July at a rate of 20,000 tons of ore a day. The second division was started in October and capacity of 40,000 tons a day was expected early in 1975. The operation includes mining, concentrating, and transporting of concentrates through a 10.7 mile slurry pipe line to a filtering plant near Inspiration's smelter. The ore averaged 0.44% copper and contains some molybdenum. Concentrates were smelted on a toll basis by Inspiration.

Ranchers Exploration and Development Corp. maintained production at its Bluebird and Old Reliable properties at about the same rate as in 1973. The Bluebird mine in Gila County has been operating since 1964; reserves in 1974 were estimated as 75 million tons. The ore from the open pit was placed in heaps and the copper leached by solutions of water and sulfuric acid. The copper from the solutions was treated by solvent extraction and electrowinning to produce cathode copper. At the Old Reliable property in Pinal County, in-place fractured ore was leached by sulfuric acid solutions. Copper in solution was digested in launders containing detinned iron resulting in precipitates of cement copper.

McAlester Fuel Co. operated the Zonia mine in Yavapai County by leaching in-place ore shattered by extremely large blasts near the edge of the formerly mined open pit. Production of precipitate copper was about one fourth of that in 1973.

Companies having production of less than 1 million pounds included Little Hills Mines, Inc., shipping fluxing ore from the Gold Hill mine near Oracle, in Pinal County; Big Hole Mining Co., shipping ore and precipitates from the United Verde open pit near Jerome, in Yavapai County; Producers Mineral Corp., shipping cement copper from the Peacock mine near Safford, in Graham County; Charles Nichols shipping fluxing ore from the Copper Hill mine near Globe, in Gila County; and McFarland and Hullinger shipping material from the old Tiger dump near Mammoth in Pinal County for smelter fluxing material. Eight other producers had minor production of copper.

Hecla Mining Co. continued mine development and metallurgical plant construction at the Lakeshore copper project, 22 miles south of Casa Grande in Pinal County. The project, costing an estimated $185 million, was expected to be in the break-in operating stage in the last quarter of 1975. Production will be gradually increased to planned capacity of about 65,000 tons per year of copper in electrowon cathodes and copper precipitates. Hecla is the operator and owns a 50% interest in the project with El Paso Natural Gas Co. owning 50%.

Continental Oil Co. was encouraged by an economic and technical feasibility study of its copper project near Florence in Pinal County. The company continued evaluation of the project for an open pit mine operation. Additional drilling, along with environmental, hydrological, and archaeological studies were in progress in 1974. Two pilot mine shafts were drilled into the ore deposit, and underground test mining continued. Pilot plant metallurgical testing was being done on large mine samples. Following evaluation of processing results, a project may be proposed early in 1976 for a commercial size mine and plant.

Gold.—Production of gold was 90,586 troy ounces, a decrease of 11.9% from 1973, but it represented an increase in value of 43.8% because of higher prices in 1974. Most of the gold was recovered from copper concentrates and direct ship-

ping copper-gold ore. Minor quantities were recovered from zinc, copper concentrates, and silver and copper ores.

Iron Ore.—CF&I Steel Corp. mined iron ore, resulting from development work done at the Apache open pit in Navajo County. The ore was shipped to the company's iron and steel plant at Pueblo, Colo.

Lead.—Lead output in the State increased by 296 short tons in 1974. The production came from zinc-lead mines and as a byproduct from copper processing. The Tonto Basin Mining and Milling Co. converted its fluorspar mill, in Gila County, to a custom mill for concentrating base and precious ores. Lead and zinc producers were able to ship ores to this mill for concentration, resulting in increased production of lead in 1974.

Molybdenum.—Molybdenum production decreased 25% in 1974 to 28.3 million pounds. The value, however, was only 3.9% less because of higher prices. The production was a byproduct of copper-ore mining and concentration. In 1974 the Inspiration and Silver Bell operations did not produce molybdenum and this accounted for some of the decreased output. The State ranked second in the Nation in molybdenum production.

Silver.—Production of silver was 6.4 million ounces, a decrease of 11.7% from 1973. The value, however, was 62.5% greater in 1974, due to increases in the price which averaged $4.71 per ounce. Virtually all the silver was recovered as a byproduct of copper-ore mining. Two properties operated primarily for silver yielded less than 4,000 ounces.

Tungsten.—Although one property was mined for tungsten, production was insignificant.

Zinc.—Output of zinc increased 15.1%, and the value 100%. The major output was from the copper-zinc ore from the Cyprus Bruce mine in Yavapai County. The Glove mine in Santa Cruz County had the second largest output.

NONMETALS

The value of nonmetals mineral production increased 6% over that of 1973 to $101.8 million. Commodities with increases in value were asbestos, clays, gem stones, lime, pumice, perlite, sand and gravel, and stone. Those with decreases were cement, feldspar, and mica.

Asbestos.—The quantity of chrysotile asbestos sold in 1974 was 68.6% less than in 1973; the value of the product, however, increased 12.6%. Jaquays Mining Corp., operating an underground mine in Gila County, accounted for the total State production. The decrease in quantity produced was due to loss of market, caused by Environmental Protection Agency (EPA) regulations on consumer use and handling procedures. Jaquays lost most of the output formerly used in special cements and some of the product in the beverage filtering industry. The corporation completed a $100,000 mill modification program to comply with air pollution requirements in asbestos processing.

Cement.—Production of portland and masonry cement decreased by 14.8% in 1974. Portland cement consumption in the State declined from 1,711,000 short tons in 1973 to 1,385,000 tons in 1974, a decrease of 19%, reflecting less activity in building and road construction. Production came from two plants, the Phoenix Cement Co., a division of Amcord, Inc., operating a plant at Clarkdale in Yavapai County, and Arizona Portland Cement Co., a division of California Portland Cement Co., operating a plant at Rillito in Pima County. The Phoenix Cement Co. plant was converted from natural gas as a source of energy to coal in December. The Arizona Portland Cement plant has installed coal-burning equipment, but will continue to use natural gas or heating oil as long as conveniently obtainable.

Of the total portland cement transported, 11.8% was by rail and 88.2% by truck; 89.4% of the cement was shipped in bulk and 10.6% was in containers. The largest use was for ready-mix concrete (64%). Other markets were concrete-product manufacturing plants (16.5%), building material supply firms (8.5%), contractors (3.6%), highway contractors (3.0%), and miscellaneous (4.4%).

Clays.—Eight companies produced 199,000 tons of clays from nine operations. The production, which was valued at 35.5% more in 1974 than in 1973, included miscellaneous clay and shale, ball clay, fire clay, and swelling and nonswelling bentonite. Common clay for the manufacture of brick was produced by Phoenix Brick Yard, with plants in Maricopa and Pima Counties, and by Tucson Pressed Brick Corp. in Pima County. Phoenix Ce-

ment Co. produced common clay for use in processing cement in Yavapai County. Filtrol Corp. produced nonswelling bentonite and McCarrell & Gurley mined swelling bentonite in Apache County; most of these products were used to filter solutions in food processing by firms in California and Mississippi. Superior Co. mined swelling bentonite in Yavapai County. Ball clay was mined by McKusick Mosaic Co. in Gila County for use in making ceramic products, and fire clay for smelter use was mined by Magma Copper Co. in Pinal County.

Feldspar.—Feldspar production value was 51.2% less in 1974 than in 1973. The Arizona Feldspar Corp. operated the Taylor mine near Kingman in Mohave County, producing ground potash feldspar. Most of the feldspar was bagged and shipped to firms in California for use in porcelain products and manufacturing.

Gemstones.—Collecting precious or semiprecious gemstones was of interest to many individuals, both as hobbyists and as small commercial dealers. Accurate data on output are not available. Gemstones collected in Arizona included turquoise, agate, petrified wood, obsidian, and various varieties of other metal and nonmetal minerals. Turquoise has become by far the most important gemstone obtained in the State. During the year, turquoise production came from four large copper mines at which the copper companies contracted turquoise mining or collecting privileges. The value of gemstones as collected and before preparation into jewelry or special art objects was much greater in 1974 than in 1973. The major value of turquoise production came from sources in Mohave, Gila, Greenlee, and Cochise Counties. The L. W. Hardy Company in Kingman collected, sorted, treated, and stabilized turquoise and offered the stone to wholesale consumers. The graded product was sold wholesale for as much as $250 per pound.

Gypsum.—Four open pit mines, three in Pinal County and one in Yavapai County, produced 141,000 tons of crude gypsum valued at $473,000, a decrease in output of 10% compared to that of 1973. Crude gypsum was sold for portland cement retarder and agricultural use, and calcined gypsum was used for manufacturing building materials. National Gypsum Co., Superior Co., and Pinal Mammoth Gypsum Co. mined in Pinal County, and Superior Co. mined a second deposit in Yavapai County. National Gypsum Co. transported gypsum to Phoenix, Maricopa County, for calcining and manufacturing wallboard, vinyl-covered wallboard, and plaster products.

Lime.—Lime output value at $9 million increased 29.2% and came from eight plants operated by eight companies in seven counties. Production increased 57,000 tons (15.6%). Most of the lime was used as a chemical reagent by the copper industry; the remainder was used in sugar refining, soil stabilization, manufacturing paper and pulp, mason's lime, and neutralizing acid mine water. Production came from the following counties: Cochise, Greenlee, Gila, Pinal, Yavapai, Maricopa, and Pima. Companies producing lime, in order of production were, Paul Lime Plant, Inc., Phelps Dodge Corp., Kennecott Copper Corp., Carley L. Moore, Magma Copper Co., U.S. Lime Division of the Flintkote Co., and Home-Stake Production Co. The Flintkote Co. began production from its newly expanded plant at Nelson. The Home-Stake Production Co. ceased production during the year at its Santa Rita mine and plant in Pima County.

Mica.—Buckeye Mica Co. in Maricopa County and San Antonio Mine Co. in Pima County produced scrap and flake mica valued at $82,000. Buckeye Mica Co. also operated a grinding plant preparing the mica for use in roofing products, well drilling needs, and paint.

Perlite.—Crude perlite was produced by Filters International, Inc., Harborlite Corp., and Guzman Construction Co. at Superior in Pinal County. Production was 42.9% greater than in 1973. The crude perlite was crushed and sized in plants at Superior, but most of the production was shipped out of the State. The Harborlite Corp. maintains expanding plants at Vicksburg, Mich., and Escondido, Calif. The product from the Arizona operations was used in food and drug filtering plants.

Pumice and Pumicite.—Seven companies, two county highway departments, the State Highway Department, and the U.S. Forest Service operated 54 mines and 4 plants to produce 844,400 tons of volcanic cinders and 1,200 tons of pumice. Output was 0.8% less, but the value was 21% more than for 1973. Mines were operated in the following counties (in order of decreasing production): Coconino, Apache, Navajo, Graham, Yavapai, and Mohave. The material was used in road construction

(46.8%), railroad ballast (27.6%), and concrete aggregate (25.6%).

Pyrite.—Magma Copper Co. recovered a small amount of pyrite at its Superior copper ore concentrating mill and sold it to a chemical company in California where it was used in preparation of fertilizer and soil conditioners.

Sand and Gravel.—Production of sand and gravel sold or used decreased 4 million short tons or 14.7% although the value increased 8.8% compared to 1973. Following copper and its byproducts, sand and gravel had the highest value of all the minerals produced in Arizona. Output was reported in every county with 147 mines being operated by 115 companies. The five leading producers, in descending order, were United Metro, Inc., Union Rock & Materials Corp., Skousen Corp., Arizona State Highway Department, and Arizona Sand & Rock Co.; each had a production over 1 million tons and collectively accounted for 60% of the State output. The average value per short ton of processed sand was $1.98 and for gravel $1.77; unprocessed material averaged $1.18 per short ton and industrial sand and gravel averaged $5.02 per short ton. Building construction accounted for $30.8% of the output.

Table 13.—Arizona: Sand and gravel sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974			
	Number of mines	Quantity	Value	Number of mines	Quantity	Value	Number of companies
Apache	4	W	218	3	29	128	3
Cochise	13	430	1,063	15	442	1,190	13
Coconino	3	306	750	4	749	1,378	4
Gila	10	424	1,024	5	273	1,157	5
Graham	5	171	189	5	158	244	5
Greenlee	W	W	W	4	187	378	3
Maricopa	34	17,503	20,385	36	14,251	22,761	22
Mohave	9	1,551	2,657	11	861	2,652	9
Navajo	8	686	1,345	9	748	1,248	7
Pima	26	2,856	4,832	17	2,456	4,531	13
Pinal	10	1,100	1,841	7	1,105	1,399	6
Santa Cruz	4	114	256	4	93	304	4
Yavapai	13	1,158	2,679	19	1,540	3,879	13
Yuma	8	490	629	8	525	657	8
Undistributed [1]	6	649	635	--	--	--	--
Total	153	[2]27,440	38,503	147	23,417	41,906	115

W Withheld to avoid disclosing individual company confidential data; included in "Undistributed."
[1] Includes Greenlee County and some sand and gravel that cannot be assigned to any specific counties.
[2] Data do not add to total shown due to independent rounding.

Table 14.—Arizona: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	27,440	38,503	6,413	12,666
Gravel			14,281	25,339
Unprocessed:				
Sand and gravel			2,544	3,001
Industrial:				
Sand	W	W	179	897
Gravel			--	--
Total	27,440	38,503	23,417	41,903

W Withheld to avoid disclosing individual company confidential data; included with "Construction" (1973).
[1] Value data in this table may not be directly comparable to that in tables 1, 13, 15, and 16 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 15.—Arizona: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			6,565	11,285
Highway and bridge construction			633	1,107
Other uses (dams, waterworks, airports, etc.)			211	616
Concrete products (cement blocks, bricks, pipe, etc.)	20,837	28,063	790	1,769
Bituminous paving (asphalt and tar paving)			1,522	2,384
Roadbase and subbase			3,246	4,535
Unprocessed aggregate			1,152	1,477
Fill	2,740	2,517	817	1,530
Other uses [2]	1,033	2,449	114	309
Industrial sand and gravel	W	W	179	897
Total	24,610	33,029	15,229	25,909

W Withheld to avoid disclosing individual company confidential data; included with "Other uses" (1973).
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).

Table 16.—Arizona: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			636	907
Highway and bridge construction			658	965
Other uses (dams, waterworks, airports, etc.)			W	W
Concrete products (cement blocks, bricks, pipe, etc.)	2,696	5,359	W	W
Bituminous paving (asphalt and tar paving)			2,478	6,367
Roadbase and subbase			2,830	5,969
Unprocessed aggregate			1,392	1,524
Fill	134	115	194	266
Other	--	--	W	W
Total	2,830	5,474	8,188	15,998

W Withheld to avoid disclosing individual company confidential data; included with "Bituminous paving."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—The quantity and value of stone increased 15.6% and 21.2%, respectively. Seventy-two quarries had production, six more than in 1973. Graham was the only county where no production was reported. Limestone, quartz, sandstone, and miscellaneous rock were mined and sold as crushed and broken stone. Sandstone, marble, quartzite, and miscellaneous stone were also sold as dimension stone. Uses of crushed and broken stone included cement, smelter flux, lime, roadbase, surface cover, terrazzo, acid neutralizer, concrete, and roofing aggregate. Dimension stone was used as building stone veneer, flagging, and rough block.

Table 17.—Arizona: Stone sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value
Apache	--	--	--	4	57	169
Coconino	14	25	83	20	337	537
Gila	4	265	814	5	W	W
Graham	3	89	215	--	--	--
Maricopa	4	W	W	7	338	522
Navajo	1	W	8	1	W	10
Pima	10	W	2,500	8	1,707	4,300
Pinal	6	W	W	6	556	1,040
Santa Cruz	1	48	W	1	W	W
Yavapai	12	1,119	1,888	11	1,088	2,686
Undistributed [1]	1	2,719	3,962	9	851	2,214
Total [2]	66	4,265	9,469	72	4,932	11,479

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes Cochise, Greenlee, Mohave, and Yuma Counties.

[2] Data may not add to totals shown because of independent rounding.

Table 18.—Arizona: Stone sold or used by producers, by kind

(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension [1]	6	128	4	116
Crushed and broken:				
Limestone	2,310	4,045	2,619	5,978
Granite	43	77	83	121
Sandstone, quartz, and quartzite	1,026	3,183	1,092	2,409
Traprock	W	W	1,070	2,253
Other stone [2]	879	2,037	64	601
Total [3]	4,259	9,341	4,928	11,363
Grand total	4,265	9,469	4,932	11,479

W Withheld to avoid disclosing individual company confidential data; included with "Other stone."

[1] Data represent sandstone. 1973 data include marble, quartz, and other stone.

[2] Includes data for marble.

[3] Data may not add to totals shown because of independent rounding.

Table 19.—Arizona: Stone sold or used by producers, by use

(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Irregular-shaped stone	W	W	(1)	1
Rubble	2	W	1	24
Flagging	1	33	1	19
Other uses [2]	3	95	2	73
Total (thousand short tons) [3]	6	128	4	116
Crushed and broken:				
Bituminous aggregate [4]	384	981	162	886
Concrete aggregate	224	540	221	417
Dense graded roadbase stone	441	707	349	545
Surface treatment aggregate	73	199	194	459
Unspecified construction aggregate and roadstone	(5)	(5)	281	590
Manufactured fine aggregate (stone sand)	109	W	W	W
Lime manufacture	263	517	146	323
Flux stone	901	2,369	778	2,055

See footnotes at end of table.

Table 19.—Arizona: Stone sold or used by producers, by use—Continued
(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Crushed and broken—Continued				
Riprap and jetty stone	265	W	206	419
Refractory stone	7	W	W	W
Filter stone	82	246	W	W
Other uses [6]	1,511	3,781	2,591	5,669
Total [3]	4,259	9,341	4,928	11,363
Grand total	4,265	9,469	4,932	11,479

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Less than ½ unit.
[2] Includes data for rough blocks, dressed architectural stone and uses not specified.
[3] Data may not add to totals shown because of independent rounding.
[4] 1973 data includes unspecified construction aggregate and roadstone.
[5] 1973 data included with bituminous aggregate.
[6] Includes stone used for agricultural limestone, terrazzo and exposed aggregate, cement manufacture, acid neutralization (1973).

Vermiculite.—Ari-Zonalite exfoliated vermiculite concentrate, received from out of State, at its mill in Phoenix. The exfoliated product was used for block insulation, concrete aggregate, horticulture, and acoustical and fire proofing.

MINERAL FUELS

The value of mineral fuels, coal, petroleum, helium, and natural gas, increased 69.6%. Increases in production were registered for coal and natural gas, with decreases in petroleum and helium.

Coal (Bituminous).—Coal production and value increased 98.6% and 95%, respectively; all coal was mined by Peabody Coal Co. at two surface mines on Black Mesa in Navajo County from coal-bearing lands leased from the Navajo and Hopi Tribes. The coal occurs in the Wepo formation of upper Cretaceous rocks in beds varying up to 35 feet thick. Stripping has been planned for as much as 120 feet. The coal is ranked as bituminous, rated at over 11,000 Btu with an average ash content of 8% and a sulfur content of about 0.5%. The increase in output resulted in the company starting production from the Kayenta mine which supplied coal for the first unit of the Navajo powerplant operated by the Salt River Project (SRP) at Page. The coal was transported to the powerplant by unit train over a 78-mile electrified railroad, also operated by SRP. Coal from the Black Mesa mine is transported through a 273-mile pipeline to the Mohave Generating Station on the Colorado River in Nevada. Peabody Coal Co. restored the mined land and planted vegetation. Peabody Coal Co., a subsidiary of Kennecott Copper Corp. has been ordered by the Federal Trade Commission and Federal Courts to divest itself of the ownership of the coal company.

Table 20.—Arizona: Bituminous coal production, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				Production (thousand short tons)				Value (thousands)
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total	
Navajo	--	2	--	2	--	6,448	--	6,448	W

W Withheld to avoid disclosing company confidential data.

Helium.—Helium gas decreased 38% in output and 32.1% in value. All production was from Pinto Dome field in Apache County by the Kerr-McGee Corp. The helium content of the gas was about 8%, which was upgraded in a processing plant operated by Kerr-McGee and sold as grade A helium.

Natural Gas.—A small quantity of natural gas was sold to El Paso Natural Gas Co. and transported by pipeline to other states. The remaining natural gas was consumed in the crude oil producing operations.

Petroleum.—Output of petroleum decreased 8%, but value increased 25%. Production came from 28 wells in four fields operated by four companies. One development well was completed and two exploratory wells were dry. Oil production was on lands owned by the Navajo Tribe.

Table 21.—Arizona: Oil and gas well drilling in 1974, by county

County	Proved field wells			Exploratory			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Apache	1	--	--	--	--	2	--	17,098
Total	1	--	--	--	--	2	--	17,098

Source: Arizona Oil and Gas Commission.

Table 22.—Principal producers

Commodity and company	Address	Type of activity	County
Asbestos: Jaquays Mining Corp	1219 South 19th Avenue Phoenix, Ariz. 85009	Underground mine and plant.	Gila.
Cement:			
Amcord, Inc., Phoenix Cement Co.	610 Newport Center Drive Newport Beach, Calif. 92660	Plant	Yavapai.
Arizona Portland Cement Co., a division of California Portland Cement Co.	800 Wilshire Blvd. Los Angeles, Calif. 90017	---- do	Pima.
Clays:			
American Cement Corp., Phoenix Division.	2404 Wilshire Blvd. Los Angeles, Calif. 90051	Open pit mine	Yavapai.
Filtrol Corp	5959 W. Century Blvd., Suite 918 Los Angeles, Calif. 90045	---- do	Apache.
McCarrell & Gurley	Box 1377 Gallup, N. Mex. 87301	---- do	Do.
Phoenix Brick Yard	1814 South 7th Ave. Phoenix, Ariz. 85007	---- do	Maricopa.
Tucson Pressed Brick Corp	Box 17176 Tucson, Ariz. 85710	---- do	Pima.
Coal: Peabody Coal Co	P.O. Box 605 Kayenta, Ariz. 86033	---- do	Navajo.
Copper:			
American Smelting and Refining Co.[1]	P.O. Box 5795 Tucson, Ariz. 85703	Open pit mines, leach dumps, and plants.	Pima and Pinal.
Anamax Mining Co.[2]	P.O. Box 127 Sahuarita, Ariz 85629	Open pit mine and mill.	Pima.
Cities Service Co., Miami Copper Co. division.[3]	Box 100 Miami, Ariz. 85539	Open pit mine, leach dumps, and plant.	Gila.
Cyprus Mines Corp.[4]	555 South Flower St. Los Angeles, Calif. 90071	Open pit and underground mines, mills.	Cochise and Yavapai.
Duval Corp.[1]	---- do	Open pit mines, leach dumps, and plant.	Pima.
Duval Sierrita Corp.[1]	Box 125 Sahuarita, Ariz. 85629	Open pit mine and mill.	Pima.
Hecla Mining Co	P.O. Box 493 Casa Grande, Ariz. 85222	Plant	Pinal.
Inspiration Consolidated Copper Co.[3]	Inspiration, Ariz. 85537	Open pit mine and plant.	Gila.
Kennecott Copper Corp., Ray Mines division.[3]	Hayden, Ariz. 85235	Open pit mine, leach dumps, and plants.	Pinal and Gila.
McAlester Fuel Co	Route 1 Kirkland, Ariz. 86332	Insitu leaching.	Yavapai.
Magma Copper Co., San Manuel and Magma divisions.[5]	Box M San Manuel, Ariz. 85631	Mines, mills, and plant.	Pinal.
Pima Mining Co.[1]	Box 7187 Tucson, Ariz. 85713	Open pit mine and mill.	Pima.
Phelps Dodge Corp.[6]	Box 1238 Douglas, Ariz. 85607	Open pit and underground mines, leach dumps, and plants.	Cochise, Greenlee, and Pima.
Ranchers Exploration and Development Corp.	P.O. Box 880 Miami, Ariz. 85539	Open pit mine, insitu leaching, plant.	Gila and Pinal.

See footnotes at end of table.

Table 22.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Diatomite: Superior Companies.[7]	Box 6497 Phoenix, Ariz. 85005	Open pit mine and plant.	Pinal.
Feldspar: Arizona Feldspar Corp	Box 229 Kingman, Ariz. 86401	---- do -------	Mohave.
Gypsum: National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	---- do -------	Maricopa and Pinal.
Helium: Kerr-McGee Corp., Gas Processing Dept.	Kerr-McGee Bldg. Oklahoma City, Okla. 73102	6 wells and plant.	Apache.
Iron ore: CF&I Steel Corp	Box 316 Pueblo, Colo. 81002	Open pit mine	Navajo.
Lime:			
Paul Lime Plant, Inc.[8]	Douglas, Ariz. 85607	Plants	Cochise.
Flintkote Co., U.S. Lime Division.	P.O. Box 197 Peach Springs, Ariz. 86434	Quarries and plant.	Yavapai.
Mica:			
Buckeye Mica Co	P.O. Box 416 Buckeye, Ariz. 85326	Open pit mine and grinding plant.	Maricopa.
San Antonio Mica Co	Box 397 Ajo, Ariz. 85321	Open pit mine	Pima.
Perlite:			
Filters International, Inc	10 South LaSalle St. Chicago, Ill. 60603	---- do -------	Pinal.
Harborlite Corp	Box 458 Escondido, Calif. 92025	---- do -------	Do.
Petroleum: Kerr-McGee Corp	Kerr-McGee Bldg. Oklahoma City, Okla. 73102	Crude oil wells	Apache.
Pumice:			
Atchison Topeka & Santa Fe Railway.	Winslow, Ariz. 86047	Open pit mine and plant.	Coconino.
Superlite Builders Supply, Inc	5201 North 7th St. Phoenix, Ariz. 85014	Open pit mine	Do.
Salt: Southwest Salt Co	P.O. Box 1237 Litchfield Park, Ariz. 85340	Brine from wells.	Maricopa.
Sand and gravel:			
Arizona Sand & Rock Co	Box 20067 Phoenix, Ariz. 85036	Pits and plants	Do.
Johnson-Stewart and Materials	1901 N. Alma School Rd. Mesa, Ariz. 85201	---- do -------	Do.
Skousen Corp	Box 71 Mesa, Ariz. 85202	---- do -------	Do.
Union Rock & Materials Corp., Bentson Contracting Co.	2800 South Central Ave. Phoenix, Ariz. 85040	---- do -------	Maricopa and Pima.
United Metro, Inc	Box 13309 Phoenix, Ariz. 85002	---- do -------	Maricopa, Pima, Pinal, and Yuma.
Stone:			
American Cement Corp., Phoenix Division.	P.O. Box 428 Clarkdale, Ariz. 86324	Quarry -------	Yavapai.
Arizona Portland Cement Co	Rillito, Ariz. 85246	---- do -------	Pima.
New Pueblo Constructors	P.O. Box 12765 Tucson, Ariz. 85711	---- do -------	Do.
Zinc: Sunrise Mining Co	Amado, Ariz. 85640	Underground mine.	Santa Cruz.

[1] Also molybdenum and silver.
[2] Also silver.
[3] Also molybdenum.
[4] Also molybdenum and zinc.
[5] Also gold, molybdenum, pyrites, and silver.
[6] Also gold, lime, and silver.
[7] Also gypsum.
[8] Also stone.

The Mineral Industry of Arkansas

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Arkansas Geological Commission, under a memorandum of understanding for collecting information on all minerals except fuels.

By Raymond B. Stroud [1]

Arkansas mineral output in 1974 was valued at $406.8 million, an increase of $133.1 million above the 1973 figure. The State retained its rank near the midpoint among all States in terms of mineral production value. Of the 19 mineral commodities produced, all but 5 registered value increases. Carbon black, gallium, and elemental sulfur were also produced, but values of these minerals were not included in the overall total value of the State's mineral output. Significantly, impressive value gains were scored in the production of mineral fuels, but volumes of energy minerals decreased except for bituminous coal. Substantial increases in outputs and resultant combined value of bromine and vanadium accounted for more than one-third of the 1974 value gain recorded in Arkansas.

Arkansas again led the Nation in production of bauxite, bromine, and vanadium. Value of petroleum output at $122.8 million made the commodity the most important mineral in terms of value produced in the State. Nonmetallic minerals continued to account for the major part of the total mineral value; mineral fuels contributed 41.4%; metals comprised the remainder.

Bromine was the most important nonmetallic mineral, in value, produced in Arkansas; not only did Arkansas lead the Nation in production, but also about one-half the world's supply of bromine was produced in the State. Outputs of sand and gravel and stone were valued at nearly $30 million and $39 million, respectively, and were the highest of record. Cement, lime, gypsum, clays (including kaolin), barite, abrasive stone, tripoli, gem stones, and soapstone, ranked in order of value, comprised the remaining nonmetallic minerals produced in the State.

Bauxite, the source of aluminum, was the State's most prominent metallic mineral. Expansion of gallium production facilities by Aluminum Co. of America (Alcoa), begun in 1972, was completed in 1974. The gallium extraction facility was operated in conjunction with Alcoa's alumina plant near Benton, Ark. Union Carbide Corp. continued operation of its vanadium mine and extraction plant in Garland County. Production and value of vanadium increased substantially over those of 1973. Leber Mining Co. produced a small tonnage of iron ore in Nevada County.

Mineral fuels including petroleum (crude oil), coal, natural gas, and natural gas liquids were produced in Arkansas in 1974. Combined value of the commodities exceeded $168.6 million. Output volumes of petroleum, natural gas, and natural gas liquids declined, but unit values of these commodities increased in accord with worldwide rising prices for fuels. Petroleum (crude oil) production was at its lowest level since 1937. Production of natural gas dropped to about 124 billion cubic feet, the lowest output since 1967. Natural gas liquids output also declined as lesser volumes of natural gas were processed to recover the liquids. Coal production increased about 5% in 1974, but fewer mines were operated.

[1] State Liaison Officer, Bureau of Mines, Little Rock, Ark.

Table 1.—Mineral production in Arkansas [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Bauxite ---- thousand long tons	1,686	$23,884	1,731	$23,597
Clays ---- thousand short tons	[2] 1,446	[2] 1,412	984	1,597
Coal (bituminous) ---- do	434	5,806	455	9,673
Gem stones	NA	50	NA	60
Iron ore (usable) thousand long tons, gross weight	W	W	4	W
Lime ---- thousand short tons	177	2,742	187	3,189
Natural gas ---- million cubic feet	157,529	28,985	123,975	32,234
Natural gas liquids:				
Natural gasoline and cycle products thousand 42-gallon barrels	204	861	199	1,344
LP gases ---- do	449	1,688	418	2,491
Petroleum (crude) ---- do	18,016	70,618	16,527	122,817
Sand and gravel ---- thousand short tons	12,465	20,625	14,878	29,922
Stone ---- do	16,223	26,209	20,381	38,905
Value of items that cannot be disclosed: Abrasive stone, barite, bromine, cement, clays (kaolin, 1973), gypsum, soapstone, tripoli, vanadium, and values indicated by symbol W	XX	90,825	XX	140,992
Total	XX	273,705	XX	406,821
Total 1967 constant dollars	XX	200,653	XX	p 194,542

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes kaolin; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Arkansas, by county

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Arkansas	$1	--	
Ashley	W	$115	Sand and gravel.
Baxter	W	936	Stone, sand and gravel.
Benton	W	W	Do.
Boone	W	W	Stone.
Bradley	W	13	Sand and gravel.
Calhoun	1,306	1,350	Do.
Carroll	233	206	Stone, sand and gravel.
Chicot	W	W	Sand and gravel.
Clark	475	1,136	Stone, sand and gravel, clays.
Clay	183	258	Sand and gravel.
Cleburne	W	492	Stone, sand and gravel.
Cleveland	3	4	Sand and gravel.
Columbia	30,183	W	Bromine, natural gas liquids, sand and gravel.
Conway	591	502	Stone.
Craighead	W	W	Sand and gravel, clays.
Crawford	W	W	Stone, sand and gravel.
Crittenden	W	88	Clays, sand and gravel.
Cross	419	589	Sand and gravel.
Dallas	6	2	Do.
Desha	W	W	Do.
Drew	170	90	Do.
Faulkner	2	847	Stone, sand and gravel.
Franklin	1,130	2,315	Coal, sand and gravel, stone.
Fulton	2	W	Sand and gravel, stone.
Garland	10,456	17,632	Vanadium, tripoli, abrasive stone, sand and gravel.
Grant	139	182	Sand and gravel.
Greene	174	W	Sand and gravel, stone.
Hempstead	W	W	Sand and gravel, clays.
Hot Spring	5,077	2,671	Barite, stone, clays, sand and gravel.
Howard	11,429	12,907	Cement, stone, gypsum, clays, sand and gravel.
Independence	3,305	4,881	Stone, lime, sand and gravel.
Izard	2,242	7,681	Sand and gravel, stone.
Jackson	W	604	Sand and gravel.
Jefferson	W	W	Do.

See footnotes at end of table.

Table 2.—Value of mineral production in Arkansas, by county—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Johnson	W	W	Coal, stone, clays.
Lafayette	$1,973	$2,313	Natural gas liquids, sand and gravel.
Lawrence	904	2,196	Stone, sand and gravel.
Lee	8	--	
Lincoln	W	125	Sand and gravel.
Little River	20,936	W	Cement, stone, sand and gravel, clays.
Logan	W	902	Stone, coal, sand and gravel.
Lonoke	W	W	Stone, clays.
Madison	W	W	Stone, sand and gravel.
Marion	W	559	Sand and gravel.
Miller	W	2,619	Sand and gravel, clays.
Mississippi	14	W	Sand and gravel.
Monroe	W	W	Do.
Montgomery	W	W	Stone.
Nevada	W	550	Sand and gravel, iron ore.
Newton	65	2	Sand and gravel.
Ouachita	W	W	Sand and gravel, clays.
Perry	80	W	Stone, sand and gravel.
Phillips	W	292	Sand and gravel.
Pike	610	W	Gypsum, sand and gravel, stone.
Poinsett	W	484	Sand and gravel.
Polk	W	670	Do.
Pope	W	W	Stone, sand and gravel.
Prairie	(1)	W	Sand and gravel.
Pulaski	12,235	15,934	Stone, sand and gravel, clays, bauxite.
Randolph	54	W	Stone, sand and gravel.
St. Francis	W	869	Sand and gravel.
Saline	26,418	26,667	Bauxite, lime, sand and gravel, stone, clays, talc.
Scott	25	167	Stone, sand and gravel.
Searcy	91	W	Do.
Sebastian	W	6,021	Coal, stone, sand and gravel, clays.
Sevier	W	W	Stone, sand and gravel.
Sharp	W	W	Do.
Stone	W	W	Sand and gravel, stone.
Union	W	W	Bromine, sand and gravel.
Van Buren	W	W	Stone.
Washington	W	W	Stone, sand and gravel.
White	W	W	Do.
Woodruff	(1)	W	Sand and gravel.
Yell	W	W	Do.
Undistributed [2]	142,765	290,949	
Total [3]	273,705	406,821	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Less than ½ unit.

[2] Includes value of petroleum and natural gas production that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Arkansas business activity

	1973	1974 p	Change, percent
Annual labor force and employment:			
Total labor force ---------- thousands --	820.0	NA	NA
Unemployment ---------- do ----	33.6	NA	NA
Nonagricultural employment:			
Mining ---------- do ----	4.2	4.2	--
Contract construction ---------- do ----	33.6	35.5	+5.7
Manufacturing ---------- do ----	200.1	202.4	+1.1
Transportation and public utilities ---------- do ----	36.8	38.3	+4.1
Wholesale and retail trade ---------- do ----	125.6	130.7	+4.1
Finance, insurance, and real estate ---------- do ----	26.9	27.5	+2.2
Services ---------- do ----	82.6	86.2	+4.4
Government ---------- do ----	110.1	117.2	+6.4
Personal income:			
Total ---------- millions --	$8,050	$8,826	+9.6
Per capita ----------	$3,956	$4,280	+8.2
Construction activity:			
Nonresidential construction contracts ---------- millions --	$128.7	$97.3	-24.4
New housing units authorized ----------	10,692	6,271	-41.3
Cement shipments to and within Arkansas thousand short tons --	937	949	+1.3
Farm marketing receipts ---------- millions --	$2,366.1	NA	NA
Mineral production value ---------- do ----	$273.7	$406.8	+48.6

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; and the U.S. Bureau of Mines.

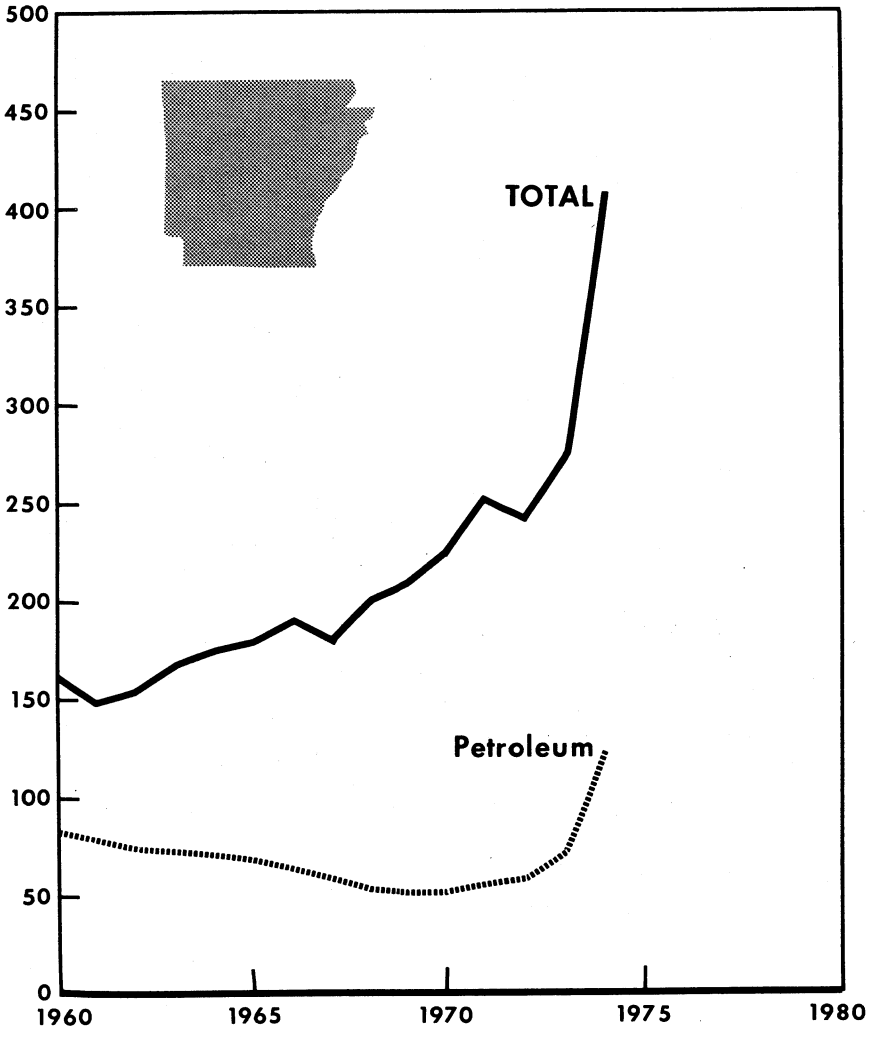

Figure 1.—Value of petroleum and total value of mineral production in Arkansas.

Trends and Developments.—In the last quarter of 1974, the Arkansas Public Service Commission (APSC) granted a permit to Arkansas Power and Light Co. to build two coal-fired steam-electric generating units near Redfield in Jefferson County. Originally, the utility company proposed a four-unit plant, but after lengthy hearings, only two units were allowed by the APSC at the site with a proviso that two more units could be built at another site. Construction was started on a plant that will have a net generating capacity of 1,400 megawatts. Total estimated cost of installation was placed at $440 million. The two units are scheduled to be in commercial operation in 1978 and 1979. Final approval that would give Southwestern Electric Power Co. and Arkansas Electric Cooperative Corp. permission to jointly construct a coal-fired steam-electric generating plant in northwest Arkansas was pending at yearend. Plans for the 530-megawatt plant, to cost an estimated $101 million, were submitted to the APSC for approval in April 1974.

Production of electricity through the use of nuclear fuel began at unit 1 of

Arkansas Power and Light Co.'s nuclear power plant near Russellville in August 1974; full commercial operation began in December. The plant, in construction stages for over 7 years, was built at a cost of $235 million. Unit 1 has a net generating capability of 831 megawatts. At year-end, unit 2 was about 38% complete. This $341 million unit will generate 912 megawatts and was scheduled for commercial operation in late 1977. Both units will be used to furnish baseload requirements.

According to U.S. Army Corps of Engineers preliminary reports, tonnage moved on the Arkansas River Navigation System set a new record in 1974, as nearly 6.1 million tons of commodities were shipped by barge. Major quantities of minerals were moved and consisted of about 3 million tons of sand and gravel and stone, 841,000 tons of petroleum products, 517,000 tons of bauxite, 186,000 tons of fertilizers, 318,000 tons of iron and steel, and 174,000 tons of coal. Minerals and mineral products comprised 82.5% of the total tonnage shipped.

The Arkansas State Chamber of Commerce reported in its 24th Annual Inventory of Arkansas' Industrial Growth that $777.3 million in capital outlays were programed for business and industrial growth in 1974, compared with $617.7 million in 1973. Utilities, transportation, and communications firms expended about $303 million for expansion of systems and services. The largest part of investments in 1974 were made by companies utilizing minerals and mineral products. Of major significance were announcements that included plans to build a $30 million chemical plant to manufacture photographic chemicals, a $40 million wire fencing plant, a $31 million urea manufacturing plant expansion, and a $20 million plant for bromine extraction.

Plans for construction of coal docking facilities in two Arkansas towns on the Mississippi River, announced in 1973, were postponed. Tennessee Forging Steel Services, Inc., completed its $1 million plant to manufacture bar joists at Hope, Ark.; steel supplies were furnished by the Tennessee Forging Steel Corp. from its plant at Newport, Ark.

Arkansas Louisiana Gas Co. sold its fertilizer plant that was operated by Arkla Chemical Corp. to SOPAG International, a subsidiary of the Gardinier Group, a French conglomerate, for $75.5 million. The plant, at Helena, was built in 1966–67. Products include sulfuric, nitric, and phosphoric acids; diammonium phosphate; urea; anhydrous ammonia; and ammonium nitrate. Agrico Chemical Co., at Blytheville, Ark., began construction of a $31 million plant expansion to produce urea at the rate of 1,000 tons per day. The original plant, built in 1966 at a cost of $20 million, produces anhydrous ammonia.

Arkansas residential construction contracts decreased significantly in 1974, to $354.9 million from $450.0 million in 1973. Personal income in Arkansas in 1974 was $8.8 billion, according to data furnished by the University of Arkansas, Bureau of Business and Economic Research.

Employment.—Preliminary data on employment and injury statistics for 1973 and 1974, compiled by the Mining Enforcement and Safety Administration, excluding the petroleum industry, are shown in table 4. According to the Employment Security Division, Arkansas Labor Department, mineral industry payrolls totaled $42.9 million, a 14.1% increase over 1973 figures. In 1974, weekly wages averaged $215.06 in metal mining, $292.61 in coal mining, $198.09 in production of crude oil and natural gas, and $170.78 in nonmetallic mining and quarrying. The mining industry average monthly employment was 4,204 workers, compared with average monthly employment of 4,167 workers in 1973.

Table 4.—Arkansas: Employment and injury statistics[1]

Year and industry	Men	Man-hours	Fatal injuries	Fatal frequency rate per million man-hours	Nonfatal disabling injuries	Nonfatal disabling frequency rate per million man-hours
1973:						
Metal and nonmetal:						
Underground	192	295,131	--	--	14	47.44
Surface	1,197	2,194,566	2	0.91	65	29.62
Mills	1,842	2,062,674	1	.48	32	15.51
Total	3,231	4,552,371	3	.66	111	24.38
Coal:						
Surface	98	261,175	--	--	2	7.66
Mills	4	9,482	--	--	--	--
Total	102	270,657	--	--	2	7.39
1974:						
Metal and nonmetal:						
Underground	157	293,404	1	3.41	17	57.94
Surface	1,598	2,621,991	2	.76	62	23.65
Mills	2,932	2,930,103	--	--	35	11.95
Total	4,687	5,845,498	3	.51	114	19.50
Coal:						
Surface	133	261,366	--	--	2	7.65
Mills	4	8,072	--	--	--	--
Total	137	269,438	--	--	2	7.42

[1] All data are preliminary.
Source: Mining Enforcement and Safety Administration, U.S. Department of the Interior.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Combined value of mineral fuels, petroleum, natural gas, coal, and natural gas liquids, listed in order of significance, comprised 41.4% of the total mineral production value. Petroleum registered a substantial gain in value and continued as the most important single contributor to the State's total mineral value; output volume decreased 8.3%. Marketed production of natural gas in 1974 was about 124 billion cubic feet, a drop of about 34 billion cubic feet from that of 1973. Output of natural gas liquids declined 5.5%. Production of bituminous coal increased to 454,669 short tons from 434,379 short tons recorded in 1973.

Carbon Black.—The El Dorado plant of Cities Service Co.'s Columbian Carbon Division in Union County, the only carbon black producer in the State, recorded production for the 23d successive year. Output decreased about 2%, but value increased 44.2%. Feedstock comprised of hydrocarbon liquids and natural gas is converted to carbon black through the use of the furnace process. The spectacular increase in value was attributable to increased costs of feedstocks.

Coal (Bituminous).—Production of coal increased 4.7% over that of 1973, and total value gained $3.87 million as the unit value rose to $21.26 per short ton compared with $13.38 per short ton in 1973. Only seven mines registered outputs greater than 1,000 tons annually, four fewer than in 1973. All coal was strip-mined from operations in Sebastian, Johnson, Franklin, and Logan Counties, listed in order of production. A brief strike closed mines temporarily in November, but the effect on production was negligible. National Steel Corp. purchased the coal land holdings of Farrell Mining Co. in Sebastian County for a reported $7.4 million. National Steel Corp. continued operation of the mines and an attendant washing plant at Sugar Loaf Mining Co.

The State's coal output was shipped mainly by rail to out-of-State users. The principal uses were for coke manufacture used by the steel industry and as a smelter fuel in base metal reduction plants.

Renewed and substantial interest developed in 1974 in Arkansas lignite resources. Private companies and the State Geological Commission began separate investigations of lignite deposits to determine the extent, character, grade, and potential uses of the resource.

Table 5.—Arkansas: Bituminous coal production in 1974
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines (strip)	Production (short tons)	Value (thousands)
Franklin	1	100,889	W
Johnson	2	161,035	W
Logan	1	17,001	W
Sebastian	3	175,734	W
Total	7	454,659	$9,673

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

Natural Gas.—Marketed production of natural gas decreased from 157,529 million cubic feet in 1973 to 123,975 million cubic feet in 1974; decreases in production have occurred for 4 consecutive years since the record production of 181,351 million cubic feet of natural gas in 1970. Natural gas was produced in conjunction with crude oil in eight contiguous south Arkansas counties; the gas was treated before marketing at five gas-cleaning plants operated in that part of the State. Dry natural gas was produced in 10 northwest Arkansas counties in the Arkansas Valley portion of the Arkoma Basin. By far the greater volume of natural gas output was from northwest Arkansas. Franklin County led the State in production.

Proved reserves of natural gas in Arkansas at the end of 1974, according to the American Gas Association, Inc. (AGA), were placed at 2,113,404 million cubic feet, a 6.9% decline from comparable 1973 reserve data. According to the 1974 annual report of Arkansas Oil and Gas Commission, the seven gas storage reservoirs in northwest Arkansas contained 11.4 billion cubic feet of natural gas at the end of 1974.

Table 6.—Arkansas: Gross withdrawals and disposition of natural gas
(Million cubic feet)

	Gross withdrawals [1]			Disposition			
				Marketed production [2]			
	From gas wells	From oil wells	Total	Quantity	Value (thousands)	Repressuring	Vented and wasted [3]
1970	128,241	55,409	183,650	181,351	$29,560	2,073	226
1971	120,454	54,429	174,883	172,154	29,426	995	1,734
1972	125,319	43,852	169,171	166,522	28,808	--	2,649
1973	120,068	39,408	159,476	157,529	28,985	--	1,947
1974	92,265	33,426	125,691	123,975	32,234	--	1,716

[1] Marketed production plus quantities used in repressuring, vented, and wasted.
[2] Comprises gas sold or consumed by producers, including losses in transmission, quantities added to storage, and increases in gas in pipelines.
[3] Include direct waste on producing properties and residue blown to air.

Natural Gas Liquids.—Production of natural gas liquids, including natural gasoline and cycle products and liquefied petroleum gases recovered through the treatment of wet natural gases at five south Arkansas gas processing plants, totaled 617,000 barrels in 1974, a decrease of 36,000 barrels from that of 1973. Four plants—Arkla Chemical Corp.'s Hamilton plant, Columbia County; H. A. Chapman's plant in the Walker Creek field, Columbia County; Phillips Petroleum Co.'s McKamie plant, Lafayette County; and O. B. Mobley, Jr.'s plant in the Lewisville field, Lafayette County—were operated throughout the year. These plants were joined by American Petrofina's plant in Miller County in June 1974. The latter

plant treated gas from the Pleasant Hill and Days Creek fields.

According to the 1974 annual report of the AGA, proved reserves of natural gas liquids in Arkansas totaled 4.7 million barrels at the end of 1974, a decrease of 5.9% from reserves reported at the end of 1973.

Petroleum.—Although petroleum production decreased, unit value increased and production value accounted for 30.1% of the State's total mineral value. Unit value in 1974 was about $7.43 per barrel. Eight counties—Miller, Lafayette, Nevada, Columbia, Union, Ouachita, Calhoun, and Bradley—recorded oil outputs. Crude oil production came from 7,265 wells in 162 fields in south Arkansas. Walker Creek field, with a production of 1.9 million barrels of crude oil in Columbia and Lafayette Counties, continued as the leading oilfield, followed by the Chalybeat Springs field in Columbia County, Midway field in Lafayette County, and Days Creek field in Miller County. Proved reserves of crude oil, according to the American Petroleum Institute (API), were 106.3 million barrels on December 31, 1974, a slight increase of 784,000 barrels from reserves recorded at the end of 1973.

Production of crude oil from 64 secondary recovery projects operated in 1974 accounted for 5,461,581 barrels of output, or about 33% of the State's total oil production for the year. There were 442 salt water injection wells operated during the year to dispose of 189.5 million barrels of produced water; 40.7 million barrels of water were injected for secondary recovery purposes.

Table 7.—Arkansas: Crude petroleum production, indicated demand, and stocks in 1974, by month
(Thousand 42-gallon barrels)

Month	Production	Indicated demand	End-of-month stocks originating within Arkansas
January	1,383	1,371	506
February	1,333	1,263	576
March	1,492	1,452	616
April	1,447	1,371	692
May	1,458	1,193	957
June	1,363	1,031	1,289
July	1,455	1,844	900
August	1,303	1,579	624
September	1,242	1,012	854
October	1,318	1,236	936
November	1,333	1,366	903
December	1,400	1,450	853
Total:			
1974	16,527	16,168	XX
1973	18,016	18,185	XX

XX Not applicable.

Petroleum and Natural Gas Exploration and Development.—According to the API, 317 wells were drilled in 1974, an increase of 32 wells from comparable 1973 data. Of the wells drilled, 99 were oil productive, 41 produced natural gas, and 177 were dry holes. Overall success ratio was about 44%; 10 exploratory wells out of 80 wells drilled were productive of either oil or gas, a 1-to-8 ratio.

According ot the Arkansas Oil and Gas Commission, exploration drilling resulted in the discovery of eight new fields, one rediscovery, and nine new reservoirs. Two new fields and one rediscovery were found in Columbia County, three new fields were found in Miller County, and one new field was found in each of Lafayette, Ouachita, and Union Counties. New oil pools were found in Miller and Nevada Counties. In north Arkansas, seven new gas sources were found, in Johnson County.

Table 8.—Arkansas: Oil and gas well drilling completions in 1974, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Ashley	--	--	--	--	--	5	5	28,412
Bradley	--	--	--	--	--	1	1	3,596
Calhoun	--	--	--	--	--	4	4	13,880
Chicot	--	--	--	--	--	2	2	6,476
Columbia	41	5	12	2	1	13	74	564,049
Conway	--	--	--	--	--	1	1	6,461
Crawford	--	3	1	--	--	1	5	27,382
Desha	--	--	--	--	--	1	1	4,608
Faulkner	--	--	--	--	--	1	1	10,600
Franklin	--	3	4	--	--	1	8	37,511
Hempstead	--	--	1	--	--	1	2	13,023
Hot Spring	--	--	--	--	--	1	1	1,389
Howard	--	--	--	--	--	1	1	750
Johnson	--	19	8	--	--	2	29	116,608
Lafayette	4	2	12	1	--	13	32	214,783
Little River	--	--	--	--	--	1	1	5,000
Logan	--	--	1	--	--	2	3	30,759
Madison	--	--	--	--	--	3	3	3,268
Miller	3	--	5	2	--	4	14	115,595
Nevada	10	--	7	1	--	11	29	114,292
Ouachita	15	--	19	--	1	7	42	121,250
Pope	--	3	--	--	--	--	3	13,572
Sebastian	--	4	4	--	--	--	8	54,226
Union	18	--	23	2	--	4	47	181,493
Total	91	39	97	8	2	80	317	1,688,983

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 9.—Arkansas: Estimated proved recoverable reserves of crude oil, natural gas liquids, and natural gas

Commodity	Proved reserves Dec. 31, 1972	Changes in proved reserves due to revisions, extensions, and discoveries in 1973	Proved reserves Dec. 31, 1973 (production deducted)	Changes from 1972 (percent)
Crude oil ---- thousand barrels	113,100	9,573	105,552	−6.7
Natural gas liquids ---- do	7,778	(−1,611)	5,044	−35.2
Natural gas ---- million cubic feet	2,455,877	(−22,938)	2,269,353	−7.6

Commodity	Changes in proved reserves due to revisions, extensions, and discoveries in 1974	Proved reserves Dec. 31, 1974 (production deducted)	Changes from 1973 (percent)
Crude oil ---- thousand barrels	16,627	106,336	+.74
Natural gas liquids ---- do	580	4,748	−5.9
Natural gas ---- million cubic feet	(−32,259)	2,113,404	−6.9

Source: American Petroleum Institute and American Gas Association, Inc.

Petroleum Refineries.—Four petroleum refineries were operated in Arkansas in 1974—Lion Oil Co., a division of The Oil Shale Corp., at El Dorado, Union County; MacMillan Ring-Free Oil Co., Inc., at Norphlet, Union County; Cross Oil & Refining Co. at Smackover, Union County; and Berry Petroleum Co., a division of Crystal Oil and Land Co., at Stephens, Ouachita County.

The refineries collectively processed 19,462,539 barrels of crude oil in 1974, according to the Arkansas Oil and Gas Commission, an increase of 1,607,968 barrels over the crude oil processed in 1973. An average of 53,322 barrels of crude oil was processed daily in 1974.

Lion Oil Co. continued construction of facility improvements and additions to its El Dorado refinery, expanding daily capacity throughput from 37,500 barrels of crude oil per day to 47,000 barrels per

day. At yearend, other plant improvements were under construction including installation of a new modern catalytic cracking unit which will have a throughput capacity of 14,000 barrels per day.

NONMETALS

Production of 12 nonmetallic minerals in 1974 had a combined value that accounted for nearly half of the State's total mineral value. Outputs of eight commodities increased, and decreases were recorded in production of four minerals. Values of nine minerals produced showed gains, and only three commodities dropped in value. A spectacular value rise was scored by bromine production. The greatest value decrease occurred in clay output, because much smaller tonnages of both common clays and high-grade clays were mined.

Abrasive Stone.—Production of Arkansas novaculite, a unique rock with a nearly pure silica content, used for oilstone and whetstone manufacture, increased nearly 12% in quantity, and value gained about 23.6% over that reported in 1973. The stone was mined in Garland County by six operators: Arkansas Abrasives, Inc.; John O. Glassford; K & K Mines, Inc.; Cleve Milroy; Norton-Pike Co.; and Hiram A. Smith. The whetstone was widely accepted for use in finishing fine surgical instruments and in cutlery sharpening.

Barite.—Production and value of barite mined in Arkansas dropped sharply from that reported in former years. Baroid Division, NL Industries, Inc., was the State's only producer of barite, as the company continued mining and processing operations in Hot Spring County. The company made plans, however, to open barite mines in Montgomery County, where deposits were the subject of investigations by the Federal Bureau of Mines in the late 1940's. The Milwhite Co., Inc., processed barite, mined in Missouri, at a company plant at Bryant, Ark. All of the barite produced in the State was used in drilling-mud manufacture.

Bromine.—Arkansas bromine operations, which began in 1957 with a single plant processing oilfield brines, had a combined annual plant capacity that exceeded 350 million pounds at the end of 1974. From five plants in operation in 1974, production established a new record high, and total value was nearly double that recorded in 1973. Arkansas led the Nation in bromine production. Output value accounted for much of the total value increase recorded by Arkansas mineral industries. The commodity ranked second only to petroleum in importance for the sixth successive year. Three plants were operated in Union County, and two plants produced in Columbia County to supply elemental bromine and brominated products.

The Arkansas Oil and Gas Commission reported that 206.9 million barrels of brine was produced in 1974 to supply the five bromine extraction plants. A total of 227.6 million barrels of effluent from the plants was disposed of into underground disposal systems through 39 disposal wells. Great Lakes Chemical Corp., already a bromine producer in the State, announced construction plans for a new $16 to $20 million bromine extraction plant in September. This sixth plant will be sited about 15 miles west of El Dorado in Union County. The expanding markets for bromine compounds, used worldwide in flame retardants and agricultural fumigants, led to the company decision. The new plant, scheduled for operation in early 1976, will expand the company's bromine capacity by about 50%.

Table 10.—Arkansas: Bromine compounds sold or used by primary producers
(Thousand pounds and thousand dollars)

Year	Quantity		Value
	Gross weight	Bromine content	
1972	233,011	195,949	40,571
1973	266,815	222,819	52,015
1974	290,055	242,859	84,200

Cement.—Combined shipments of portland and masonry cement in 1974 decreased about 11%; however, the combined value increased about 11%. Principal markets for cement continued to be ready-mix concrete companies, building contractors, and concrete product manufacturers. Arkansas Cement Corp. and Ideal Cement Co., the State's only producers of cement, used limestone (chalk), clay, sand, gypsum, and iron oxides in the manufacture of the commodity. Both companies utilized natural gas to fire the cement kilns.

Clays.—Total clay production and attendant value dropped sharply in 1974; the largest part of the decrease was attributable to a lower output of kaolin. Twelve companies operated mines or plants in 14 counties; 19 mines contributed to the total output because some companies operated two or more mines. Clay for lightweight aggregate was produced in two counties, clay for cement manufacture was mined in two counties, and kaolin was produced in two counties. Clay output from eight counties (about 58% of the State's total production) was used in producing brick and sewer pipe. The five leading clay-producing counties (Hot Spring, Lonoke, Crittenden, Pulaski, and Little River) accounted for 73.4% of the total production.

Gem Stones.—Diamonds found at the Crater of Diamonds State Park near Murfreesboro continued to highlight gem stone production in the State. Three diamonds weighing 2 or more carats each had an estimated total value of about $9,000. In all, 245 diamonds were reportedly found at the park in 1974.

Production of quartz crystals, wavellite, and jasper totaled several thousand pounds. Individual quartz crystals were valued from less than $1 to more than $100 each. A small quantity of a copper-bearing mineral, possibly turquoise, was produced in Polk County.

Gypsum.—The quantity of crude gypsum produced was about 7.5% greater and the total value was 14.1% larger than comparable data for 1973. The State's two producing companies—Gypsum Division, Dulin Bauxite Co., Inc., in Pike County, and Weyerhaeuser Co. in Howard County—mined and processed gypsum for use in cement and wallboard manufacturing, respectively. Temple Gypsum, Inc., continued the manufacture of gypsum wallboard at its plant at West Memphis using crude gypsum mined in Oklahoma.

Lime.—Alcoa and Reynolds Metals Co. were principal producers of primary lime that was used in converting bauxite to alumina in Saline County. The companies processed limestone that was mined in Izard County. Rangaire Corp. produced lime in Independence County that was used for paper and pulp manufacture, soil stabilization, water purification, and other applications. The State's output of lime increased 6% to 187,000 tons but was 10% below the 1966 record. The lime was used in Arkansas, Louisiana, Tennessee, and other States. Consumption of lime in Arkansas was 183,600 tons.

Sand and Gravel.—Production and value of sand and gravel gained 19.3% and 45.1%, respectively, over that reported in 1973. The increase was the highest recorded in recent years. Sand and gravel ranked sixth in importance among the State's mineral products, accounting for 7.4% of total value. Output of sand and gravel was reported from 276 operations in 67 of the State's 75 counties. The five leading counties in production included Miller, Pulaski, Crawford, Calhoun, and Craighead, ranked in order of significance. Thirteen counties in all had outputs exceeding 400,000 tons. Most of the output was used for highway construction and building. The Arkansas Highway Department provided the largest single market in the State. Silica sand was produced in Izard County for the 54th consecutive year. This high-purity sand found special markets such as the glass, molding, and foundry industries.

Table 11.—Arkansas: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	12,465	20,625	6,075	15,662
Gravel			6,065	12,773
Unprocessed: Sand and gravel			2,738	1,445
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	12,465	20,625	14,878	29,880

W Withheld to avoid disclosing individual company confidential data; included with "Construction."

[1] Value data may not be directly comparable to that in tables 1, 12, and 13 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 12.—Arkansas: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	9,666	17,199	5,247	10,535
Highway and bridge construction			452	879
Other uses (dams, waterworks, airports, etc.)			234	480
Concrete products (cement blocks, bricks, pipe, etc.)			1,388	2,738
Bituminous paving (asphalt and tar paving)			1,558	2,739
Roadbase and subbase			378	570
Unprocessed aggregate			797	528
Fill	447	384	264	285
Other uses [2]	991	2,040	577	6,681
Industrial sand and gravel	W	W	W	W
Total	11,104	19,623	10,895	25,435

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes railroad ballast and miscellaneous (1978).

Table 13.—Arkansas: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	1,348	998	154	264
Highway and bridge construction			374	786
Other uses (dams, waterworks, airports, etc.)			61	81
Concrete products (cement blocks, bricks, pipe, etc.)			W	W
Bituminous paving (asphalt and tar paving)			765	1,415
Roadbase and subbase			519	980
Unprocessed aggregate			1,941	917
Fill	13	4	169	144
Other	--	--	--	--
Total	1,361	1,002	3,983	4,487

W Withheld to avoid disclosing individual company confidential data; included with "Bituminous paving."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Soapstone.—Although The Milwhite Co., Inc., mined and processed soapstone for the 22d consecutive year in Saline County, production diminished markedly for the second successive year. Value was only about one-sixth that reported in 1973. The ground soapstone was used primarily in roofing, insecticide, and rubber compounds.

Stone.—Production of stone, including chalk (a variation of limestone), limestone, nepheline syenite (classified as granite), slate, novaculite, sandstone, and dimension stone (cut sandstone) increased by more than 4 million tons in 1974 over that reported in 1973. Stone output totaled 20.4 million tons and was valued at nearly $39 million. The commodity ranked third in the State in terms of overall mineral value. Ninety-one quarries in 38 counties accounted for the production of the diverse stone types. The five leading counties were Pulaski (syenite), Little River (chalk), Izard (limestone), Independence (limestone), and Washington (limestone), listed in order of significance of tonnage produced. Most of the State's sandstone production was from five counties—Clark, White, Lonoke, Pope, and Faulkner, ranked in order of production. Dimension sandstone was produced in Logan, Independence, and Sebastian Counties. All of the syenite produced was from Pulaski County.

Limestone production, the State's most important stone in terms of overall output, was reported in 14 counties; chalk was mined in Little River and Howard Counties for cement manufacture. The leading limestone-producing counties were Little River, Izard, Independence, Washington, and Lawrence. Slate was produced in Montgomery County for roofing granule manufacture. Novaculite output was recorded from Hot Spring and Pike Counties. The principal uses of the major stone types—sandstone, syenite, and limestone—were for roadbase stone, riprap and jetty stone, cement, roofing granules, bituminous and concrete aggregate, railroad ballast, and lime manufacture.

Sulfur (Recovered Elemental).—Three companies reported sulfur recovery from processing of wet, sulfur-bearing natural gases in south Arkansas. These were Arkla Chemical Corp. at its Hamilton plant in Columbia County, Phillips Petroleum Co. at its McKamie plant in Lafayette County, and Lion Oil Co. at its El Dorado refinery in Union County. However, the Bromet Co. led the State in recovery of elemental sulfur from the processing of brines at its bromine extraction plant in Columbia County. Combined output from the four plants was 24,632 long tons valued at $553,081, compared with 23,737 long tons valued at $343,921 in 1973.

Tripoli.—Malvern Minerals Co., in Garland County, was the sole producer of tripoli in Arkansas in 1974. Output of tripoli increased 6.3%, and value gained substantially, compared wih similar data for 1973. Tripoli was used as an abrasive to polish metal parts and as a filler in various compounds.

Vermiculite.—Crude vermiculite, mined out-of-State, was processed by W. R. Grace & Co. at its plant in Pulaski County and by Strong-Lite Products at its plant in Jefferson County. The exfoliated mineral product had a host of uses but was mainly consumed in concrete and plaster aggregates and in block insulation.

METALS

Bauxite was the principal metal-bearing ore produced in Arkansas. Vanadium ore was mined and processed in Garland County. Gallium was recovered in conjunction with bauxite processing at one operation in the State. A small quantity of iron ore was mined in Nevada County.

Aluminum.—Two primary aluminum plants—Jones Mills and Gum Springs—operated by Reynolds Metals Co. continued near-capacity production in 1974 until December, when a production cutback occurred at the Jones Mills plant. Because of the decline in demand for aluminum metal used by the auto and housing industries, the company curtailed output 20%. The plant has a rated capacity of 122,000 tons annually. Simultaneously, the company reduced alumina output at its Hurricane Creek facility and decreased product output at its aluminum cable plant at Jones Mills.

Alumina was produced by Reynolds Metals Co. and Alcoa at their plants in Saline County. Gallium was extracted from alumina refinery solutions by Alcoa, who completed an expansion of facilities to increase gallium output at its plant at Benton.

Bauxite.—Output of bauxite increased slightly (by 45,000 long tons) in 1974, but value declined $287,000 compared with

that reported in 1973. The State continued to be the leading U.S. bauxite producer with about 89% of the total output. Reynolds Mining Corp., Alcoa, and American Cyanamid Co. mined bauxite in Saline County. All mines were open pit operations except one Reynolds underground operation. Production was cut back at this mine in June as the result of "sand runs," which caused a section of the mine to become inaccessible. Bauxite processing plants were operated by Alcoa, Reynolds Metals Co., American Cyanamid Co., Porocel Corp., and Stauffer Chemical Co. Plant products included alumina, alumina chemicals, and activated and calcined bauxite.

Table 14.—Arkansas: Mine production of bauxite and shipments from mines and processing plants to consumers in the United States
(Thousand long tons and thousand dollars)

Year	Mine production			Shipments from mines and processing plants to consumers		
	Crude	Dry equivalent	Value [1]	As shipped	Dry equivalent	Value [1]
1970	2,251	1,869	26,293	2,194	1,917	29,049
1971	2,157	1,781	24,979	2,161	1,892	28,296
1972	1,973	1,634	21,010	2,128	1,844	25,426
1973	2,040	1,686	23,884	2,079	1,782	27,180
1974	2,098	1,731	23,597	2,130	1,811	26,841

[1] Computed from selling prices and values assigned by producers and from estimates of the Bureau of Mines.

Iron Ore.—Leber Mining Co. continued mining and processing brown iron ore and siderite at its Falcon operation in Nevada County. Plant products were used in iron and steel, pigments, and other chemical applications.

Vanadium.—Union Carbide Corp. continued the mining and processing of vanadium-bearing ores at Wilson Springs, Garland County, for the seventh consecutive year. Arkansas continued to lead the Nation in output of vanadium. Production of both ore and oxide increased over that of 1973. Value of the output increased substantially. The plant product, vanadium oxide, was shipped at Marietta, Ohio, for conversion to a vanadium ferroalloy prior to marketing.

Table 15.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasives:			
Arkansas Abrasives, Inc	P.O. Box 1298 Hot Springs, Ark. 71901	Mine and plant	Garland.
Norton-Pike Co	Littleton, N.H. 03561	Mine	Do.
Barite:			
NL Industries, Inc	P.O. Box 1675 Houston, Tex. 77001	Mine and plant	Hot Spring.
Bauxite:			
Aluminum Co. of America.[1]	1501 Alcoa Bldg. Pittsburgh, Pa. 15219	Mine	Saline.
American Cyanamid Co	Berdan Ave. Wayne, N.J. 07470	Mine and plant	Do.
Reynolds Metals Co.[2]	P.O. Box 398 Bauxite, Ark. 72011	do	Do.
Bromine:			
Arkansas Chemicals, Inc	Route 6, Box 98 El Dorado, Ark. 71730	Brine wells and plant.	Union.
Bromet Co.[3]	P.O. Box B Magnolia, Ark. 71753	do	Columbia.
The Dow Chemical Co	Midland, Mich. 48640	do	Do.
Great Lakes Chemical Corp	P.O. Box 2200 West Lafayette, Ind. 47901	do	Union.
Michigan Chemical Corp	351 East Ohio St. Chicago, Ill. 60611	do	Do.

See footnotes at end of table.

Table 15.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Carbon black: Cities Service Co.	3200 West Market St. Akron, Ohio 44313	Furnace	Union.
Cement:			
Arkansas Cement Corp.[4]	P.O. Box 398 Foreman, Ark. 71836	Pit and plant	Little River.
Ideal Basic Industries, Inc.[4]	420 Ideal Cement Bldg. Denver, Colo. 80202	---- do	Howard.
Clays:			
Acme Brick Co	P.O. Box 425 Fort Worth, Tex. 76101	---- do	Hot Spring and Sebastian.
Arkansas Lightweight Aggregate Corp.	El Dorado, Ark. 71730	---- do	Crittenden and Lonoke.
W. S. Dickey Clay Manufacturing Co.	Texarkana, Ark. 75501	---- do	Miller.
Coal:			
Garland Coal & Mining Co.	Fort Smith, Ark. 72901	Strip mine	Franklin and Johnson.
Peabody Coal Co	St. Louis, Mo. 63102	---- do	Johnson.
Sugar Loaf Mining Co	P.O. Drawer 2045 Ft. Smith, Ark. 72901	---- do	Sebastian.
Gypsum: Weyerhaeuser Co	Route 4, Box 78 Nashville, Ark. 71852	Mine and plant	Howard.
Iron ore: Leber Mining Co	36 South Market St. Elizabethtown, Pa. 17022	---- do	Nevada.
Lime: Rangaire Corp.[5]	P.O. Box 1311 Batesville, Ark. 72501	Plant	Independence.
Natural gas liquids:			
Arkla Chemical Corp.[3]	Magnolia, Ark. 71753	---- do	Columbia.
Phillips Petroleum Co.[3]	Stamps, Ark. 71860	---- do	Lafayette.
Petroleum refineries:			
Berry Petroleum Co	Magnolia, Ark. 71753	Refinery	Ouachita.
Cross Oil & Refining Co. of Arkansas.	Smackover, Ark. 71762	---- do	Union.
Lion Oil Co.[3]	El Dorado, Ark. 71730	---- do	Do.
MacMillan Ring-Free Oil Co., Inc.	Norphlet, Ark. 71759	---- do	Do.
Roofing granules:			
Bird and Son, Inc	East Walpole, Mass. 02032	Plant	Montgomery.
Minnesota Mining & Manufacturing Co.	Little Rock, Ark. 72203	---- do	Pulaski.
Sand and gravel:			
Arkhola Sand & Gravel Co.[5]	323 Merchants Bank Bldg. Fort Smith, Ark. 72901	Pit	Crawford.
Brasswell Sand & Gravel Co. Inc.	P.O. Box 798 Minden, La. 71055	Pit	Little River.
Gifford-Hill & Co., Inc.	P.O. Box 47127 Dallas, Tex. 75247	Pits	Lafayette and Miller.
Greenville Gravel Co	P.O. Box 220 Greenville, Miss. 28701	Pit	Chicot.
Jeffrey Sand Co., Inc	Fort Smith, Ark. 72901	Dredge	Pulaski.
Mobley Construction Co., Inc.	P.O. Box 109 Morrilton, Ark. 72110	Dredges	Jackson and Pope.
St. Francis Material Co	P.O. Box 999 Forrest City, Ark. 72335	Pits	Ashley, Calhoun, Craighead, Poinsett, St. Francis.
Silica Products Co., Inc	P.O. Box 248 Guion, Ark. 72540	Underground mine.	Izard.
Stone:			
Freshour Construction Co	P.O. Box 77 Sweet Home, Ark. 72164	Quarries	Lonoke, Sharp, Van Buren, White.
Ben M. Hogan Co., Inc	P.O. Box 2860 Little Rock, Ark. 72203	---- do	Lawrence, Pope.
McClinton Brothers Co	P.O. Box 1367 Fayetteville, Ark. 72701	---- do	Benton, Madison, Washington.
McGeorge Contracting Co	P.O. Box 248 Pine Bluff, Ark. 71601	Quarry	Pulaski.
Midwest Lime Co	P.O. Box 608 Batesville, Ark. 72501	---- do	Independence.
Minnesota Mining & Manufacturing Co.	Little Rock, Ark. 72203	---- do	Do.
Talc and soapstone:			
The Milwhite Co., Inc	P.O. Box 15038 Houston, Tex. 77020	Mine and plant	Saline.
Vanadium: Union Carbide Corp.	Route 2, Box 563 Hot Springs, Ark. 71901	Mine and mill	Garland.
Vermiculite (exfoliated):			
Strong-Lite Products	Pine Bluff, Ark. 71601	Plant	Jefferson.

[1] Also lime and cement.
[2] Also lime.
[3] Also recovered sulfur.
[4] Also clay and stone.
[5] Also stone.

The Mineral Industry of California

This chapter has been prepared under a cooperative agreement for the collection of mineral data between the U.S. Department of the Interior, Bureau of Mines, and the California Department of Conservation, Division of Mines and Geology.

By William H. Kerns [1]

The total output value of California's mineral industry rose to $2.8 billion, a 37% increase compared with that of 1973. The primary reason for the advance was the inflationary trend in mineral commodity prices during 1974. Output quantities of some of the most significant commodities, such as (in descending order) petroleum, portland cement, sand and gravel, natural gas, and boron minerals actually declined in 1974.

Crude petroleum output again was by far the most important mineral product in California in terms of value, accounting for 61% of the total value of all minerals produced. The quantitative production of crude petroleum, as well as that of natural gas and natural gas liquids, again declined as they had done in 1973. Output of other major mineral products, such as cement and sand and gravel, declined because of the slump in construction activity. Others, such as boron minerals, declined because of labor strikes and inability to obtain chemicals for processing and other materials and supplies for plant construction.

Other important mineral products, in terms of value of output, included iron ore, tungsten, and rare-earth elements among the metals group; and diatomite, sodium carbonates and sulfates, magnesium compounds, salt, lime, and potassium salts in the nonmetals group. Although less significant to the State total mineral value, a variety of other nonmetallic minerals including clays, gypsum, asbestos, pumice, and talc were produced.

In the nonmetallics area, some events of significance during the year were the closing of two asbestos mines, major expansions by U.S. Borax and Chemical Corp. (boron) and Kerr-McGee Chemical Corp. (soda ash) in processing Searles Lake brines, and the trend in the cement industry to convert to coal as a fuel because of natural gas shortages.

Less significant was the output value of other metals, including, in descending order, molybdenum, gold, mercury, copper, silver, lead, and zinc.

[1] State Liaison Officer, Bureau of Mines, Sacramento, Calif.

Table 1.—Mineral production in California [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Asbestos ---- short tons --	105,663	$10,886	58,331	$5,697
Barite ---- thousand short tons --	11	152	4	W
Boron minerals ---- do ----	1,225	113,648	1,185	128,306
Cement:				
Masonry ---- do ----	W	W	2	42
Portland ---- do ----	9,395	201,892	8,262	210,478
Clays ---- do ----	2,723	6,853	2,497	7,626
Copper (recoverable content of ores, etc.) short tons --	369	440	194	300
Gem stones ----	NA	220	NA	220
Gold (recoverable content of ores, etc.) troy ounces --	3,647	357	5,049	807
Gypsum ---- thousand short tons --	1,778	5,834	1,716	6,642
Lead (recoverable content of ores, etc.) short tons --	44	14	35	16
Lime ---- thousand short tons --	632	13,602	600	14,877
Magnesium compounds short tons MgO equivalent --	184,105	19,233	163,847	18,356
Mercury ---- 76-pound flasks --	1,219	349	1,311	370
Natural gas ---- million cubic feet --	449,369	167,615	365,354	160,756
Natural gas liquids:				
Natural gasoline and cycle products thousand 42-gallon barrels --	6,865	23,475	5,709	26,104
LP gases ---- do ----	5,329	19,824	5,095	29,296
Peat ---- thousand short tons --	21	373	14	322
Petroleum (crude) --- thousand 42-gallon barrels --	336,075	1,045,193	323,003	1,710,350
Pumice ---- thousand short tons --	768	3,237	909	3,219
Rare-earth metal concentrates ---- short tons --	W	W	34,284	15,798
Salt ---- thousand short tons --	1,507	15,533	W	W
Sand and gravel ---- do ----	117,470	176,286	105,191	176,213
Silver (recoverable content of ores, etc.) thousand troy ounces --	56	143	42	197
Stone ---- thousand short tons --	43,838	77,175	45,709	91,891
Talc ---- short tons --	179,191	1,501	161,154	1,682
Zinc (recoverable content of ores, etc.) ---- do ----	20	8	8	6
Value of items that cannot be disclosed: Bromine, calcium-magnesium chloride, carbon dioxide, diatomite, feldspar, iron ore, lithium minerals, molybdenum, perlite, potassium salts, sodium carbonates and sulfates, tungsten, and values indicated by symbol W ----	XX	137,843	XX	187,509
Total ----	XX	2,041,686	XX	2,797,080
Total 1967 constant dollars ----	XX	1,496,760	XX	p 1,337,564

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in California, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Alameda ----	$28,932	W	Sand and gravel, salt, stone, petroleum, clays.
Alpine ----	W	W	Gold, silver, sand and gravel, zinc, lead, copper.
Amador ----	5,040	W	Sand and gravel, stone, clays.
Butte ----	W	W	Sand and gravel, natural gas, stone.
Calaveras ----	21,186	$18,624	Cement, stone, asbestos, sand and gravel, clays.
Colusa ----	3,334	4,084	Natural gas, stone, sand and gravel.
Contra Costa ----	11,301	14,518	Stone, sand and gravel, natural gas, petroleum, lime, clays, peat.
Del Norte ----	W	912	Stone, sand and gravel.
El Dorado ----	W	W	Stone, lime, sand and gravel, talc.
Fresno ----	51,828	77,337	Petroleum, sand and gravel, natural gas, natural gas liquids, stone, asbestos, gold, clays, tungsten, silver.
Glenn ----	6,151	W	Natural gas, sand and gravel, lime.

See footnotes at end of table.

Table 2.—Value of mineral production in California, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Humboldt	W	W	Natural gas, sand and gravel, stone.
Imperial	W	W	Gypsum, lime, sand and gravel, clays, salt, stone.
Inyo	$19,592	$34,556	Tungsten, boron minerals, talc, molybdenum concentrates, stone, sand and gravel, copper, perlite, silver, pumice, clays, lead, gold, zinc.
Kern	528,711	780,112	Petroleum, boron minerals, cement, natural gas, natural gas liquids, stone, sand and gravel, gypsum, clays, sodium sulfate, salt, carbon dioxide, silver, pumice.
Kings	7,045	8,575	Natural gas, natural gas liquids, petroleum.
Lake	W	2,262	Sand and gravel, pumice, stone, mercury.
Lassen	W	W	Sand and gravel, pumice, stone.
Los Angeles	367,770	565,267	Petroleum, sand and gravel, natural gas, natural gas liquids, stone, lime, clays, gold, tungsten.
Madera	2,386	10,247	Stone, natural gas, sand and gravel, pumice.
Marin	2,359	3,749	Stone, clays, mercury.
Mariposa	86	103	Stone, sand and gravel, gold, copper, tungsten, silver.
Mendocino	784	1,291	Sand and gravel.
Merced	1,524	1,838	Sand and gravel, gold, stone, silver.
Modoc	W	W	Peat, sand and gravel, pumice, stone.
Mono	1,727	W	Pumice, sand and gravel, stone, clays, tungsten.
Monterey	62,561	91,228	Petroleum, magnesium compounds, lime, stone, sand and gravel, feldspar, natural gas.
Napa	2,829	2,897	Salt, stone, clays, mercury, sand and gravel, diatomite.
Nevada	1,968	W	Sand and gravel, stone, clays.
Orange	137,768	201,648	Petroleum, sand and gravel, natural gas, natural gas liquids, clays, lime, stone.
Placer	2,184	W	Sand and gravel, clays, stone.
Plumas	428	W	Stone, sand and gravel, pumice, gold.
Riverside	86,163	95,761	Iron ore, cement, sand and gravel, stone, clays, petroleum, natural gas.
Sacramento	21,885	24,619	Sand and gravel, natural gas, stone, petroleum, gold, clays, silver.
San Benito	14,706	7,461	Asbestos, stone, sand and gravel, clays, cement, petroleum, natural gas.
San Bernardino	170,492	189,725	Cement, boron minerals, stone, rare-earth minerals, potassium salts, sodium sulfate, sodium carbonate, sand and gravel, iron ore, lime, salt, clays, petroleum, magnesium chloride, lithium minerals, talc, gold, bromine, pumice, tungsten, gypsum, feldspar, natural gas, silver, copper, lead, zinc.
San Diego	30,934	20,923	Sand and gravel, stone, salt, magnesium compounds, gypsum, clays, tungsten.
San Francisco	--	W	Sand and gravel.
San Joaquin	19,162	W	Natural gas, sand and gravel, stone, lime, gold, peat, silver.
San Luis Obispo	7,890	W	Petroleum, stone, sand and gravel, natural gas, clays.
San Mateo	11,182	10,144	Magnesium compounds, stone, salt, sand and gravel, petroleum, natural gas.
Santa Barbara	105,826	155,086	Petroleum, diatomite, natural gas, natural gas liquids, sand and gravel, lime, stone.
Santa Clara	36,807	46,005	Cement, stone, sand and gravel, mercury, clays.
Santa Cruz	W	W	Cement, sand and gravel, stone, clays.

See footnotes at end of table.

Table 2.—Value of mineral production in California, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Shasta	$8,867	$10,063	Cement, sand and gravel, stone, clays, pumice, copper, barite, gold, silver.
Sierra	W	W	Gold, silver, zinc.
Siskiyou	W	W	Sand and gravel, pumice, stone.
Solano	31,142	26,304	Natural gas, stone, petroleum, clays, sand and gravel.
Sonoma	W	6,926	Sand and gravel, stone.
Stanislaus	W	W	Sand and gravel, gold, clays, silver.
Sutter	10,189	W	Natural gas, sand and gravel, clays.
Tehama	W	W	Natural gas, sand and gravel, stone, pumice.
Trinity	452	W	Stone, sand and gravel, gold.
Tulare	2,428	W	Sand and gravel, stone, natural gas, petroleum.
Tuolumne	W	W	Stone, lime, sand and gravel.
Ventura	96,535	148,428	Petroleum, natural gas, natural gas liquids, sand and gravel, clays, stone, pumice.
Yolo	8,860	12,626	Natural gas, sand and gravel, lime, stone.
Yuba	1,204	W	Sand and gravel, stone, clays.
Undistributed [2]	109,465	223,773	
Total [3]	2,041,686	2,797,080	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Value of petroleum is based on an average price per barrel for the State.

[2] Includes federal offshore petroleum, and natural gas (1973), some sand and gravel and mercury (1974) that cannot be assigned to specific counties, natural carbon dioxide (1973), gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of California business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total non-agricultural labor force	thousands	7,618.5	7,832.4	+2.8
Unemployment	do	613	NA	NA
Employment:				
Mining	do	30.2	31.7	+5.0
Contract construction	do	331	317.9	−4.0
Manufacturing	do	1,643.5	1,687.5	+2.7
Government	do	1,524.8	1,571.3	+3.0
Wholesale and retail trade	do	1,708.5	1,760.9	+3.1
Services	do	1,470.3	1,536.2	+4.5
Transportation and public utilities	do	469.3	475.5	+1.3
Finance, insurance, and real estate	do	440.9	451.4	+2.4
Personal income:				
Total	millions	$113,746	$125,379	+10.2
Per capita		$5,508	$5,997	+8.9
Construction activity:				
Total private nonresidential construction	millions	$2,571.4	$2,549.3	−0.9
Number of new housing units authorized		216,790	128,326	−40.8
Portland cement shipments to and within California	thousand short tons	8,608	7,779	−9.6
Farm marketing receipts	millions	$7,178.1	NA	NA
Mineral production value	do	$2,042	$2,797	+37.0

p Preliminary. NA Not available.

Source: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

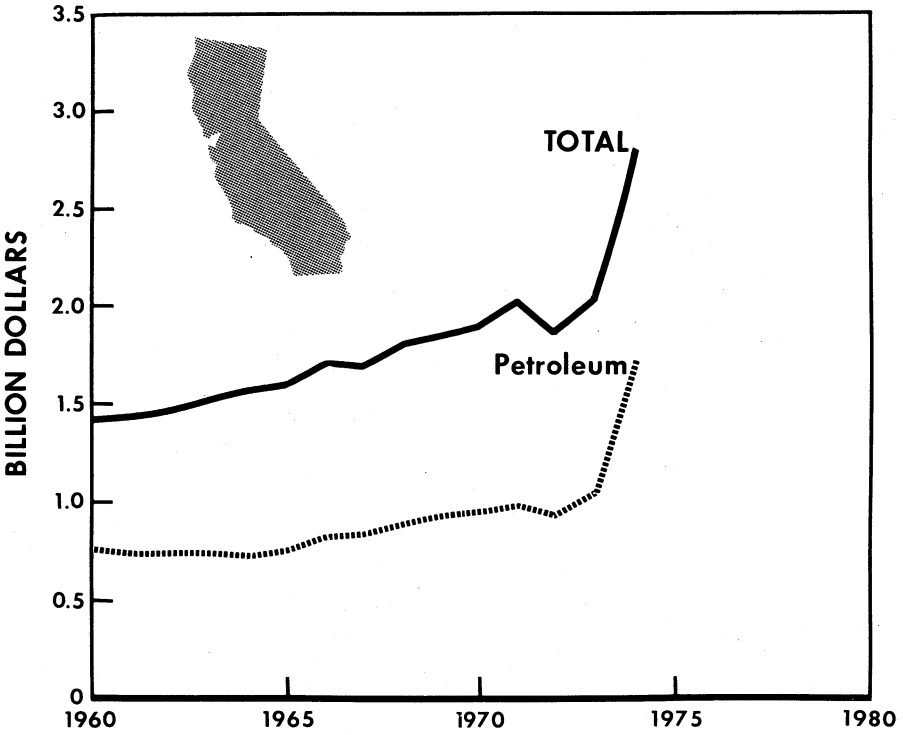

Figure 1.—Value of petroleum and total value of mineral production in California.

Legislation and Government Programs.—The following legislation that will have an impact on minerals was enacted during calendar year 1974 in the Regular Session 1973–74 which convened January 8, 1973, and adjourned November 30, 1974.

Assembly Joint Resolution (AJR) 77, filed August 8, 1974, urges the President and Congress of the United States to support and enact legislation to insure strict regulation of surface mining. It also urged Federal authorities to hold public hearings on proposed agreements to permit exploration on Federal lands for the development of natural resources within the local communities that would be affected by such exploration before such agreements are entered into and exploration permits are granted.

AJR 108, filed May 3, 1974, urges the President and Congress to support and adopt such laws and regulations as will permit the State to participate in decision-making relating to the leasing of Federal submerged lands off the California coast for oil or gas production, and requests that the State be compensated by an adequate portion of the revenue derived from such Federal leases for expenses incurred by the State in providing support functions.

Senate Joint Resolution (SJR) 59, enrolled August 27, 1974, urges the Congress of the United States to call a convention for proposing a constitutional amendment that would grant to the people of the United States the right to acquire, possess, and market gold.

SJR 60, enrolled August 27, 1974, urges Congress to propose to the several States for ratification an amendment that provides that the right of people to acquire, possess, or market gold shall not be infringed, and that no treaty or executive agreement shall abrogate this right.

Assembly Bill (AB) 1575, filed May 21, 1974, to become effective January 7, 1975, requires that environmental impact reports include statements to reduce wasteful, inefficient, and unnecessary consumption of energy; establishes the State Energy Re-

sources Conservation and Development Commission; provides for forecasting and assessment of energy demands and supplies; requires the Commission to develop and coordinate a program of research and development in energy supply, consumption, conservation, and the technology of siting facilities; and provides for development of contingency plans to deal with possible shortages of electrical energy or fuel supplies.

AB 3554, approved September 23, 1974, defines "low-temperature geothermal well," and presents regulations concerning drilling wells (oil, gas, or geothermal) too close to property boundaries and too near public roads.

AB 4108, approved September 26, 1974, deals with pollution control financing. It revises provisions regarding eligibility and priorities in financing projects under the California Pollution Control Financing Authority Act, and prohibits financing more than $50 million per calendar quarter.

Senate Bill (SB) 1476, Electrical and Gas Shortages, approved September 26, 1974, directs the Public Utilities Commission to establish priorities for electricity and gas use in order of greatest public benefit and to order service temporarily reduced during any shortage in accordance with such priorities.

SB 1673, Geothermal Amortizing, approved September 23, 1974, permits the Public Utilities Commission to establish a schedule for rapid amortization of the cost of public utility facilities using geothermal resources. Such provisions would remain in effect until January 1, 1985.

The effect of Federal and State legislation and government programs on activities in the oil and gas industry in California in 1974 and the outlook for 1975 was analyzed by the west coast editor of the Oil and Gas Journal.[2]

The Warren-Alquist State Energy Resources Conservation and Development Act (AB 1575) was passed by the 1974 State legislature and approved by the Governor in May 1974 to become effective January 7, 1975. The act created in the California Resources Agency a five-member State Energy Resources Conservation and Development Commission. Powers and duties of the Commission include (1) development of energy conservation policy and measures, (2) administration of energy research and development programs, (3) independent analysis of energy supply and demand projections, (4) development of safety and environmental guidelines for siting electrical power facilities and sites, and (6) coordinated planning for action to relieve energy shortages. The functions provided in the act, including research and development, are to be funded by a surcharge of 0.1 mill ($0.0001) per kilowatt hour on electricity sold in California. AB 1575 was the product of 4 years of legislative analysis and study, which included active participation by agencies of Federal and State governments, California utilities, and the public.

Great strides were made during 1974 in coordinating the thinking of all interested parties and getting some State legislation on a Surface Mining and Reclamation act for California.

Senate Resolution 134 of the 1967 Regular Session of the California Legislature requested a legislative study on the subject of "Uniform Controls and Standards for Strip Mining." The Senate Committee on Natural Resources subsequently requested the State Mining and Geology Board to advise the legislature as to the nature of the problem and the need for legislation. As a result, late in 1968, the State Secretary of Resources requested the formation of a seven-man committee representing industry, State, and local governments, and the academic community to review the problem in the light of California's needs and to provide recommendations for such legislation, if needed. The Surface Mining Study Committee held extensive hearings throughout the State and submitted its report late in 1970 recommending that there should ". . . be devised a fundamental State policy toward the conservation of mineral resources, the conduct of surface mining, and the reclamation of mined lands." Soon thereafter, a working committee responsible to the State Mining Board was formed and prepared at least nine different drafts of proposed legislation, but because of nonagreement, none was presented to the legislature for introduction.

Because he saw the need for action, the Chairman of the California Senate Committee on Natural Resources and Widlife, Senator John A. Nejedly, directed the preparation of a legislative proposal

[2] Wilson, H. M. Outlook Bleak for Revival of California Oil Activity. Oil and Gas J., v. 73, No. 2, 1975, pp. 15–18.

for a surface mining reclamation act for California, preprint SB 10. The preprint was published late in 1974 for consideration and discussion and for use in public hearings. The first public hearing on the preprint was held in southern California in November with excellent representation from Federal, State, and local governments, the mineral industry, and special interest groups. Another hearing was planned for northern California in January 1975, and suggested changes to the proposal would be considered at that time. The final bill would be introduced into the legislature in early 1975.

Solid waste management is one of the major environmental demands facing the Nation and California. California alone reportedly generates over 79 million tons of solid waste each year. Valuable and irreplaceable resources that could be reclaimed and reused are consigned to the trash heap, and irresponsible dumping and open burning of residuals foul the land and pollute the air and water.

To deal with the problem in California, the State Legislature enacted the Nejedly-Z'Berg-Dills Solid Waste Management and Resources Recovery Act creating the Solid Waste Management Board. The first Annual Report [3] of the Board, which includes an accounting of the Board's legislative mandates, achievements, and future objectives covering the period from the Board's organization in May 1973 through December 1974, was published. The Board met the legislative mandate by preparing a draft for a proposed state policy for solid waste management and minimum standards for solid waste handling and disposal. After public hearings and modification of the proposed policy, it was formally adopted on December 20, 1974.

The Solid Waste Management and Resources Recovery Act requires each county to submit to the Board by January 1, 1976, a solid waste management plan with concurrence of a majority of the cities. The Board is required to review these plans for compliance with State policy. The guidelines were prepared by the Board and adopted in April 1974 to provide counties and cities with principles, objectives, criteria, and definitions to be used in developing and submitting their local solid waste management plan to the Board. Four technical bulletins were published by the Board in 1974: No. 1, Population Projections for California Counties; No. 2, Solid Waste Generation Factors in California; No. 3, Resource Recovery Systems; and No. 4, Resource Recovery of Special Wastes.

A report [4] on Shasta County was published by the California Division of Mines and Geology in 1974. The report is a continuation of a new series of county reports on mines and mineral resources, giving descriptions of individual mines, quarries, processing plants, and mineral deposits.

Following the disastrous San Fernando earthquake of February 1971, Governor Reagan created the Governor's Earthquake Council, which has the responsibility of preparing recommendations for reducing losses in future earthquakes. The council consisted of 35 members representing Federal, State, and local agencies, universities, and representatives of the public and private sectors. The first report of the council, which made 26 major recommendations for reducing earthquake losses, was published in 1972. The second report,[5] outlining progress achieved during 1973–74, was completed by the council in 1974 and published.

An index [6] to graduate theses and dissertations on California geology from 1962 through 1972 was published. The index contains approximately 860 thesis titles by students at 51 universities and colleges in and out of the State.

Activities of the California Division of Mines and Geology, July 1, 1973, through June 30, 1974, were published in the 67th Report of the State Geologist.[7]

A mandate by California voters, who on November 7, 1972, approved the Coastal Initiative (Proposition 20), created the California Coastal Zone Conservation Commission—one statewide and six regional—and directed them to prepare a

[3] California, Resources Agency, Solid Waste Management Board. Annual Report 1974. 23 pp.
[4] California, Resources Agency, Department of Conservation, Division of Mines and Geology. County Report 6, Mines and Mineral Resources, Shasta County, Calif., 1974, 154 pp.
[5] California, Resources Agency, Department of Conservation, Division of Mines and Geology. Second Report of the Governor's Earthquake Council. Spec. Pub. 46, September 1974, 86 pp.
[6] California, Resources Agency, Department of Conservation, Division of Mines and Geology. Index to Graduate Theses and Dissertations on California Geology, 1962 through 1972. Spec. Rept. 115, 1974, 89 pp.
[7] California, Resources Agency, Department of Conservation, Division of Mines and Geology. Sixty-Seventh Report of the State Geologist (1973–1974). 1974, 56 pp.

plan for the future of the California coast and to regulate coastal development temporarily while the plan was being prepared. The seven Coastal Commissions were helped by the public who reviewed and commented on draft proposals, attended informational forums, and testified at hearings on the various plan elements. During 1974, the assembly of the Preliminary Coastal Plan made progress; the plan was scheduled to be published in early 1975. It was reported that the coastal plan as presently constituted recognizes that the coast must serve the varied needs of today, but that it also recognizes that unless development is guided to protect special resources of the coast, Californians may well deprive future generations of the coastal values enjoyed and cherished today. The commission asked for cooperation in reviewing the plan and attending public hearings that were planned for the spring and summer of 1975 because the commission's final plan and recommendations were scheduled for presentation to the Governor and Legislature in December 1975. Without further legislative enactment, and under present law, the coastal commissions would go out of existence at the end of 1976.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Lignite).—The McGuire Pit of Interpace Corp. in Amador County near Ione continued to produce modest amounts of lignite, which was used in the manufacture of montan wax, which is a hard, brittle mineral wax mainly used for polishes, carbon paper, and insulating compositions.

Geothermal Resources.—Geothermal exploration and development took a definite upswing in 1974.[8] The increased activity was caused by renewed interest in geothermal energy resulting from the 1973 oil embargo and the related rise in the price of fossil fuels during 1974. Eleven exploration wells were drilled in California during the year. Six wells were located in Imperial County (three of which are on Federal land), two in Modoc County, and one each in Sonoma, Lake, and Mendocino Counties. The Sonoma County well was the first to be drilled by a private operator on Federal land in California. The six wells drilled in Imperial County—three each in the East Mesa and Heber areas—were completed and suspended. One of the Modoc County wells was suspended, and one was abandoned. The Sonoma, Lake, and Mendocino County wells were still being drilled at yearend. The wells drilled in the Heber area were the most significant of the 11 exploratory wells drilled in 1974. These wells were drilled and tested to determine the size and potential of the geothermal reservoir in preparation for the possible construction of a powerplant. This project is a joint venture of Magma Energy Co., Chevron Oil Co., and San Diego Gas and Electric Co.

During 1974, 21 new wells were drilled at The Geysers Geothermal field in Lake and Sonoma Counties. Eighteen of these wells were completed, two were abandoned, and one was being drilled at yearend. Powerplant unit 11 of Pacific Gas & Electric Co. (PG & E) did not go on-line in 1974 as scheduled because of delays caused by environmental, legal, and labor problems. It was rescheduled for operation in May 1975 and would bring the net capacity of the Geysers to 502,000 kilowatts. Construction of units 12, 13, and 14 was scheduled to start in 1976, with net capacities of 106,000, 135,000, and 110,000 kilowatts, respectively. Unit 15, scheduled to start construction in 1977, was planned for a net capacity of 55,000 kilowatts.

In the Salton Sea field, Magma Power Co. drilled one additional well. New Albion Resources Co., a subsidiary of San Diego Gas and Electric Co., in a joint program with Magma Power Co., continued the research started in 1973 directed toward utilization of both steam and hot-brine heat exchangers. Early in 1974, the Lawrence Livermore Laboratory began its investigation of the Salton Sea area high-temperature, high-salinity geothermal resources.

The shallow observation well program begun in 1973 was continued at the East Mesa Known Geothermal Resource Area (KGRA) into the early part of 1974. An

[8] California, Resources Agency, Department of Conservation, Division of Oil and Gas. 60th Annual Report of the State Oil and Gas Supervisor. . . 1974. 1975, pp. 27–30, 169–171.

additional 10 wells were drilled by the U.S. Bureau of Reclamation with depths ranging from 300 feet to 1,000 feet. To date, 60 holes have been drilled on the East Mesa anomaly. Data obtained from these shallow wells led to the siting and drilling of three additional deep wells in 1974.

Chevron Oil Co. drilled three additional wells on the Heber anomaly in 1974. Chevron, Magma Energy, and New Albion Resources Co. began a joint venture project early in 1974 to test and evaluate the geothermal potential at Heber. The fluids produced at Heber are much lower in salinity than those produced at the Salton Sea geothermal field, and it was reported that it appears feasible that direct-heat-exchanger operations may be performed.

The first Federal geothermal lease sale was held by the Bureau of Land Management in Sacramento on January 22, 1974. The sale involved 52,632 acres of Federal land in 33 units in three KGRA's—The Geysers (12 units), Mono-Long Valley (7 units), and East Mesa (14 units). No bids were received on four units in the Mono-Long Valley KGRA and on seven units in the East Mesa KGRA. Bids received by unit ranged from a high of $3.2 million for a unit in The Geysers area to a low of $3,960 for a unit in the East Mesa area. The total of the high bids in the three KGRA's was $6.8 million. The sale was authorized under the Geothermal Act of 1970, which permits opening public lands for development of underground steam power resources.

The Bureau of Land Management held its second California geothermal lease sale on May 29, 1974. Sales were restricted to two leasing units at The Geysers, which had been offered for sale in January 1974, but the bids were rejected as being below Federal Geological Survey evaluations. The successful bidder on one 625-acre lease (unit 7) was the Natomas Co. at $2,055,000 and the other by Union Oil Co. of California for a 160-acre (unit 9) tract at $220,342.40.

The Bureau of Reclamation is conducting a geothermal resource development program in the Imperial Valley with the objective of desalting geothermal fluids to provide additional fresh water supplies to the lower Colorado system. As part of its overall research effort, Bureau of Mines researchers are testing and trying to develop materials that will survive the phenomenal corrosion and scaling processes that occur in handling the brines. Laboratory testing was initially conducted on the corrosion resistance of 28 commercial metals and alloys. Onsite corrosion and scaling field tests were also being conducted at PG&E's Niland geothermal well site.

The National Science Foundation (NSF) sponsored a conference attended by over 600 persons on research for the development of geothermal energy resources. The conference was held September 23-25, 1974, at the California Institute of Technology's Jet Propulsion Laboratory in Pasadena. Proceedings of the conference were published.[9]

In December 1974, the State of California's Department of Water Resources published a survey[10] of the present geothermal situation in California. The report provides an overview to what is presently known about geothermal resources and tries to answer such questions as the reasons for the slowness in development and whether or not it can provide fresh water supplies. A bibliography is presented as an appendix.

Natural Gas.—Production declined 19% compared with that of 1973, but value of output only declined 4% because of increased unit prices. This drop in output resulted primarily from a greater decline in dry gas production than a decline in oil well gas production. The decrease in dry gas production was primarily due to the curtailment in the use of natural gas for generating electricity ordered by the California Public Utilities Commission in early 1974.

[9] California Institute of Technology, Jet Propulsion Laboratory. Conference on Research for the Development of Geothermal Energy Resources. September 23–25, 1974, 349 pp.

[10] California, Department of Water Resources. Water and Power from Geothermal Resources in California, An Overview. Bull. 190, December 1974, 52 pp.

Table 4.—California: Estimated proved recoverable reserves of crude oil, natural gas liquids, and natural gas

Commodity	Dec. 31, 1973	Revisions during 1974	Dec. 31, 1974 (production deducted)	Revisions from 1973 (percent)
Crude oil ____ thousand barrels __	3,488,100	+251,987	3,557,036	+2.0
Natural gas liquids _____ do ____	105,963	+746	98,232	−7.3
Natural gas _ million cubic feet __	5,199,837	+134,092	5,194,592	−.1

Sources: American Petroleum Institute and American Gas Association.

According to a review of oil and gas production,[11] by the Conservation Committee of California Oil Producers, one new oilfield—the Yowlumne field in Kern County—and five new dry gas fields were discovered in 1974. Exploratory drilling was active for dry gas in the Sacramento Valley where the five new fields were discovered and where the area of five existing fields was extended.

Imports of natural gas from out of State were down slightly from that of 1974, being 4.3 billion cubic feet per day, off 4% from that of 1973. In 1974 the imports came from Canada, Permian and Delaware Basin (west Texas and southeast New Mexico) fields, Anadarko Basin fields, the San Juan Basin (northwest New Mexico and southwest Colorado) field, and Paradox Basin (southwest Utah and northeast Arizona) fields.

Natural Gas Liquids.—Total output of natural gas liquids, including natural gasoline and cycle products, and liquid petroleum gases, declined 11% compared with that of 1973; however, value of these products increased 28% because of increased unit prices. The California Division of Oil and Gas reported[12] that 132,908 barrels of condensate was produced from California dry gas fields onshore and 67,333 barrels from dry gas fields on State-owned offshore lands in 1974.

Petroleum.—California ranked third among the States, below Texas and Louisiana, in crude oil (including lease condensate) production. Almost 26% of this output came from offshore wells. The State accounted for 10% of the U.S. total output. Production declined from 336 million 42-gallon barrels in 1973 to 323 million barrels in 1974, a 4% drop. Value of output increased 64% in 1974 compared with that of 1973 because of increased prices. The decline in production followed a downhill trend begun in 1969 after an alltime production high in 1968.

[11] Conservation Committee of California Oil Producers. Annual Review of California and Gas Production, 1974. 78 pp.
[12] Page 133 of work cited in footnote 8.

Table 5.—California: Oil and gas salient statistics

	1973	1974
Production:		
Crude oil: [1]		
Quantity ---- thousand 42-gallon barrels --	336,075	323,003
Value ---- thousands --	$1,045,193	$1,710,350
Daily rate ---- thousand 42-gallon barrels --	921	885
Price, average ---- per barrel --	$3.11	$5.30
Natural gas, marketed:		
Quantity, net ---- million cubic feet --	449,369	365,354
Value ---- thousands --	$167,615	$160,756
Price at wellhead, average ---- per thousand cubic feet --	$0.373	$0.440
Natural gas liquids:		
Quantity ---- thousand 42-gallon barrels --	12,194	10,804
Value ---- thousands --	$43,299	$55,400
Price, average ---- per barrel --	$3.55	$5.13
Operating companies (yearend) ----	776	733
Producing wells:		
Oilfield (average) ----	38,762	40,002
Gasfield (maximum) ----	1,098	1,100
Exploration and development (well completions):		
Exploration:		
Oil ----	17	28
Gas ----	17	16
Dry ----	r 186	191
Development: [2]		
Oil ----	r 867	1,539
Gas ----	r 44	53
Dry (abandoned) ----	95	123
Total ----	r 1,226	1,950
Footage ---- thousand feet --	4,108	5,115
Refineries:		
Number in operation (yearend) ----	36	37
Crude oil throughput capacity (operating) thousand 42-gallon barrels per day --	1,775	1,847
Gasoline output capacity (operating) ---- do ----	1,028	1,017

r Revised.
[1] Includes field condensate but not plant condensate; also includes output from offshore State and Federal leases.
[2] Includes service wells.

Sources: California Department of Conservation, Division of Oil and Gas; Conservation Committee of California Oil Producers; American Petroleum Institute; and Federal Bureau of Mines.

Table 6.—California: Production of crude petroleum and natural gas in 1974, by county [1]

County	Number of producing wells		Production		
				Natural gas (net)	
	Oil (average)	Dry gas (maximum)	Petroleum (thousand barrels)	Oil zones (million cubic feet)	Dry gas zones (million cubic feet)
Alameda	8	--	97	--	--
Butte	--	20	--	--	2,923
Colusa	--	95	--	--	9,107
Contra Costa	46	51	[2]330	2,290	5,001
Fresno	2,583	6	[2]11,415	7,239	678
Glenn	--	102	--	--	10,797
Humboldt	--	25	--	--	1,834
Kern	22,348	45	109,458	64,905	1,049
Kings	142	5	423	7,401	102
Los Angeles	6,097	3	94,150	58,137	124
Madera	--	14	--	--	3,420
Monterey	917	--	12,964	271	--
Orange	3,222	--	33,998	10,565	--
Riverside	13	3	62	34	155
Sacramento	--	104	[2]13	--	24,901
San Benito	29	--	54	20	--
San Bernardino	40	--	179	61	--
San Joaquin	--	134	--	--	17,614
San Luis Obispo	227	--	1,659	1,130	--
San Mateo	11	--	21	1	--
Santa Barbara	1,673	23	[2]18,517	20,635	9,246
Solano	--	190	84	--	56,704
Sutter	--	145	--	--	19,920
Tehama	--	40	--	--	2,844
Tulare	23	14	41	--	771
Ventura	2,623	5	23,121	24,379	1,183
Yolo	--	76	--	--	15,089
Total	40,002	1,100	306,586	197,068	183,462

[1] Includes State offshore but not Federal offshore production.
[2] Includes field condensate from dry gas zones.

Source: California Department of Conservation, Division of Oil and Gas.

Table 7.—California: Offshore oil and gas production in 1974, by field [1]

Field or area	Number of producing wells	Production	
		Oil (thousand barrels)	Gas (million cubic feet)
State:			
Alegria	1	36	140
Belmont	76	2,124	529
Byer Island, Offshore area	1	--	3,536
Caliente: Gas zone	1	--	1,111
Carpinteria	60	1,535	2,228
Coal Oil Point	1	13	37
Elwood	16	50	286
Elwood, South	11	1,193	--
Gaviota: Gas zone	2	--	140
Huntington Beach	317	14,901	2,227
Molino: Gas zone	7	--	5,356
Montalvo, West	6	89	--
Newport, West	15	109	37
Point Conception	2	70	30
Rincon	74	510	234
Summerland	19	206	1,376
Torrance	29	460	404
Venice Beach	3	116	45
Wilmington	938	45,725	11,178
Total	1,579	67,137	28,954
Federal:			
Carpinteria	47	1,871	1,274
Dos Cuadras	124	14,908	5,960
Total	171	16,779	7,234
Grand total	1,750	83,916	36,188

[1] Includes production from offshore portions of onshore fields.

Source: California Department of Conservation, Division of Oil and Gas.

Table 8.—California: Oil and gas well drilling completions in 1974, by county

County	Development wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Alameda	1	--	1	--	--	1	3	8,654
Butte	--	--	--	--	--	4	4	16,874
Colusa	--	2	1	--	--	7	10	63,431
Contra Costa	--	--	1	--	--	3	4	25,690
Fresno	21	--	7	--	--	10	38	169,516
Glenn	--	--	--	--	--	3	3	18,643
Kern	1,186	6	35	12	--	41	1,280	2,259,119
Kings	--	--	--	--	--	3	3	29,516
Los Angeles	49	--	4	3	--	6	62	233,333
Madera	1	--	1	--	--	2	4	12,720
Merced	--	1	1	--	--	6	8	48,150
Monterey	46	--	1	--	--	4	51	124,042
Orange	26	--	5	--	--	--	31	76,438
Riverside	1	--	--	--	--	1	2	4,478
Sacramento	--	9	2	--	6	7	24	116,361
San Bernardino	1	--	--	--	--	--	1	3,678
San Joaquin	--	1	1	--	--	7	9	71,196
San Luis Obispo	15	--	3	--	--	1	19	31,273
San Mateo	1	--	--	--	--	2	3	6,382
Santa Barbara	73	--	4	9	--	12	98	376,588
Solano	--	8	11	--	2	6	27	174,475
Stanislaus	--	--	--	--	--	3	3	21,323
Sutter	--	4	--	--	1	6	11	67,776
Tulare	--	1	5	--	--	--	6	18,272
Ventura	68	--	6	2	--	24	100	490,018
Yolo	--	20	28	--	7	28	83	453,206
Other: Federal offshore	50	1	6	2	--	4	63	194,180
Total	1,539	53	123	28	16	191	1,950	5,115,332

[1] As defined by American Petroleum Institute.

Source: American Petroleum Institute.

The trend in exploratory and development activity continued on the upswing. In 1974, 2,509 notices of intention to drill new wells were received by the California Division of Oil and Gas, 59% more than in 1973. The number of notices to abandon wells decreased from 1,750 in 1973 to 1,059 in 1974, a 39.5% decline. This was the first year since 1969 that the number of notices to abandon has decreased.

Increased exploratory activity included the search for deeper production. This quest resulted in the drilling of Tenneco Oil Co.'s "Tenneco-Superior Sandhills" No. 64X in Kern County. At 22,711 feet, it is currently California's deepest well. At the close of the year, production tests were being made and evaluated for this well, but the results had not been released. The previous California record holder was a well in the Buttonwillow area, Kern County, which held the depth record for 1½ years at 21,640 feet.

Programs begun in 1973 by the California Division of Oil and Gas for correcting oilfield hazards as well as environmental enhancement, including the elimination or screening of oilfield sumps, were continued and expanded and others begun in 1974. The California Legislature added several new sections to the Public Resources Code during the year that required the State Oil and Gas Supervisor to establish rules and regulations for the screening or eliminating of all oil sumps determined by the Department of Fish and Game to be hazardous to wildlife.

A regional sump inventory project using high-altitude photography was initiated with the remote sensing unit of the University of California at Santa Barbara. Using color infrared imagery made during extremely high-altitude U–2 flights, 1,503 oil sumps, or possible oil sumps, throughout the southern region of California were identified and located, most of which were examined by the Department of Fish and Game by the close of 1974. Most were found to have been eliminated or corrected and were no longer considered to be a hazard to wildlife. A program to control the emission of poisonous hydrogen sulfide gas throughout the southern region was continued in the Santa Maria area.

Cleanup operations continued to improve the esthetic aspects of oilfield operations. A large and no longer used portion of the Elwood field was converted to a golf course overlooking the Santa Barbara Channel. A large restoration project by Getty Oil Co. required the removal of 250 tons of junked equipment, as well as the abandonment of 45 substandard and antiquated oil wells. This restoration project included more than 1 square mile of land in Ventura County.

Production from California offshore fields declined for the fourth straight year, largely because of restricted drilling activity resulting from opposition of special interest groups for the granting of drilling and production permits by local, State, and Federal governments for operations in the Santa Barbara Channel. However, during 1974, the U.S. Department of the Interior approved one major project and proposed a lease sale off California in 1975.

The U.S. Department of the Interior gave Exxon Corp., operator of the Santa Ynez unit, permission to develop the Hondo field. Plans included the construction of a platform to be placed in 850 feet of water, 5.1 miles from shore and 23 miles west of Santa Barbara. The 20-well platform was to cost more than $50 million. Oil was to be piped to treating and storage facilities about 1.3 miles inland in Las Flores Canyon. The rezoning for the onshore facility was approved by the Santa Barbara County Planning Commission, but it was contested at yearend by the public.

About 1.6 million acres of southern California's outer continental shelf was selected during 1974 for possible lease sale in 1975. Areas were taken from a nomination area originally offered containing 7.7 million acres. An environmental impact statement was being prepared for public hearings scheduled for early 1975.

Increased drilling activity was anticipated as a result of the relaxation late in 1973 of the drilling moratorium imposed by the State on State-owned lands in 1969. The moratorium was eased to the extent that drilling was permitted from existing facilities; however, proposed drilling from existing facilities was delayed by various governmental and legal actions.

Thirty-seven petroleum refineries were operating in California—one more than in 1973—with a combined crude oil throughput capacity of 1,846,722 barrels per calendar year and a combined gasoline output capacity of 1,017,295 barrels per calendar

year. Five new plants with a combined crude oil throughput of 364,278 barrels per calendar year also were under construction in the State during the year.

During the year, settlement was reportedly[13] made in the $500 million lawsuit filed by the State of California against the oil firms involved in the Santa Barbara oilspill on January 28, 1969. The four firms and a contract drilling company agreed to pay $9,475,000, of which $4.5 million goes to the State, $4 million to the city of Santa Barbara, $775,000 to Santa Barbara County, and $200,000 to the city of Carpinteria. The California Attorney General reported that the settlement was reached without the firms (Union Oil Co. of California; Mobil Oil Corp.; Texaco, Inc.; Gulf Oil Corp.; and Peter Bawden Drilling, Inc.) admitting responsibility for the blowout and spill. In 1971 the firms paid $6.5 million in settlements to beachfront property owners and other claims. An additional property-owner suit still is pending.

In the fall of 1974, a 60-foot oil skimmer catamaran went on duty in San Francisco Bay to protect against oil spills. The vessel is sponsored by Clean Bay, Inc., a cooperative of 12 bay-area oil companies.

Peat.—Output, which was significantly reduced from that of 1973, came from three operations in Contra Costa, Modoc, and San Joaquin Counties. About half of the peat production was reed-sedge and the other half moss. The reed-sedge peat was shredded and marketed, and the moss peat was sold as produced—unprepared. All of the peat was sold in bulk for use as a general soil improver except for a small quantity that was used for specialty uses, such as an ingredient in potting soils.

NONMETALS

Asbestos.—Production in 1974, from four mines, was 45% below that of 1973. This was due primarily to the closing of two of the State's mines during the year. Operations at the Pacific Asbestos Corp. open pit mine and processing mill near Copperopolis, Calaveras County (the leading producer in the State in several prior years) were terminated in April because of financial problems resulting from a long and unusually heavy rainy season. This hampered mining operations and raised operating costs because of advancing costs for fuel, which is utilized for drying the ore. In addition, because of the depressed activity in the construction industry, demand for asbestos was greatly diminished, thus reducing the price. Throughout the remainder of the year, the company was trying to locate a financial backer for renewed operations or a purchaser of the property.

Another large producer, Coalinga Asbestos Co., suspended operations at its Christie mine and mill in Fresno County in June. Although ore reserves in the area are substantial, a decision was made by the parent company to phase out the operation for economic reasons. At yearend, the mill was being dismantled and removed.

The Atlas Asbestos Co. continued to operate in Santa Cruz mine and mill in Fresno County throughout the year as did the Union Carbide Corp. at its Santa Rita mine and mill in San Benito County.

Barite.—Barite output in the State, about one-third that of 1973, was produced by one company, Industrial Minerals Co., from the Castella mine in Shasta County.

A total of 49,167 tons of barite was processed by four companies: Wilbur Ellis Co. (Fresno plant), Fresno County; Industrial Minerals Co. (Florin plant), Sacramento County; FMC Corp., Industrial Chemical Division (Modesto plant), Stanislaus County; and Calcite Corp. (Rosamond plant), Kern County. Of the crude barite processed, 61% was used for chemicals, 38.8% for well drilling, and 0.2% for filler and extender.

Boron.—California supplied the total U.S. output of boron minerals, and as in past years, most came from Kern County with lesser quantities from San Bernardino and Inyo Counties. The State's total output of boron compounds, in terms of B_2O_3 content sold or used, declined 3% below the record level in the previous year, primarily because of a major labor strike in the industry that curtailed operations. However, value of output showed a 12.9% increase compared with that of 1973 because of the increased demand, which resulted in four price rises during the year.

In Kern County, the U.S. Borax and Chemical Corp. open pit mining and processing plant at Boron continued to be the world's largest source of boron. The com-

[13] Offshore. Companies Settle Suit with California in Santa Barbara Spill. September 1974, p. 63.

pany's production declined only 9% compared with that of 1973 despite a 4-month-long strike during which white collar workers took over all operations. Late in 1974, U.S. Borax announced a program to raise output by about one-third in 3 or 4 years at a cost of $55 to $60 million.

In San Bernardino County, Kerr-McGee Chemical Corp. continued to be the major producer of boron minerals from Searles Lake brines at its Trona plant. Stauffer Chemical Co. also produced borax from Searles Lake brines at its plant at Westend. Officially, on October 1, Kerr-McGee purchased the Stauffer Westend holdings and plant but did not plan to disturb normal operations of the two facilities until it was economically expedient. Kerr-McGee was progressing on the construction of its new $100 million, 1.3 million-ton-per-year soda ash plant at Trona, but costs were escalating. When the plant is completed, plans call for the soda ash unit of the old plant to be scrapped, the borate unit retained, and the salt cake unit expanded.

In Inyo County, output of colemanite from Tenneco Oil Co.'s open pit Kern Borate operation in Death Valley National Monument near the site of the old town of Ryan was significantly increased compared with that of 1973. The colemanite was trucked 30 miles to a company plant near Lathrop Wells, Nev., for calcining and marketing, primarily in the tire and textile markets. Ulexite (boronatrocalcite), a new commercial product from the mine in 1974, was trucked 100 miles to a railroad siding at Dunn where it was upgraded and marketed for use by insulating glass manufacturers. The company conducted an extensive exploration program in and adjacent to the monument for boron deposits to replace or supplement the depletion of reserves at the Boraxo pit. It was reported that the program was successful, and sizable deposits were discovered that will be developed.

Reportedly, no commercial progress was made by Hooker Chemical Corp., subsidiary of the Occidental Petroleum Corp., on its feasibility study of recovering boron minerals principally by solar evaporation of brines from the south end of Searles Lake.

Bromine.—Bromine output, all recovered by Kerr-McGee Chemical Corp. as a co-product along with other minerals from Searles Lake brines at its Trona plant, declined 31% below that of 1973.

Calcium Chloride.—National Chloride Co. of America and Leslie Salt Co. produced calcium chloride from wells at Bristol Lake in San Bernardino County. Output declined 5% below that of 1973, but value increased 23% because of unit price advances.

Cement.—Shipments of portland cement were 12% less than in 1973, but total value of output increased 4% because of price advances for cement. Users were as follows: Ready-mix concrete, 69%; concrete products, 13%; building material dealers, 10%; highway contractors, 4%; and miscellaneous, 4%.

In addition to rising fuel costs, one of the major problems facing the California cement industry was the decreasing availability of natural gas because all the cement plants are on interruptible contracts. As gas supplies have decreased, the firms have been carefully considering coal as an alternate fuel source. A number of cement producers have acquired coal supplies through contracts, and others, such as California Portland Cement Co., have actually purchased coal mines to insure long-term fuel sources. In September 1974, the California Portland Cement Co., which operates two cement plants in southern California and one in Arizona, purchased the Soldier Creek Coal Co. located near Price, Utah. The company reportedly [14] plans to expand the productive capacity of the mine so that by late 1976 all three of its cement plants could be operated totally on coal for 25 years. Such plans are indicative of the transition from insecure natural gas supplies to coal by the California cement industry.

Monolith Portland Cement Co., which operates a one kiln cement plant at Tehachapi, southeast of Bakersfield, and markets a substantial part of its production in the Los Angeles area, completed a 4-year, $15 million modernization program. A new kiln and clinker cooler was brought on-stream during 1974 to reduce the amount of labor, fuel, and power consumed, to comply with air pollution control regulations, and to produce higher quality cement.

[14] California Portland Cement Company. Annual Report 1975. Pp. 6–7.

Table 9.—California: Finished portland cement production, capacity, and stocks[1]
(Thousand short tons and thousand dollars)

District[2]	Active plants	Clinker capacity[3] Dec. 31	Production	Shipments from mills			Stocks at mills Dec. 31	Apparent consumption[4]
				Quantity	Value			
					Total	Average per ton		
1973:								
Northern California	5	3,161	2,797	3,075	64,953	21.12	231	3,135
Southern California	8	7,124	6,705	6,321	136,939	21.66	324	5,473
Total	13	10,285	9,502	[5]9,396	201,892	21.48	555	8,608
1974:								
Northern California	4	2,729	2,723	2,907	73,704	25.35	234	3,184
Southern California	8	6,832	5,479	5,355	136,774	25.54	281	4,645
Total	12	9,561	8,202	8,262	210,478	25.48	515	7,779

[1] Includes white cement.
[2] Northern and southern California are divided by the northern boundaries of San Luis Obispo and Kern Counties and the western boundaries of Inyo and Mono Counties.
[3] Calculated on individual company data (365 days minus average days for maintenance times the reported 24-hour capacity).
[4] Includes receipts from other States; excludes imports from foreign countries.
[5] Data do not add to total shown because of independent rounding.

Table 10.—California: Portland cement shipments by type of customer in 1974[1]
(Thousand short tons)

Type of customer	District of origin							
	Northern California				Southern California			
	1973		1974		1973		1974	
	Quantity	Percent	Quantity	Percent	Quantity	Percent	Quantity	Percent
Building material dealers	206	6.7	247	8.5	631	10.0	543	10.1
Concrete product manufacturers	326	10.6	363	12.5	803	12.7	746	13.9
Ready-mixed concrete	2,207	71.8	2,059	70.8	4,399	69.6	3,651	68.2
Highway construction	165	5.4	130	4.5	274	4.3	206	3.9
Other contractors	77	2.5	70	2.4	114	1.8	113	2.1
Federal, State, and other government agencies	3	.1	3	.1	26	.4	20	.4
Miscellaneous, including own use	91	2.9	34	1.2	74	1.2	77	1.4
Total[2]	3,075	100.0	2,907	100.0	6,321	100.0	5,355	100.0

[1] Includes white cement.
[2] Data may not add to totals shown because of independent rounding.

Table 11.—California: Masonry cement salient statistics in 1974
(Short tons)

Number of active plants	1
Production	2,579
Shipments from mills:	
Quantity	1,869
Value	$41,727
Stocks at mills, Dec. 31	931

Clay and Shale.—Clay and shale was produced at 76 mines in 29 counties in 1974. Total output was 8% less than in 1973, but value of production increased 11% because of increased prices. Of the total clay and shale sold and used, 90% was common clay, 6% fire clay, 2% bentonite, 2% kaolin, and less than 1% fuller's earth and ball clay. Six companies—Lightweight Processing Co., Pacific Clay Products Co., Interpace Corp., The Flintkote Co., Homestake Mining Co., and Amcord, Inc.—operated 24 of the State's mines and accounted for more than half of the total output.

Diatomite.—Total production of diatomite, reported from five operations in two counties in the State in 1974, increased 7% but value of output increased 46% because of increased prices for the product. Of the total, 66% was used for filtration, 19% for fillers, 5% for insulation, and 10% for miscellaneous other uses. Johns-Manville Products Corp., Celite Div. at Lompoc, Santa Barbara County, was by far the State's major producer. Three other companies, Grefco, Inc.; Airox, Inc.; and Excel Minerals Co.; had diatomite mines in Santa Barbara County. Basalt Rock Co., Inc. mined pozzolan in Napa County for special uses.

California continued to be the largest producer of diatomite in the United States; the Johns-Manville Lompoc operations was still the world's largest single operation. A soon-to-be published report by the California Division of Mines and Geology concludes that, "If the problems (zoning, taxation, fuel shortages, costly antipollution steps) do not become too great, California should continue to be a major source of diatomite for the next 50 to 100 years."

Feldspar.—Feldspar production was reported from two operations, Owens-Illinois, Inc., at Pacific Grove, Monterey County, and Calspar Corp. at Ord Mountain, San Bernardino County. At Ord Mountain, felspathic quartzite is mined from several small open pits and then trucked to the firms' grinding plant at Santa Fe Springs, near Los Angeles. Wedron Silica Co., a feldspar producer in former years from its feldspar-glass sand operation near Pebble Beach, Monterey County, was forced to close in September 1973 because of environmental considerations. As a result of the closing of the Wedron operation, the State's feldspar output was 46% below that of 1973, and value of output declined 12%.

Graphite (Manufactured).—Output in 1974 was almost 9% higher than in the previous year, and value increased almost 17% owing manily to inflation. Great Lakes Carbon Corp., at its Rosamond plant, produced synthetic graphite products, anodes, electrodes, crucibles and ves-

sels, and other products from petroleum coke. HITCO Co. at Gardena produced a substantial quantity of synthetic graphite and fibers. Polycarbon, Inc., of North Hollywood, produced a smaller quantity of synthetic graphic high modulus fibers.

Gypsum.—California ranked first in output of both crude and calcined gypsum. Crude gypsum output in 1974 declined 3% below that of 1973, although the total value in 1974 was up almost 14% above that of 1973 because of higher prices. Six firms, led by United States Gypsum Co.'s mine at Plaster City (Imperial County), produced 1,716,000 tons. Output of calcined gypsum was 14% below that of 1973, although total value was up over 9%. Seven calcining plants, the largest of which was also U.S. Gypsum's Plaster City plant, produced 1,123,000 tons valued at $16,242,000. Three firms, Valley Nitrogen Producers, Inc. (Nichols, San Joaquin County), Occidental Petroleum Corp. (Lathrop, Contra Costa County), and Collier Carbon & Chemical Corp. (Helms Point, Fresno County), sold 463,300 tons of byproduct gypsum for agricultural uses, which was 44% more than in 1973.

Iodine.—Deepwater Chemical Co., Ltd., at Compton, Los Angeles County, continued to import crude iodine and process it into potassium, ammonium, and silver iodide; potassium, ammonium, calcium, and silver iodate; and also resublimed iodine.

Iron Oxide Pigments.—Pfizer, Inc., reported [15] completion of an expansion program at its Emeryville (Alameda County) plant, that produces both natural and manufactured iron oxide pigments.

Lime.—Output of lime in 1974 declined 5% below record 1973 levels to 600,000 tons. Ten firms operated 15 plants in 12 counties. The three largest plants were in Monterey, San Bernardino, and Yolo Counties. The leading firms were Kaiser Aluminum & Chemicals Corp. (Monterey County) and Holly Surgar Corp. (Glenn, Imperial, Orange, and San Joaquin Counties). Lime was used for making magnesia, in sugar refining, in refractories, and for other uses. Consumption of lime in the State was over 799,000 tons, which exceeded the State total amount by about one-third.

Lithium Compounds.—Kerr-McGee, the State's only lithium producer, recovered byproduct lithium carbonate from Searles Lake brines at Trona, San Bernardino County. The lithium content of the feed brines is declining, and as a result, the firm's output in 1974 declined 60% below that of 1973 but more than doubled in value owing to increased prices. Further production declines were expected for 1975.

Magnesium Compounds.—Output was 11% lower than in 1973, but value declined only 5% because of increased prices. The major producer, Kaiser Aluminum & Chemical Corp., Refractories Division, continued to recover magnesium from sea water and dolomite—using dolomite to precipitate magnesium from seawater—at Moss Landing, Monterey County. Caustic-calcined magnesia, refractory magnesia, and magnesium hydroxide were produced.

Merck & Co., Inc., produced magnesium ranging from extra-light to heavy oxide, carbonate, hydroxide, and trisilicate from seawater and bitterns in San Mateo County; FMC Corp., Inorganic Chemicals Div., produced magnesium chloride crystals and brines in San Diego County; and Philadelphia Quartz Co. produced hydrous and anhydrous magnesium sulfate in Alameda County.

Perlite.—Sales and use of crude perlite declined 24% compared with that of 1973. American Perlite Co., at its Fish Springs quarry near Big Pine, Inyo County, was the sole producer in the State. Six companies—four in Los Angeles County and one each in San Diego and Sonoma Counties—prepared expanded perlite for use (in order of importance) as filter aid, horticultural aggregate, plaster aggregate, concrete aggregate, and miscellaneous applications. Production of expanded perlite was 21,137 tons, 14% below that of 1973.

Potassium Salts.—Output, all from the Kerr-McGee Chemical Corp. operation at Trona, San Bernardino County, was virtually the same as in 1973. Marketed products were potassium sulfate, which contained 52.5% K_2O equivalent, standard muriate, 61.6% K_2O_3 equivalent; and coarse muriate, 61.4% K_2O_3 equivalent.

Pumice.—Combined output of crude and prepared pumice, pumicite (volcanic ash), and scoria (volcanic cinder) increased 18% compared with that of 1973, but value of output remained about the same. Production was recorded from 34 mines located in 13 counties in the State. Lake, Siskiyou, Lassen, and Shasta Counties accounted for most of the production.

[15] Pfizer, Inc. 1974 Annual Report. P. 8.

Salt.—Total production of salt declined compared with that of 1973, but total value increased. All of the production, sold or used, was recovered as evaporated salt except for a small quantity of rock salt produced in San Bernardino County. All of the evaporated salt was recovered by solar evaporation except for a small quantity recovered by vacuum pan in Alameda County. Leslie Salt Co., the State's leading producer, had operations in Alameda, Napa, San Bernardino, and San Mateo Counties. The firm reported a major expansion at its Newark (Alameda County) plant, which will increase capacity from 560,000 tons in 1973 to 900,000 in 1978. New crystallizers at the Newark facility added 34,000 tons to the 1974 harvest. These expansions will provide increased supplies for increased demands at the Newark refineries and contractual obligations to The Dow Chemical Co.'s Pittsburg, Calif., chemical complex.

Sand and Gravel.—California was the Nation's second largest sand and gravel producer. Output in 1974 declined 10% compared with that of 1973, although total value was almost the same because of increased prices. Production was reported from 386 mines owned by 302 firms operating in all except 3 counties—Kings, Marin, and Sierra. The greatest activity continued to be in major urban areas of Los Angeles (Los Angeles, Orange, San Bernardino, and San Diego Counties) and San Francisco (Alameda County). Output from these five counties amounted to nearly half of the State's total.

Two important studies were published in late 1974 and early 1975 concerning the future availability of sand and gravel resources in the Sacramento area. The first [16] estimated the county's needs through the year 2000, made recommendations to protect both the resources and environment, and concluded that adequate resources could be obtained until 2000 from 1% of the county's total area provided appropriate land use plans are implemented. The second study [17], authored by a geologist from the California Division of Mines and Geology, concluded similarly that local reserves and resources of sand and gravel amounted to about 200 million tons and were adequate for the next 25 years. The study recommended the multiple-land-use concept for the county and delineated development areas.

[16] Sacramento County Aggregate Resource Management Technical Advisory Committee. Aggregate Resources, A Study Report. November 1974, pp. 3–9, 65.

[17] Rapp, J. S. Sand and Gravel Resources of the Sacramento Area Calif. Div. Mines and Geol., Spec. Rept. 121, 1975, p. 34.

Table 12.—California: Construction sand and gravel aggregate sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Alameda	12	9,044	13,140	12	10,106	16,267
Alpine	1	8	11	1	4	8
Amador	5	W	W	4	708	3,660
Butte	8	1,018	1,355	7	942	1,563
Contra Costa	5	207	198	6	1,480	3,336
Del Norte	3	149	W	2	174	298
El Dorado	6	163	206	4	86	141
Fresno	10	3,781	5,351	8	4,351	6,897
Glenn	5	W	W	5	805	933
Humboldt	11	451	746	8	431	763
Imperial	7	714	681	8	617	467
Inyo	8	124	294	5	147	250
Kern	11	1,714	2,413	12	2,249	3,788
Lake	9	323	450	9	2,170	1,709
Lassen	5	267	494	6	292	425
Los Angeles	27	22,195	33,054	20	20,310	31,047
Marin	2	33	82	--	--	--
Mariposa	4	23	44	3	27	46
Mendocino	10	403	763	8	354	1,291
Merced	8	1,108	1,520	18	1,161	1,826
Modoc	6	274	192	4	57	59
Mono	7	198	267	5	76	109
Monterey	9	643	W	9	794	1,665

See footnotes at end of table.

Table 12.—California: Construction sand and gravel aggregate sold or used by producers, by county—Continued

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Napa	3	43	89	3	45	89
Nevada	4	871	1,958	4	762	1,761
Orange	21	13,343	17,434	14	8,322	12,078
Placer	5	W	W	4	575	1,227
Plumas	6	117	132	4	104	195
Riverside	15	3,149	6,266	15	4,705	7,129
Sacramento	12	4,476	6,429	9	5,616	12,736
San Benito	W	W	W	4	287	661
San Bernardino	23	12,268	10,031	17	5,096	7,441
San Diego	26	9,377	24,799	31	7,311	16,137
San Joaquin	8	2,083	3,403	5	2,794	5,624
San Luis Obispo	5	361	696	4	276	704
Santa Barbara	7	1,504	1,864	8	1,554	2,693
Santa Clara	10	1,884	2,612	5	1,247	1,585
Santa Cruz	6	2,367	3,030	6	2,646	3,306
Shasta	17	1,115	1,130	14	795	1,146
Sierra	1	7	2	--	--	--
Siskiyou	11	830	1,544	13	740	1,580
Solano	1	90	312	1	5	1
Sonoma	13	4,079	6,542	9	3,315	5,581
Stanislaus	9	1,403	2,196	9	1,574	2,527
Sutter	W	W	W	1	66	83
Tehama	6	170	222	4	91	163
Trinity	9	135	W	6	111	269
Tulare	4	W	W	4	1,337	1,498
Tuolumne	5	W	W	1	51	W
Ventura	11	5,119	6,239	8	3,784	4,916
Yolo	9	3,862	4,516	7	2,829	5,131
Yuba	4	568	912	3	600	1,138
Undistributed [1]	20	5,410	12,664	9	1,209	2,271
Total [2]	450	117,470	176,286	386	105,191	176,213

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes Calaveras, Colusa, Madera, San Francisco (1974), and San Mateo Counties, and some sand and gravel that cannot be assigned to specific counties.

[2] Data may not add to totals shown because of independent rounding.

Table 13.—California: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	115,331	165,355	41,035	64,373
Gravel			52,371	90,012
Unprocessed: Sand and gravel			9,600	9,046
Industrial:				
Sand	2,139	10,931	2,185	12,231
Gravel			--	--
Total	117,470	176,286	105,191	175,662

[1] Value data may not be directly comparable to that in tables 1, 12, 14, 15, and 16, because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 14.—California: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			29,346	49,079
Highway and bridge construction			5,727	9,165
Other uses (dams, waterworks, airports, etc.)			2,643	4,274
Concrete products (cement blocks, bricks, pipe, etc.)	88,260	131,283	5,942	9,954
Bituminous paving (asphalt and tar paving)			11,148	18,659
Roadbase and subbase			8,150	12,993
Unprocessed aggregate			7,006	7,778
Fill	6,006	5,276	4,970	6,525
Other uses [2]	2,475	3,951	725	1,292
Industrial sand and gravel	2,139	10,931	2,185	12,231
Total	98,880	151,441	77,842	131,950

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).

Table 15.—California: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			1,769	2,815
Highway and bridge construction			2,386	3,696
Other uses (dams, waterworks, airports, etc.)			446	939
Concrete products (cement blocks, bricks, pipe, etc.)	11,358	22,487	740	1,123
Bituminous paving (asphalt and tar paving)			7,585	13,587
Roadbase and subbase			10,988	19,700
Unprocessed aggregate			2,594	1,268
Fill	1,326	436	718	923
Other	5,906	1,921	123	211
Total	18,590	[2]24,845	27,349	44,262

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Data do not add to totals shown because of independent rounding.

Table 16.—California: Industrial sand sold or used by producers in 1973 and 1974, by use

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Industrial unground sand:				
Molding	W	W	W	W
Glass	1,939	10,107	1,342	8,025
Blast	149	638	297	939
Grinding and polishing	W	W	14	88
Fire and furnace	W	W	--	--
Engine	51	186	W	W
Filtration	W	W	W	W
Oil (hydrofrac)	W	W	W	W
Other uses	W	W	306	2,076
Industrial ground sand:				
Filler	W	W	W	W
Abrasives	--	--	W	W
Foundry	W	W	W	W
Glass	W	W	212	1,062
Other uses	--	--	14	41
Total industrial sand [1]	2,139	10,931	2,185	12,231

W Withheld to avoid disclosing individual company confidential data; included with "Glass (unground)."
[1] Data may not add to totals shown because of independent rounding.

Sodium Compounds.—Production of sodium carbonate (soda ash) and sodium sulfate (salt cake) was 1% less than that of 1973, but value increased 27% because of increased prices. Kerr-McGee recovered both chemical products from its Trona and Westend (formerly Stauffer Chemical Co.) plants in San Bernardino County, and U.S. Borax recovered salt cake at its plant at Boron in Kern County. Engineering design was underway on the soda ash and salt cake expansion and construction program at the Trona facilities of Kerr-McGee. The project, scheduled for completion in 1978, is reported to require investments of over $100 million and will have an annual production capacity of 1.3 million tons of soda ash and 400,000 tons of salt cake.

Stone.—Output in 1974 increased 4% and value increased 19% compared with that of 1973. Crushed limestone and dolomite accounted for 44% of the total output; granite, 17%; traprock, 13%; sandstone, quartz, and quartzite, 11%; and other stone, 15%. Principal uses were cement, 30%; roadbase, 17%; bituminous aggregate, 14%; concrete aggregate, 10%; fill, 8%; construction aggregate and roadstone, 7%; riprap and jetty stone, 4%; and other, 10%.

Table 17.—California: Stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974			Type of stone produced in 1974
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Alameda	7	3,602	4,306	6	3,551	4,487	Limestone, sandstone, traprock.
Butte	--	--	--	6	127	365	Other stone.
Colusa	1	55	194	1	222	178	Sandstone.
Contra Costa	8	2,244	5,126	4	2,025	4,929	Sandstone, traprock, other stone.
Del Norte	4	W	W	6	372	614	Do.
El Dorado	8	442	1,917	5	361	1,861	Limestone, other stone.
Imperial	1	1	(1)	1	(1)	(1)	Granite.
Inyo	10	W	W	8	220	439	Dolomite, other stone.
Kern	8	3,211	4,856	7	2,594	4,660	Limestone, granite, quartzite, other stone.
Lassen	2	298	W	2	(1)	(1)	Other stone.
Los Angeles	12	683	1,321	36	927	1,818	Granite, other stone.
Madera	4	W	W	19	2,881	7,962	Granite.
Mariposa	2	W	41	3	2	51	Slate, other stone.
Mendocino	3	5	21	--	--	--	Traprock.
Merced	--	--	--	2	(1)	(1)	Limestone, traprock.
Modoc	4	13	10	5	12	17	Sandstone, traprock, other stone.
Mono	1	(1)	(1)	5	22	43	Other stone.
Nevada	4	19	10	10	12	24	Sandstone, quartzite.
Placer	4	W	W	7	5	W	Granite.
Plumas	5	W	265	13	46	197	Granite, marble, other stone.
Riverside	17	3,479	5,004	15	1,509	2,859	Limestone, granite, quartzite, traprock.
San Bernardino	30	7,173	13,339	99	8,207	17,308	Dolomite, granite, sandstone, quartz, quartzite, other stone.
San Diego	17	2,051	4,665	21	1,259	3,594	Granite, traprock.

See footnotes at end of table.

Table 17.—California: Stone sold or used by producers, by county—Continued

(Thousand short tons and thousand dollars)

County	1973			1974			Type of stone produced in 1974
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
San Mateo	8	1,652	3,351	7	954	2,155	Limestone, sandstone, traprock, other stone.
Santa Barbara	6	4	42	12	16	98	Limestone, sandstone, other stone.
Santa Clara	10	6,323	8,248	10	5,904	9,250	Limestone, granite, sandstone, traprock, other stone.
Santa Cruz	4	1,076	1,684	6	1,015	2,141	Limestone, granite.
Sierra	1	(1)	(1)	--	--	--	Other stone.
Siskiyou	3	385	419	7	156	274	Traprock, other stone.
Sonoma	8	760	1,063	10	627	1,345	Shell, traprock, other stone.
Tehama	2	17	39	7	81	93	Other stone.
Tuolumne	10	172	703	17	536	1,706	Dolomite, granite, marble, sandstone, other stone.
Ventura	7	213	559	8	249	678	Granite, sandstone, traprock, other stone.
Yuba	2	74	241	6	174	422	Traprock, other stone.
Undistributed [2]	62	9,886	19,755	91	11,643	22,322	
Total [3]	225	43,838	77,175	462	45,709	91,891	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Less than ½ unit.

[2] Includes Amador, Calaveras, Fresno, Humboldt, Lake, Marin, Monterey, Napa, Orange, Sacramento, San Benito, San Joaquin, San Luis Obispo, Shasta, Solano, Trinity, Tulare, and Yolo Counties.

[3] Data may not add to totals shown because of independent rounding.

Table 18.—California: Stone sold or used by producers, by type

(Thousand short tons and thousand dollars)

Type of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Granite	8	591	45	946
Sandstone, quartz, quartzite	1	24	1	16
Traprock	(1)	(1)	(1)	3
Other stone [2]	7	149	321	1,207
Total	16	767	368	2,172
Crushed and broken:				
Limestone and dolomite	21,796	37,450	19,926	38,191
Granite	6,108	10,119	7,634	16,694
Marble [4]	155	384	107	400
Sandstone, quartz, quartzite	5,737	9,440	4,854	10,497
Traprock	5,359	9,423	6,101	11,174
Other stone	4,668	9,591	6,718	12,763
Total [3]	43,822	76,407	45,341	89,719

[1] Less than ½ unit.

[2] Data also include limestone, dolomite, and slate.

[3] Data may not add to totals shown because of independent rounding.

[4] Data include shell.

Table 19.—California: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Rough stone:				
Rough blocks	4	274	5	391
Construction	5	79	356	1,453
Flagging	1	18	3	60
Other rough stone	--	--	(1)	1
Dressed stone:				
Architectural	3	220	2	164
Construction	2	23	(1)	2
Flagging	W	10	W	W
Roofing slate (architectural)	W	30	W	30
Flooring slate	W	W	(1)	1
Other uses [2]	2	114	2	70
Total [3]	16	767	368	2,172
Crushed and broken:				
Bituminous aggregate	3,865	8,568	6,208	12,496
Concrete aggregate	4,160	5,604	4,546	7,052
Dense-graded roadbase stone	8,289	13,173	7,690	12,948
Macadam aggregate	367	927	254	720
Surface treatment aggregate	409	601	193	295
Unspecified construction aggregate and roadstone	5,616	8,991	3,246	7,114
Agricultural purposes [4]	156	821	155	884
Cement manufacture	15,080	19,121	13,716	21,340
Fill	352	429	3,637	8,404
Glass manufacture	389	2,250	363	2,371
Lime manufacture	470	1,838	607	1,598
Mineral fillers, extenders, whiting [5]	403	3,003	385	3,048
Riprap and jetty stone	1,502	3,682	1,945	4,713
Filter stone	W	840	388	1,076
Sugar refining	230	W	180	729
Terrazzo and exposed aggregate	126	879	103	727
Roofing aggregates, chips, granules	733	1,616	741	1,405
Other uses [6]	1,677	4,065	983	2,799
Total [3]	43,822	76,407	45,341	89,719
Grand total [3]	43,838	77,175	45,709	91,891

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Less than ½ unit.
[2] Includes stone used for monumental purposes and curbing (1973).
[3] Data may not add to totals shown because of independent rounding.
[4] Includes agricultural limestone, agricultural marl and other soil conditioners, and poultry grit and mineral food.
[5] Includes whiting or whiting substitute and other fillers or extenders. No production for asphalt filler reported in this category.
[6] Includes stone used for railroad ballast, manufactured fine aggregate (stone sand), dead-burned dolomite, ferrosilicon, flux stone, refractory stone, building products, chemicals, magnesium metal manufacture (1973), waste material, and uses not specified.

Sulfur.—Thirteen oil companies operating 14 plants—4 in Contra Costa County, 9 in Los Angeles County, and 1 in Solano County—recovered and sold 382,301 long tons of sulfur valued at $4,716,000 in 1974. Principal producers were Standard Oil of California, Mobil Oil Corp., Texaco, Inc., and Atlantic Richfield Co. in Los Angeles County; Union Oil Co. of California and Shell Oil Co. in Contra Costa County; and Exxon Co. USA in Solano County.

Talc, Soapstone, and Pyrophyllite.—Mine production declined 10% in 1974, but value of production increased 12% because of increased unit prices. Production was reported from 14 mines—1 in El Dorado County, 6 in Inyo County, and 7 in San Bernardino County. Major producers were Johns-Manville Warm Spring mine, Cyprus Mines Corp., and Pfizer, Inc., in the southeast part of the Death Valley National Monument in Inyo County. Pomona Tile Co., R. T. Vanderbilt Co., Pfizer, Inc., Cyprus Mines Corp., and Interpace Corp. mined talc in San Bernardino County; Commercial Minerals Co. mined soapstone near Shingle Springs in El Dorado County; and Industrial Mineral & Chemicals milled talc near Sacramento in Sacramento County. Prepared ground material was used in ceramics, paints, refractories, paper, and other applications. Some of the products are also exported.

Vermiculite.—Production and sales of ex-

foliated vermiculite derived from crude vermiculite produced in Montana and South Carolina declined 15% below that of 1973, and value declined 17%. W. R. Grace & Co., with exfoliation plants at Newark (Alameda County), Santa Ana (Orange County), and Los Angeles (Los Angeles County), and La Habra Products, Inc., with a plant at Anaheim (Orange County), were the producers in 1974.

Consumption by end use was 48% for fire proofing, 30% for concrete aggregate, 13% for fertilizer carrier, 4% for ceiling textures, 2% for plaster aggregate, and 3% for miscellaneous uses.

METALS

Copper.—Production of recoverable copper was down by almost half compared with 1973 production. Output was reported from eight mines in five counties, but most of it was produced as a byproduct of mining tungsten ore at the Pine Creek mine in Inyo County by Union Carbide Corp. The next highest recorded producer was Stauffer Chemical Co., which recovered copper as copper precipitates from mine waters at Iron Mountain near Redding, Shasta County. Smaller quantities were recovered from gold-silver ore from the Zaca mine in Alpine County, lead-zinc ore from the Darwin and Santa Rosa mines in Inyo County, copper ore from the Copper Queen mine in Mariposa County, and gold ore from the Bagdad Chase and Boomerang mines in San Bernardino County.

Scrap prices for copper and brass continued to rise in early 1974 until they reached an alltime high in mid-April when reportedly the price for No. 2 copper scrap was $1.07 per pound. Following this, prices declined to the 60- to 70-cent level (No. 1 copper) in late August and further declined at yearend.

Table 20.—California: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county

County	Mines producing [1]		Material sold or treated [2] (short tons)	Gold		Silver	
	Lode	Placer		Troy ounces	Value	Troy ounces	Value
1972, total	5	4	18,005	3,974	$232,876	175,467	$295,661
1973, total	8	7	6,941	3,647	356,712	55,897	142,987
1974:							
Fresno	--	--	--	976	155,906	130	613
Inyo	3	--	1,030	80	4,793	15,370	72,393
Los Angeles	--	--	--	93	14,856	--	--
Merced	--	--	--	66	10,543	5	24
Plumas	--	2	--	25	3,994	--	--
San Joaquin	--	--	--	683	109,102	61	287
Shasta	1	--	W	182	29,073	16	75
Stanislaus	--	--	--	543	86,738	50	236
Trinity	--	1	3	32	5,111	--	--
Undistributed [3]	6	1	4,656	2,419	386,412	26,262	123,696
Total	10	4	5,689	5,049	806,528	41,894	197,324

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1972, total	598	$612,246	1,153	$346,736	1,202	$426,768	$1,914,287
1973, total	369	439,696	44	14,320	20	8,229	961,944
1974:							
Fresno	--	--	--	--	--	--	156,519
Inyo	140	216,159	27	11,985	W	W	W
Los Angeles	--	--	--	--	--	--	14,856
Merced	--	--	--	--	--	--	10,567
Plumas	--	--	--	--	--	--	3,994
San Joaquin	--	--	--	--	--	--	109,389
Shasta	W	W	--	--	--	--	W
Stanislaus	--	--	--	--	--	--	86,974
Trinity	--	--	--	--	--	--	5,111
Undistributed [3]	54	83,641	8	3,721	8	5,630	937,578
Total	194	299,800	35	15,706	8	5,630	1,324,988

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Operations from which gold and silver are recovered as byproducts from sand and gravel operations not counted as producing mines.

[2] Does not include gravel washed.

[3] Alpine, Kern, Mariposa, Sacramento, San Bernardino, and Sierra Counties combined to avoid disclosing individual company confidential data and items indicated by symbol W.

Table 21.—California: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by type of material processed and method of recovery

Type of material processed and method of recovery	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Smelting of concentrates[1]	569	35,490	140	2	6
Direct smelting of ore and copper precipitates[2]	1,630	6,110	54	33	2
Gold cleanup	41	22	--	--	--
Total lode material	2,240	41,622	194	35	8
Placer	2,809	272	--	--	--
Grand total	5,049	41,894	194	35	8

[1] Includes byproduct recovery from tungsten ore.
[2] Combined to avoid disclosing individual company confidential data.

Table 22.—California: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by class of ore or other source material

Source	Number of mines[1]	Material sold or treated[2] (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Dry gold, gold-silver, silver[3]	5	4,574	2,162	26,222	9	8	3
Copper, lead, lead-zinc, tungsten[3]	4	[4]1,041	37	15,378	140	27	5
Total	9	5,615	2,199	41,600	149	35	8
Other lode material:							
Gold cleanup	--	6	41	22	--	--	--
Copper precipitates	1	68	--	--	45	--	--
Total	1	74	41	22	45	--	--
Total lode material	10	5,689	2,240	41,622	194	35	8
Placer	4	--	2,809	272	--	--	--
Grand total	14	5,689	5,049	41,894	194	35	8

[1] Operations from which gold and silver are recovered as byproduct from sand and gravel operations not counted as producing mines.
[2] Does not include gravel washed.
[3] Combined to avoid disclosing individual company confidential data.
[4] Excludes tungsten ore tonnage.

Gold.—Output was up 38% over that of 1973, and total value rose over 2¼ times owing to soaring gold prices. More than half of the reported gold production (recoverable gold) was from placer operations. The bulk of this gold came from 14 operations that recovered gold as a byproduct of washing sand and gravel to produce aggregate and were not classed as gold mines. A small quantity of gold was produced at four operations classed as placer mines. Two of these mines employed small-scale mechanical and hand methods, and two used suction dredges to recover the gold. Major producers of gold (recoverable) from lode mines included Great Western Gold Co. (gold ore from the Boomerang dump) and Clark Mining & Exploration Co. (gold ore from the Bagdad Chase mine), both in San Bernardino County, Claude B. Lovestedt (gold-silver ore from the Zaca mine in Alpine County), and Empire Mining & Development Co. (gold ore from the Empire mine in Sierra County). Smaller quantities were recovered from tungsten ore by Union Carbide Corp. at the Pine Creek mine in Inyo County and from cleanup by American Primary Resources Co. at the Brown Bear mine in Trinity County.

Because of increasing gold prices, Yuba Goldfields, Inc., was studying the possibility of reactivating dredging of placer deposits near Hammonton. Its predecessor, Yuba Consolidated Goldfields, dredged

over 1 billion cubic yards of gravel in the area from 1905 to October 1, 1968, when its last dredge was shut down.

In mid 1974, Homestake Mining Co. was reportedly conducting an exploration drilling program on the Royal-Mountain King mines, Hodson Mining District, Calaveras County, which had earlier reportedly produced about $6 million in gold.

The San Juan Gold Co. at French Corral, Calaveras County, was reevaulating its Cherokee placer mining property. Other firms reporting revived gold mining activity during the year were the Ruby Mining Co. (Sierra County) and the Keystone Canyon Mining Co. (Inyo County).

Work was completed under the Office of Minerals Exploration (OME)-assisted project at the Brown Bear Mine of American Primary Resources Co. near Lewiston, Trinity County. OME contracts continued at both the Rex Montis mine (Mono County) and the Lucky Jack mine (Plumas County). No new projects were initiated under the OME program because no funding was appropriated for this type of work.

Because of the high level of gold prices during the year, there were renewed exploration activities by numerous groups, which included several major mining companies. In addition, considerable amateur weekend prospecting was reported including one gold-seeking scuba diver who in late 1973, recovered a 25-pound gold-quartz nugget from the Yuba River near Domnieville. The nugget was worth an estimated $22,500 in gold value and considerably more as a museum piece.

Iron Ore and Concentrate.—Usable iron ore shipments to consumers, which included direct-shipping ore, concentrates, and agglomerates, declined 17% in 1974, but total value increased 25% because of increased prices. The major producer was Kaiser Steel Corp. at its Eagle Mountain mine, Riverside County. The ore was treated, and concentrates and agglomerates amounting to a reported 3.5 million tons were shipped to the company's steelworks at Fontana, San Bernardino County, according to its 1974 Annual Report. In addition, California Portland Cement Co. produced small amounts of direct-shipping ore at the Baxter mine, San Bernardino County, and Standard Slag Co. produced direct-shipping ore and concentrates from the Beck mine, San Bernardino County, for export to Japan.

Iron and Steel.—In 1974, California consumed over 8 million tons of steel mill products, which amounted to nearly 73% of seven western States (California, Oregon, Washington, Arizona, Nevada, Utah, and Idaho) total consumption. Kaiser Steel Corp. operated the only fully integrated steel plant on the Pacific Coast at Fontana, Calif., and was the West's largest steel producer. The company produces approximately 2% of the total steel output in the United States and ranks 10th in total production among the Nation's steel producers. Kaiser Steel operated its steelmaking facilities at high levels during 1974 and shipped 2,008,000 tons of steel products, compared with 2,381,000 tons during the 1973 record year. Raw steel production at the Fontana plant was 2,922,000 tons in 1974 compared with 3,169,000 tons in 1973. Production during 1974 was adversely affected by the relining of three of the company's four blast furnaces during the year. A $43 million modernization and improvement program was authorized for the Fontana facility, which will be completed in 1977. A contract was signed to purchase 80,000 tons of semifinished steel from Japanese steel mills in 1975 and a like amount the following year to permit the company to operate its finishing mills at higher rates. Its finishing capacity is higher than its raw steelmaking capacity.

Kaiser's Fontana plant is among the cleanest steel facilities in the United States, which is a direct result of large investments over the years in pollution control equipment and programs. However, much additional work is now required to meet the new and more stringent air standards adopted for the Los Angeles Basin. To meet these standards, the company expects to spend from $10 to $15 million per year over the next several years.

Slag.—Kaiser's Fontana steelworks continued to have International Mill Services, Inc., process and reclaim all its blast furnace slag. The major use has been in highway construction, although it has also been used as railroad ballast, filter media, roofing, landscaping, and concrete aggregate.

Scrap.—In January, the Commerce Department gave allocations for export licenses to scrap dealers based on their record of shipments for the 3 previous years. At this time, No. 1 heavy-melting scrap was selling at about $70 per ton.

Because of increased demand, by April the price for No. 1 scrap had risen to almost $100 per ton, where it remained until it declined to the $80 level in early November. Because of sharply lessening demand, it closed out the year weakly at the $65 to $70 range for No. 1 heavy-melting scrap. Shipments to Japan, which at mid-year had been estimated to be 150,000 to 160,000 tons per month, declined to practically nothing at yearend.

Lead-Zinc.—Production was substantially below that of 1973. Most of the lead (recoverable) came from the Santa Rosa mine in Inyo County operated by the Brownstone Mining Co., and most of the zinc (recoverable) came from the Darwin mine in Inyo County operated by Montecito Minerals Co. Smaller quantities of lead and zinc were recovered from the Boomerang dump (San Bernardino County) by Great Western Gold Co., and from the Zaca mine (Alpine County) by Claude B. Lovestedt.

Mercury.—Mercury mining activity continued to be curtailed in the State because of reduced demand and soft prices caused by environmental problems and the banning of mercury used for certain purposes. However, about 60% of the total U.S. production was provided by California producers. The State's output increased 8% compared with that of 1973, but value increased only 6% because of reduced prices. Production was reported from 9 mines in 1974; there were 18 in 1973. The largest producers were, in descending order of output, the Chileno Valley mine (Marin County), the Manhattan-One Shot and Oat Hill mines (Napa County), and the Guadalupe and New Almaden mines (Santa Clara County).

New Idria Mining and Chemical Co. put the entire town of Idria (San Benito County), including the New Idria mercury mine, the mill, 3,700 acres of land, 48 houses, a church, a school, garages and shops, up for sale at public auction in August. The mine was the Country's largest mercury producer until it was shut down in 1972. The town was offered as an ideal campground or recreational facility, but the highest bid of $105,000 for the entire town was not accepted by the company.

Table 23.—California: Mercury production, by method of recovery

Year	Recovery method						Total	
		Furnaced		Retorted				
	Operating mines	Ore treated (short tons)	76-pound flasks	Ore treated (short tons)	76-pound flasks	Unclassified (76-pound flasks) [1]	76-pound flasks	Value [2] (thousands)
1970	51	[3]222,495	17,587	15,005	547	459	18,593	$7,582
1971	39	[3]131,120	12,485	19,089	698	306	13,489	3,944
1972	30	58,942	5,835	W	W	W	5,835	1,274
1973	18	14,280	1,133	W	W	86	1,219	349
1974	9	13,108	1,123	12,465	164	24	1,311	370

W Withheld to avoid disclosing individual company confidential data; included with "Furnaced."
[1] Includes mercury recovered from old surface ores, dumps, and placers.
[2] Value calculated at average New York price.
[3] Includes ore and mercury from dumps not separable.

Molybdenum.—Output of molybdenum declined about 50%. The molybdenum was in the form of oxide and sulfide concentrates recovered as a byproduct of treating tungsten ore from the Pine Creek mine (Inyo County) by Union Carbide Corp. This was mainly due to a lowering of the ore grade.

Nickel.—The Bureau of Mines Albany (Oregon) Metallurgy Research Center has been conducting research to develop a process of selectively recovering nickel and cobalt from a low-grade laterite deposit; namely, the Pine Flat deposit occurring in northern California and southern Oregon. The process involves reduction of the ore followed by an oxidizing ammonium hydroxide-ammonium sulfate leach with countercurrent solvent extraction and electrowinning. The initial results are encouraging.

One of the Bureau's long-range programs is to complete an up-to-date computerized information bank on all domestic mineral

resources to be known as the Minerals Availability System (MAS). As part of the input to this MAS program, the Bureau conducts and sponsors cooperative mineral resource projects with State mineral resource organizations. One such effort was being conducted on nickel resources in California by the California Division of Mines and Geology. About 45 properties were under investigation, and the work was expected to be finished in 1975.

Rare-Earth Minerals.—Molybdenum Corporation of America (Molycorp) produced more than 97% of the U.S. output of rare-earth oxides (REO) contained in concentrates at its bastnäsite mine at Mountain Pass. According to the company's annual report for 1974, sales of rare-earth products were a record $23.1 million compared with the previous high of $21.6 million in 1973. Rare-earth oxides contained in concentrates produced at Mountain Pass totaled 43.9 million pounds compared with 38.7 million pounds in 1973. Operating profits were below the 1973 level due to higher production costs as a result of substantial increases in the cost of supplies and shortages of chemical reagents. This resulted in lower mill recovery and less production than would otherwise have been achieved. By yearend, the problems had been resolved.

All markets except color television phosphors remained strong throughout 1974. Demand for rare-earth minerals in iron and steel, petroleum cracking catalysts, glass additives, and glass polishing more than compensated for the downturn in color television. To meet these increased market needs, grinding and other processing capacities were expanded at the Mountain Pass mine and mill. Additional dryer capacity was being added to the Mountain Pass chemical processing facilities.

Silver.—Silver production (recoverable content) declined 25% compared with that of 1973. Gold-silver ore from the Zaca mine in Alpine County—operated by Claude B. Lovestedt—was the major source of the State's silver production. Smaller quantities were recovered from tungsten ore from the Pine Creek mine and lead-zinc ore from the Darwin mine (both in Inyo County), silver ore from the Amelia-Cowboy No. 2 mine (Kern County), and gold ore from the Boomerang dump (San Bernardino County).

Tungsten.—More than two-thirds of the United State's recorded production of tungsten ore and concentrates came from California mines, and over 99% of this came from the Pine Creek mine in Inyo County, which is operated by Union Carbide Corp. Small tonnages of ore were reported from 12 other mines in California in 1974, which are located in Fresno, Inyo, Los Angeles, Mariposa, Mono, San Bernardino and San Diego Counties. Most of this ore was treated and the concentrate shipped to Union Carbide plant at Pine Creek near Bishop, Calif., or to Kennametal, Inc., plant in Churchill County, Nev., for upgrading to a marketable product. Teledyne Wah Chang was reported to have produced and stockpiled tungsten ore at the Strawberry mine in Madera County. Others reported assessment work or exploration work only at their tungsten mines in California during 1974.

Late in 1974 Union Carbide announced plans to reopen the Tempiute tungsten property in southern Nevada near Alamo. Part of this property is leased from Teledyne Wah Chang. When in full-scale operation by about mid 1976, about 2 million pounds of tungsten in concentrate will be produced annually. The concentrate will be trucked to the Union Carbide Corp. Pine Creek facility near Bishop, to be converted to ammonium paratungstate, a marketable product.

The Bureau of Mines Salt Lake City Metallurgy Research Center continued studies on developing extractive metallurgical techniques to economically recover tungsten from the Searles Lake brines, which contain an estimated one-half of the Nation's tungsten resources.

Uranium.—There is no uranium activity presently; however, there has been renewed exploration interest in the State, primarily by the major oil and energy firms. The most recent commercial production was in 1966, and the first reported output of uranium ore was in 1954, followed by modest shipments until 1966. In the 1970's, among the potential uranium resource areas that have had revived interest are the Peterson Mountain deposit in Lassen County, the Sonora Pass deposit in Tuolumne County, and the Coso Range deposit in Inyo County. During the year, the California Division of Mines and Geology inspected most of the radioactive mineral deposits discovered in the mid-fifties and sixties.

Table 24.—Principal producers

Commodity and company	Address	Type of activity	County
Asbestos:			
Atlas Asbestos Co	P.O. Box 805 Coalinga, Calif. 93210	Open pit mine	Fresno.
Coalinga Asbestos Co	P.O. Box 1045 Coalinga, Calif. 93210	do	Do.
Pacific Asbestos Corp	P.O. Box 127 Copperopolis, Calif. 95228	do	Calaveras.
Barite: Industrial Minerals Co	1057 Commercial St. San Carlos, Calif. 94070	do	Shasta.
Boron minerals and compounds: U.S. Borax and Chemical Corp.[1]	P.O. Box 75128 Sanford Station Los Angeles, Calif. 90005	do	Inyo and Kern.
Bromine: Kerr-McGee Chemical Corp.[2]	OMB–508, Kerr-McGee Bldg. Oklahoma City, Okla. 73102	Lake brines	San Bernardino.
Calcium chloride: National Chloride Co. of America	615 South Flower St. Suite 803 Los Angeles, Calif. 90017	do	Do.
Carbon dioxide (natural):			
Standard Oil Co.[3]	225 Bush St. San Francisco, Calif. 94120	Plant	Kern.
Cement:			
Amcord, Inc.[4]	610 Newport Center Dr. Newport Beach Calif. 92660	Plants	Riverside and San Bernardino.
The Flintkote Co.[5]	San Francisco, Calif. 94104	do	Calaveras and Shasta.
California Portland Cement Co.[6]	800 Wilshire Blvd. Los Angeles, Calif. 90017	do	Kern and San Bernardino.
Kaiser Cement and Gypsum Corp.[6]	300 Lakeside Dr. Oakland, Calif. 94612	do	San Bernardino and Santa Clara.
Monolith Portland Cement Co.	3326 San Fernando Rd. Los Angeles, Calif. 90065	Plant	Kern.
General Portland, Inc	3810 Wilshire Blvd. Los Angeles, Calif. 90005	do	Do.
Southwestern Portland Cement Co.[4]	1034 Wilshire Blvd. Los Angeles, Calif. 90017	do	San Bernardino.
Clays:			
Wilbur Ellis Co	P.O. Box 1286 Fresno, Calif. 93715	Pit	San Benito.
Interpace Corp	2901 Los Feliz Blvd. Los Angeles, Calif. 90039	Pits	Amador, Placer, Riverside, Sutter, Yuba.
Lightweight Processing Co	650 South Grand Ave. Los Angeles, Calif. 90017	Pit	Ventura.
NL Industries	Box 218 Newberry Springs, Calif. 92365	Pit	San Bernardino.
Copper: Union Carbide Corp.[7]	270 Park Ave. New York, N.Y. 10017	Underground mine.	Inyo.
Diatomite:			
GREFCO, Inc	630 Shatto Pl. Los Angeles, Calif. 90005	Open pit mine	Santa Barbara.
Johns-Manville Products Corp.[8]	Lompoc, Calif. 93436	do	Do.
Feldspar: Owens-Illinois, Inc	P.O. Box 1035 Toledo, Ohio 43601	do	Monterey.
Gold:			
Great Western Gold Co	Vanderbilt Star Rte. Nipton, Calif. 92366	Underground mine.	San Bernardino.
Santoni & Santoni	5078 West Shields Fresno, Calif. 93705	Placer mines	Various.
Gypsum:			
H. M. Holloway, Inc	714 6th St. Wasco, Calif. 93280	Open pit mine	Kern.
United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	Open pit mine and plant.	Imperial.
Iron ore: Kaiser Steel Corp	P.O. Box 158 Eagle Mountain, Calif. 92241	do	Riverside.
Lead: Brownstone Mining Co	425 Inge Lone Pine, Calif. 93545	Underground mine.	Inyo.

See footnotes at end of table.

Table 24.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Lime:			
Amstar Corp	50 California St. San Francisco, Calif. 94106	Plants	Monterey and Yolo.
Holly Sugar Corp	Box 1052 Colorado Springs, Colo. 80901	do	Glenn, Imperial, Orange, San Joaquin.
Kaiser Aluminum & Chemical Corp.[9].	Moss Landing, Calif. 95039	Plant	Monterey.
Pfizer, Inc.[10]	Box 558 Lucerne Valley, Calif. 92356	do	San Bernardino.
Magnesium compounds:			
FMC Corp	P.O. Box 344 Newark, Calif. 94560	do	San Diego.
Merck & Co., Inc	Rahway, N.J. 07065	do	San Mateo.
Mercury:			
Floyd Edwards	415 7th St. Petaluma, Calif. 94952	Underground mine.	Marin.
Guadalupe Mining Co	14900 Guadalupe Mine Rd. San Jose, Calif. 95120	do	Santa Clara.
W. T. Kritikos	1036 Reisling Dr. Pleasanton, Calif. 94566	do	Napa.
Santa Clara Quicksilver Co	21731 Almaden Rd. San Jose, Calif. 95120	do	Santa Clara.
Natural gas liquids:			
Atlantic Richfield Co.[11]	445 South Figueroa St. Los Angeles, Calif. 90054	Plants	Kern, Santa Barbara, Ventura.
Union Oil Co. of California [11]	P.O. Box 7600 Los Angeles, Calif. 90054	do	Various.
Peat:			
Delta Humus Co	P.O. Box 89 Holt, Calif. 95234	Bog	San Joaquin.
Peter J. Gambetta	Route 1, Box 78 Brentwood, Calif. 94513	Bog	Contra Costa.
Radel, Inc	P.O. Box 7075 Reno, Nev. 89502	Bog	Modoc.
Perlite (crude): American Perlite Co.	11831 Vose St. North Hollywood, Calif. 91605	Open pit mine	Inyo.
Perlite (expanded):			
Harborlite Corp	P.O. Box 458 Escondido, Calif. 92025	Plant	San Diego.
Paramount Perlite Co., Inc	P.O. Box 83 Paramount, Calif. 90723	do	Los Angeles.
Redco, Inc	11831 Vose St. North Hollywood, Calif. 91605	do	Do.
Petroleum and natural gas:[12]			
Pumice:			
Cinder Products Co	3450 Lakeshore Ave. Oakland, Calif. 94610	Open pit mine	Lake.
Glass Mountain Block, Inc	Redding Highway Alturas, Calif. 96101	do	Siskiyou.
Red Lava Products of California.	Star Route Clearlake, Calif. 95423	Plant	Lake.
Shastalite Cinder Co	P.O. Box 341 Weed, Calif. 96094	do	Siskiyou.
Rare-earth minerals: Molybdenum Corp. of America	Nipton, Calif. 92366	Open pit mine	San Bernardino.
Salt: Leslie Salt Co.[13]	505 Beach St. San Francisco, Calif. 94111	Open pit mines and evaporators.	Alameda, Napa, San Bernardino, San Mateo.
Sand and gravel:			
Conrock Co	Box 2950, Terminal Annex Los Angeles, Calif. 90051	Pits	Los Angeles, Orange, San Bernardino.
Kaiser Industries Corp.[6]	300 Lakeside Dr. Oakland, Calif. 94612	do	Alameda, Contra Costa, Glenn, Santa Clara, Santa Cruz, Sonoma.

See footnotes at end of table.

Table 24.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
Owl Rock Products Co	P.O. Box 47 Irwindale, Calif. 91707	Pits	Fresno, Los Angeles, Orange, Riverside.
Pacific Cement & Aggregates [6]	400 Alabama St. San Francisco, Calif. 94110	do	Alameda, Fresno, Monterey, Sacramento, San Joaquin, San Mateo, Santa Cruz, Tulare, Yolo.
Silver: Claude B. Lovestedt [14]	P.O. Box 1496 Carson City, Nev. 89701	Mine	Alpine.
Sodium compounds: Stauffer Chemical Co.	Box 3050 San Francisco, Calif. 94108	Lake brines	San Bernardino.
Stone:			
Granite Rock Co	P.O. Box 151 Watsonville, Calif. 95076	Quarry	San Benito.
Basalt Rock Co., Inc	P.O. Box 2540 Napa, Calif. 94558	do	Marin, Napa, Sonoma.
East Bay Excavating Co	28814 Mission Blvd. Hayward, Calif. 94544	do	Kern and San Bernardino.
Tungsten: Union Carbide Corp.[15].	270 Park Ave. New York, N.Y. 10017	Underground mine.	Inyo.

[1] Also sodium compounds.
[2] Also boron minerals and compounds, lime, lithium minerals, potassium salts, and sodium compounds.
[3] Byproduct of natural gasoline processing; also petroleum production.
[4] Also clays and stone.
[5] Also clays, sand and gravel, and stone.
[6] Also stone.
[7] Also crude asbestos, gold, silver, molybdenum, and tungsten.
[8] Also talc, soapstone, and pyrophyllite.
[9] Also magnesium compounds.
[10] Also clays, and talc, soapstone, and pyrophyllite.
[11] Also petroleum and natural gas.
[12] Most of the major oil and gas companies, and many smaller companies operate in California; several commercial directories contain lists of them.
[13] Also calcium compounds.
[14] Also gold, copper, lead, and zinc.
[15] See also listing under copper and footnote number 7.

The Mineral Industry of Colorado

By Joseph Blake Smith [1]

Mineral production in Colorado in 1974 was valued at $750.3 million, 41% greater than in 1973. Most notable increases were in the value of molybdenum, which was up $25 million, and the value of petroleum production, up $128 million over the 1973 value. The value of production for most other mineral commodities increased over that of 1973. Exceptions were clay, fluorspar, pumice, and sand and gravel.

Colorado ranked first in the nation in output of molybdenum and tin, and was second in production of tungsten.

Thirty-one mineral commodities, the same as 1973, were produced in 1974. Of these, 13 were classified as nonmetals, 11 as metals, and 7 as fuels. The metals comprised 33% of the total mineral value, fuels 54%, and nonmetals 13%. Based on value, the leading commodity in each group was molybdenum, petroleum, and sand and gravel, respectively (see fig. 1). These three commodities accounted for more than 60% of the total value. All of the fuels and all of the commodities within the metals group had gains in value compared with 1973. Nine of the nonmetals had increases in value and four had losses. Twenty-one of the 31 commodities produced had output valued at over $1 million; 13 had values exceeding $10 million.

[1] State Liaison Officer, Bureau of Mines, Denver, Colo.

Table 1.—Mineral production in Colorado [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Carbon dioxide ---- thousand cubic feet --	W	W	123,016	W
Clays ---- thousand short tons --	794	$1,710	663	$1,588
Coal (bituminous) ---- do ----	6,233	46,190	6,896	64,677
Copper (recoverable content of ores, etc.) short tons --	3,123	3,716	3,012	4,657
Gem stones ----	NA	131	NA	135
Gold (recoverable content of ores, etc.) troy ounces --	63,422	6,203	52,083	8,320
Gypsum ---- thousand short tons --	151	568	191	800
Lead (recoverable content of ores, etc.) - short tons --	28,112	9,159	24,609	11,074
Lime ---- thousand short tons --	178	3,371	198	3,815
Natural gas ---- million cubic feet --	137,725	24,304	144,629	28,926
Natural gas liquids:				
Natural gasoline and cycle products thousand 42-gallon barrels --	1,424	4,295	1,574	9,319
LP gases ---- do ----	1,978	6,488	2,580	14,190
Peat ---- thousand short tons --	28	163	30	201
Petroleum (crude) ---- thousand 42-gallon barrels --	36,590	155,507	37,508	283,904
Sand and gravel ---- thousand short tons --	33,767	45,493	23,793	39,674
Silver (recoverable content of ores, etc.) thousand troy ounces --	r 3,598	r 9,204	2,784	13,113
Stone ---- thousand short tons --	6,357	14,003	6,572	15,109
Uranium (recoverable content U_3O_8) thousand pounds --	r 1,888	r 12,274	W	W
Zinc (recoverable content of ores, etc.) - short tons --	58,339	24,106	49,489	35,533
Value of items that cannot be disclosed: Cement, feldspar, fluorspar, iron ore, molybdenum, perlite, pumice, pyrites, salt, tin, tungsten, vanadium, and values indicated by symbol W ----	XX	164,806	XX	215,264
Total ----	XX	r 531,691	XX	750,299
Total 1967 constant dollars ----	XX	389,783	XX	p 358,793

r Revised. p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

Table 2.—Value of mineral production in Colorado, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	$19,451	$32,553	Petroleum, sand and gravel, natural gas, natural gas liquids, lime, stone.
Alamosa	W	W	Sand and gravel, peat.
Arapahoe	18,225	23,697	Petroleum, natural gas liquids, sand and gravel, natural gas, stone.
Archuleta	W	W	Petroleum, sand and gravel, natural gas.
Baca	1,021	W	Natural gas, petroleum, sand and gravel, stone.
Bent	176	251	Natural gas, petroleum, sand and gravel, clays, stone.
Boulder	18,366	18,080	Cement, sand and gravel, stone, lime, clays, gold, petroleum, peat, tungsten.
Chaffee	W	W	Stone, sand and gravel, peat.
Cheyenne	W	4,674	Petroleum, natural gas liquids, natural gas.
Clear Creek	W	W	Molybdenum, sand and gravel, silver, lead, gold, stone, copper.
Conejos	183	112	Silver, gold, sand and gravel, zinc, copper.
Costilla	W	W	Pumice.
Crowley	W	W	Sand and gravel.
Custer	W	W	Sand and gravel, perlite.
Delta	W	W	Coal, sand and gravel, lime.
Denver	W	75	Sand and gravel, stone.
Dolores	2,166	3,231	Petroleum, natural gas, silver, copper, stone, gold, lead, zinc.
Douglas	W	W	Clays, sand and gravel, stone.
Eagle	W	W	Zinc, silver, lead, sand and gravel, copper, gold, stone, pumice.
Elbert	856	604	Petroleum, natural gas, clays, sand and gravel, stone.
El Paso	W	W	Stone, sand and gravel, clays.
Fremont	r 17,208	17,955	Cement, stone, coal, gypsum, clays, petroleum, sand and gravel, feldspar.
Garfield	r 1,087	2,203	Vanadium, sand and gravel, uranium, natural gas, stone, coal.
Gilpin	W	W	Gold, silver, lead, zinc, copper, peat, stone.
Grand	109	165	Sand and gravel, stone.
Gunnison	W	W	Coal, zinc, sand and gravel, lead, silver, copper, gold.
Hinsdale	--	2	Sand and gravel.
Huerfano	162	W	Sand and gravel, petroleum, natural gas.
Jackson	6,147	5,013	Petroleum, natural gas, fluorspar, coal, sand and gravel, stone.
Jefferson	r 18,029	25,850	Sand and gravel, uranium, stone, clays, peat.
Kiowa	W	W	Petroleum, natural gas, sand and gravel.
Kit Carson	W	W	Sand and gravel, petroleum.
Lake	r 117,115	152,909	Molybdenum, tungsten, zinc, lead, silver, gold, tin, copper, pyrites, sand and gravel.
La Plata	10,287	12,542	Natural gas liquids, natural gas, sand and gravel, petroleum, stone, coal.
Larimer	18,669	20,571	Cement, stone, sand and gravel, petroleum, gypsum, lime.
Las Animas	W	10,906	Coal, sand and gravel, clays, stone.
Lincoln	164	128	Sand and gravel.
Logan	7,109	10,555	Petroleum, natural gas liquids, natural gas, lime, sand and gravel.
Mesa	r 3,495	3,507	Natural gas liquids, uranium, sand and gravel, vanadium, natural gas, petroleum, stone, coal.
Mineral	6,491	7,214	Silver, lead, zinc, copper, gold.
Moffat	11,174	14,051	Petroleum, natural gas, coal, sand and gravel, stone.
Montezuma	1,331	1,884	Petroleum, sand and gravel, natural gas, stone.
Montrose	r 4,447	6,167	Uranium, vanadium, coal, sand and gravel, salt, stone.
Morgan	4,444	5,918	Petroleum, natural gas liquids, lime, natural gas, sand and gravel.
Otero	W	W	Lime, sand and gravel, stone.
Ouray	W	7,291	Zinc, lead, copper, silver, gold, sand and gravel.
Park	W	W	Peat, sand and gravel, gold, silver, lead.
Phillips	W	6	Sand and gravel.
Pitkin	6,665	10,309	Coal, iron ore, sand and gravel, natural gas, stone.
Prowers	W	136	Sand and gravel, petroleum, natural gas.
Pueblo	W	W	Lime, sand and gravel, clays, stone.
Rio Blanco	94,487	171,928	Petroleum, natural gas, natural gas liquids, coal.
Rio Grande	W	W	Sand and gravel.
Routt	W	W	Coal, petroleum, sand and gravel, natural gas.

See footnotes at end of table.

Table 2.—Value of mineral production in Colorado, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Saguache	W	--	
San Juan	$8,380	$11,925	Gold, zinc, lead, silver, copper.
San Miguel	r 19,063	28,067	Vanadium, zinc, uranium, lead, copper, gold, silver, natural gas, petroleum, sand and gravel, stone.
Sedgwick	W	W	Lime, natural gas, sand and gravel.
Summit	897	468	Sand and gravel.
Teller	W	250	Gold, stone, peat, silver, sand and gravel.
Washington	11,083	W	Petroleum, natural gas, sand and gravel.
Weld	18,218	37,755	Petroleum, natural gas, natural gas liquids, coal, sand and gravel, lime, stone.
Yuma	W	W	Sand and gravel, natural gas.
Undistributed [2]	r 84,988	101,344	
Total [3]	r 531,691	750,299	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Values for petroleum are based on an average price per barrel for the State. Values for uranium have been estimated for 1973.

[2] Includes some sand and gravel (1973) that cannot be assigned to specific counties, gem stones, natural carbon dioxide (1974), and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Colorado business activities

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	1,052.7	NA	NA
Employment	do	1,016.7	NA	NA
Unemployment	do	36	NA	NA
Wholesale and retail trade	do	226	232.2	+2.7
Finance, insurance, and real estate	do	55	56.5	+2.7
Mining	do	14.7	16.3	+10.9
Construction	do	72.1	66	−8.5
Government	do	197.2	201.9	+2.4
Services	do	169.2	180	+6.4
Transportation and public utilities	do	58.8	61	+3.7
Personal income:				
Total	millions	$12,255	$13,377	+9.2
Per capita		$4,966	$5,343	+7.6
Construction activity:				
New housing units authorized		45,502	19,778	−56.5
Value of nonresidential construction	millions	$387.1	$382	−1.3
Highway construction contracts awarded	do	$79	$75	−5.1
Cement shipments to and within Colorado	thousand short tons	1,639	1,373	−16.2
Farm marketing receipts	millions	$2,103	NA	NA
Mineral production value	do	$532	$750	+41.1

p Preliminary. NA Not available.

Source: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and U.S. Bureau of Mines.

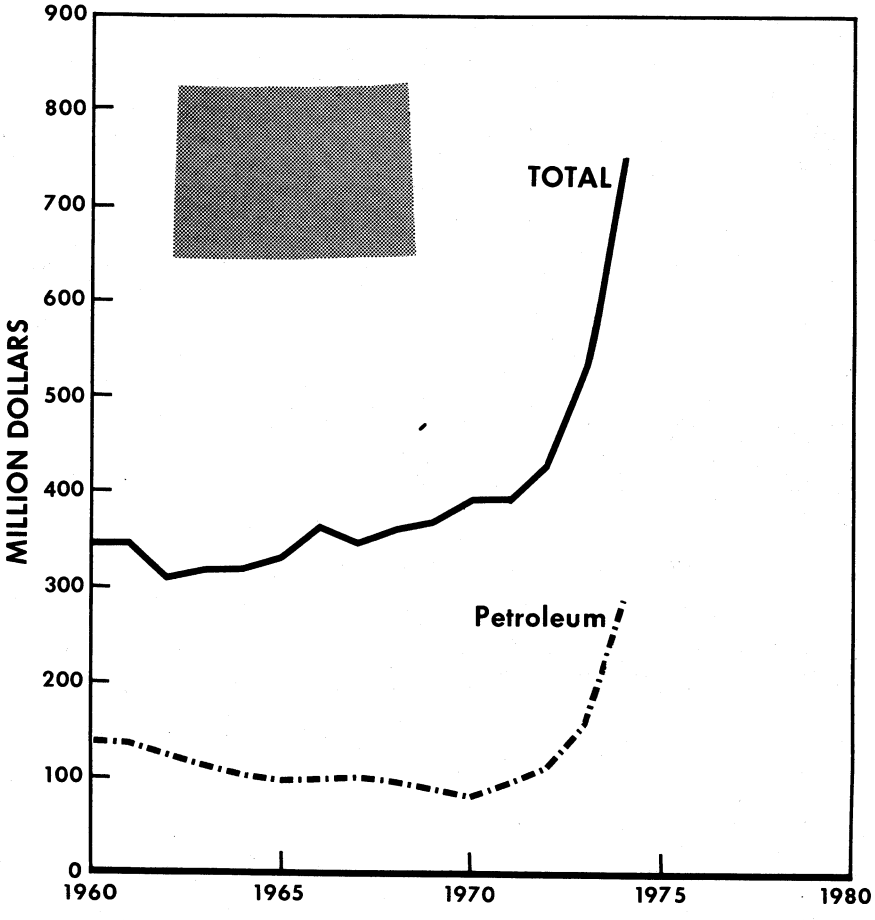

Figure 1.—Value of petroleum, and total value of mineral production in Colorado.

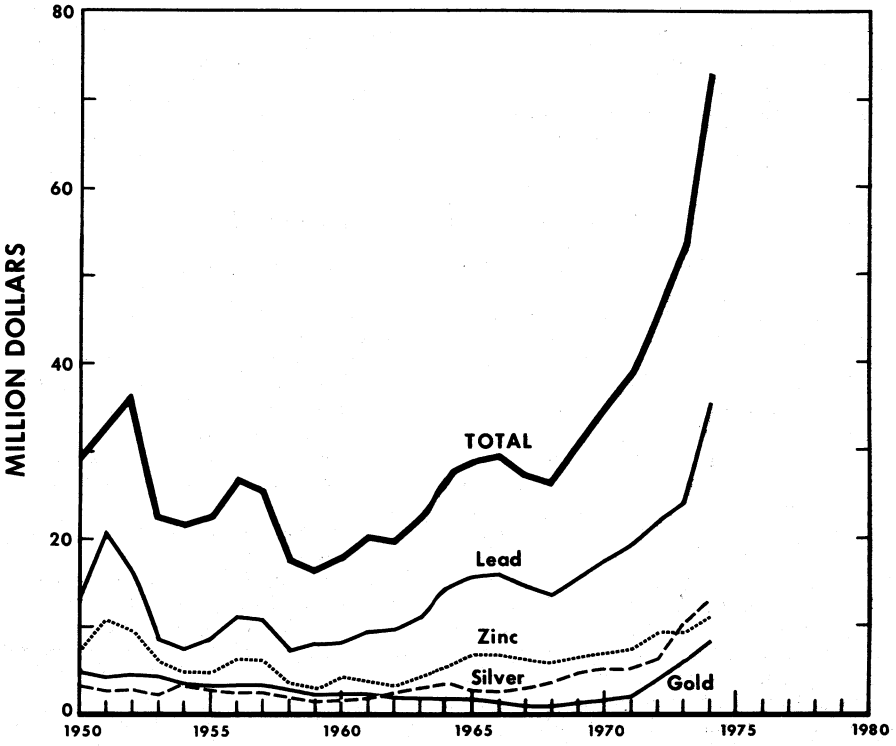

Figure 2.—Total value of mine production of gold, silver, lead, copper, and zinc, in Colorado.

Legislation and Government Programs.—Governor John Vanderhoof signed into law a bill creating the Colorado Energy Research Institute (CERI) to be headquartered at the Colorado School of Mines. CERI will coordinate statewide efforts for solutions to Colorado's energy problems. An important feature of the bill was funding for 100 1-year CERI scholarships of $660 each to be awarded at 8 colleges to Colorado students entering energy or mineral related programs. The Governor also signed a bill broadening the distribution of monies received from leasing Federal mineral lands to assist in planning and providing facilities and services for areas affected by development and production of energy resources on such lands, and a bill for designating areas as mineral resource areas that shall be protected and administered to permit the extraction and exploration of minerals.

In cooperation with the Federal Bureau of Mines, the U.S. Geological Survey (USGS) published a 12-color Colorado map showing the location and value of metallic and related mineral production of the State through 1970.

Colorado voters approved a constitutional amendment requiring voter approval for nuclear shots to take place in the State.

The Library of Congress sponsored a study that estimated that 27 billion tons of aluminum-bearing dawsonite and 30 billion tons of nahcolite (sodium bicarbonate) can be found in oil shale deposits underlying 150,000 acres of the Piceance Creek basin.

The Atomic Energy Commission (AEC) announced completion of an experimental gas well 8,170 feet deep demonstrating application of massive hydraulic fracturing of tight gas sands. The test well, cosponsored by the Federal Bureau of Mines and industry, is located in the Piceance Creek basin, Rio Blanco County.

AEC awarded uranium mining leases

for eight tracts of land in Montrose County covering about 5,300 acres. Cotter Corp., acquired during the year by Commonwealth Edison Co., received leases on seven of the tracts. The other was awarded to Union Carbide Corp.

The Colorado Division of Mines presented its small coal mine safety award to the King Coal Co. The operator has been at variance with Federal mine inspectors for years and, to emphasize her position, she has forced inspectors off the property.

REVIEW BY MINERAL COMMODITIES

Cadmium, Indium, and Thallium.—American Smelting and Refining Co. (Asarco) recovered cadmium, indium, thallium metal, and thallous sulfate at its Globe smelter in Denver from flue dust, dross, and byproduct materials from out-of-State smelters. The output was not included in the State mineral production because the origin of the processed materials could not be determined. Cadmium was produced with zinc ores mined in Lake, Ouray, San Juan, and San Miguel Counties.

Copper.—Copper production decreased 4% in quantity and increased 25% in value compared with 1973. The increase in value reflected an increase in the average price which was 77.3 cents for the year. Of the 18 mines having copper production, the Idarado mine of Idarado Mining Co. in Ouray and San Miguel Counties accounted for 62% of the State copper output. Federal Resources Corp.'s Camp Bird mine in Ouray County was the second largest producer of copper, followed by Standard Metal Corp.'s Sunnyside mine at Cement Creek, north of Silverton, San Juan County.

Other major producers were American Smelting and Refining Co.'s Black Cloud mine at Leadville, The New Jersey Zinc Co.'s Eagle mine at Gilman, Rico Argentine Mining Co.'s Rico mine in Dolores County, and Homestake Mining Co.'s Bulldog Mountain mine at Creede.

Exxon Co., U.S.A. staked 60 lode mining claims for copper and other minerals in the Elk Park area of San Juan County.

Henrietta Mines, Ltd. reported extensive low-grade (0.1% to 0.67%) copper resources at its Allard mine 18 miles west of Durango on 31 optioned and 105 staked mining claims in the La Plata Mountains. More than 40 holes have been drilled, 1 at least 2,718 feet deep. A six-hole program intersected 50 to 1,080 feet of mineralization containing 0.41% to 0.67% copper.

In Montrose County, James R. Lammert reopened the Maude Copper mine, and ore was shipped to a mill in Lisbon Valley, Utah.

Gold.—Gold output decreased 11,339 troy ounces below the 1973 production of 63,422 troy ounces. Value for the year was up 34%; average price for the year was $159.74 per troy ounce. Most of the gold was recovered as a coproduct with base metal ores.

Standard Metal Corp.'s Sunnyside mine near Silverton maintained its position as the State's largest gold producer and accounted for 55% of the total output.

Other principal gold production was from Idarado Mining Co. operations with 13,819 ounces, the Leadville unit (Black Cloud mine) of American Smelting and Refining Co., The New Jersey Zinc Co.'s Eagle mine, and Earth Sciences, Inc.'s heap leaching operation at the Stratton Estate in the Cripple Creek district.

Twenty-five lode mines and a single placer operation yielded gold, compared with 16 lode mines and 5 placer mines in 1973. In addition, a sand and gravel operation in Boulder County produced 80 troy ounces. Eight lode mines yielded more than 200 ounces of gold. Among the 14 counties with gold output during 1974, San Juan, San Miguel, Lake, and Ouray were the leading sources; their production accounted for nearly 95% of the State's output.

At Colorado Springs, Gold Hill Mesa Corp. engaged in a project seeking to recover 362,000 ounces of gold contained in 14 million tons of mill tailings which cover 400 acres on a site just 2 miles west of the Colorado Springs business district. The tailings are the result of a 40-year milling operation by Golden Cycle Corp. which processed Cripple Creek ores until 1949.

In the Central City-Blackhawk district, Earth Sciences, Inc. put into production the Smith mine, and also acquired leases

on the Pittsburgh and Notaway groups from Kazel Mountain Mines.

In Dolores County, Rico Argentine Mining Co. joined with Crystal Oil Co., Inc., to construct a cyanide leach plant north of Rico.

In the Cripple Creek district, Golden Cycle Corp. rehabilitated the Carlton mill, the 3,100-foot-deep Ajax shaft, and the 6.5-mile Carlton tunnel. The Ajax, north of Victor, was being sunk an additional 250 feet. The Strong shaft was cleaned out and repaired, and the mine was extensively sampled. At the Globe Hill deposit on the Stratton Estate, Earth Sciences, Inc. completed placing low-grade-surface-mined ore on an asphalt leach pad and extracted gold using cyanide.

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

County	Mines producing [1]		Material sold or treated [2] (short tons)	Gold		Silver	
	Lode	Placer		Troy ounces	Value	Troy ounces	Value
1972, total	14	4	1,276,795	61,100	$3,580,461	3,663,832	$6,173,558
1973, total	16	5	1,297,513	63,422	6,203,306	r 3,598,209	r 9,204,220
1974:							
Boulder	--	--	--	80	12,779	--	--
Clear Creek	4	--	2,862	24	3,834	2,740	12,906
Eagle	1	--	200,232	701	111,978	206,012	970,317
Gilpin	5	--	2,225	339	54,152	4,659	21,943
Gunnison	1	--	12,719	5	799	15,153	71,371
Ouray	3	--	142,759	2,148	343,122	134,090	631,563
San Juan	1	--	192,041	28,493	4,551,472	237,476	1,118,512
San Miguel	1	--	339,807	11,840	1,891,321	358,328	1,687,725
Undistributed [3]	9	1	428,844	8,453	1,350,283	1,825,520	8,598,199
Total [4]	25	1	1,321,489	52,083	8,319,740	2,783,978	13,112,536

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1972, total	3,944	$4,038,969	31,346	$9,422,556	63,801	$22,649,280	$45,864,824
1973, total	3,123	3,716,417	28,112	9,159,034	58,339	24,105,692	r 52,388,669
1974:							
Boulder	--	--	--	--	--	--	12,779
Clear Creek	(5)	513	16	7,029	--	--	24,282
Eagle	167	258,826	2,143	964,483	17,213	12,358,880	14,664,484
Gilpin	7	10,642	36	16,084	18	13,038	115,859
Gunnison	11	16,243	196	88,342	318	228,386	405,141
Ouray	618	955,269	3,475	1,563,861	5,127	3,681,393	7,175,208
San Juan	321	495,860	3,531	1,588,930	5,808	4,169,938	11,924,712
San Miguel	1,591	2,459,425	7,085	3,188,175	8,716	6,257,905	15,484,551
Undistributed [3]	298	460,018	8,127	3,657,310	12,289	8,823,800	22,889,610
Total [4]	3,012	4,656,796	24,609	11,074,214	49,489	35,533,340	72,696,626

[1] Operations from which gold, silver, copper, lead, or zinc were recovered as byproducts from fluorspar, sand and gravel, or cleanup, not counted as mines.
[2] Does not include gravel washed.
[3] Includes Conejos, Dolores, Lake, Mineral, Park, and Teller Counties, combined to avoid disclosing individual company confidential data.
[4] Data may not add to totals shown because of independent rounding.
[5] Less than ½ unit.

Table 5.—Colorado: Mine production (recoverable) of gold, silver, copper, lead, and zinc, in 1974, by type of material processed and method of recovery

Type of material processed and method of recovery	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Amalgamation	11,074	2,379	--	--	--
Cyanidation	929	178,615	--	--	--
Smelting of concentrates	39,360	2,505,312	2,874	24,537	49,385
Direct smelting of:					
Ore	308	91,205	136	15	[1]
Cleanup	186	6,467	2	57	104
Total	51,857	2,783,978	3,012	24,609	49,489
Placer	226	--	--	--	--
Grand total	52,083	2,783,978	3,012	24,609	49,489

[1] Less than ½ unit.

Table 6.—Colorado: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by class of ore or other source material

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Dry gold, dry gold-silver, dry silver [2 3]	6	218,761	1,232	1,423,935	53	1,380	609
Copper	2	10,975	339	115,404	199	16	3
Copper-lead-zinc	1	396,600	13,819	418,216	1,857	8,269	10,172
Lead	10	3,110	43	5,303	1	33	[4]
Lead-zinc	6	464,300	35,829	626,811	869	12,654	21,385
Zinc	1	195,563	400	116,945	31	2,143	17,213
Lead tailings and lead-zinc cleanup [2]	2	32,180	195	77,364	2	114	107
Total	25	1,321,489	51,857	2,783,978	3,012	24,609	49,489
Placer	[5] 1	--	226	--	--	--	--
Grand total	26	1,321,489	52,083	2,783,978	3,012	24,609	49,489

[1] Detail will not necessarily add to totals shown because some mines produce more than one class of material.
[2] Combined to avoid disclosing individual company confidential data.
[3] Includes material that was leached.
[4] Less than ½ unit.
[5] Sand and gravel operations not counted as producing mines.

Standard Metals Corp. will expand, by 50%, the capacity of its Howardsville mill near Silverton. Idarado Mining Co. continued to expand its position by acquiring the former West Shore Co. and East Ridge Co. mining properties.

Iron Ore.—Pitkin Iron Corp.'s Cooper mine near Ashcroft, operated by Morrison-Knudsen Co., Inc., was the State's only iron ore producer. The 67% magnetite ore is trucked through Aspen to a secondary crusher at Woody Creek, and then rail shipped to the Pueblo smelter of CF&I Steel Corp. Trucking schedules have been designed to avoid disrupting traffic flow to ski areas near Aspen and Snowmass.

Lead.—Output of lead decreased 13% however, because of a price increase, the value of production was up by 21%. Average price for the year was 22.5 cents per pound.

The Idarado mine in Ouray and San Miguel Counties was the largest source with 8,404 tons of lead. Other principal mines, in order of output, were the Leadville Unit of the Black Cloud mine (Asarco), Sunnyside mine (Standard Metals Corp.), Camp Bird mine (Federal Resources Corp.), Eagle mine (New Jersey Zinc Co.), and Bulldog Mountain mine (Homestake Mining Co.).

Five of the 10 counties with lead production had output of over 500 tons. Ranked according to output, the principal counties were San Miguel, Lake, San Juan, Ouray, and Mineral.

Supplying 29% of the State output, San

Miguel County had the most production.

Previous negotiations by Minerals Engineering Co. to acquire all of the stock of Statesman Mining Co., announced in August 1973, were not consummated. Instead, the transaction was altered to acquisition of the principal assets of Statesman by Minerals Engineering Co. The main asset acquired was Statesman's interest in the Emperius mine at Creede. Minerals Engineering Co. expanded capacity of the 150-ton-per-day Emperius mill to 300 tons, and continued exploration of a new ore body found on the 320 level of the Emperius mine.

U.S. Energy Corp. acquired a 47% interest in the outstanding shares of Crested Butte Silver Mining Co., Inc., in exchange for 80,000 shares of U.S. Energy's common stock. Crested Butte's assets are the Keystone mine and mill, 3 miles west of Crested Butte, and 2,300 acres of patented and unpatented mining claims. The mill is a 320-ton-per-day flotation plant.

In Lake County, the Sherman tunnel and Norsigo mill owned by Leadville Corp. was leased to Day Mines, Inc. of Wallace, Idaho. Day will modify the mill prior to further concentrate production.

Molybdenum.—Molybdenum was again the second most valuable mineral produced in Colorado. In 1974, shipments rose 3.7 million pounds above those of 1973. The two mines in Colorado, Climax in Lake County, and Urad in Clear Creek County, provided 58% of the nation's output of molybdenum and more than one-third of the world's production. Both mines are owned and operated by American Metal Climax, Inc. (AMAX). The Urad molybdenum mine, about 50 miles west of Denver, was closed due to exhaustion of its ore reserves. Urad's ore supply was known to be limited to 6 to 7 years from its startup in 1967. Comprehensive reclamation work will begin in 1975. Between $5 and $6 million is allocated for the reclamation work at Urad which includes landfill, reseeding, and closing of mine openings. All 130 employees at Urad will be transferred to AMAX's nearby Henderson molybdenum mine which is scheduled to begin production in mid-1976, and ultimately will produce over 50 million pounds per year of molybdenum contained in concentrates. In 1974, AMAX completed several major projects at the Henderson mine.

Silver.—Output of silver from 25 operations in 13 counties decreased 814 troy ounces (23%) below that of 1973; average price of silver for the year was $4.71 per troy ounce.

Nine mines had production exceeding 20,000 ounces. The two principal mines, Bulldog and Idarado, were responsible for 59% of the State output. As with gold, most of the silver was recovered as a coproduct of base metal ores. The Bulldog Mountain mine of Homestake Mining Co. was the major source of silver during the year. Production from the mine exceeded the output of the next largest producer, Idarado, by an appreciable amount. Other mines having silver production in excess of 20,000 troy ounces were the Rico (Rico Argentine Mining Co.), Silver Clad (Silver Bell Industries, Inc.), Eagle (New Jersey Zinc Co.), Black Cloud (Asarco), Sherman Tunnel (Leadville Corp. and Day Mines, Inc.), Camp Bird (Federal Resources Corp.), and Sunnyside (Standard Metals Corp.). Leading counties in silver output, in order of production were Mineral, Lake, San Miguel, San Juan, Eagle, and Ouray Counties.

Tin.—Byproduct tin concentrate was produced at the Climax mill of AMAX in Lake County. Shipments were slightly more than double that of 1973. Colorado, again the leading producing State with 94% of the nation's output, was followed by Alaska and New Mexico.

Tungsten.—Most of the output of tungsten concentrate was produced as a byproduct of milling operations at the Climax Molybdenum mine of AMAX. A small amount of tungsten was shipped from the Boulder County district by the Colorado Tungsten Corp. Colorado was second in the nation in production of tungsten in 1974; California was first.

Uranium.—Output of uranium oxide (U_3O_8) decreased in 1974 from the production of 1973, but value increased because of higher prices. Colorado stayed fourth in rank in the nation in uranium output behind New Mexico, Wyoming, and Utah. Colorado mines produced fewer tons of uranium ore in 1974 compared with that produced in 1973, but average grade of ore shipped was slightly higher.

Two uranium mills were active during 1974; the Uravan mill of Union Carbide Corp. and the Canon City mill of Cotter Corp. Combined capacity of the two mills is 1,750 tons of uranium ore per day.

At the beginning of the year, AEC esti-

mated uranium ore reserves for Colorado at 2.6 million tons with a 0.31% grade of U_3O_8 containing 8,000 tons of uranium oxide. Only ore reserves that can be mined at a cost of $8.00 or less per pound of U_3O_8 were included in the estimate. This reserve is 3% of the nation's total. After years of cutbacks, AEC's Grand Junction Raw Materials Procurement Office will expand its managing contractor's staff (Lucius Pitkin, Inc.) from 150 employees to 214. Most of the new employees will be professionals to boost research and development efforts in geological investigations. Appropriations reportedly will increase to $6.3 million in fiscal year 1975, up from $2.4 million in fiscal year 1974. AEC has 67 employees at the site, the all time low since the uranium heyday of the late 1950's when 500 people were employed. A new prime contract, now held by Lucius Pitkin, Inc., for a wider range of services will be negotiated with selected bidders and will take effect on July 1, 1975.

AEC awarded uranium mining leases to eight tracts of land in Montrose County covering about 5,325 acres. Cotter Corp., of Golden, received leases on seven of the tracts; the other was awarded to Union Carbide Corp. Cash payments totaling $1.65 million were received and are in addition to future production royalties and royalty bid amounts which are payable under lease terms.

In October, AEC presented uranium seminars at Grand Junction, Colo.

AEC Chairman Dr. Dixy Lee Ray asked Colorado's Governor Vanderhoof and seven other western governors for State participation in surveying piles of uranium tailings from inactive mills. The survey, which would be conducted by AEC in cooperation with the Environmental Protection Agency, is the first of a two-phase program to determine whether the tailings are properly controlled and, if not, what corrective actions might be taken if Congress authorizes a program.

AEC advertised (Commerce Business Daily, December 20, 1974) for services to design procedures for control of uranium mill tailing piles at approximately 18 locations in 8 western States. Control measures to be considered are for stabilization rather than for moving the pile to another location.

Commonwealth Edison Co. of Chicago completed acquisition, for $18 million, of Cotter Corp. of Lakewood, a uranium mining and milling concern. Cotter reportedly has the capability of producing about 1.5 million pounds of uranium concentrate a year, and has known reserves to sustain that production rate for several years. Cotter is operator of the Schwartzwalder uranium mine near Denver and a mill at Canon City. The Schwartzwalder mine produced throughout the year, and a winze was being sunk to ore bodies below the 12th level. The nearby Ludwig uranium mine was operated part-time.

In the Uravan mineral belt—Mesa, Montrose, and San Miguel Counties—the number of uranium-vanadium mines increased only slightly, but leasing by AEC of several tracts or uranium-bearing land and advancing prices for U_3O_8 prompted increased exploration throughout the district.

Union Carbide Corp. mill near Uravan operated at full capacity following a 50% cutback in mining which curtailed operations last year. The mill ran 3 shifts a day, 7 days a week, with a possibility of feeding between 15% to 20% more ore into the mill, if it was available. An AEC lease tract on Atchinson Mesa, acquired by Carbide, will be brought into production after exploration and testing, which will require up to 1 year.

Vanadium.—Colorado ranked second among States producing vanadium. Output increased this year after 5 years of decline. Production was in the form of fused vanadium oxide recovered at Union Carbide Corp.'s finishing mill at Rifle, Colo.

San Miguel and Montrose Counties were the leading sources of vanadium-bearing ore; other counties with production were Garfield and Mesa.

Zinc.—Zinc output was down by a substantial amount, 8,850 tons, but up 47% in value because of higher zinc prices. Average price per pound in 1974 was 35.9 cents. Ten counties had 15 operating mines. Eagle County ranked first in production, followed, in order of output, by Lake, San Miguel, San Juan, and Ouray Counties. These five counties accounted for 98% of the State total. Of the 15 producing mines, 6 had output of over 500 tons. The largest producers were the Eagle mine, operated by New Jersey Zinc Co. in Eagle County, and the Leadville Unit (Black Cloud mine), operated by

Asarco in Lake County. Other mines having more than 500 tons of output were the Idarado mine (Idarado Mining Co.), Sunnyside mine (Standards Metals Corp.), Camp Bird mine (Federal Resources Corp.), and Bulldog Mountain mine (Homestake Mining Co.).

MINERAL FUELS

Carbon Dioxide.—According to the Colorado Oil and Gas Conservation Commission, sales of carbon dioxide from the McElmo field, Montezuma County, were 123 million cubic feet. Production declined 19.8 million cubic feet (13.9%) below that of 1973.[2]

Coal (Bituminous).—Although coal production increased only 11% (663,000 tons) in 1974 over that of 1973, value increased 40%. Thirty-one producing mines operated in 14 counties; 1 mine more than in 1973. For the first time, strip mine production exceeded that of underground mines. Eight strip mines produced about 52.7% of the State's output. Twenty-three underground mines produced 3,260,000 tons of coal. Routt County, with five mines, again had the highest production with 3.4 million tons, 49.3% of the State output. It was also the only county with production of more than 2 million tons. Three other counties had output over 500,000 tons. In order of rank they were Gunnison, Pitkin, and Las Animas.

[2] Colorado Department of Natural Resources. Oil and Gas Conservation Commission. Oil and Gas Statistics 1974. Production review, p. 10; all natural gas and petroleum production figures cited in the chapter are from this publication.

Table 7.—Colorado: Bituminous coal production, by type of mine and county, 1974
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines			Production (thousand short tons)			Value (thousands)
	Underground	Strip	Total	Underground	Strip	Total	
Delta	3	--	3	W	--	W	W
Fremont	2	1	3	35	W	[1] 35	$922
Garfield	1	--	1	1	--	1	20
Gunnison	3	--	3	891	--	891	14,278
Jackson	--	1	1	--	8	8	W
La Plata	1	--	1	10	--	10	97
Las Animas	1	--	1	540	--	540	10,797
Mesa	1	--	1	1	--	1	12
Moffat	2	--	2	W	--	W	W
Montrose	--	1	1	--	W	W	W
Pitkin	5	1	6	W	W	W	W
Rio Blanco	1	--	1	12	--	12	115
Routt	1	4	5	11	3,385	3,396	17,837
Weld	2	--	2	300	--	300	1,920
Undistributed	--	--	--	1,460	243	1,703	18,679
Total [2]	23	8	31	3,260	3,636	6,896	64,677

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Incomplete total.
[2] Data may not add to totals shown because of independent rounding.

The average price of coal mined in 1974 was $9.38 per ton. Coal from underground mines averaged $13.89 per ton, while that from strip mines averaged $5.33 per ton; comparable figures for 1973 were $9.95 and $4.43, respectively.

Colorado's coal mining industry provided direct employment to 1,636 workers; of these, 1,163 worked in underground mines, 287 at strip mines, and 186 in miscellaneous surface jobs. The average number of days worked in 1974 by an employee was 197, compared with 213 in 1973. Coal was loaded principally by machine. Less than 2% was loaded by hand.

Colorado mined coal was transported to markets by either rail or truck.

Most of the coal was consumed in the State; about 40% was shipped to out-of-State markets. A small quantity was consumed at the mines. Most of Colorado coal was consumed as "mine run" coal. Of the State coal output, 14% was processed in washing and cleaning plants.

Of the 6.9 million tons of coal mined during the year, 1.4 million tons was captive production and 5.5 million tons was sold on the open market. Nearly all of the captive production was used in making steel in Colorado and Utah. The principal purchaser and/or consumer of merchant

coal was the electric utility industry; most of the steam operated plants in the State use coal for electric power generation.

Natural Gas.—Marketed natural gas increased only 5% in quantity but increased 19% in value. Marketed production of natural gas during the year was 144.6 billion cubic feet, 6.9 billion cubic feet more than in 1973.

Of the counties reporting production of natural gas, the three leading counties were: La Plata with 25.4 billion cubic feet; Rio Blanco with 24.4 billion; and Moffat with 24.3 billion.

The principal source of dry gas was the Ignacio-Blanco field, La Plata County, with production of 23.4 billion cubic feet. The productive horizons were Cretaceous in age—the Dakota, Fruitlands-Pictured Cliffs, and Mesaverde Formations.

The Wattenberg field, producing from the D & J sands in Adams and Weld Counties, was the second most productive field with an output of 12.5 billion cubic feet of dry gas. Piceance Creek with 9.3 billion was third; and Powder Wash and Dragon Trail ranked fourth and fifth, respectively, with 9.0 and 6.5 billion cubic feet.

The American Gas Association (AGA) and the American Petroleum Institute (API), in their annual reserve estimates, gave Colorado natural gas reserves of 1.9 trillion cubic feet as of December 21, 1974. New fields, revisions, and extensions added 145.2 billion cubic feet; this exceeded production and resulted in a slight increase in reserves.[3]

The State's six gas-storage projects, Asbury Creek, Fort Morgan, Fruita, House Creek, Leyden Mine, and Springdale, had 22.4 billion cubic feet of gas in storage at the beginning of 1974, 10.8 billion were injected, and 11.1 billion withdrawn during the year for a yearend balance of 22.1 billion cubic feet. As in past years, the Fort Morgan reservoir, Morgan County, was the most active, with 7.5 billion cubic feet injected and 8.7 billion cubic feet withdrawn. The second most active was the Leyden reservoir in Jefferson County, a converted coal mine, with 2.5 billion cubic feet injected and 2.4 billion cubic feet withdrawn.

Natural Gas Liquids.—Production of natural gas liquids rose 22% in quantity and 118% in value compared with that of 1973. A substantial increase in the weighted average value for natural gas liquids accounted for the difference in the percentage rates. The weighted average value for natural gasoline almost doubled, and that for LP gases rose 68% over 1973 figures. Natural gas throughput at 26 gasoline plants in Colorado, according to the Oil and Gas Conservation Commission, was 138.8 billion cubic feet for the year; output was 61.2 million barrels of product.[4]

Oil Shale.—The Department of the Interior accepted a bid of $210,305,000 offered by Standard Oil of Indiana and Gulf Oil Corp. for the right to develop oil shale on the 5,089 acre Colorado C-a tract. The tract, on the western edge of the Piceance basin, Rio Blanco County, is 15 miles southeast of Rangely, Colo., and was the first tract leased as part of Interior's prototype lease program for oil shale development. The second tract in the program, Colorado C-b, was leased to a consortium of four companies; Atlantic Richfield Co., The Oil Shale Corp., Ashland Oil Co., and Shell Oil Co. Their bid was $117.7 million for the 5,094-acre tract which is about 13 miles southeast of tract C-a.

The Secretary of the Interior created an Oil Shale Environmental Advisory Panel to advise the district manager of the Bureau of Land Management and the newly-established area oil shale supervisor of the U.S. Geological Survey about environmental impacts under the prototype lease program. Colony Development Corp. suspended its development plans for a 56,000-barrel-per-day oil shale plant on Parachute Creek, 16 miles north of Grand Valley. Reasons stated for the suspension were higher construction costs and lack of a Federal energy policy. At a site near De Beque, experimental and development work on in situ retorting of oil shale was continued by Garrett Research and Development Co., Inc., a subsidiary of Occidental Petroleum Corp. At Anvil Points, Development Engineering, Inc. successfully tested a vertical kiln for retorting oil shale.

[3] American Gas Association, Inc., American Petroleum Institute, and Canadian Petroleum Association. Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada and United States Productive Capacity as of Dec. 31, 1974. V. 29, May 1975, p. 114.

[4] Reference cited in footnote 2, pp. 125–131.

Table 8.—Colorado: Gas input and products at natural gas liquids extraction plants in 1974

Plant	County	Owner	Gas input (million cubic feet)	Products (thousand barrels)
Adena	Morgan	Union Oil Co. of Calif	2,273	227
Bennett	Adams	Halliburton Resource Mgt	173	21
Comanche Creek	Elbert	Sun Oil Co	16	0
Denver Central	Arapahoe	do	2,254	202
Dragon Trail	Rio Blanco	do	4,294	180
Dragoon	Arapahoe	do	330	39
Fruita	Mesa	Continental Oil Co	6,446	160
Irondale	Adams	Halliburton Resource Mgt	4,133	321
Latigo	Arapahoe	Gas Producing Enterprises	1,495	64
Lowry	do	N. C. Ginther	613	36
McClave	Kiowa	Fleetwood Drilling Co	1,894	63
Peoria	Arapahoe	Amoco Production Co	5,355	560
Piceance Creek	Rio Blanco	Chadbourne Corp	9,302	104
Rangely	do	Chevron Oil Co	1,654	224
Roundup	Morgan	Halliburton Resource Mgt	287	10
San Juan	La Plata	Northwest Pipeline Corp	70,829	1,216
Spindle	Weld	Amoco Production Co	5,388	465
Tampa	do	Phillips Petroleum Co	951	109
Third Creek	Adams	Koch Oil Co. & Amoco Production Co.	6,464	405
Vallery	Morgan	Vallery Corp	695	47
Watkins Plant	Adams	Amoco Production Co	7,513	487
Wattenberg	Weld	Production Operators, Inc	3,038	14
Wilson Creek	Rio Blanco	Texaco, Inc	797	76
Yenter	Logan	Excelsior Oil Corp	1,286	126
W. Douglas Creek	Rio Blanco	Western Slope Gas Co	1,279	11
Total[1]			138,758	5,167

[1] Data may not add to totals shown because of independent rounding.

Source: Colorado Department of Natural Resources. Oil and Gas Conservation Commission. Oil and Gas Statistics 1974. Plant Intake and Products, pp. 125–131.

Peat.—Eight companies mined 30,444 tons of peat in seven counties. Universal Peat Co., in Park County, was the largest producer. Park County had the most production with 15,000 tons, followed by Teller County with 9,370 tons. Two producers operated in Teller County; and one each operated in Alamosa, Boulder, Chaffee, Gilpin, Jefferson, and Park Counties. Most of the output, 97%, was moss type, and the rest was reed sedge. Average value for 1974 was $6.61, 80 cents more than in 1973.

Most of the output was shipped in bulk; the rest was packaged. Of the total, 27,911 tons were not processed. Sixty-three percent of the production, 19,194 tons, was used for general soil improvement, and the remainder for other uses.

Petroleum.—Output of petroleum was up 2.5% in quantity and 83% in value compared with that of 1973. The great increase in value reflects a worldwide increase in the price of petroleum. Petroleum continued to be the most valuable mineral produced in Colorado, and accounted for 38% of the State's total value.

Leading county in oil output was Rio Blanco with 21.6 million barrels, or 58% of the State total; also the county had the leading oilfield, the Rangely-Weber. The second largest oilfield in the State was the Peoria in Arapahoe County. Weld and Adams Counties ranked second and third, with 10% and 7%, respectively, of the State's total production. Passing the half-billion-barrel mark for cumulative production, the Rangely-Weber reservoir continued to dominate the State's oil yield. With a cumulative output at yearend of 500.8 million barrels of oil, it had produced 46% of Colorado's cumulative oil production. Output of 20.3 million barrels in 1974 was 6% higher than that of 1973.

During the year, 39 fluid-injection projects were operated in 36 fields; of these, 36 were waterflood projects, 2 were gas injection, and 1 was combined water and gas injection.

Water injected in all projects totaled 170.6 million barrels; of this, 111.3 million barrels or 65% was injected into Rangely-Weber reservoir. Again, the State data does not differentiate between "new"

water and water produced with the oil and reinjected.

API and AGA estimated crude oil reserves for Colorado as of December 31, 1974, at 289.3 million barrels, a decline of 15.5 million barrels from 1973. An additional 97.1 million barrels were considered economically available by fluid injection. New fields and new pools added 3.4 million barrels; revision and extensions added 18.1 million barrels.[5]

The State's three operating refineries were Continental Oil Co. and the Refinery Corp., both in the Denver area and Gary-Western, Inc., at Fruita. Total refining capacity for the State was 51,500 barrels of crude oil per calendar day, an increase of 6% over capacity in 1973. The increase is the result of Gary-Western, Inc. resuming operation after rebuilding sections of the refinery destroyed by fire in early 1973.

The refineries processed 14.4 million barrels of crude oil, of which 10.3 million were from other States. Wyoming continued as the principal out-of-State supplier with 7.4 million barrels. Montana and Utah also supplied petroleum to Colorado. State producers shipped 32.8 million barrels of petroleum out of State, or 87.5% of Colorado's output. Utah, with Salt Lake City as a refinery and marketing center, received 21.4 million barrels, chiefly from the Rangely-Weber and other northwestern Colorado oilfields. Other recipients, in order of quantity, were Illinois (3.5 million barrels), Kansas (2.9 million barrels), and Texas (1.7 million barrels). A small quantity was shipped to California, Wyoming, Indiana, and New Mexico.

Exploration and Development.—Colorado ranked second in total well completions among States in the Rocky Mountain Region (RMR). A total of 836 wells were drilled, 4 fewer than during 1973, and well below the 1972 record when 1,005 wells were drilled. Of the wells drilled, 498 were development drilling and 338 were wildcat drilling. Of the development drilling, 193 were completed as oil wells, 175 as gas wells, and 130 were dry holes. Wildcat drilling resulted in 51 successful wells; of these, 25 were oil and 26 were gas. Wildcats opened 38 new fields. Seven wildcats tapped new pays, and 14 were successful wildcat outposts. Twenty-seven of Colorado's new fields were found in the Denver Julesburg basin. Sixteen of the wildcats produced from "J" sand, eight from "D" sand, and one from Sussex. Two were dually completed from "D" and "J" sand. A Pennsylvania gas discovery was completed in Prowers County, and in Cheyenne County, Mull Drilling Co. found oil production in Mississippian age rocks. Weld County, with 261 completions, was the RMR's most active county in 1974, and it was the eighth most active in the United States. It was the only county in the RMR to rank among the top 10 in the United States. Work was focused on development of the Wattenberg field by Amoco Production Co. and others. In western Colorado 14 wells were completed. Thirteen wildcats resulted in new discoveries, 1 oil and 12 gas. Discoveries of gas were reported in Garfield, La Plata, Mesa, Moffat, Rio Blanco, and Routt Counties, and oil was discovered in Montezuma County.

Weld, Adams, and Washington Counties, all in the Denver Julesburg basin, accounted for 59% of all drilling done in the State during 1974. Activity in Washington County picked up over the year, but successful completions were scarce. Only 18 of 97 were producers. The pace of development drilling in Weld County carried over from 1973 into 1974. Eleven new fields were discovered in the county during the year, and much of the development drilling is part of an intensive infield program in the Wattenberg field.

An important new find in Weld County is the Lanyard field discovered by Beaver Mesa Exploration Co. The discovery well, 41–18 Preston, located in the NE ¼–NE ¼ sec. 18, T2N, R62W, flowed more than 500 barrels of oil per day from the Denver ("D") sand. A Charter Exploration & Production Co. extension drilled in sec. 24, T2N, R63W, flowed 1,920 barrels of oil and 588,000 cubic feet of gas per day on 32/64-inch choke. At yearend field production was limited by the Colorado Oil and Gas Conservation Commission until completion of facilities to market the gas produced with the oil.

In Adams County, Beaver Mesa Exploration Co., drilling 1 mile north of the Trapper field in sec. 24, T1S, R65W, found oil in the "D" sand and gas in the Julesburg ("J") sand. The well flowed 225 barrels of oil per day on an 8/64 choke.

In western Colorado, two new oilfields and seven new gasfields were found. Mo-

[5] Reference cited in footnote 3, pp. 22, 23.

tain Fuel Supply Co., drilling in the Paradox basin of Montezuma County, found oil and gas in the Desert Creek zone of Pennsylvanian age. The discovery well flowed 504 barrels of oil and 713,000 cubic feet of gas per day. Cities Service Oil Co. found gas production in the Ismay Formation in La Plata County. Fuel Resources Development Co. made a major gas find in Moffat County. The discovery well flowed 6.6 million cubic feet of gas daily from the Cretaceous age Mesa Verde Formation.

NONMETALS

Cement.—Portland and masonry cement were produced and shipped by Ideal Cement Co., a division of Ideal Basic Industries, Inc., and Dewey Rocky Mountain Cement Co., a division of Martin Marietta Corp. Shipments of Portland and masonry cement were 8% and 21% less, respectively, than those of 1973. At yearend, cement stocks at mills increased 38% compared with yearend 1973. Lower shipments and increased stocks reflect a general downturn in the level of activity of the State's economy, particularly the construction sector. Ready-mix concrete companies purchased almost three-quarters of the Portland cement. Other customers, in order of quantity, were concrete product manufacturers, building material dealers, and highway contractors. Almost 90% of the portland cement production shipped from plants was by truck and the balance was by rail. Ideal Cement Co.'s new plant near Portland, Colo., cost $30 million and has an annual production capacity of 470,000 tons. The new kiln, 500 feet long, has a daily capacity of 1,300 tons and, built to be coal-fired, uses 15 tons per hour. Coal is supplied by Pittsburgh & Midway Coal Mining Co. from its Edna mine near Oak Creek. Another product of the new plant is white cement by a process which uses ceramic milling balls supplied by Coors Porcelain Co. CF&I Steel Corp. supplies steel milling balls for grinding regular cement.

Clays.—Production of clay decreased 16.5% in quantity and 7.2% in value compared with 1973. Decreased output was due to a lessened demand for clay products by the building industry. Miscellaneous clay (including shale) accounted for about 90% of total clay production, the remainder was fire clay, kaolin, and bentonite. Fire clay was used for making heavy clay products, refractories, and a bonding agent; miscellaneous clay and shale were used for building brick, lightweight aggregate, and pottery. Output of clay came from 53 mines operated by 21 companies, compared with 65 mines and 21 companies in 1973. Seven companies produced fire clay, 3 bentonite, and 13 common and undifferentiated clay. The largest producer, the Idealite Co., a division of Ideal Basic Industries, Inc., mined shale from a quarry south of Boulder for making lightweight aggregate. Clay was produced in nine counties. Jefferson County had the most production, more than 61% of the total output of the State. The average unit price for miscellaneous clay and shale was $2.19 per ton, that of fire clay $4.10 per ton compared with $2.01 and $3.87 per ton, respectively, for 1973.

Table 9.—Colorado: Clays sold or used by producer, by county

County	1973		1974	
	Quantity (short tons)	Value	Quantity (short tons)	Value
Bent	632	$3,159	261	$2,088
Boulder	W	W	24,020	69,118
Douglas	92,818	264,278	79,003	224,200
Elbert	35,953	W	20,100	W
El Paso	W	W	10,052	W
Fremont	27,334	83,257	44,507	179,889
Jefferson	503,102	923,764	407,548	765,478
Las Animas	24,750	51,417	18,867	36,834
Pueblo	76,482	225,311	58,922	242,877
Other [1]	32,552	158,665	--	67,730
Total	793,623	1,709,851	663,280	1,588,214

W Withheld to avoid disclosing individual company confidential data.
[1] Includes data indicated by symbol W.

Feldspar.—Lockhard & Sons produced feldspar from the Mica lode west of Canon City, and Colonna & Co. produced feldspar from pegmatites in the Rampart Range. The output of 1974 was a considerable increase over that reported in 1973. The product was used for decorative aggregate.

Fluorspar.—A long history of fluorspar production in Colorado ended in late 1973 when Ozark Mahoning Co. closed its Northgate mine in Jackson County. Allied Chemical Corp. had earlier closed its Burlington mine in Boulder County. Shipments of fluorspar during 1974 were from stockpiled material.

Gypsum.—The Flintkote Co., U.S. Soil Conditioning Co., Quad-Honstein Joint Venture, and Ernest W. Munroe mined 191,000 tons of gypsum in 1974; of these, the first two were in Fremont County, and the last two were in Larimer County. Output expanded 27% above the 1973 record. The Flintkote Co. calcined gypsum in Fremont County at its Florence plant. Calcined gypsum was used in the manufacture of building products, principally wallboard material. Uncalcined gypsum was marketed as a soil conditioner and cement retarder, the former to farm supply stores, the latter to cement manufacturing plants.

Lime.—CF&I Steel Corp., Great Western Sugar Co., American Crystal Sugar Co., and Holly Sugar Corp. produced lime at 11 plants in 10 counties for steel furnaces, sugar refining, and other uses. Leading counties were Pueblo, Morgan, and Boulder. Output increased 11% to 198,000 tons and was 3% above the 1971 record. The lime was used in Colorado.

Perlite.—The only crude perlite produced in Colorado was mined at the Rosita mine of Persolite Products, Inc. in Custer County. Output was 20% lower than that of 1973. Production from the mine was shipped to the company's expanding plant near Florence. A small quantity of crude perlite was sold to local markets. Perlite was expanded at two mills in Colorado; the Antonito, operated by Grefco, Inc., and the Florence, operated by Persolite Products, Inc. The Denver mill, operated by W. R. Grace & Co., discontinued expanding perlite. Source of the crude perlite for the Grefco, Inc. mill was from deposits in New Mexico.

Expanded perlite was used principally as material for filter aid (78%). Other uses included concrete, plaster, and horticulture aggregate, and for low-temperature insulation.

Pumice.—Output of pumice, in the form of volcanic cinders and scoria, decreased only 4%, but value declined 76% from that of 1973. Scoria was produced by Colorado Aggregate Co., Inc. at its Mesita Hill mine in Costilla County, and volcanic cinders were mined by Dotsero Block Co., Inc. from its mine near Gypsum in Eagle County. Except for a small amount consumed for roofing, use of pumice was almost equally divided between concrete aggregate and landscaping.

Salt.—Salt in the form of brine was recovered from a well in Montrose County by Union Carbide Corp. for use in the company's uranium-vanadium mill at Uravan. Value of production was 46% over the value of production in 1973.

Sand and Gravel.—Production of sand and gravel decreased 30% compared with that of 1973. The decrease reflected a downturn in the level of construction in the State. Sand and gravel, the most valuable nonmetallic mineral produced in Colorado, comprised 40% of the value of the nonmetallics and 5% of the value of all minerals. Sand and gravel ranked fourth in value after petroleum, molybdenum, and coal. Most sand and gravel mined in Colorado was used in construction by commercial operators or by government agencies and their contractors. That portion not used in construction is classified as industrial sand and is used in oil well hydrofracturing or glass.

A major portion of the sand and gravel used in construction, 21.5 million tons, was processed before use, that is, washed, screened, crushed, or a combination of these. The balance, 2.3 million tons, was pit run. Average value of the processed material was $1.76 per ton, compared with $0.70 for pit run sand and gravel; the overall average was $1.66. Output of commercial operators was 15.1 million tons, 64% of total production. Noncommercial production, that produced by governmental agencies either by their employees or contractors, amounted to 8.6 million tons, 36% of total construction output. A dozen operators and one government agency, Jefferson County Highway Department, each produced more than a half million tons of sand and gravel and their output accounted for almost a quar-

ter of the total production. The leading producers, in order of output, were Western Paving Construction Co., Mobile Pre-Mix Sand and Gravel Co., Cooley Gravel Co., Plains Aggregate Co., and Brannan Sand & Gravel Co. The number of sand and gravel mines decreased from 268 in 1973 to 200 in 1974. Most of the mines, 164, had an output of less than 200,000 tons.

Construction aggregate consumed 7.6 million tons of sand and gravel, roadbase consumed 9.4 million tons, and bituminous paving consumed 3.4 million tons. Almost 650,000 tons of sand and gravel was used for fill. The remaining amount was utilized for railroad ballast and miscellaneous uses.

Among the 63 counties in Colorado, all except Cheyenne, Costilla, Dolores, Mineral, Rio Blanco, Saguache, and San Juan had sand and gravel production. Jefferson County had the greatest production, 6.1 million tons; it was followed, in order of output, by Adams, Larimer, Boulder, Weld, Arapahoe, El Paso, and Pueblo Counties, all of which had production of over 1.0 million tons. Output of these eight counties was 75% of Colorado's total.

Cooley Gravel Co. was developing a gravel deposit on Rocky Flats, 15 miles northwest of Denver. The company had leased 500 acres of land containing high-quality road aggregate resources. Construction of a mine and a plant having a capacity of 1 million tons per year was scheduled for completion in early 1975. The gravel deposits are associated with the massive outwash fans formed along the Front Range of the Rocky Mountains.

Table 10.—Colorado: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	33,767	45,493	4,591	7,964
Gravel			16,944	30,009
Unprocessed:				
Sand and gravel			2,258	1,578
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	33,767	45,493	23,793	39,551

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data may not be directly comparable to that in tables 1, 11, and 12 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 11.—Colorado: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	21,600	31,358	4,625	9,346
Highway and bridge construction			287	612
Other uses (dams, waterworks, airports, etc.)			193	371
Concrete products (cement blocks, bricks, pipe, etc.)			627	1,159
Bituminous paving (asphalt and tar paving)			1,406	3,139
Roadbase and subbase			5,097	9,064
Unprocessed aggregate			1,194	1,015
Fill	786	635	476	766
Other uses [2]	2,041	3,676	1,267	2,528
Industrial sand and gravel	W	W	W	W
Total	24,427	35,669	15,172	28,000

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).

Table 12.—Colorado: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			692	931
Highway and bridge construction			1,021	1,552
Other uses (dams, waterworks, airports, etc.)			127	212
Concrete products (cement blocks, bricks, pipe, etc.)	6,163	8,084	W	W
Bituminous paving (asphalt and tar paving)			2,006	3,079
Roadbase and subbase			3,344	4,762
Unprocessed aggregate			1,064	563
Fill	3,175	1,737	172	221
Other	2	3	195	354
Total	9,340	9,824	8,621	11,674

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Production of stone totaling 6.6 million tons was 3.4% higher than in 1973. Twenty-five counties had stone production from 88 quarries. The number of quarries is down from 91 in 1973 and 116 in 1972. The principal producer was Fremont County. Six counties had output exceeding 100,000 tons; in addition to Fremont, they were Boulder, Chaffee, El Paso, Jefferson, and Larimer. Virtually all stone produced, 99.8%, was as crushed and broken stone; 10,000 tons was dimension stone. Principal uses of crushed and broken stone were for making cement and lime, and as flux stone, dense roadbase, riprap, and concrete aggregate. Limestone, including dolomite, was the principal stone produced followed by granite, sandstone, and quartzite.

Table 13.—Colorado: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone:				
Rough:				
Irregular-shaped stone and rubble	2	55	2	47
Architectural ____ thousand cubic feet	29	55	20	77
Monumental [1] ____ do				
Flagging [2] ____ do	28	29	29	41
Dressed:				
Architectural ____ do	30	56	51	94
Monumental [3] ____ do	13	116	5	70
Total ____ (short tons)	10	311	10	329
Crushed and broken stone:				
Bituminous aggregate	W	W	71	153
Concrete aggregate (coarse)	1,346	2,763	1,100	2,314
Dense-graded roadbase stone	752	989	884	1,211
Surface-treatment aggregate	151	305	152	276
Unspecified construction aggregate and roadstone [4]	388	944	222	880
Cement and lime manufacture	W	W	2,668	5,827
Riprap and jetty stone	474	1,079	605	1,375
Filter stone	--	--	4	14
Terrazzo and exposed aggregate	10	105	8	92
Other uses [5]	3,226	7,507	846	2,638
Total [6]	6,347	13,692	6,562	14,780
Grand total	6,357	14,003	6,572	15,109

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Rough monumental and architectural stone combined to avoid disclosing individual company confidential data.
[2] Data include uses not specified (1974).
[3] Data include stone for flagging and construction stone (1974).
[4] Data include manufactured fine aggregate (1974).
[5] Data include stone used for agricultural limestone (1973), flux and refractory stone, railroad ballast (1973), sugar refining, mine dusting (1973), and other fillers (1974).
[6] Data may not add to totals shown because of independent rounding.

Table 14.—Colorado: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Dolomite	W	W	W	W
Granite	W	W	W	W
Sandstone	9	191	9	194
Undistributed	1	120	2	135
Total [1]	10	311	10	329
Crushed and broken:				
Limestone and dolomite	4,200	9,750	4,427	10,519
Granite	1,672	2,767	1,614	2,972
Marble	1	4	W	W
Sandstone, quartz, quartzite	409	1,029	494	1,223
Traprock	(2)	(2)	--	--
Other stone	65	143	W	W
Undistributed	--	--	28	65
Total [1]	6,347	13,692	6,562	14,780
Grand total	6,357	14,003	6,572	15,109

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Data may not add to totals shown because of independent rounding.
[2] Less than ½ unit.

Table 15.—Colorado: Stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974			Kind of stone produced in 1974
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Adams	1	4	8	1	4	8	Granite.
Arapahoe	1	1	1	1	1	2	Do.
Baca	1	(1)	1	1	(1)	1	Do.
Bent	1	1	1	1	1	1	Do.
Clear Creek	1	1	2	1	1	2	Do.
Delta	1	(1)	(1)	--	--	--	Do.
Denver	1	3	5	1	3	5	Do.
Dolores	1	61	59	2	78	93	Granite, sandstone.
Eagle	2	W	W	1	18	26	Granite.
Elbert	1	3	5	1	3	5	Do.
Fremont	13	1,190	2,471	13	1,421	2,741	Limestone, dolomite, granite, marble, sandstone, quartz.
Garfield	2	134	252	2	W	147	Limestone, granite.
Gilpin	1	W	W	1	(1)	(1)	Granite.
Grand	--	--	--	1	15	15	Do.
Huerfano	1	1	1	--	--	--	Do.
Jackson	--	--	--	1	(1)	(1)	Do.
La Plata	1	1	1	5	52	115	Granite, sandstone.
Las Animas	--	--	--	1	(1)	(1)	Granite.
Logan	1	(1)	1	--	--	--	Do.
Mesa	3	9	23	2	W	W	Sandstone, granite.
Moffat	--	--	--	1	19	51	Granite.
Montezuma	2	2	8	1	1	1	Do.
Montrose	2	3	4	2	4	9	Granite, sandstone.
Otero	1	1	1	1	1	1	Granite.
Park	1	2	5	--	--	--	Do.
Pitkin	1	1	1	1	(1)	1	Do.
Pueblo	1	(1)	(1)	1	(1)	(1)	Do.
Saguache	1	(1)	2	--	--	--	Quartz.
San Miguel	--	--	--	1	W	8	Limestone.
Weld	1	(1)	(1)	1	(1)	(1)	Granite.
Undistributed [2]	48	4,938	11,153	43	4,952	11,878	
Total [3]	91	6,357	14,003	88	6,572	15,109	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Less than ½ unit.
[2] Includes Boulder, Chaffee, Douglas, El Paso, Jefferson, Larimer, Rio Blanco (1973), and Teller Counties.
[3] Data may not add to totals shown because of independent rounding.

Sulfur.—Continental Oil Co. recovered elemental sulfur from acid gases at its petroleum refinery near Denver. Elemental sulfur was not included in table 1 because it is considered a secondary product.

Vermiculite.—Crude vermiculite from Montana was exfoliated by W. R. Grace & Co. at its plant in Denver. The product was used for concrete aggregate, insulation, fire-proofing, horticulture, and plaster aggregate.

Table 16.—Principal producers

Commodity and company	Address	Type of activity	County
Carbon dioxide (natural):			
Tenneco Oil Co	Box 2410 Denver, Colo. 80201	Well	Montezuma.
Cement:			
Ideal Basic Industries, Inc.[1]	Box 231 Florence, Colo. 81226	Plants	Fremont and Larimer.
Martin Marietta Cement[2]	11300 Rockville Pike Rockville, Md. 20852	Plant	Boulder.
Clays:			
George W. Parfet Estate, Inc.	Box 266 Golden, Colo. 80401	Mine	Jefferson.
Robinson Brick & Tile Co	Box 1619 Denver, Colo. 80223	Mines	Douglas, Elbert, El Paso, Jefferson.
Coal, bituminous:			
CF&I Steel Corp.[3]	Box 316 Pueblo, Colo. 81002	Mine	Las Animas.
Energy Coal Co	2850 N. Meridian St., Indianapolis, Ind. 46208	Strip mine and plant.	Routt.
Mid-Continental Coal and Coke Co.	Carbondale, Colo. 81623	Mine and plant	Pitkin.
Peabody Coal Co	301 N. Memorial Dr. St. Louis, Mo. 63102	Strip mines and plant.	Montrose and Routt.
Pittsburg & Midway Coal Mining Co.	Ten Main Center Kansas City, Mo. 64105	Strip mine and plant.	Routt.
United States Steel Corp	Box 807 Dragerton, Utah 84520	Mine and plant	Delta and Gunnison.
Copper:			
Federal Resources Corp.[4]	---- do ----	Mine	Ouray.
Idarado Mining Co.[5]	Ouray, Colo. 81427	---- do	Ouray and San Miguel.
Standard Metals Corp.[5]	Box 2471 Silverton, Colo. 80217	---- do	San Juan.
Fluorspar:			
Allied Chemical Corp	Box 228 Boulder, Colo. 80202	Mine and plant	Boulder.
Ozark-Makoning Co	Box 0 Cowdry, Colo. 80434	---- do	Jackson.
Gypsum:			
The Flintkote Co	400 Westchester Ave. White Plains, N.Y. 10604	---- do	Fremont.
Ernest W. Munroe	101 E. Vine Drive Fort Collins, Colo. 80521	Mine	Larimer.
Quad-Honstein Joint Venture.	1301 Arapahoe Golden, Colo. 80401	---- do	Do.
U.S. Soil Conditioning Co	Box 336 Salida, Colo. 81201	---- do	Fremont.
Iron ore: Pitkin Iron Corp	105 W. Adams St. Chicago, Ill. 60603	Strip mine	Pitkin.
Lead:			
American Smelting & Refining Co.[6]	Box 936 Leadville, Colo. 80461	Mine	Lake.
Homestake Mining Co.[7]	Box 98 Creede, Colo. 81130	---- do	Mineral.
Lime:			
American Crystal Sugar Co	101 N. 3rd St. Moorhead, Minn. 56560	Plant	Pueblo.
The Great Western Sugar Co.	Box 5308 Denver, Colo. 80217	---- do	Adams.
Molybdenum:			
American Metal Climax, Inc.[8]	Mines Park Golden, Colo. 80401	Mine	Clear Creek.

See footnotes at end of table.

Table 16.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Peat:			
Colorado Peat Industries	6003 Indian Rd. Boulder, Colo. 80302	Bog	Boulder.
Universal Peat Co	1557 S. Ingalls St. Lakewood, Colo. 80422	Bog	Park.
Ver-Ja Peat Moss	Woodland Park, Colo. 80863	Bog	Teller.
Perlite (crude and expanded):			
Persolite Products, Inc.[9]	Box 105 Florence, Colo. 81226	Mine and plant	Custer.
Petroleum (crude):			
Amoco Production Corp	Box 591 Tulsa, Okla. 74102	Wells	Arapahoe, Montezuma, Washington.
Champlin Petroleum Co	Box 9365 Fort Worth, Tex. 76107	do	Morgan and Washington.
Chevron Oil Co	Box 599, 1700 Broadway Denver, Colo. 80201	do	Weld.
Continental Oil Co	Box 2197 Houston, Tex. 77001	do	Jackson and Washington.
International Nuclear Corp	308 Lincoln Tower Bldg. Denver, Colo. 80203	do	Kiowa.
Monsanto Co	800 N. Lindbergh Blvd. St. Louis, Mo. 63116	do	Jackson, Montezuma, Washington.
Texaco, Inc	Box 2100 Denver, Colo. 80201	do	Moffat and Rio Blanco.
Union Oil Co. of California	1860 Lincoln St. Denver, Colo. 80203	do	Morgan.
Union Texas Petroleum	3000 Richmond Ave. Houston, Tex. 77001	do	Washington.
Pumice:			
Colorado Aggregate Co., Inc.	Box 106 Mesita, Colo. 81142	Strip mine and plant.	Costilla.
Dotsero Block Co., Inc	Box 933 Glenwood Springs, Colo. 81601	do	Eagle.
McCoy Aggregate Co	Box 575 McCoy, Colo. 80463	do	Routt.
Sand and gravel:			
Asphalt Material & Paving Co.	Golden, Colo. 80401	Pits and plants	Douglas, Garfield, Jefferson.
Brannan Sand & Gravel Co	4800 Brighton Blvd. Denver, Colo. 80216	do	Adams, Arapahoe, Jefferson.
Cooley Gravel Co.[2]	Box 313 Pueblo, Colo. 81102	do	Pueblo, Adams, Arapahoe.
L. G. Everist Inc	313 S. Phillips Sioux Falls, S. Dak. 57102	do	Jefferson.
Mobile Pre-Mix Sand and Gravel Co.	7620 Madison St. Denver, Colo. 80204	do	Adams and Arapahoe.
Plains Aggregate Co	P.O. Box 229 Boulder, Colo. 80302	Pit	Larimer.
Western Paving Construction Co.	5105 Washington St. Denver, Colo. 80216	Pit and plant	Adams.
Stone: Castle Concrete Co	Box 2379 Colorado Springs, Colo. 80901	Quarry	El Paso.
Uranium:			
Cotter Corp	Box 352 Golden, Colo. 80401	Mine	Jefferson.
Union Carbide Corp.[10]	270 Park Ave. New York, N.Y. 10017	Mines	Garfield, Mesa, Montrose, San Miguel.
Zinc: New Jersey Zinc Co.[11]	Gilman, Colo. 81634	Mine and mill	Eagle.

[1] Also stone and clays.
[2] Also stone.
[3] Also lime and stone.
[4] Also lead and zinc.
[5] Also gold, lead, silver, and zinc.
[6] Also silver and zinc.
[7] Also zinc.
[8] Also pyrites, tin, and tungsten.
[9] Also a plant in Fremont county.
[10] Also vanadium.
[11] Also lead and silver.

The Mineral Industry of Connecticut

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Connecticut Geological and Natural History Survey for collecting information on all minerals except fuels.

By William R. Barton [1]

The value of mineral production in Connecticut decreased 4% in 1974, while the total quantity of mineral products registered a greater decline. Stone and sand and gravel were the principal mineral products, and they led the quantitative decline due to lessened construction activity. Other mineral products included: Clays, feldspar, gem stones, lime, mica, calcium, and barium.

The Connecticut Geological and Natural History Survey moved to Hartford to become part of the Department of Environmental Protection. In addition to being Director of the Natural Resources Center, Dr. Hugo Thomas was appointed State Geologist in charge of the Connecticut Survey. During 1974, the Connecticut Survey published Quadrangle Report No. 30, Bedrock Geology of the Southbury Quadrangle. The U.S. Geological Survey (USGS) published three geologic maps of Connecticut: GQ-1148, Surficial Geology of the Cornwall Quadrangle; GQ-11657, Bedrock Geology of the Thompson Quadrangle; and GQ-1170, Bedrock Geology of the Southwick Quadrangle.

The Connecticut Valley Urban Area Project of the USGS continued their Mineral Investigation Field Studies Maps (MF) series with the publication of "Resources of Coarse Aggregate" for four quadrangles in the project area, and "Unconsolidated Materials" for seven quadrangles.

The Connecticut Department of Transportation completed a sand and gravel study of the State and published a final construction aggregate availability study.

The Federal Bureau of Mines completed a report on "Mineral Resources and Mining Study Element I-4," Long Island Sound Regional Study for the New England River Basins Commission (NERBC). The report was forwarded to the Commission and was included in the overall Long Island Sound Regional Report of NERBC.

Governor Thomas Meskill named a permanent head for the Connecticut Energy Agency. Lynn Alan Brooks of West Hartford replaced Eckhardt Beck, who returned to his permanent post as Deputy Commissioner in the Department of Environmental Protection.

Land use in Connecticut had a critical impact on the minerals industry owing to rapid urbanization and soaring land values. Many old mines, such as the Bristol copper mine and the Jinny's Hill barite mine, have been wholly or partly built over. Numerous old iron mines in Litchfield County were in what have become exclusive residential and vacation areas. The Bureau of Mines published a summary of present land use and reclamation practices in the mining industry that indicated 0.39% of the State has been used for mining, or 12,300 acres out of 3.1 million acres. Of the

[1]State Liaison Officer, Bureau of Mines, Newmarket, N.H.

mined land, 28.7% has been reclaimed.[2]

Governor Meskill signed into law a bill forbidding contrived fuel shortages that are designed to increase prices or restrict competition. The law gives the Connecticut Energy Agency authority to investigate suspected violations and to institute civil actions in State Superior Court or in Federal courts. The new statute defines an artificial shortage as one contrived to restrict supply below consumer demand.

An impending State ban on phosphates in household laundry detergents was rescinded. The ban reportedly would have gone into effect on July 1, 1974, but instead was replaced by increased State funding for facilities to remove phosphates from waste waters.

On December 10, 1974, work was begun on Connecticut's $250 million integrated State-wide solid wastes system. Groundbreaking at the 5½-acre Bridgeport site was indicative of the substantial progress made by the Connecticut Resources Recovery Authority since it was established by Public Act 73–459 in May 1973. The $50 million Bridgeport processing and separation facility reportedly would be built and operated by Garrett Research and Development Co. (wholly-owned subsidiary of Occidental Petroleum Corp.). A second facility, at Berlin, reportedly would be built and operated by Combustion Equipment Associates, Inc. A third facility was in the planning stage for the New Haven area. Tentatively, a pyrolysis unit was to be incorporated in the New Haven design in line with Connecticut's avowed policy of optimizing resource recovery of combustible materials for fuel use. Many of the resource recovery techniques, on which Connecticut solid waste plans are based, were developed by the Bureau of Mines. The published process flow diagram for the Bridgeport facility closely follows the process used at the Bureau of Mines pilot plant in Edmonston, Md.[3]

[2] Paone, J., J. L. Morning, and L. Giorgetti. Land Utilization and Reclamation in the Mining Industry, 1930–71. BuMines IC 8642. 1974, 61 pp.

[3] Connecticut Resources Recovery Authority. 1974 Annual Report, Hartford, Conn. 1974, 20 pp.

Table 1.—Mineral production in Connecticut [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ____ thousand short tons __	162	$320	156	$363
Feldspar ____ short tons __	77,206	W	W	W
Gem stones	NA	16	NA	15
Lime ____ thousand short tons __	W	W	33	1,148
Mica (scrap) ____ do ____	3	W	2	W
Mica (sheet) ____ thousand pounds __	__	__	W	W
Sand and gravel ____ thousand short tons __	7,806	12,788	6,345	11,272
Stone ____ do ____	9,682	21,305	8,457	21,134
Value of items that cannot be disclosed: Values indicated by symbol W ____	XX	2,375	XX	1,430
Total ____	XX	36,804	XX	35,362
Total 1967 constant dollars ____	XX	26,981	XX	p 16,910

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

Table 2.—Value of mineral production in Connecticut, by county
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Fairfield	$699	$798	Sand and gravel.
Hartford	12,385	10,952	Stone, sand and gravel, clays.
Litchfield	W	4,486	Stone, sand and gravel, lime.
Middlesex	2,574	2,912	Feldspar, sand and gravel, stone, clays, mica.
New Haven	12,108	12,840	Stone, sand and gravel, clays.
New London	W	W	Sand and gravel, stone.
Tolland	W	W	Sand and gravel.
Windham	942	W	Stone, sand and gravel.
Undistributed [1]	8,097	3,375	
Total [2]	36,804	35,362	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes gem stones, some sand and gravel which cannot be assigned to specific counties, and values indicated by symbol W.
[2] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Connecticut business activity

		1973	1974 [p]	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	1,365.0	1,424.8	+4.4
Unemployment	do	77.4	89.7	+15.9
Employment:				
Construction [1]	do	58.5	54.1	−7.5
Manufacturing	do	420.7	430.8	+2.4
Government	do	167.7	172.3	+2.7
Other [2]	do	591.1	606.3	+2.6
Personal income:				
Total	millions	$18,265	$19,981	+9.4
Per capita		$5,931	$6,471	+9.1
Construction activity:				
Number of private and public residential units		22,278	13,120	−41.1
Valuation of nonresidential construction authorized	millions	$298.2	[3] $888.5	+198.0
Mineral production value	thousands	$36,804	$35,362	−3.9

[p] Preliminary.
[1] Includes mining.
[2] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services.
[3] Includes $650 million for an atomic energy plant in Waterford Town, Connecticut.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; New England Economic Indicators; and the U.S. Bureau of Mines.

Table 4.—Employment and injury statistics in the Connecticut mineral industries [1]

Year	Average number of men working daily	Man-hours worked	Number of injuries		Injury rates, frequency per million man-hours	
			Fatal	Nonfatal	Fatal	Nonfatal
1973	726	1,387,210	--	29	--	19.46
1974	745	1,259,393	--	28	--	19.06

[1] Data supplied by Mining Enforcement & Safety Administration. All data are preliminary.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—There are no cement manufacturing plants in Connecticut. Cement shipment data in preliminary form suggest an 18% decrease from the 1973 consumption of all cements of 922,000 short tons. Apparent 1974 consumption was 757,000 short tons.

Clays.—Common clay was mined by four companies in Hartford, Middlesex, and New Haven Counties. Most of the clay was consumed in the manufacture of building brick; the rest was utilized by the ceramic and specialty clay products industry.

Feldspar.—The Feldspar Corp. mined feldspar from the Middletown and Hale mines, and ground it at their Middletown plant in Middlesex County. The ground feldspar was shipped to various States and Canada for use in manufacturing glass and pottery.

Gem Stones.—Mineralogical societies, dealers, and individuals collected specimens from dumps, quarries, and pegmatite deposits in the State. The value of the collectors' items was about $15,000.

Gypsum.—National Gypsum Co. imported crude gypsum for processing into finished building plaster products and board and sheathing materials at its New Haven plant. The plant was closed in May 1974, with no plans to reopen it in the future. The southwestern New England market of National Gypsum will be serviced from Bronxville, N.Y.

Lime.—Pfizer, Inc. produced lime in Litchfield County for sewage treatment, mason's lime, and other uses. The lime was consumed in Connecticut, New York, Massachusetts, and other States. Total consumption of lime in Connecticut was 66,870 tons.

Mica.—Sheet, scrap, and flake mica were byproducts of feldspar mining and processing in Middlesex County.

Sand and Gravel.—Sand and gravel output was exceeded only by stone in both quantity and value among the minerals produced in Connecticut. Production of sand and gravel was reported in all eight of the counties in the State; the leaders were Hartford and New Haven Counties.

Of the 6.3 million tons of sand and gravel produced, 9% was reported sold or used commercially and the rest was used in publicly funded projects. The production, 19% below 1973 in quantity, was used primarily as aggregate in concrete for structural and paving construction. Other uses were fill, railroad ballast, molding sand, and other.

During the year, the sand and gravel industry was affected by environmental or zoning bodies in several localities. The Deep River, Conn., Planning and Zoning Commission ordered sand and gravel operators in the town to furnish site rehabilitation plans, post bonds, and obtain special operating permits. A Commission member said that two firms were probably violating inland wetland regulations, and that they were delaying conforming to town requirements until "they can extract all gravel on the land and leave it an environmental disaster." In Naugatuck, orders to cease mining gravel were issued to three operators for failure to fully comply with zoning regulations. In Killingworth, the Planning and Zoning Commission asked the Shoreline Washed Sand and Stone Co. for additional information on its operations to determine if they were in full zoning compliance. In Oxford, residents appealed a zoning board approval for a new sand and gravel operation. Nearby residents charged that the operation would lessen the value of their property and result in truck traffic dangerous to their children.

Table 5.—Connecticut: Construction and industrial sand and gravel
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	7,806	12,788	3,042	5,599
Gravel			2,019	4,265
Unprocessed:				
Sand and gravel			1,284	1,317
Industrial:				
Sand	W	W	--	--
Gravel			--	--
Total	7,806	12,788	6,345	11,181

W Withheld to avoid disclosing individual company confidential data; included with "Construction" (1973).
[1] Value data in this table may not be directly comparable to that in tables 1, 6, and 7 because unit value of construction aggregates may be higher than the individual unit values for sand or gravel.

Table 6.—Connecticut: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction	6,115	10,690	1,378	2,977
Highway and bridge construction			150	229
Other uses such as dams, waterworks, airports, etc			203	403
Concrete products (cement blocks, bricks, pipe, etc.)			1,015	1,853
Bituminous paving (asphalt and tar paving)			719	1,566
Roadbase and subbase			737	1,232
Unprocessed aggregate			1,227	1,275
Fill	985	747	182	214
Other uses	371	650	177	305
Industrial sand and gravel	W	W	--	--
Total	7,471	12,087	5,788	10,054

W Withheld to avoid disclosing individual company confidential data; included with "Other uses" (1973).
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 7.—Connecticut: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction	247	632	85	282
Highway and bridge construction			109	149
Other uses such as dams, waterworks, airports, etc			W	W
Concrete products (cement blocks, bricks, pipe, etc.)			31	68
Bituminous paving (asphalt and tar paving)			221	568
Roadbase and subbase			48	109
Unprocessed aggregate			W	W
Fill	34	34	27	41
Other	54	35	36	51
Total	335	701	557	1,218

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Production of stone decreased 13% in volume and 1% in value as compared with 1973.

Crushed basalt, used chiefly as construction aggregate and railroad ballast, was the major product in both volume and value. It was produced in Hartford, Litchfield, and New Haven Counties.

Crushed limestone and dolomite were produced in Litchfield County only, by three operators. It was marketed for metallurgical flux, soil neutralizer, lime manufacturing, stucco, and filler.

Crushed sandstone produced in Middlesex County was used in manufacturing fine aggregate and terrazzo. Quartz was produced in New London and Middlesex Counties for use in glass, asphalt filler, and abrasives. Dimension sandstone was produced in Windham County and sold primarily for use as rubble and in rough construction work. The dressed stone was marketed as building stone veneer.

New Haven Trap Rock/Tomasso (division of Ashland Oil, Inc.), Balf Co., and Roncari Industries, Inc. were the leading stone producers.

New Haven Trap Rock/Tomasso and the New Haven Water Co. were developing plans to convert a trap rock ridge in North Branford into a 3-billion-gallon-capacity reservoir. It was hoped that all planning plus local, State, and Federal approvals could be obtained and quarrying started during 1975. Completion of the project reportedly will require 25 years and should result in a reservoir 60 feet deep on the 120-acre site. The mining firm, the water company and the public will benefit—it was reported that the mining company will get access to 50 million tons of stone, New Haven Water Co. and the cities of New Haven and North Branford will receive a needed increase in water supplies, and land around the new reservoir will become scenic open space available for public use. New Haven Trap Rock/Tomasso operations and the company concern for environmental planning were reviewed in a journal article.[4]

METALS

Pfizer, Inc., at Canaan, Litchfield County, is the only known producer of calcium metal in the United States. Calcium is used to remove impurities during steelmaking, and in the production of aluminum, magnesium, uranium oxide, and thorium. Pfizer also produces barium metal which is used by the electronics, metals, and chemical industries and prefiltron, an iron-copper powder, which is used in the manufacture of electrodes.

The State has six steel mills that produced bars, rods, coils, strip, and wire rope from primary shapes. The Abbott Ball Co., Hartford County, produced steel shot and grit. Approximately 75 foundries produced ferrous and nonferrous castings, and 11 foundries produced ferrous and nonferrous forgings and ingots.

About 25 scrap metal dealers collected and processed ferrous metal for export, and for sale to area foundries.

The "Hartford Courant Magazine" of March 31, 1974, contained an article titled "Connecticut's Iron Belt." The article was a nostalgic review of the now defunct Connecticut iron mining industry that had its start in 1732.

MINERAL FUELS

Petroleum.—Each March issue of "Yankee Oilman" is devoted to the tabulation and analysis of published Bureau of Mines and other fuel and energy statistics for the latest available calendar year. Data on New England, including Connecticut, for 1972 was published in the March 1974 issue.[5]

Two proposals to build oil refineries and tanker terminals generated considerable controversy during the year. International Oil Ventures, Inc. ("In-O-Ven") proposed a $300 million inland refinery at Montville with docking facilities off New London. Pepco International, Inc. ("Pepco") proposed a $600 million refinery-terminal to be built upon a shoal in Long Island Sound near Cornfield Point. Numerous environmental groups organized to battle the proposals. Proponents cited economic and energy benefits to be gained from an area refinery.

A Hartford area group, including United Paving and Construction Co. of Enfield, announced plans for an oil reclaiming plant to process 48,000 gallons a day of used oil

[4] Robertson, J. L. Modernization Program Coordinates Environmental and Functional Planning. Rock Products, v. 77, No. 11, November 1974, pp. 42–47.

[5] Yankee Oilman. 1974 Fuel-Energy Facts, The Annual NEFD Statistical Fact Book. New England Fuel Institute, Boston, Mass. V. 19, No. 11, March 1974, 74 pp.

products normally discarded as waste. The proposed plant will recycle used crankcase oil, marine sludges, and heavy industrial lubricating wastes back into usable products. About 80 percent of the plant feed will be recovered by the process, similar to the one installed at Raffinerie Russikon A. G. in Zurich, Switzerland. While there are about 40 "re-refining" plants in the United States, they only treat about 10% of the available waste oil. The rest, presumably is discharged into water, or onto land, or is burned.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Clays:			
The Michael Kane Brick Co	654 Newfield St. Middletown, Conn. 06475	Pit	Middlesex.
Keller Potter Corp. of Conn	Four Rod Road Kensington, Conn. 06037	Pit	Hartford.
Kelsey-Ferguson Brick Co	Route 5 East Windsor Hill, Conn. 06028	Pit	Do.
Plasticrete Corp., Stiles Brick Div.	P.O. Box 248 North Haven, Conn. 06473	Pit	New Haven.
Feldspar:			
The Feldspar Corp.[1]	Spruce Pine, N.C. 28777	Pit	Middlesex.
Lime:			
Pfizer, Inc.[2]	Daisy Hill Road Canaan, Conn. 06018	Plant	Litchfield.
Gypsum (calcined):			
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	do	New Haven.
Sand and gravel:			
Balf Co.[3]	P.O. Box 11190 Newington, Conn. 06111	Pit	Hartford.
Beard Sand and Gravel Co., Inc	127 Boston Post Rd. Milford, Conn. 06460	Pit	New Haven.
Chapman Sand and Gravel Inc	Box 442 Broad Brook, Conn. 06016	Pit	Hartford.
The Leverty & Hurley Co	260 Bostwick Ave. Bridgeport, Conn. 06605	Pit	New Haven.
New London Sand and Gravel	47 Fog Plain Rd. Waterford, Conn. 06385	Pit, dredge	New London.
Oneglia and Gervasini Building Materials.[3]	P.O. Box 907 Torrington, Conn. 06790	Pits	Hartford.
Roncari Industries, Inc.[3]	1776 South Main St. East Granby, Conn. 06026	Pit	Do.
Sega Sand and Gravel Co., Inc	271 Danbury Rd. New Milford, Conn. 06776	Pits	Litchfield.
Stone:			
Basalt, crushed and broken:			
New Haven Trap Rock/ Tomasso (Div. of Ashland Oil, Inc.)[4]	P.O. Box 5033 Hamden, Conn. 06518	Quarries	Hartford and New Haven.
York Hill Trap Rock Quarry Co.	Westfield Rd. Meriden, Conn. 06450	Quarry	New Haven.

[1] Also sandstone and scrap mica.
[2] Also dolomite.
[3] Also basalt.
[4] Also sand and gravel.

The Mineral Industry of Delaware

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Delaware Geological Survey for collecting information on all minerals except fuels

By Joseph A. Sutton [1]

Mineral production in Delaware, excluding the value of magnesium compounds produced, totaled $3.8 million in 1974. Of the minerals produced in the State, sand and gravel was produced in the largest quantity and value. Clay production and value was slightly less than that of the previous year. Other commodities produced in 1974 included magnesium hydroxide and gem stones.

Other mineral-related activities included the recovery of sulfur from petroleum refining and the calcining of gypsum. These mineral products were recovered from raw materials produced outside the State and were not counted as part of Delaware's mineral production.

[1] Liaison Officer—Delaware and Maryland.

Table 1.—Mineral production in Delaware [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons --	15	$9	14	$8
Gem stones	NA	W	NA	2
Sand and gravel ---- thousand short tons --	3,408	3,678	2,396	3,783
Value of items that cannot be disclosed:				
Other nonmetals and values indicated by symbol W --	XX	202	XX	W
Total	XX	3,889	XX	[2] 3,793
Total 1967 constant dollars	XX	2,851	XX	[p] 1,814

[p] Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Total of listed figures only. Excludes value of magnesium compounds produced.

Table 2.—Indicators of Delaware business activity

	1973	1974 [p]	Change, percent
Employment and labor force, annual average:			
Civilian work force ---- thousands --	250.1	NA	NA
Unemployment ---- do ----	11.6	NA	NA
Manufacturing ---- do ----	73.4	72.4	—1.4
Contract construction ---- do ----	16.1	16.1	--
Nonmanufacturing ---- do ----	146.5	145.3	—0.8
Personal income:			
Total ---- millions --	$3,328	$3,568	+7.2
Per capita	$5,813	$6,227	+7.1
Construction activity:			
Cement shipments to Delaware ---- thousand short tons --	232	188	—19.0
Mineral production value ---- thousands --	$3,889	[1] $3,793	XX

[p] Preliminary. NA Not available. XX Not applicable.
[1] Incomplete total.

Sources: Survey of Current Business; Employment and Earnings; U.S. Bureau of Mines.

Legislation and Government Programs.—The Getty Oil Co. Inc., suppliers of fuel to Delmarva Power and Light Co., that in turn furnishes steam and electricity to Getty's eastern operation, was thus affected by fuel restrictions imposed on Delmarva Power and Light Co., and was ordered by the Secretary of the Department of Natural Resources and Environmental Control (DNREC) to comply with the 1% sulfur regulation of DNREC's plan rather than the Federal Energy Administration's plan (FEA). FEA prohibits further substitution of lower sulfur fuels at power stations during the time of the current energy shortage.

On September 20, 1974, Getty Oil Eastern and Delmarva Power and Light Co. filed an action in the U.S. District Court for the District of Delaware to seek a judicial determination on the conflict between the State's DNREC and the FEA. The State of Delaware took no action on the order requiring a switch to 1% sulfur, so during the year Getty Oil Eastern continued to supply 3.5% sulfur oil to Delmarva Power and Light Co.

On March 17, 1975, the Supreme Court reaffirmed its decision that the sea bed and subsoil underlying the Atlantic Ocean from 3 miles offshore to the continental shelf belong to the United States, not the Coastal States. This decision caused Delaware and other Coastal States to lose their bid for title to the water and underlying oil from the 3-mile limit seaward as far as 100 miles and gave the Federal Government the right to exploit energy resources from 3 miles offshore to the continental shelf. It was anticipated that a minimum of 1 year would pass before exploration would start on the outer continental shelf, and 3 to 5 years before oil would begin to flow from the area.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Clays.—Delaware Brick Co. remained the sole producer of clay in the State, operating a pit in New Castle County. The clay was used for making building brick.

Gem Stones.—Small quantities of mineral specimens were collected along the Delaware beaches by hobbyists.

Gypsum.—Georgia-Pacific Corp. calcined gypsum in New Castle County. Output decreased 8% below the 1973 record.

Magnesium Compounds.—The Barcroft Co. plant at Lewes continued to produce magnesium hydroxide (milk of magnesia) from sea water.

Sand and Gravel.—Sand and gravel was produced by 11 companies in Delaware; five in New Castle County, four in Kent County, and two in Sussex County. Of the total sand and gravel produced, 635,200 tons valued at $1,674,893 was processed, and 1,760,749 tons valued at $2,107,895 was unprocessed.

The main use for sand and gravel produced in the State continued to be for roadbase purposes. All sand and gravel produced in the State was transported by truck.

Sulfur.—One company recovers sulfur as a byproduct of the production of petroleum products from imported crude petroleum. Nationally, the State was the seventh largest producer of recovered sulfur.

Table 3.—Principal producers

Commodity and company	Address	Type of activity	County
Clays: Delaware Brick Co	River Rd. New Castle, Del. 19720	Pit	New Castle.
Gypsum, calcined: Georgia-Pacific Corp.	900 SW Fifth Ave. Portland, Oreg. 97204	Plant	Do.
Magnesium compounds: Barcroft Co.	P.O. Box 474, Henlopen Dr. Lewes, Del. 19958	do	Sussex.
Sand and gravel:			
Barber Sand and Gravel	R.F.D. 1 Harrington, Del. 19952	Pit	Kent.
Clough & Caulk Sand & Gravel	Route 1, Box 129 Wyoming, Del. 19934	Pit	Do.
Delaware Sand & Gravel	R.D. 2, Box 286 New Castle, Del. 19720	Pit	New Castle.

Table 3.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
George Nashold, Inc	Box 286 Frederica, Del. 19946	Pit	Kent.
Material Transit, Inc	Box 210 924 South Herald St. Wilmington, Del. 19800	Pit	New Castle.
Parkway Gravel, Inc	4048 New Castle Ave. New Castle, Del. 19720	3 Pits	Do.
St. Jones River Gravel Co	Box 426 Dover, Del. 19901	Pit	Kent.
Sussex Sand and Gravel Co	Millsboro, Del. 19966	Pit	Sussex.
Swain Construction Co	Lincoln, Del. 19960	Pit	Do.
Whittington's Sand & Gravel Co.	U.S. Route 40 Bear, Del. 19701	Pit	New Castle.
Woodlawn Gravel Co	Box 2501 Wilmington, Del. 19805	Pit	Do.

The Mineral Industry of Florida

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Florida Bureau of Geology.

By John W. Sweeney [1] and Charles W. Hendry Jr.[2]

The value of mineral production in Florida totaled over $1 billion in 1974, more than $400 million or 74% above that of 1973. This increase was directly attributable to the 134% increase in value of petroleum production and a 114% increase in phosphate rock production value. Peat, lime, natural gasoline, magnesium compounds, and zircon concentrates showed significant increases in production over 1973 levels.

For the 81st consecutive year, Florida led the nation in phosphate rock output. Florida also ranked first in the production of fuller's earth, zircon, and monazite; second in ilmenite, third in peat and Florida was the only producer of rutile and staurolite.

Florida and North Carolina supplied 81% of the domestic phosphate rock market and was the second leading exporter to world markets. Florida exports were through the Ports of Tampa, Boca Grande, and Jacksonville.

During the year the phosphate industry added 68,000 kw of new load to Tampa Electric Co.'s system, and it is planned that an additional 120,000 kw of demand will be required over the next 5 years to meet increased production by the phosphate industry.[3]

Uranium Recovery Corp. announced construction of a $4 to $5 million uranium recovery plant to go onstream in late 1975. The operation reportedly will be located in Polk County in close proximity to existing phosphate mining and fertilizer operations. The system includes uranium recovery equipment at several wet-acid plants to strip the uranium from the phosphoric acid. Uranium Recovery has signed contracts to recover uranium from International Minerals & Chemicals Corp. and W. R. Grace & Co.

Gulf Oil Corp., one of the Nation's largest uranium producers, announced it is arranging joint ventures with phosphate mining companies in Polk and Hillsborough Counties to extract uranium from phosphates. Gulf has demonstrated its process in a $500,000 pilot operation at Agrico Chemical Co.'s operation at Pierce. It is expected that the first 300,000-pounds-per-year extracting plant will go onstream in 1975.

Westinghouse Corp. also actively explored the possibility of extracting uranium from phosphoric acid process streams. The company has been working with Gardinier Inc. on a uranium extraction pilot plant, which has demonstrated the basic feasibility of its process, according to Westinghouse.

Ashland Oil Co. announced that it was considering building an oil refinery, an offshore port, and a sizable town in St. Lucie County on Florida's east coast. The company was considering a medium-size refinery with a capacity to process 250,000 barrels a day. The refinery would be supported by an offshore port facility where medium and small tankers could pipe crude oil, via a submarine line, to the onshore refinery.

The Belcher Oil Co. of Miami proposed to construct an oil refinery at Port Mana-

[1] State Liaison Officer, Bureau of Mines, Tallahassee, Fla.
[2] Chief, Bureau of Geology, Florida Department of Natural Resources.
[3] Tampa Electric Co., 1974 Annual Report, 1974, p. 7.

tee that would be connected to a deep-water tanker terminal offshore in the Gulf by two 48-inch submarine pipelines. The terminal, first of its kind off U.S. coastal waters, is slated to be located 24 miles west from Anna Maria Island. The refinery would have a capacity to process 200,000 barrels a day initially with the capability of expanding to 400,000 barrels.

Tampa Electric Co. purchased the remaining 50% of the Cal-Glo Coal. Co. of Harlan, Ky. The Kentucky mine has a present annual output of 275,000 tons. It is estimated that production can be increased to 750,000 tons annually. The coal contains about 1.3% sulfur and reserves are estimated at 26 million tons, or enough to last 30 years at an annual production rate of 750,000 tons.

Oil exploration began on the Outer Continental Shelf (OCS) leases in the eastern Gulf of Mexico off Florida's coast. Exxon Corp., Shell Oil Co., Sunoco Oil Co., and Texaco Oil Co. drilled exploratory wells on their OCS leases. No oil or gas were found in commercial quantities.

Exxon Corp. began operating a sulfur recovery unit at its Black Jack Creek field in Santa Rosa County.

The Jay Oil field, composed of 85 producing wells on 13,000 acres, was unitized to extend the life of the field. Without unitization it was estimated the field would last through 1977, and with unitization the field should produce at least until 1995. Exxon Corp. was named as the operator.

The Blackjack Creek Oil field was unitized in December 1974. The unitization was completed before any wells were producing. This action authorized pressure maintenance procedures in the reservoir to be instituted immediately and it is calculated that the total oil produced will be doubled.

Legislation and Government Programs.—The U.S. Congress passed Public Law 93–440. This Act established the Big Cypress National Preserve in the State of Florida. Under the Act the Secretary of the Interior shall develop rules and regulations as he deems necessary and appropriate to limit or control the use of Federal lands and waters with respect to: Exploration for and extraction of oil, gas, and other minerals; and such other uses the Secretary determines must be limited.

Public hearings were held on phosphate leasing in the Osceola National Forest. The Secretary of the Interior has taken the testimony under advisement and requested additional studies covering the economic impact of mining in the Osceola National Forest.

The Governor and Cabinet, sitting as the Administrative Commission on January 15, 1974, created the Office of Petroleum Allocation and Energy Conservation for the express purpose of dealing with hardship cases of fuel shortages caused by the Organization of Petroleum Exporting Countries (OPEC) oil embargo. The two functions of the office were allocation to administer the State-set aside, and conservation and planning to develop appropriate plans relating to energy conservation, provision of fuel to meet emergencies, and to develop emergency distribution and availability plans.

The Florida Energy Committee responsible for: (1) Studying in detail the present policies affecting energy conservation and use in Florida; (2) studying the available sources of energy for use in Florida; (3) recommending a comprehensive system of energy policies to meet the needs of Florida; and (4) recommending any other administrative, statutory, or constitutional changes which the Committee deems necessary to improve energy policies, published its first report entitled Energy in Florida.[4]

The Governor of Florida signed into law a bill entitled, the Florida Resource Recovery Management Act. The Act provides for State and local resource recovery and management programs; establishes a resource recovery and management grant fund and advisory council; provides for a State pilot project; and where economically feasible, may require municipalities to operate a resource recovery program. The Act will be administered by the Florida Department of Pollution Control.

Florida's tough oil spill law was modified by the 1974 legislature. The previous law placed unlimited liability on the owner of a vessel that had a spill, it was contended that it made it difficult for some municipalities to obtain bids for oil. The law has been altered in the following manner:

> A $14 million liability or $100 per gross ton, whichever is less, has been established for shippers to pay for the

[4] Florida Energy Committee. Energy In Florida, A Report and Recommendations on Energy and Energy Policy In Florida To the Governor and the Florida Legislation. Mar. 1, 1974, 191 pp.

cost of an oil spill or other pollutants in Florida waters. The liability for terminals is $8 million. A $35 million trust fund is being created to pay for damages to private and personal property. This fund will be financed by a 2-cent per gallon tax on oil shipped to Florida ports.

The phosphate slimes dewatering cooperative program between the Federal Bureau of Mines and the Florida Phosphate Council, representing 10 phosphate rock mining companies, was continued for a second year at a total funding level of about $600,000. During the year characterization, electrophoretic mobility, cation exchange capacities, quantitative mineral composition, flocculation, and other studies were carried out under the project.

The Bureau of Mines Tuscaloosa (Ala.) Metallurgy Research Laboratory also worked on upgrading waste gypsum from phosphate rock processing; and beneficiation of the phosphate-bearing Hawthorne Formation limestone to determine if recovery of the phosphorite in the Formation is feasible. Under the cooperative clay testing and utilization program waste clays from a Florida sand operation were beneficiated, tested, and found to be a high-quality ball clay, suitable for ceramics applications.

The Bureau's Albany (Oreg.) Metallurgy Research Center, continued to work on direct acidulation of Florida phosphate matrix to improve P_2O_5 recovery and to eliminate slimes. Results on a number of Bureau of Mines programs relating to Florida were published.[5]

The Florida Bureau of Geology, Department of Natural Resources continued studies of mineral resources throughout the State and published the second in its Environmental Geology Studies.[6]

Hillsborough County passed a mine control ordinance modeled after the State's oil spill law. Manatee, Hardee, DeSoto, and Bradford Counties also passed mine control ordinances.

[5] Edgerton, C. D. Effects of Urbanization Upon the Availability of Construction Minerals in Southeastern Florida. BuMines IC 8664, 1974, 20 pp.
Wang, K–L., B. W. Klein, and A. F. Powell. Economic Significance of the Florida Phosphate Industry. BuMines IC 8653, 1974, 51 pp.

[6] Wright, A. P. Environmental Geology and Hydrology, Tampa Area, Florida. Bureau of Geology, Florida Department of Natural Resources, 1974, 94 pp.

Table 1.—Mineral production in Florida[1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Masonry ---------- thousand short tons	256	$8,706	235	$4,737
Portland ---------- do	2,725	72,666	2,562	75,138
Clays ---------- do	1,139	13,718	[2]808	[2]14,261
Lime ---------- do	187	4,026	185	5,315
Natural gas ---------- million cubic feet	33,857	11,613	38,137	20,441
Peat ---------- thousand short tons	44	384	67	616
Petroleum (crude) thousand 42-gallon barrels	32,695	150,070	36,351	351,331
Titanium concentrates (rutile) - short tons	9,045	1,212	6,446	996
Sand and gravel ----- thousand short tons	20,167	21,415	24,372	33,400
Stone[3] ---------- do	61,735	103,595	54,560	100,378
Value of items that cannot be disclosed: Clays, (kaolin) (1974), kynite, magnesium compounds, natural gas liquids, phosphate rock, rare-earth metals, staurolite, stone (dimension), titanium concentrates, and zircon concentrate ------	XX	r 213,695	XX	487,287
Total ----------	XX	601,100	XX	1,043,895
Total 1967 constant dollars ----------	XX	440,666	XX	p 499,191

p Preliminary. r Revised. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes kaolin; included with "Value of items that cannot be disclosed."
[3] Excludes dimension stone and shell; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Florida, by county [1] [2]
(Thousands)

County	1973	1974 [3]	Minerals produced in 1974 in order of value
Alachua	$1,971	$3,245	Stone.
Bay	W	W	Sand and gravel.
Bradford	W	W	Natural gas.
Brevard	892	W	Stone, sand and gravel.
Broward	20,346	22,553	Do.
Calhoun	W	W	Sand and gravel.
Charlotte	W	--	
Citrus	W	1,828	Stone, phosphate rock.
Clay	W	W	Ilmenite, zircon, rutile, staurolite, sand and gravel, clays, monazite.
Collier	8,762	6,008	Stone.
Dade	88,330	87,767	Cement, stone, sand and gravel.
DeSoto	--	W	Sand and gravel.
Escambia	30,735	W	Sand and gravel, clays.
Franklin	W	W	Sand and gravel.
Gadsden	W	12,794	Clays, sand and gravel.
Gilchrist	W	--	
Glades	--	W	Sand and gravel.
Gulf	W	W	Magnesium compounds, lime.
Hamilton	W	W	Phosphate rock.
Hendry	18,978	W	Sand and gravel.
Hernando	W	23,186	Stone, lime, clays, phosphate rock.
Highlands	--	W	Peat.
Hillsborough	W	W	Cement, sand and gravel, stone, peat.
Jackson	W	W	Stone, sand and gravel.
Lake	2,160	3,869	Sand and gravel.
Lee	3,879	W	Stone.
Leon	W	W	Sand and gravel.
Levy	W	247	Stone.
Manatee	59	W	Cement, stone.
Marion	4,306	5,133	Stone, clays, sand and gravel, phosphate rock.
Martin	--	W	Sand and gravel.
Monroe	1,336	1,296	Stone.
Okaloosa	W	W	Sand and gravel.
Okeechobee	--	W	Stone.
Orange	W	W	Sand and gravel, peat.
Palm Beach	326	W	Stone.
Pasco	420	611	Do.
Pinellas	W	W	Stone, sand and gravel.
Polk	175,605	355,028	Phosphate rock, sand and gravel, peat, stone.
Putnam	W	2,749	Sand and gravel, clays, peat.
St. Lucie	W	383	Sand and gravel.
Santa Rosa	110,404	--	
Sarasota	--	W	Sand and gravel.
Sumter	W	7,904	Stone, lime, peat.
Suwannee	W	W	Stone.
Taylor	W	W	Do.
Walton	W	W	Sand and gravel.
Washington	W	W	Do.
Undistributed [4]	133,092	509,298	
Total [5]	601,100	1,043,895	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Baker, Columbia, Dixie, Duval, Flagler, Hardee, Holmes, Indian River, Jefferson, Lafayette, Liberty, Madison, Nassau, Osceola, St. Johns, Seminole, Union, Volusia, and Wakulla.

[2] Values of petroleum are based on an average price per barrel for the State.

[3] County data for 1974 petroleum and natural gas are not available.

[4] Includes values of counties indicated by W and petroleum and natural gas values for 1974.

[5] Values may not add to totals shown because of independent rounding.

Table 3.—Indicators of Florida business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total nonagricultural employment	thousands	2,756.5	2,837.5	+2.9
Manufacturing	do	373.8	373.7	--
Mining	do	9.3	10.3	+10.8
Contract construction	do	277.3	265.1	-4.4
Other nonagricultural employment [1]	do	2,096.1	2,188.4	+4.4
Personal income:				
Total	millions	$37,799	$42,352	+12.0
Per capita		$4,880	$5,235	+7.3
Construction activity:				
Housing units authorized		266,982	116,645	-56.3
Value of nonresidential construction	millions	$1,446.1	1,185.7	-18.0
Highway construction contract awards	do	$366.3	$315.0	-14.0
Farm marketing receipts	do	$1,921	NA	NA
Mineral production value	do	$601.1	$1,043.9	+73.7

p Preliminary. NA Not available.
[1] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; service; and government.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; Highlights of U.S. Export and Import Trade; and Federal Bureau of Mines.

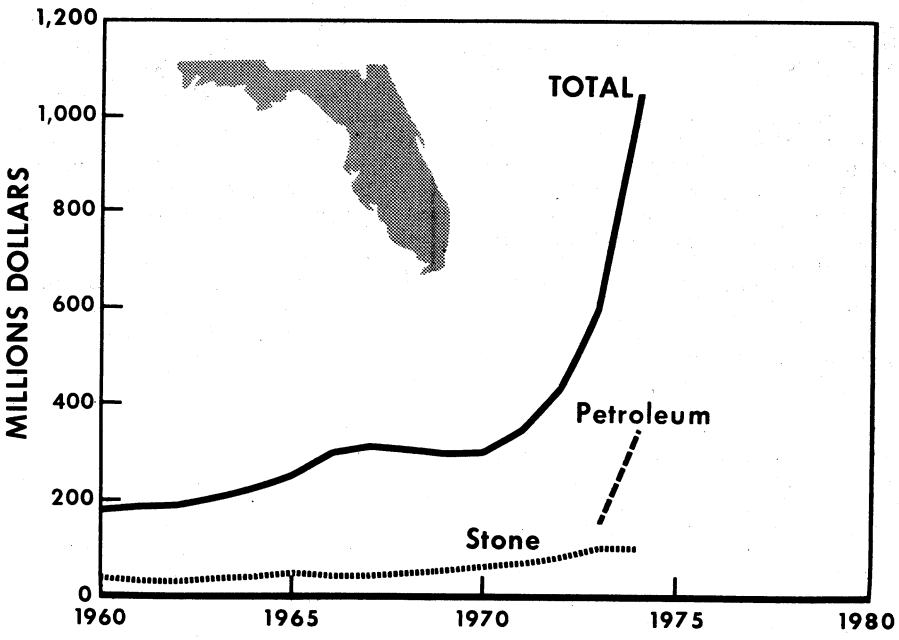

Figure 1.—Value of phosphate rock, stone, and total value of mineral production in Florida.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Nonmetals accounted for 61%, fuels 37%, and metals 2% of the State's total mineral production value in 1974. The principal nonmetals produced, listed in order of value, were phosphate rock, stone, cement, sand and gravel, and clays.

Cement.—Shipments of masonry cement decreased both in quantity and value. Shipments of portland cement decreased 6% in quantity but increased 3% in value, reflecting the slowdown in Florida building construction and continued high prices paralleling that of the Nation.

Types I and II (general-use and moderate heat), Type III (high-early-strength), white cement, and pozzolan cements were produced. Most of the shipments were made within the State. Masonry cement shipments were principally within the State.

Portland cement shipments, mainly in bulk form, were made by truck (95%) and by rail (5%). Principal consumers were ready mix concrete companies, concrete products manufacturers, and building materials dealers.

Raw materials used in manufacture of cement were mined principally within the State and included limestone, clay, sand, and staurolite. Oolitic aragonite imported from the Bahamas was used exclusively by one company. Small amounts of blast furnace slag and gypsum were used, but it was obtained from out-of-State sources. Twelve rotary kilns were operated at the four plants. All plants used the wet process. Over 300 million kilowatt-hours of electrical energy were consumed in the manufacture of cement; 100% of the power was purchased.

Florida Mining and Materials Corp. of Tampa announced that they will construct a 3-million-barrel-per-year cement plant near Brooksville, Fla. The $35 million project will be located adjacent to their 4,000 area holdings, and adjacent to the quarry. The mill is expected to go onstream late in 1975.

Clays.—Total clay output decreased 29%, while the value increased 4%.

Florida's fuller's earth production ranked second highest in the Nation. Fuller's earth output remained the same but its value increased 14%. Three producers were active in Gadsden County and one produced in Marion County. Fuller's earth was used for fillers, absorbents, pesticides, drilling mud, filter aids, and other uses.

Kaolin output decreased 2% and the value increased 13% from that of 1973. Kaolin was produced by one company in Putnam County; principal uses were in whiteware, pottery, and wall tile.

Miscellaneous clay output decreased 47% and the value decreased 41% from that of 1973. The decreases were in the clays used for cement and lightweight aggregate. The clays were used in the manufacture of cement, lightweight aggregate, and building buck. Mines were operated in Clay, Escambia, and Hernando Counties in 1974.

Fluorine.—Fluorine in the form of fluosilicic acid was recovered from six plants as a byproduct of wet-process phosphoric acid manufacture. The fluosilicic acid was used to produce cryolite, aluminum fluoride, sodium silica fluoride, and for water fluoridation. The value of fluorine byproducts is not included in the State mineral production statistics.

Gypsum.—Imported crude gypsum was calcined by three companies for use in the manufacture of gypsum building products. U.S. Gypsum Co. and Kaiser Cement & Gypsum Corp. operated plants near Jacksonville, Duval County; and National Gypsum Co. operated a plant near Tampa, Hillsborough County. The three plants used calcining kettles, one rotary kiln, and one holoflite in processing gypsum and manufacturing of gypsum products, total capacity of the plants was about 1 million tons of calcined products. Crude ore for most operations was transported by ship from company-owned deposits in Nova Scotia, Canada, and Jamaica. A total of 547,000 short tons of calcined gypsum was produced, a decrease of 15% from 1973 production.

Approximately 100,000 tons of byproduct gypsum was sold by several phosphate fertilizer manufacturers for agricultural purposes.

Lime.—Basic Magnesia, Inc. in Gulf County, Chemical Lime, Inc. in Hernando County, and Dixie Lime & Stone Co. in Sumter County produced 185,000 tons of lime for magnesia, water treatment, sewage disposal, and other uses. Output was 1% below the 1973 record. The lime was used in Florida. Consumption of lime in Florida was 382,500 tons.

Magnesia.—Basic Magnesia, Inc. produced caustic-calcined magnesia, refractory grade magnesia, and magnesia hydroxides from seawater. Production was less than plant design of 60,000 tons per year. Shipments decreased 3% but value increased 64% compared with that of 1973.

Perlite.—Four companies produced expanded perlite from ore mined in Colorado and New Mexico. Production increased to 24,066 short tons in 1974 from 23,378 short tons in 1973. The 24,038 short tons sold or used was an increase of 6% over that of 1973. The value of the quantity sold or used was $1,403,000, an increase of 9% over the 1973 value. Production from plants in Dade, Duval, Escambia, and Indian River Counties was used in plaster

aggregate, concrete aggregate, formed products, horticultural aggregate, and miscellaneous filter aids and fillers.

Phosphate Rock.—Marketable production of phosphate rock increased 6% in quantity and 114% in value reflecting a widening gap between supply and demand.

Florida's 1974 production data is combined with that of North Carolina to conceal the latter's output, because there is only one producing company in North Carolina. Combined marketable production from both States in 1974 was 36,980 million short tons, valued at $409 million and represented 81% of the total national output. Marketable production sold or used totaled 39,920 million tons valued at $437,158 million, an 8% increase over the 36,916 tons in 1973. Agricultural uses accounted for 26 million tons or 66%, industrial uses and exports accounted for the remainder. Exports from the two States were valued at $183 million. Agricultural uses were for ordinary superphosphate, triple superphosphate, wet-process phosphoric acid, direct application to the soil, stock and poultry feed, and fertilizer filler. Industrial uses included the manufacture of elemental phosphorus.

Mine production of crude dry ore in Florida and North Carolina was 142 million tons with a P_2O_5 content of 18 million tons.

Land-pebble phosphate was produced at 16 mines by 10 companies in 2 counties. One company processed tailings from an abandoned mine.

Soft-rock phosphate was produced by four companies operating five mines in two counties. Total mine production was 38,813 tons with a P_2O_5 content of 7,700 tons, valued at $571,000. The soft rock was used for direct application to the soil, in stock and poultry feed, and as fertilizer filler.

Marketable phosphate rock was produced from Florida land-pebble phosphate mines by Agrico Chemical Co., Borden, Inc.; Brewster Phosphates; Gardinier, Inc.; W. R. Grace & Co.; International Minerals & Chemical Corp.; Mobil Oil Corp.; Poseidon Mines, Inc.; Occidental Petroleum Corp.; U.S.S. Agri-Chemicals, Inc.; and Swift Chemical Co.

Agrico Chemical Co. began development of its new Ft. Green mine in Polk County. Construction of a washer and flotation plant began. Design capacity of the operation is 3.5 million tons per year.

Construction of an $18 million wet-phosphate rock shipping terminal at Big Bend, Hillsborough County began. The terminal will handle about 2 million tons of wet rock annually to be shipped by barge for domestic conversion to upgraded fertilizer products.

Beker Industries Corp., exercised its option to acquire about 9,000 acres of phosphate reserves from PPG Industries, Inc. It also acquired several other tracts for a total holding of 11,000 acres in Manatee County, 6,000 of which are to be mined. Most of the regional and State approvals were received and mine development was scheduled for late 1975, contingent upon approval of a Manatee County mining permit and a water-use permit.

Brewster Phosphates was granted a mining permit from Hillsborough County to operate a phosphate mine on its 18,000 acres in the Ft. Lonesome area of Hillsborough County. Of the 18,000 acres, only 9,800 contain marketable reserves. Brewster plans to produce about 3 million tons of marketable phosphate for 18 years at its Lonesome mine. Mine development was expected in early 1975, with the operations going onstream in 1976.

CF Industries' new 800-ton-a-day P_2O_5 wet-process phosphoric acid plant at Plant City went onstream during the year.

W. R. Grace & Co. expressed its intentions to submit a Development of Regional Impact Report on mining plans for its 12,000-acre tract in the Ft. Lonesome area lying in parts of Polk, Hillsborough, and Manatee Counties.[7] Construction at its 2.5-million-ton-per-year Hooker Prairie mine continued.

International Minerals & Chemical Corp. was granted a mining permit by the Hillsborough County Commission to develop its new East Kingsford mine covering 6,000 acres in Hillsborough County.[8] The Phosphoria mine and washer went onstream during the year.

Mobil Oil Corp. announced its intentions to open a phosphate mine in Hardee County in 1979.[9]

Occidental Petroleum Corp. of the United States, signed six contracts with the

[7] The Tampa Tribune. Apr. 5, 1974.
[8] The Tampa Tribune. Apr. 5, 1974.
[9] The Herald-Advocate-Wauchula. Aug. 29, 1974.

Soviet Union worth $20 billion in a chemical fertilizer barter. Under the 20-year agreement, Occidental's Florida plants will provide up to 1 million tons a year of superphosphoric acid to the Soviets. It will get in return, Soviet ammonia and urea.[10]

Occidental announced a two-phase expansion at its White Springs operations. Phase I included the addition of a 45-cubic-yard dragline at its Suwannee River mine and a 150% expansion at its existing chemical facilities. Development of a second mine in Hamilton County reportedly began with approximately a 3-million-ton-per-year capacity; reportedly it will utilize 3 additional 45-cubic-yard draglines. The second mine was scheduled to go onstream in January 1976. Phase II encompassed additional facilities required for the U.S.S.R. trade agreement that would include a third mine to be located in northern Columbia County, and a second chemical complex to be located in Hamilton County with an anticipated starting date in 1979.[11]

Phillips Petroleum started pumping tests on its properties in Manatee and DeSoto Counties. The company owns 15,000 acres in these counties.[12]

Swift Chemical Co. announced that it planned to seek permits to mine phosphate rock on 11,000 acres it owns in Manatee County.[13]

Sand and Gravel.—Sand and gravel output totaled 24 million tons valued at $33 million in 1974. This increased production was primarily due to increased statistical coverage. Polk County was the leading producer of sand used for building purposes and accounted for 17% of the output and 20% of the value. Nearly all of the sand was produced by commercial operators. There were 67 sand and gravel operations during the year; of these 20 produced between 500,000 and 1,000,000 tons, 27 produced between 100,000 and 500,000 tons, and 20 produced less than 100,000 tons. Ninety-one percent of the commercial output was transported by truck, 8% by rail, and 1% by water. The sand and gravel was mainly used for construction purposes with a small amount going into industrial uses.

Staurolite.—Staurolite was recovered as a byproduct of ilmenite production at the Highland and Trail Ridge plants of E. I. du Pont de Nemours & Co., Inc. in Clay County. Both output and value increased over 1973 levels. It was principally used in sand blasting and minor amounts for cement. Florida is the only State with a recorded production of staurolite.

[10] Business Week. Aug. 13, 1974.
[11] Live Oak Independent Post. Sept. 3, 1974.
[12] Bradenton Herald. Nov. 5, 1974.
[13] Bradenton Herald. Nov. 5, 1974.

Table 4.—Florida: Sand and gravel sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Brevard	1	57	165	1	W	W
Broward	3	1,430	1,455	6	3,461	4,990
Dade	5	2,541	3,389	5	3,414	5,809
Escambia	5	506	688	5	525	1,025
Hendry	1	1,529	1,816	2	W	W
Hillsborough	1	263	W	1	283	W
Lake	4	2,137	2,166	8	3,588	3,869
Polk	8	4,371	5,567	14	4,180	6,659
St. Lucie	--	--	--	1	574	383
Other [1]	23	7,335	6,175	24	8,349	10,667
Total [2]	51	20,167	21,415	67	24,372	33,400

W Withheld to avoid disclosing individual company confidential data; included with "Other."
[1] Includes Bay, Calhoun, Clay, DeSoto, Franklin, Gadsden, Glades, Jackson, Leon, Marion, Martin, Okaloosa, Orange, Pinellas, Putnam, Sarasota, Walton, and Washington Counties.
[2] Data may not add to totals shown because of independent rounding.

Table 5.—Florida: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	19,466	18,578	14,265	18,055
Gravel			4,051	7,264
Unprocessed:				
Sand and gravel			5,329	3,995
Industrial:				
Sand	701	2,837	727	3,940
Gravel			--	--
Total	20,167	21,415	24,372	33,254

[1] Value data may not be directly comparable to that in tables 1, 4, 6, and 7 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 6.—Florida: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1974	
	Quantity	Value [1]
Construction aggregates:		
Nonresidential and residential construction	6,746	9,382
Highway and bridge construction	1,075	1,816
Other uses such as dams, waterworks, airports, etc.	195	301
Concrete products (cement blocks, bricks, pipe, etc.)	3,749	5,141
Bituminous paving (asphalt and tar paving)	529	672
Roadbase and subbase	755	1,227
Unprocessed aggregate	5,103	3,936
Fill	1,236	1,101
Other uses	727	3,940
Industrial sand and gravel	--	--
Total	20,115	27,516

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 7.—Florida: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1974	
	Quantity	Value [1]
Construction aggregates:		
Nonresidential and residential construction	W	W
Highway and bridge construction	1,849	2,111
Other uses such as dams, waterworks, airports, etc.	1,119	1,594
Concrete products (cement blocks, bricks, pipe, etc.)	--	--
Bituminous paving (asphalt and tar paving)	W	W
Roadbase and subbase	1,289	2,180
Unprocessed aggregate	W	W
Fill	W	W
Other	--	--
Total	4,257	5,885

W Withheld to avoid disclosing individual company confidential data; included with "Other uses such as dams, waterworks, airports, etc.".
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Florida stone (all limestone) is divided into two types—hard-rock and soft-rock. Each type has a different end use and value. Hard-rock is used as concrete, bituminous and macadam aggregates, and ranges in value from $0.80 to over $4.00 per ton. Soft-rock limestone is used as dense-graded roadbase material, surface treatment aggregate, and in the manufacture of lime; it ranges in value from $0.64 to over $2.50 per ton.

Hard-rock limestone was produced in Broward, Collier, Dade, Hernando, Lee, Monroe, Okeechobee, Palm Beach, and Suwanee Counties. Soft-rock limestone was produced in all of the counties listed in table 8. Soft rock limestone accounted for approximately 63% of the output and 57% of the value of the crushed limestone produced in 1974.

Crushed limestone output was 55 million tons valued at $100 million, a decrease of 12% in tonnage and 3% in value from 1973 level. The decreases were directly attributed to the slowdown in the construction and road building industries. Output came from 96 quarries in 19 counties compared with 89 quarries in 18 counties in 1973. The three leading producing counties were Dade, Broward, and Hernando, which supplied 66% of the State's total tonnage and 67% of the value. Eighteen companies operating 37 quarries accounted for 75% of the crushed stone output and 76% of the value. Of the total crushed limestone sold or used, agricultural stone accounted for 3% of the quantity and 5% of the value; concrete aggregate, 27% and 32% respectively; bituminous aggregate, 9% and 10%, respectively; and dense-graded roadbase stone, 35% and 24%, respectively. One company processed oyster shells for roadbase material.

Table 8.—Florida: Crushed limestone and dolomite sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value
Alachua	4	2,438	1,971	4	3,449	3,245
Brevard	1	196	227	1	173	220
Broward	17	10,271	18,891	18	9,185	17,563
Citrus	5	1,072	1,593	5	953	1,336
Collier	9	2,705	5,473	10	2,628	6,008
Dade	19	23,185	33,478	18	18,361	28,488
Hernando	5	10,399	21,853	8	8,670	20,838
Levy	3	304	W	3	236	247
Marion	6	1,543	3,032	7	1,255	3,119
Monroe	1	625	1,336	1	550	1,296
Okeechobee	--	--	--	1	66	W
Palm Beach	3	313	326	4	W	W
Pasco	1	300	420	2	352	611
Polk	1	127	145	1	112	141
Sumter	4	5,274	W	4	4,163	5,865
Undistributed [1]	10	2,983	14,851	9	4,409	11,401
Total [2]	89	61,735	103,595	96	54,560	100,378

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes Jackson, Lee, Manatee, Suwanee, and Taylor Counties.
[2] Data may not add to totals shown because of independent rounding.

Table 9.—Florida: Crushed limestone and dolomite sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	2,671	4,424	4,930	10,341
Concrete aggregate	20,067	40,176	14,918	32,309
Dense graded roadbase stone	22,930	34,139	19,114	24,590
Macadam aggregate	1,446	2,612	260	458
Surface treatment aggregate	828	1,392	5,407	13,699
Unspecified construction aggregate and roadstone	5,399	4,877	2,089	3,479
Agricultural purposes [1]	1,425	4,326	1,478	5,154
Cement manufacture	1,775	2,271	1,840	2,412
Fill	1,020	1,476	1,802	2,756
Manufactured fine aggregate (stone sand)	2,210	3,297	1,779	3,130
Railroad ballast	295	566	W	W
Riprap and jetty stone	W	W	218	547
Other uses [2]	1,669	4,039	725	1,504
Total [3]	61,734	103,537	54,560	100,378

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Data include agricultural limestone, other soil conditioners, and stone used in poultry grit and mineral food.
[2] Data include stone used in other fillers and lime manufacture. 1973 data also include stone used in drain fields and uses not specified.
[3] Data may not add to totals shown because of independent rounding.

Sulfur.—Recovered sulfur from petroleum production in Escambia and Santa Rosa Counties increased from 224,416 long tons in 1973 to 249,929 long tons in 1974. Sulfur sales increased from 225,407 long tons in 1973 to 248,627 long tons in 1974.

Vermiculite.—Exfoliated vermiculite was produced by two operators from four plants in Broward, Duval, and Hillsborough Counties from crude material shipped into the State. The vermiculite was used for lightweight aggregate, plaster aggregate, insulation, and other uses.

METALS

Metals accounted for only 2% of the State's total mineral production value.

Ferroalloys.—Two companies produced ferrophosphorus as a byproduct of elemental phosphorus manufacture. The value of ferroalloys is not included in the total State mineral production value.

Rare Earth Minerals.—Titanium Enterprises produced monazite concentrate from its Green Cove Springs plant. The monazite concentrate contains rare earth metals and thorium oxide.

Titanium Concentrates.—Shipments of ilmenite concentrate decreased 13% in tonnage but increased 10% in value from that of 1973, reflecting the worldwide increase in price.

E. I. du Pont de Nemours & Co. and Titanium Enterprises produced ilmenite concentrate from their plants in Clay County. NL Industries, Inc. moved its dredge from the Folkston, Ga. mine into the Boulogne, Fla. area. The concentrate will be trucked back to its Folkston plant for beneficiation.

Titanium Enterprises produced rutile concentrate from its Green Cove Springs plant. Shipments decreased 29% in tonnage and 18% in value from that of 1973.

Zircon Concentrate.—Production of zircon concentrate at E. I. du Pont de Nemours & Co.'s Trail Ridge plant and Titanium Enterprises Green Cove Spring operations, both in Clay County, increased 16% over that of 1973. The value was 117% higher than that reported in 1973. The zircon sands were used in ferrous foundries, refractory shapes, and ceramics.

MINERAL FUELS

Mineral fuels produced were natural gas, natural gas liquids, crude petroleum, and peat.

Natural Gas.—Total net sales of natural gas in Florida in 1974 was about 31 billion cubic feet. The difference between the total net sales volume and the 38.1 billion cubic feet measured at the wellhead was a 12.3% H_2S, CO_2, and N_2 content, plus plant losses and in plant consumption for combustion purposes. All of the gas sold was from the Jay field, except for a small quantity that was produced from the nearby Mt. Carmel

field. The Florida Gas Transmission Pipeline Co. marketed most of the sales volume for intrastate consumption. The remainder was sold through Five Flags Pipeline Co. to industrial customers in the Pensacola area.

Prior to distribution by the Florida Gas Transmission Pipeline Co., the gas was stripped of natural gas liquids at its processing plant in north-central Florida. The British thermal unit value of the gas was reduced from 1,450 to 1,040 Btu per cubic foot before distribution through the intrastate pipeline.

Peat.—Peat production increased from 43,800 short tons valued at $384,000 in 1973 to 67,300 short tons valued at $616,000 in 1974. The 53.6% increase in production was accompanied by a 60.4% increase in value. Nine companies produced moss, reed-sedge, and humus peat. Shipments totaled 67,000 short tons and consisted of 34% moss, 14% reed-sedge, and 52% humus peat. All but a few tons were shipped in bulk and used to pack flowers, plants, and shrubs; for general soil improvement and potting soils; and for earthworm culture.

Petroleum.—Total oil production in Florida was 36.4 million barrels in 1974. The 11% increase was primarily attributed to further development of the Jay field. The Jay field yielded 86.8% of the total crude oil production in the State. The wellhead value of northwest Florida high-grade crude ranged from $9.07 per barrel in January 1974 to $10.22 per barrel in December 1974.[14] The yearly average value was approximately $9.66 per barrel. Northwest Florida's oil production was primarily derived from the Jurassic Age Smackover Limestone Formation. Additional production from Blackjack Creek field, some 10 miles from Jay, was scheduled for 1975.

Crude petroleum production from south Florida was derived entirely from the Lower Cretaceous Age Sunniland Limestone Formation. The average depth of a development well in the Sunniland trend is about 11,500 feet. There are 72 producing wells in 8 fields in this trend. A new field in Hendry County, discovered in November 1973, was designated Seminole field. In July 1974, Exxon discovered Lehigh Park field 10 miles east of Ft. Myers.

Approximately 4.6 million barrels of crude oil ranging from 25° API to 32° API gravity, representing 12.6% of Florida's total production, was produced from south Florida's fields. Wellhead prices ranged from $5.66 per barrel in January to over $5.88 per barrel in December 1974 for old and new oil combined.

[14] Based on 5% Gross Production Tax reported to Florida Dept. of Revenue.

Table 10.—Florida: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Alachua	--	--	--	--	--	1	1	3,340
Collier	2	--	--	--	--	4	6	74,352
Escambia	3	--	--	--	--	--	3	47,421
Gulf	--	--	--	--	--	1	1	13,284
Hendry	--	--	1	1	--	2	4	46,844
Holmes	--	--	--	--	--	1	1	11,201
Lafayette	--	--	--	--	--	2	2	6,760
Lee	1	--	1	1	--	3	6	71,285
Leon	--	--	--	--	--	1	1	10,466
Liberty	--	--	--	--	--	2	2	24,531
Okaloosa	--	--	--	--	--	1	1	15,250
Okeechobee	--	--	--	--	--	2	2	22,051
Pasco	--	--	--	--	--	2	2	13,794
Santa Rosa	1	--	6	--	--	1	8	130,042
Suwannee	--	--	--	--	--	2	2	9,016
Wakulla	--	--	--	--	--	1	1	13,489
Walton	--	--	--	--	--	1	1	14,515
Washington	--	--	--	--	--	1	1	14,044
Total	7	--	8	2	--	28	45	541,685

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Tablel 11.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
General Portland Inc	4400 Republic National Bank Tower, Box 324 Dallas, Tex. 75221	Plants	Dade and Hillsborough.
Lehigh Portland Cement Co.[1]	718 Hamilton St. Allentown, Pa. 18105	Plant	Dade.
Pennsuco Cement & Aggregates.	P.O. Box 2035 PVS Hialeah, Fla. 33012	do	Do.
Clays:			
Engelhard Minerals & Chemicals Corp.	Menlo Park Edison, N.J. 08817	Open pit mines	Gadsden.
Mid-Florida Mining	Box 68–F Lowell, Fla. 32663	do	Marion.
Pennsylvania Glass Sand Corp.	Berkeley Springs, W.Va. 25411	do	Gadsden.
Gypsum (calcined):			
Kaiser Cement & Gypsum Corp.	300 Lakeside Dr. Oakland, Calif. 94612	Plant	Duval.
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	do	Hillsborough.
U.S. Gypsum Co	101 S. Wacker Dr. Chicago, Ill. 60606	do	Duval.
Lime:			
Chemical Lime, Inc	Box 250 Ocala, Fla. 32670	do	Hernando.
Dixie Lime & Stone Co.[1]	Drawer 217 Ocala, Fla. 32670	do	Sumter.
Magnesium compounds:			
Basic Magnesia, Inc.[2]	Box 160 Port St. Joe, Fla. 32456	do	Gulf.
Peat:			
Raymond Johnson	Box 555 Zellwood, Fla. 32798	Bog	Orange.
Oxford Peat Co	Box 154 Oxford, Fla. 32684	Bog	Sumter.
Peace River Peat, Inc	P.O. Box 1192 Bartow, Fla. 33830	Bog	Polk.
F. E. Stearns Peat	Rt. 1 Box 347–I Valrico, Fla. 33594	Bog	Hillsborough.
Traxler Peat Co	Box 10 Florahome, Fla. 32635	Bog	Putnam.
Perlite (expanded):			
Airlite Processing Corp. of Florida.	Rt. 2 Box 740 Vero Beach, Fla. 32960	Plant	Indian River.
Armstrong Cork Co	Box 1991 Pensacola, Fla. 32589	do	Escambia.
Chemrock Corp	End of Osage St. Nashville, Tenn. 37208	do	Duval.
W. R. Grace & Co.[3]	62 Whittemore Ave. Cambridge, Mass. 02140	do	Broward.
Petroleum (crude):			
Exxon Co., U.S.A	Box 2024 Houston, Tex. 77001	Wells	Santa Rosa.
Sun Oil Co	Box 2880 Dallas, Tex. 75221	do	Collier and Hendry.
Petroleum (refined):			
Seminole Asphalt Refining, Inc.	Box 128 St. Marks, Fla. 32355	Refinery	Wakulla.
Phosphate rock:			
Agrico Chemical Co	Box 3166 Tulsa, Okla. 74101	Open pit mines and plants.	Polk.
Borden, Inc	Box 790 Plant City, Fla. 33566	Open pit mine and plant.	Do.
Brewster Phosphates	Bradley, Fla. 33835	do	Do.
Gardiner, Inc	Box 3269 Tampa, Fla. 33601	do	Do.
International Minerals & Chemical Corp.	Box 867 Bartow, Fla. 38830	Open pit mines.	Do.
Mobil Oil Corp.[4]	Box 311 Nichols, Fla. 33863	do	Do.
Occidental Petroleum Corp	White Springs, Fla. 32096	Open pit mine	Hamilton.
Swift Chemical Co	Box 208 Bartow, Fla. 33830	Open pit mines.	Polk.
U.S.S. Agri-Chemicals, Inc	Box 867 Ft. Meade, Fla. 33841	Open pit mine	Do.

See footnotes at end of table.

Table 11.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel:			
General Development Corp	1111 S. Bayshore Dr. Miami, Fla. 33131	Pits	Brevard and St. Lucie.
Ortona Sand Co	First & East Tillman Lake Wales, Fla. 33853	Dredge	Hendry.
Seminole Rock Products, Inc	8100 N.W. 74th St. Miami, Fla. 33166	do	Dade.
Standard Sand & Silica Co	Box 35 Davenport, Fla. 33837	Pit	Polk.
Warren Bros. Co	Fairfield, Maine 04937	Pit	Sarasota.
Staurolite:			
E. I. duPont de Nemours & Co.[5]	DuPont Bldg. D–10084 Wilmington, Del. 19898	Plant	Clay.
Stone:			
Florida Crushed Stone Co	P.O. Box 668 Ocala, Fla. 32670	Quarries	Hernando.
Florida Mining and Materials Corp.	Box 59351 Miami, Fla. 33159	Quarry	Dade.
Florida Rock Industries, Inc.[6]	Box 4667 Jacksonville, Fla. 32201	Quarries	Collier, Hernando, Lee, Sumter, Suwannee.
Houdaille-Duvall-Wright Co	Box 1588 Jacksonville, Fla. 32201	Dredge	Duval.
Maule Industries, Inc	Box 2601 Hialeah, Fla. 33012	Quarries	Broward and Dade.
Sterling Crushed Stone Co	Miami, Fla. 33163	do	Dade.
Titanium concentrates:			
Titanium Enterprises[7]	Box 1036 Greencove Springs, Fla. 32043	Mine and plant.	Clay.

[1] Also stone.
[2] Also lime.
[3] Also phosphate rock and exfoliated vermiculite.
[4] Also elemental phosphorous.
[5] Also titanium and zirconium concentrates.
[6] Also sand and gravel.
[7] Also zircon concentrate, and rare-earth oxides and thorium oxide in monazite concentrate.

The Mineral Industry of Georgia

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Georgia Department of Natural Resources, Earth and Water Division, under a cooperative agreement for collecting information on all minerals except fuels.

By James D. Cooper [1] and Sam M. Pickering, Jr.[2]

Despite production declines for some of the State's mineral commodities, particularly during the final quarter of the year, total value of mineral production in Georgia increased substantially in 1974, extending the string of successive annual increases which started in 1953. Demand for kaolin, the leading mineral product, remained high during most of the year, and, coupled with a significant increase in unit value, output of this mineral commodity was largely responsible for the relatively good showing of the Georgia mineral industry in 1974. The total value of mineral production in 1974 was $363 million, an increase of 19% over the $305 million value reported in 1973.

A number of mine and plant expansions were completed and some new operations were on line or ready to start up by the end of 1974. In the kaolin industry a number of firms installed the newly developed high-extraction magnetic filtration (HE MF) equipment for removal of iron and titanium from offgrade clays. Industrial sand production capacity was greatly increased by development of a new mine and completion of a modern sand processing complex. The State's only kyanite producer completed a major mine and plant expansion, increasing annual production capacity by 30,000 tons. In the crushed stone industry a number of major plant expansions were completed and several new or inactive quarries were opened for production of construction aggregates.

The energy crisis of late 1973 and early 1974 had no appreciable direct effect on mineral output in Georgia. However, the higher energy prices prevailing in 1974 resulted in increased production costs, particularly for energy-intensive producers, and these costs were reflected in higher product values reported throughout most of the mineral producing industries in Georgia. By the end of the year many Georgia mineral producers had instituted formal programs for monitoring energy use, eliminating wasteful practices, and making plant improvements to optimize energy costs per unit of production. Natural gas, the principal plant fuel of the mineral producers, was in relatively good supply and interruptions to industrial users were fewer than in 1973 owing to above-normal winter temperatures. Most producers with interruptable natural gas contracts, anticipating possible shortages had provided adequate storage capacity for such alternate energy supplies as fuel oils and propane.

The Bureau of Mines canvassed the Georgia mineral industry in 1974 to obtain data on use of fuels and electric energy in 1973, the latest full year for which data were available. The mineral producers reported using 31.1 billion cubic feet of natural gas, 63.7 million gallons of petroleum products, 954 million kilowatt-hours of electricity, and 71 thousand tons of coal. Converted to equivalent energy units, natural gas supplied 70% of the energy requirements, followed by petroleum fuels (19%), electricity (7%), and coal (4%).

[1] State Liaison Officer, Bureau of Mines, Atlanta, Ga.
[2] State Geologist and Director, Earth and Water Division, Georgia Department of Natural Resources.

Table 1.—Mineral production in Georgia [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Masonry ---- thousand short tons	67	$2,126	40	$1,304
Portland ---- do	1,201	28,124	1,150	31,535
Clays [2] ---- do	7,721	160,419	7,692	203,936
Feldspar ---- short tons	51,523	W	W	W
Peat ---- thousand short tons	(3)	4	1	6
Sand and gravel ---- do	4,976	6,781	4,989	9,639
Stone ---- do	40,841	97,506	40,321	105,582
Talc ---- short tons	38,000	114	33,850	102
Value of items that cannot be disclosed: Barite, bauxite, fire clay, iron ore, kyanite, mica (scrap), rare-earth metal concentrates, titanium concentrate, zircon, and values indicated by symbol W ----	XX	10,405	XX	10,[illegible]
Total ----	XX	305,479	XX	363,100
Total 1967 constant dollars ----	XX	223,947	XX	p 173,634

p Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes fire clay; included with "Value of items that cannot be disclosed."

[3] Less than ½ unit.

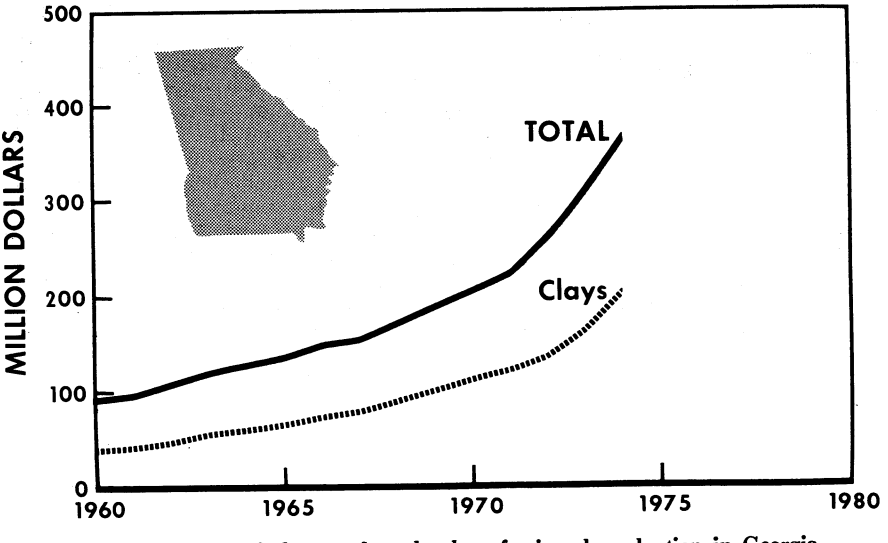

Figure 1.—Value of clays, and total value of mineral production in Georgia.

Table 2.—Value of mineral production in Georgia, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Bacon	W	$48	Sand and gravel.
Baldwin	W	W	Do.
Banks	$460	W	Stone.
Barrow	--	225	Do.
Bartow	4,873	5,199	Barite, stone, sand and gravel, clays, iron oxide pigments.
Bibb	2,393	W	Clays, sand and gravel.
Carroll	--	W	Stone.
Charlton	W	W	Titanium, zircon, rare-earth metals.
Chatham	W	W	Sand and gravel.
Cherokee	W	W	Mica.
Clarke	1,400	W	Stone.
Clayton	W	2,042	Do.
Cobb	W	W	Stone, sand and gravel.
Coffee	W	--	Sand and gravel.
Columbia	W	W	Clays, stone.
Columbus (city)	--	3,983	Stone, sand and gravel, clays.
Cook	W	W	Sand and gravel.
Coweta	391	W	Stone.
Crawford	W	W	Sand and gravel.
Dawson	W	186	Stone.
Decatur	W	W	Clays, sand and gravel.
DeKalb	W	6,223	Stone.
Dougherty	W	337	Sand and gravel.
Douglas	W	4,723	Stone, clays, sand and gravel.
Early	W	W	Stone.
Effingham	W	W	Sand and gravel.
Elbert	W	4,186	Stone.
Evans	W	194	Sand and gravel.
Fannin	W	W	Stone.
Fayette	1,492	1,083	Do.
Floyd	W	3,486	Stone, clays.
Forsyth	2,813	2,807	Stone.
Fulton	20,818	21,136	Cement, stone, clays, sand and gravel.
Gilmer	5,615	5,950	Stone.
Gordon	--	205	Do.
Greene	W	W	Stone, sand and gravel.
Gwinnett	W	W	Stone.
Habersham	W	374	Do.
Hall	W	W	Do.
Hancock	W	W	Do.
Hart	W	W	Mica.
Houston	12,768	W	Cement, stone, clays.
Jasper	W	W	Feldspar, stone.
Jefferson	W	W	Clays.
Jones	W	W	Stone.
Lee	147	191	Sand and gravel.
Lincoln	W	W	Kyanite.
Long	W	--	
Lumpkin	W	W	Stone.
McDuffie	25	W	Sand and gravel.
Madison	W	W	Stone.
Miller	4	4	Peat.
Mitchell	W	W	Stone.
Monroe	W	W	Do.
Montgomery	W	W	Sand and gravel.
Murray	114	102	Talc.
Oglethorpe	1,368	1,669	Stone.
Paulding	51	W	Do.
Pickens	W	W	Do.
Pike	W	W	Sand and gravel.
Polk	8,619	W	Cement, stone, clays.
Quitman	W	790	Iron ore.
Rabun	W	W	Stone.
Richmond	7,367	9,241	Clays, stone, sand and gravel.
Screven	--	2	Peat.
Spalding	W	W	Stone.
Stephens	537	W	Do.
Stewart	W	292	Iron ore.
Sumter	W	W	Clays, bauxite.
Talbot	W	733	Sand and gravel.
Taylor	--	W	Do.
Thomas	4,902	5,918	Clays, sand and gravel.
Troup	W	W	Stone.
Twiggs	51,346	58,616	Clays.
Union	W	W	Stone.
Upson	W	W	Sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Georgia, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Walker	W	W	Stone, clays.
Walton	$264	W	Stone.
Ware	W	W	Sand and gravel.
Warren	11,281	$16,344	Clays, stone.
Washington	49,723	66,556	Clays.
Wheeler	W	--	
Whitfield	W	W	Stone.
Wilkinson	21,313	25,292	Clays.
Undistributed [3]	95,894	114,954	
Total [3]	305,479	363,100	

W Withheld to avoid disclosing individual confidential company data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Appling, Atkinson, Baker, Ben Hill, Berrien, Bleckley, Brantley, Brooks, Bryan, Bullock, Burke, Butts, Calhoun, Camden, Candler, Catoosa, Chattahoochee, Chattooga, Clay, Clinch, Colquitt, Crisp, Dade, Dodge, Dooly, Echols, Emanuel, Glascock, Glynn, Grady, Haralson, Harris, Heard, Henry, Irwin, Jackson, Jeff Davis, Jenkins, Johnson, Lamar, Lanier, Laurens, Liberty, Lowndes, McIntosh, Macon, Marion, Meriwether, Morgan, Muscogee, Newton, Oconee, Peach, Pierce, Pulaski, Putnam, Randolph, Rockdale, Schley, Seminole, Taliaferro, Tattnall, Telfair Terrell, Tift, Toombs, Towns, Treutlen, Turner, Wayne, Webster, White, Wilcox, Wilkes, and Worth.

[2] Includes values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Georgia business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total nonagricultural employment ---- thousands	1,779.7	1,814.5	+2.0
Total unemployed ---- do	81.0	NA	NA
Employment:			
Manufacturing ---- do	496.1	482.9	−2.7
Transportation and public utilities ---- do	118.8	118.7	−0.9
Mining ---- do	7.3	7.8	+6.8
Contract construction ---- do	109.7	107.6	−1.9
Services ---- do	246.0	253.4	+3.0
Government ---- do	328.2	339.6	+3.5
Wholesale and retail trade ---- do	398.5	404.6	+1.5
Finance, insurance, and real estate ---- do	95.1	98.9	+4.0
Personal income:			
Total ---- millions	$20,928	$22,760	8.8
Per capita	$4,343	$4,662	7.3
Construction activity:			
Number of private and public residential units authorized	46,427	25,233	−45.7
Value of authorized nonresidential construction millions	$563.2	$497.8	−11.6
Cement shipments to and within Georgia:			
Portland ---- thousand short tons	2,421	2,227	−8.0
Masonry ---- do	242	178	−26.4
Farm marketing receipts ---- millions	$1,984.7	NA	NA
Mineral production value ---- do	$305.5	$363.1	+18.9

p Preliminary. NA Not available.

Source: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Highlights of U.S. Export and Import Trade; and U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Barite.—Two firms in Bartow County reported production of barite in 1974. New Riverside Ochre Co. mined crude barite ore from a large deposit in the city of Cartersville and processed the material by gravity and flotation methods. Paga Mining Co. recovered barite by flotation of fine materials recovered from mill tailing ponds in the Cartersville district. Volume of output declined about 6% but the reported value was 21% higher than in 1973. The processed barite was marketed for use in manufacturing barium chemicals, as fillers and extenders for paint and rubber, weighting medium for drilling muds, flux for

glass making, and admix for heavy concrete.

Chemical Products Corp., a Cartersville, Ga. firm affiliated with New Riverside Ochre Co., purchased much of the New Riverside output for use in manufacturing barium chemicals.

Cement.—Total 1974 shipments of cement by Georgia producers decreased by 6.2% compared with 1973 shipments, but the 1974 value rose by 8.6%. For the individual types, portland cement shipments in 1974 were down 4.3 % in quantity but 12% higher in value, while masonry cement shipments decreased 41% in volume and 39% in value. Masonry cement constituted only a small fraction of the total cement shipped by Georgia producers. Dry-process cement plants were operated by Marquette Cement Manufacturing Co. in Polk County, and Martin-Marietta Corp. in Fulton County. Medusa Cement Co., a division of Medusa Corp. operated a recently rebuilt and modernized wet-process plant in Houston County. Energy requirements per unit of product were reduced by about 65% compared with requirements of the older units which were replaced. Near the end of 1974, Medusa announced plans to add a $3.6 million finish mill, the final unit of its phased modernization program which was started in 1972.

Clays.—The quantity of clays produced in Georgia declined very slightly in 1974 owing to a substantial reduction in production of common clays, which were used primarily for manufacturing construction products. Output of all other types of clay produced in Georgia—kaolin, fuller's earth, and fire clay—increased substantially, and the combined value for all clays including common clay, increased by 27% in 1974.

Production of kaolin, the State's leading mineral commodity based on value, continued a long upward trend, increasing by 6% in volume over the previous record output of 1973. The total value of kaolin produced in Georgia in 1974 showed a much greater increase of 27%, owing to a substantial rise in the average value per ton compared with that reported for the 1973 output. In 1974 for the first time kaolin alone accounted for more than half of the total value of mineral production in Georgia.

Kaolin was mined in eight Georgia counties in 1974, all in the Fall Line kaolin belt which traverses the State between Columbus on the western border to Augusta on the east. The five largest producers accounted for 63% of the total quantity and 74% of the value of kaolin produced in Georgia in 1974. The balance was accounted for by 14 smaller producers.

The paper industry was by far the largest user of Georgia kaolin, with about 63% of the total reported output used as fillers and coatings for paper products. Other major end uses included refractories (12%), fillers and extenders for paint, plastics, and rubber (10%) and ceramic products (5%).

Recently developed high-intensity magnetic separators were installed by several of the kaolin producers in 1974 to utilize offgrade clays. The new HEMF installations, operate at 20 kilogauss and can process 15 tons of raw kaolin per hour to produce high-brightness coaters, with 120 seconds retention time in the units for removal of weakly magnetic iron and titanium impurities. At 30 seconds retention time the units can treat 66 tons per hour to produce general purpose fillers.

Thiele Kaolin Co. completed improvements in Washington County to bring the Avant mine into full production, and installed blunging and primary cleaning facilities. At Thiele's Reedy Creek division near Wrens, Ga., equipment was added for production of slurried filler clays, and a new warehouse was completed.

Albion Kaolin Co., producer of refractory-grade kaolin for the parent firm, Babcock and Wilcox, expanded production facilities at Hepzibah, and also installed equipment for production of kaolin in slurry form. General Refractories Co. (GREF CO) reopened its kaolin calcining facility at Stevens Pottery, Ga. in September 1974 after a shutdown of about 2 years. Only one of the two rotary kilns was recommissioned, but this was adequate to meet GREFCO's requirements in late 1974.

The Bureau of Mines completed the first of four scheduled alumina research miniplants at Boulder City, Nev., and starting in May 1974, conducted a number of test runs on Georgia kaolin for production of alumina using a Bureau-developed nitric acid process. Following the initial test run, which gave encouraging results, eight aluminum firms joined with the Bureau, making the research project a joint venture. Construction was started on the second

miniplant, designed to evaluate a hydrochloric acid extraction system. Two carloads of Georgia kaolin were shipped from the Wrens, Ga. area for the alumina research.

The Engineering Experiment Station, Georgia Institute of Technology, released an updated report, containing new data on reserves, transportation facilities, energy and water requirements and availability, and operating costs for production of alumina from kaolin by the nitric acid and hydrochloric acid processes.[3]

Fuller's earth production set a record high in 1974, increasing 10% in volume and nearly 50% in value over the previous records set in 1973. A major cost in the processing of fuller's earth was for fuel used in calcining, and the large increase in unit value, from $23.63 per ton in 1973 to $31.65 per ton in 1974, reflects the higher prices of fuels prevailing in 1974. Fuller's earth was used primarily for its absorbent properties—animal litter, oil absorbents, slow-release insecticide and fertilizer carriers, and oil clarifiers. An important use for the attapulgite-type fuller's earth was in preparation of drilling fluids which must maintain their jelling property in salt-water environments. Fuller's earth was mined near the town of Attapulgus, in Decatur County by Engelhard Minerals & Chemical Corp. and Milwhite Co., Inc.; in Houston County by Medusa Corp.; in Jefferson County by Georgia-Tennessee Mining and Chemical Corp.; and in Thomas County by Oil-Dri Corp., Thor Mining Co., Div. of Pennsylvania Glass Sand Co., and Waverly Mineral Products Co.

Common clay and shale, which led all Georgia clays in percentage gains for quantity and value of production in 1973, reversed its position in 1974 and was the only clay type to register declines in both quantity and value. The 1974 volume of output was 12% less and value was off by 6% compared with 1973 production data. The common clays were used in the manufacture of building materials and were directly affected by construction activity which turned downward in 1974, particularly toward the end of the year. Output of common clay and shale was 2,440,755 tons, valued at $4,884,762.

In all, 15 firms in 10 Georgia counties mined common clay and shale for production of brick and tile, sewer pipe, portland cement, and flue liners. Among the major producers, six brick manufacturers accounted for 85% of the total output. These were Bickerstaff Clay Products Co. (Floyd County), Burns Brick Co. (Bibb County), Chattahoochee Brick Co. (Floyd, Fulton, and Polk Counties), Georgia Carolina Brick Co. (Richmond County), Martin-Marietta Corp. (Douglas and Fulton Counties) and Merry Brothers Brick and Tile Co. (Richmond County).

Fire clay production was reported by two firms in Georgia in 1974. Georgia Vitrified Brick & Clay Co. obtained fire clay from mines in Columbia and Richmond Counties for production of firebrick and flue liners. Amsted Industries mined fire clay in Floyd County for use in manufacturing firebrick. Both quantity and value for the 1974 fire clay production were substantially greater than the respective figures reported for 1973.

[3] Ward, W. C. Jr., and J. E. Husted. Alumina From Kaolin. Georgia Institute of Technology, Engineering Experiment Station, November 1974, 25 pp.

Table 4.—Georgia: Kaolin sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Sumter	7	394	12,192	W	W	W
Twiggs	26	1,424	51,846	7	1,404	58,616
Warren	W	W	W	5	243	11,682
Washington	26	1,605	49,723	33	1,729	66,556
Wilkinson	5	697	21,313	6	646	25,292
Other counties [1]	7	390	10,152	8	740	21,465
Total	71	4,510	144,726	59	4,762	183,611

W Withheld to avoid disclosure of individual company confidential data; included with "Other counties."
[1] Includes Fulton, Houston, and Richmond counties; and data indicated by symbol W.

Table 5.—Georgia: Kaolin sold or used by producers, by kind

Kind	1973		1974	
	Quantity (short tons)	Value	Quantity (short tons)	Value
Airfloat	839,625	$11,629,755	920,463	$15,680,712
Calcined	146,425	11,934,459	159,260	16,956,465
Delaminated	194,180	10,193,638	221,407	13,328,375
Unprocessed	421,905	10,981,783	602,905	18,943,946
Waterwashed	2,908,128	99,986,424	2,857,965	118,701,442
Total	4,510,263	144,726,059	4,762,000	183,610,940

Table 6.—Georgia: Kaolin sold or used by producers, by use
(Short tons)

Use	1973	1974
Domestic:		
Paper coating	1,610,911	1,310,180
Paper filling	813,044	993,459
Paint	111,302	228,360
Chemicals	131,942	184,730
Whiteware	r 31,777	86,730
Rubber	112,827	130,887
Firebrick, block, and shapes	79,652	94,087
Sanitary ware	160,865	62,362
Plastics	61,889	53,558
Adhesives	44,218	46,665
Fiberglass	134,604	91,513
Floor and wall tile, ceramic	21,485	6,457
Other	r 402,275	557,132
Exports	793,472	915,880
Total	4,510,263	4,762,000

r Revised.

Table 7.—Georgia: Kaolin sold or used by producers, by kind and use

(Short tons)

Use	1973				1974			
	Airfloat	Unprocessed	Washed [1]	Total	Airfloat	Unprocessed	Washed [1]	Total
Domestic:								
Adhesives	W	--	W	44,218	35,127	--	11,538	46,665
Alum (aluminum sulfate) and other chemicals	--	W	W	131,942	W	W	W	184,730
Animal feed	117	--	--	117	2,644	--	--	2,644
Brick, face	565	--	--	565	--	--	133	133
Catalysts (oil refining)	W	--	W	43,699	W	--	W	46,319
Cement, portland	--	(2)	--	(2)	1,169	64,126	--	65,295
China/dinnerware	W	--	W	18,084	W	--	--	W
Crockery and other earthenware	3,556	--	--	3,556	37,325	--	4	37,329
Electrical porcelain	(2)	--	--	(2)	3,011	--	--	3,011
Fiberglass	W	--	W	134,604	W	--	W	91,513
Firebrick, block, and shapes	32,400	47,252	--	79,652	65,100	27,834	1,153	94,087
Floor and wall tile, ceramic	W	--	W	21,485	2,500	--	3,957	6,457
Flue linings and high alumina brick	(2)	(2)	--	(2)	W	W	--	73,719
Foundry sand	--	--	(2)	(2)	154	--	81	235
Grogs and crudes, refractory	W	W	--	153,179	W	W	--	277,362
Gypsum products	W	--	W	52,023	--	--	W	W
Ink	--	--	(2)	(2)	W	--	W	13,883
Medical, pharmaceutical, and cosmetic	--	--	(2)	(2)	1,377	--	609	1,986
Paint	11,982	--	99,320	111,302	57,663	--	170,697	228,360
Paper coating	71,502	--	1,539,409	1,610,911	2,000	--	1,308,180	1,310,180
Paper filling	182,570	--	630,474	813,044	197,613	--	795,846	993,459
Plastics	W	--	W	61,889	6,833	--	46,725	53,558
Pottery	W	--	W	9,650	19,894	--	18,400	38,294
Roofing granules	W	--	W	306	--	--	--	--
Rubber	95,208	--	17,619	112,827	115,842	--	15,045	130,887
Sanitary ware	119,920	--	40,945	160,865	W	W	15,441	62,362
Miscellaneous:								
Fertilizers (1974); glazes, glass, and enamels; kiln furniture (1974); linoleum (1973); pesticides and related products; waterproofing and sealing (1974); unknown uses; and data indicated by footnote [3]	67,279	--	--	67,279	53,745	--	--	53,745
	--	39,481	--	39,481	--	267	--	267
Fertilizers (1973); mineral oil filtering, clarifying and decolorizing; refractory mortar and cement; textiles; unknown uses; and data indicated by footnote [3]	--	--	46,113	46,113	--	--	18,487	18,487
Undistributed	241,062	251,085	178,932	--	256,978	388,671	99,951	[3]11,153
Total	826,161	337,818	2,552,812	3,716,791	858,975	480,898	2,506,247	3,846,120

Exports:								
Paint	--	--	18,916	18,916	30	--	17,660	17,690
Paper coating	8,464	--	471,495	479,959	--	--	532,593	532,593
Paper filling	--	--	35,085	35,085	40,537	--	124,203	164,740
Plastics	--	--	(2)	(2)	--	--	25,864	25,864
Grogs and crudes and other refractories	5,000	84,087	--	89,087	17,000	122,007	--	139,007
Rubber	--	--	3,681	3,681	3,921	--	1,318	5,239
Miscellaneous	--	--	166,744	166,744	--	--	30,747	30,747
Total	13,464	84,087	695,921	793,472	61,488	122,007	732,385	915,880
Grand total	839,625	421,905	3,248,733	4,510,263	920,463	602,905	3,238,632	4,762,000

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes calcined and delaminated.
[2] Included in "Miscellaneous" uses.
[3] Incomplete total; remainder included with total for each specific use.

Feldspar.—The Feldspar Corp., Division of Pacific Tin Consolidated Corp., produced feldspar by flotation of crude feldspar mined from weathered pegmatite dikes in Jasper County. The flotation product, with a high percentage of potash feldspar, was ground to specifications for use in a variety of ceramic products. Production declined slightly in 1974, and the reported value was substantially lower than that reported for the 1973 output. Shipments of Georgia feldspar went to about 20 States and to ceramic producers in Canada and Mexico.

The Bureau of Mines completed laboratory studies to determine the feasibility of obtaining feldspar and glass sand by flotation of waste granite fines from Georgia crushed stone operations. Using a continuous flotation process a commercial-grade feldspar concentrate containing 3.8% Na_2O, 5.4% K_2O, and 1.1% CaO was made with recovery of over 70% of the feldspar contained in the granite fines. A high quality glass sand concentrate was also obtained. An effective separation of the potash feldspar was made by batch flotation of the bulk flotation concentrate.[4]

Gypsum.—Three firms produced calcined gypsum and gypsum products from crude gypsum obtained by ocean shipment from sources outside the State. National Gypsum Co. and The Flintkote Co. operated plants in Chatham County, while the Gypsum Div., Georgia-Pacific Corp. operated a plant in Glynn County. Principal products were wallboard, cement retarder, fillers, and agricultural soil additive. Output of calcined gypsum in 1974 was down 8% from reported production for 1973; however, the reported value increased 6% in 1974. Nearly 500 employees were involved in gypsum operations for the 3 firms.

Construction continued on the acid sludge treatment facility of American Cyanamid Co. Pigments division at Savannah, designed to bring the titanium pigments plant into compliance with State and Federal environmental regulations. The sludge treatment plant will react waste acid sludge with aragonite to produce a synthetic gypsum suitable for use in wallboard and other gypsum products. The original plan called for an independent firm to operate the treatment plant and a separate gypsum products plant. However, this project fell through and Cyanamid assumed control of the treatment plant phase. At yearend Cyanamid was actively seeking a firm interested in utilizing the gypsum.

Kyanite–Mullite.—C-E Minerals, a division of Combustion Engineering, Inc., mined kyanite ore from the Graves Mountain quartz-kyanite schist deposit in Lincoln County, and operated a flotation plant near the mine to produce minus 35 mesh kyanite concentrate. Much of the kyanite was calcined to produce mullite refractory grog at a separate calcining and shipping operation near Washington, Ga. The quantity of kyanite produced in 1974 was about the same as that reported for 1973, but the reported 1974 value was substantially greater. A major expansion of mining and processing operations at Graves Mountain was completed in 1974, increasing annual production capacity by about 30,000 tons.

Synthetic mullite, produced by fusing or sintering mixtures of aluminous and siliceous materials was produced by two firms in Georgia in 1974. Mulcoa Div. of C-E Minerals produced synthetic mullite by sintering siliceous bauxite or bauxite-kaolin mixtures in rotary kilns near Andersonville, Sumter County. The Babcock and Wilcox Co., Refractories Div. produced electrically fused synthetic mullite until April 30, 1974, at which time the furnace was permanently closed down because it could not meet air emission requirements. Production of synthetic mullite in 1974 was far less than that reported for 1973.

Lime.—Deposits of high-grade limestone occur in Georgia but no quicklime or hydrated lime was produced in the State. Consumption in 1974 was 170,746 tons, with quicklime predominating, for an increase of about 7% over the quantity used in Georgia in 1973. Shipments came from 20 plants in 7 eastern States, but more than 90% of total requirements was supplied by 5 firms in Alabama.

Mica.—Flake mica production in Georgia in 1974 was slightly less in quantity but substantially greater in value compared with the reported figures for 1973. Jones Mining Co., Inc. produced micaceous material from the Brady underground mine in Cherokee County for the Thompson-Weinman Co. which ground the material to

[4] Eddy, W.H., E. W. Collins, and G. V. Sullivan. Recovery of Feldspar and Glass From Georgia Waste Granite Fines. BuMines RI 7928, 1974, 11 pp.

produce a filler for paint. Franklin Mineral Products Co., Inc. operated the Hartwell quarry and grinding mill in Hart County to produce ground mica for use as filler for rubber, paint, wallpaper, and other products. Low grade flake mica was available as a byproduct from processing of feldspar ore in Jasper County by The Feldspar Corp. No mica sales were reported by the Feldspar Corp. in 1974.

Perlite.—Armstrong Cork Co. produced expanded perlite at Macon, Bibb County, from raw perlite obtained from mines in the western United States. The expanded material was used in production of acoustical ceiling tile, pipe insulation, and other lightweight insulation products. Production of expanded perlite in 1974 increased substantially in volume but only moderately in value compared with that of 1973.

Sand and Gravel.—Production of sand and gravel increased by less than 1% in 1974 over that reported for 1973, but the 1974 value showed an increase of 42%. Production in 1974 was reported from 40 mines in 26 counties operated by 38 firms. Georgia Marble Co. diversified into industrial sands by development of a new deposit and construction of a modern sand processing complex near Junction City in Talbot County. First shipments from the new operation were scheduled for January 1975. Processing methods were to include washing, screening, desliming, attrition scrubbing, flotation, drying, and sizing to produce a number of high-quality sand fractions for a full range of industrial uses.

Table 8.—Georgia: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	4,976	6,781	3,865	5,257
Gravel			514	1,744
Unprocessed:				
Sand and gravel			251	162
Industrial:				
Sand	W	W	359	2,430
Gravel			--	--
Total	4,976	6,781	4,989	9,593

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data may not be directly comparable to that in tables 1, 9, and 10 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 9.—Georgia: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction	4,201	5,180	2,394	3,322
Highway and bridge construction			272	396
Other uses such as dams, waterworks, airports, etc.			105	180
Concrete products (cement blocks, bricks, pipe, etc.)			1,224	1,818
Bituminous paving (asphalt and tar paving)			260	1,129
Roadbase and sub-base			W	W
Unprocessed aggregate			251	162
Fill	358	281	83	145
Other uses [2]	417	1,320	W	W
Industrial sand and gravel	W	W	358	2,430
Total	4,976	6,781	4,947	9,582

W Withheld to avoid disclosing individual company confidential data; included with "Other uses" (1973), and "Bituminous paving" (1974).
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 10.—Georgia: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1974	
	Quantity	Value[1]
Construction aggregate:		
Nonresidential and residential construction	23	57
Highway and bridge construction	2	W
Other uses such as dams, waterworks, airports, etc	--	--
Concrete products (cement blocks, bricks, pipe, etc.)	17	W
Bituminous paving (asphalt and tar paving)	--	--
Roadbase and sub-base	--	--
Unprocessed aggregate	--	--
Fill	--	--
Other	--	--
Total	42	57

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction aggregate."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Despite a slump in demand by the construction industry during the final quarter of 1974, output of stone was almost as great in quantity as it was in 1973, and the total value in 1974 recorded an 8% increase. Volume declines occurred for dimension granite, crushed granite, and crushed slate, but all types of stone registered value gains ranging from 7% to 47%.

Crushed stone production in 1974 was 40,082,000 tons valued at $93,741,000. Corresponding figures for 1973 were 40,569,000 tons and $87,752,00. Output of dimension stone in 1974 was 239,562 tons with a value of $11,841,000, compared with production of 271,724 tons valued at $9,753,000 in 1973. Crushed granite was the largest volume category, accounting for 80% of the quantity of stone produced and 62% of the value in 1974, followed by crushed limestone and dolomite which accounted for 17% of the quantity and 16% of the value.

Crushed granite was produced from 42 quarries by 19 firms in 29 counties in 1974. The five largest producers accounted for 83% of the crushed granite output. They were: Dixie Lime & Stone Co., Georgia Marble Co. (Consolidated Quarries Div.), Ivy Corp. (Davidson Mineral Properties, Inc., North Georgia Crushed Stone Co., and Gainesville Stone Co.), Martin-Marietta Aggregates, Southeast Div., and Vulcan Materials Co.

Vulcan Materials Co. completed a major expansion program at its five crushed granite operations in the Atlanta marketing area. The final project completed was the replacement of the old Stockbridge plant by a new, modern operation. Vulcan acquired two granite quarries at Siloam in Greene County, and Newnan in Coweta County from Hall Aggregates Co. However, the Siloam quarry was not operated by Vulcan during 1974. United Materials Co., a joint venture between Vulcan Materials Co. and Dalton Rock Products Co., opened a new granite quarry and crushing plant near Grayson in Gwinnett County.

The Gainesville Stone Co. (Ivy Corp.) completely rebuilt the Candler crushed granite plant near Gainesville in Hall County. Davidson Mineral Properties, Inc. (Ivy Corp.) opened a new granite quarry and crushing plant near Demarest in Habersham County. The Hitchcock Corp., which operated crushed granite quarries in Fulton and Jones Counties, announced the opening of a new granite quarry at Tyrone, Fayette County. A portable crushing plant was installed, and plans called for a permanent plant at a later date. Dixie Lime & Stone Co. made major improvements at its Forest Park crushed granite operation in Clayton County, and announced plans to revamp its Tyrone operation in Fayette County.

Table 11.—Georgia: Crushed granite sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1973			1974		
		Value			Value	
	Quantity	Total	Average per ton	Quantity	Total	Average per ton
Bituminous aggregate	6,592	12,887	$1.95	7,120	14,392	$2.02
Concrete aggregate	8,918	16,311	1.83	8,307	16,930	2.04
Dense graded roadbase stone	5,896	11,260	1.91	6,097	12,462	2.04
Macadam aggregate	736	1,400	1.90	1,264	2,641	2.09
Surface treatment aggregate	1,604	3,170	1.98	1,448	3,094	2.14
Unspecified construction aggregate and roadstone	6,417	12,203	1.90	4,691	9,605	2.05
Railroad ballast	2,131	3,556	1.67	2,525	4,774	1.89
Riprap and jetty stone	535	1,033	1.93	428	891	2.08
Other uses [1]	67	106	1.58	295	489	1.66
Total [2]	32,896	61,925	1.88	32,174	65,277	2.03

[1] Includes poultry grit, filter stone (1974), manufactured fine aggregate, terrazzo and exposed aggregate (1974), and uses not specified (1974).
[2] Data may not add to totals shown because of independent rounding.

Table 12.—Georgia: Dimension granite sold or used by producers, by county

County	1973				1974			
	Number of quarries	Thousand cubic feet	Short tons (equivalent)	Value (thousands)	Number of quarries	Thousand cubic feet	Short tons (equivalent)	Value (thousands)
DeKalb	3	344	34,438	W	3	185	18,520	$425
Elbert	12	572	55,809	$2,555	12	536	52,361	3,543
Oglethorpe	18	680	67,148	1,368	18	659	67,099	1,669
Undistributed [1]	3	871	87,073	2,961	3	756	75,648	2,396
Total [2]	36	2,468	244,468	6,884	36	2,137	213,628	8,034

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes Hancock and Madison Counties.
[2] Data may not add to totals shown because of independent rounding.

Table 13.—Georgia: Dimension granite sold or used by producers, by use

(Thousand cubic feet and thousand dollars)

Use	1973			1974		
		Value			Value	
	Quantity	Total	Average per cubic foot	Quantity	Total	Average per cubic foot
Rough:						
Architectural	198	452	$2.28	231	656	$2.84
Construction	151	125	.83	W	W	W
Monumental	1,828	4,919	2.69	1,642	6,238	3.80
Dressed:						
Curbing [1]	W	W	W	139	980	7.05
Other uses [2]	291	1,389	4.77	125	160	1.28
Total	2,468	[3]6,884	2.79	2,137	8,034	3.76

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes sawed stone.
[2] Includes dressed monumental stone.
[3] Data do not add to total shown because of independent rounding.

Table 14.—Georgia: Crushed limestone[1] sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	492	886	672	1,350
Concrete aggregate	998	2,420	785	1,733
Dense graded roadbase stone	822	1,389	916	3,165
Surface treatment aggregate	343	720	901	2,356
Unspecified construction aggregate and roadstone	985	1,768	633	1,422
Agricultural limestone	382	942	W	W
Cement manufacture	W	W	1,675	3,036
Terrazzo and exposed aggregate	198	3,209	W	W
Manufactured fine aggregate (stone sand)	66	W	W	W
Other uses[2]	2,374	4,006	1,279	4,223
Total	[3]6,659	15,340	6,861	17,285

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Limestone used generally to include dolomite.
[2] Includes riprap and jetty stone, railroad ballast, macadam aggregate, and a small amount of fill.
[3] Data do not add to total shown because of independent rounding.

Dimension granite output of 213,628 tons valued at $8,033,813 in 1974 represented a decline of 12.6% in volume but an increase of 16.7% in value over the 1973 production of 244,468 tons worth $6,884,346. Most of the dimension granite producers were located in the Elberton area in Elbert, Madison, and Oglethorpe Counties. Principal producers were Bennie & Harvey Quarries, Inc.; Coggins Granite Industries, Inc.; Comolli Granite Co., Inc.; Georgia Marble Co.; and Middle Georgia Quarries Co. These five firms, all with operations in the Elberton area, accounted for 57% of 1974 output of dimension granite in Georgia.

Crushed limestone or dolomite was produced in 1974 by 15 firms from 19 quarries in 13 counties. End uses included cement manufacture, construction aggregates, agricultural limestone, and decorative stone for terrazzo and exposed aggregate facing. The five largest producers, accounting for 63% of the output and 64% of the value, were Dalton Rock Products Co. (Whitfield County), Florida Rock Industries (Early County), Georgia Marble Co. (Pickens and Gilmer Counties), LBI Quarries, Inc. (Floyd County), and Vulcan Materials Co. (Carroll and Troup Counties). The Villa Rica Quarry of Carroll Rock Co. was acquired by Vulcan Materials Co. in 1974.

Crushed sandstone and quartzite was produced by four firms from four quarries in four Georgia counties in 1974. Total output was 127,481 short tons valued at $556,406, substantially above the quantity and value reported for 1973. Stone Products Corp. produced crushed quartzite in Fannin County for use as terrazzo and exposed aggregate. Crushed quartzite was also produced by Buchanan Flagstone Co. in Pickens County. Marquette Cement Co. mined sandstone in Polk County for use as a component in cement manufacture, and The Feldspar Corp. produced sand for construction and other uses as a byproduct from processing of feldspar ore in Jasper County.

Dimension sandstone was produced in Pickens County by North Georgia Stone Co. and Buchanan Flagstone Co. Dimension quartzite was produced in Pickens County by Buchanan Flagstone Co. Production of these materials, used for flagging and as irregular-shaped building stone, was 16% below the 1973 output, but the value increased by 17% in 1974.

Production of dimension marble in 1974 increased 20%, and value was up 35% over the 1973 figures. Smaller increases in production and value were reported for crushed marble in 1974. Georgia Marble Co., the State's only producer, operated two surface quarries and one underground mine in Pickens County, and one underground mine in Gilmer County. Most of the material produced from the surface quarries was marketed as dimension stone but a small crushing plant was installed in 1974 to process scrap generated by dimension stone sawing operations into crushed marble aggregate for use in broken-face building block and other products. Demand for the aggregate had outstripped the capacity of the small plant by the end of

1974. The output of the underground mines was crushed and ground as raw material for a wide variety of uses ranging from decorative gardening stone, to extremely fine high-purity fillers for chewing gum and toothpaste.

Crushed slate was produced by Georgia Lightweight Aggregate Co. in Polk County and by GAF Corp. in Bartow County. Production of crushed slate, used for making lightweight aggregates, roofing granules, and ground slate fillers, was down 1% from the 1973 output, but the reported value increased by 12.6% in 1974. GAF Corp. permanently ceased operations at its Bartow County quarry at the end of 1974 and planned to sell the 760 acre property with the buyer to assume all obligations for compliance with State and Federal environmental and safety requirements. Georgia Lightweight Aggregate Co. installed equipment and changed operating conditions for the firing of lightweight aggregates, resulting in greater throughput and substantial saving of fuel required per unit of product.

Strontium.—Imported celestite from Mexico was processed by Chemical Products Corp. of Cartersville, in Bartow County, to produce a number of strontium chemicals for use in television tubes, electronic ceramics, ferrites, and other specialty uses.

Talc.—Southern Talc Co. produced crude talc from three mines in Murray County in 1974. Both quantity and value of production were down moderately from the reported 1973 figures. Southern Talc Co. also operated a talc grinding mill in Chatsworth where processed talc was produced for use in rubber, asphalt, composition roofing, insecticide powders, and numerous other products.

METALS

Bauxite.—Production of bauxite increased significantly in 1974 compared with the 1973 reported output. Two firms, American Cyanamid Co. and the Mulcoa Division, C-E Minerals, a division of Combustion Engineering, Inc., produced bauxite from open pit mines in Sumter County, principally for use in refractories and aluminum-based chemicals. C-E Minerals also operated a calcining complex in Sumter County for production of refractory grogs from bauxite, kaolin, and bauxite-kaolin mixtures.

Iron Ore.—Two firms, Lumpkin Mining Co. in Quitman County and Luverne Mining Co. in Stewart County, mined limonite iron ore and processed the material to produce marketable concentrates in 1974. Log washers and picking belts were used to recover the lump material, and all of the finely sized limonite was lost in the processing. Both the quantity and value of iron ore output were up substantially in 1974, ending a 3-year decline. The concentrates were shipped to iron and steel producers in Alabama. Ochre and umber—finely divided iron oxides of pigment grade—were mined in Bartow County, Ga. by New Riverside Ochre Co., which processed the material for sale as coloring agents for mortar, facing brick, paint, and other products. Sales of ochre and umber in 1974 were considerably greater than those reported for 1973.

Rare Earth Minerals.—Monazite, containing thorium and rare earth minerals, was produced by Humphreys Mining Co. as one of three valuable fractions contained in heavy mineral sands from the Folkston mine in Charlton County, Ga. Production in 1974 was down by about one-third compared with that of 1973 owing to depletion of the Folkston mineral deposits soon after midyear. By the end of 1974 production of monazite had been resumed at the Folkston plant, utilizing heavy mineral concentrates obtained from a new mine operated by Humphreys Mining Co. in north Florida.

Titanium.—Humphreys Mining Co., which opened the Folkston mine and plant in Charlton County in 1965 for recovering ilmenite and other valuable components of heavy sands, ceased mining in July 1974 when the deposit was depleted. The mining dredge and primary concentration units were moved to a new deposit 13 miles south of Folkston, just across the State line in Florida, and by the end of 1974 concentrates from the new mine were being trucked to the plant at Folkston for final separation of marketable mineral products. During the decade from 1965 to mid-1974, Humphreys pioneered in mined land reclamation and was returning mined land to useful purposes long before the Georgia Surface Mining Act became effective in 1969. As a strong advocate of industrial safety, the firm experienced one period of 1,755 days without a lost time injury to mine, plant, or office personnel. Produc-

tion of ilmenite from Georgia ore was appreciably less than the 1973 output owing to depletion of the deposit.

Zirconium.—Humphreys Mining Co. produced zircon concentrate from heavy mineral sands in Charlton County, until July 1974 when the deposit was mined out. Consequently, zircon output in 1974 declined appreciably from that reported for the preceding year. Major end uses for zircon were as components of ceramics, refractories, foundry molding sands, and mold facings. By yearend, Humphreys Mining Co. was producing zircon concentrate at Folkston from heavy mineral sands obtained from a new operation in north Florida.

MINERAL FUELS

Coal.—No coal was mined in Georgia in 1974, but spurred by higher coal prices resulting from the energy shortage, several firms were active in the Lookout Mountain area in the northwestern part of the State acquiring coal lands and conducting exploratory drilling. The Coal Man, Inc. property in Chattooga County, which was operated unprofitably for a brief period in 1973, was acquired by a new firm, Gregisco, Inc., and preparations for mining were underway late in 1974.

Peat.—Humus peat was obtained from limestone sinks by Colonial Peat Co. in Screven County and Shep Peat Co. in Miller County. Output of peat, which was used for general soil improvement and in potting soils, was 550 tons valued at $5,900 in 1974, up sharply from the production reported for 1973 when there was only one active producer.

Petroleum and Natural Gas.—The energy crisis of 1973–74 resulted in a small flurry of oil and gas drilling activity in Georgia in 1974. Four exploratory holes were completed in the coastal plains area in south Georgia, and one hole was drilled in the northwest corner of the State. All holes were dry.

Construction was started at Elba Island near Savannah for a large liquefied natural gas facility by Southern Natural Gas Co., the largest supplier of natural gas in the State. When completed in 1976, a total of 350,000 MCF of liquefied natural gas reportedly will be imported from Algeria each day, reconverted to gas, and piped to a main terminal at Wrens for sale to customers on the Southern's gas distribution system.

Swann Oil Corp., a major supplier of distillate and residual fuel oils to industries and electric utilities in the Southeast, completed a major expansion of its oil terminal in Savannah. The new facility, which can handle 25 ships per day, was expected to result in increased imports of 500,000 tons of fuel oils annually. Employment was increased by about 100 persons.

Superports and refinery siting received considerable interest during 1974. The Coastal Plains Regional Commission, together with eight oil firms, financed a major economic-environmental study to choose and evaluate possible sites for superports off the coasts of Georgia and the Carolinas, and refinery sites inland near the coast.

A symposium on petroleum potential of the coastal plains area was held at Americus early in 1974, and attended by about 150 geologists and other interested parties, including representatives from most major oil companies and many of the independents. All told, 20 papers covering coastal plains geology, geophysical and other exploration data, and Georgia petroleum laws, were presented and later published in a State agency bulletin.[5]

[5] Stafford, L. P. (ed.) Symposium on the Petroleum Geology of the Georgia Coastal Plain. Ga. Dept. of Natural Resources, Earth and and Water Div., Bull. 87, 1974, 196 pp.

Table 15.—Principal producers

Commodity and company	Address	Type of activity	County
Barite, primary:			
New Riverside Ochre Co.[1]	Box 387 Cartersville, Ga. 30120	Open pit mine	Bartow.
Paga Mining Co	Box 130 Cartersville, Ga. 30120	do	Do.
Bauxite:			
American Cyanamid Co	Berdan Ave. Wayne, N.J. 07470	Open pit mine and plant.	Sumter.
C-E Minerals, Inc.[2]	901 E. Eighth Ave. King of Prussia, Pa. 19406	Open pit mine	Do.

See footnotes at end of table.

Table 15.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Cement:			
Marquette Cement Manufacturing Co.[3]	20 N. Wacker Dr. Chicago, Ill. 60606	Plant	Polk.
Martin-Marietta Cement[4]	18th Floor, Daniel Bldg. Birmingham, Ala. 35233	do	Fulton.
Medusa Cement Co.[2]	Box 5668 Cleveland, Ohio 44101	do	Houston.
Clays:			
American Industrial Clay Co	433 N. Broad St. Elizabeth, N.J. 07207	Open pit mines	Warren and Washington.
Engelhard Minerals & Chemicals Corp.	Menlo Park Edison, N.J. 08817	do	Decatur.
Freeport Kaolin Corp	733 Third Ave. New York, N.Y. 10017	do	Twiggs.
J. M. Huber Co	Thornall St. Edison, N.J. 08817	do	Twiggs and Warren.
Feldspar:			
The Feldspar Corp.[3]	Box 99 Spruce Pine, N.C. 28777	Open pit mine and plant.	Jasper.
Gypsum:			
The Flintkote Co	400 Westchester Ave. White Plains, N.Y. 10604	Plant	Chatham.
Georgia-Pacific Corp	Box 311 Portland, Oreg. 97207	do	Glynn.
National Gypsum Co	327 Delaware Ave. Buffalo, N.Y. 14202	do	Chatham.
Iron ore:			
Lumpkin Mining Co	Box 234 Greenville, Ala. 36037	Mine and plant	Quitman.
Luverne Mining Co	Box 409 Luverne, Ala. 36104	do	Stewart.
Kyanite:			
C–E Minerals, Inc.[2]	433 S. Gulph Rd. King of Prussia, Pa. 19406	Open pit mine and plant.	Lincoln.
Mica:			
Franklin Mineral Products Co., Inc.	P.O. Box O Wilmington, Mass. 01887	Open pit mine	Hart.
Thompson-Weinman & Co	Box 130 Cartersville, Ga. 30120	do	Cherokee.
Peat:			
Shep Peat Co	Box 307 Colquitt, Ga. 31737	Bog	Miller.
Perlite, expanded:			
Armstrong Cork Co	1010 Concord St. Lancaster, Pa. 17604	Plant	Bibb.
W. R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	do	Gwinnett.
Rare-earth minerals:			
Humphreys Mining Co.[5]	Box 8 Folkston, Ga. 31537	Dredge and plant.	Charlton.
Sand and gravel:			
Brown Brothers Sand Co	Howard, Ga. 31039	Open pit mines	Talbot and Taylor.
Claussen-Lawrence Construction Co.	Box 4510 Augusta, Ga. 30907	Open pit mine	Richmond.
Colwell Construction Co	Box 6 Blairsville, Ga. 30512	do	Upson.
Crawford County Mining Co., Inc.	3166 Maple Dr. N.E. Atlanta, Ga. 30305	do	Crawford.
Dawes Silica Mining Co	Box 470 Thomasville, Ga. 31792	Open pit mines	Dougherty, Effingham, Thomas.
Howard Sand Co	Box 118 Butler, Ga. 31006	do	Talbot, Taylor.
The Scruggs Concrete Co., Inc	Box 2065 Valdosta, Ga. 31601	Open pit mine	Cook.
Stone:			
Dalton Rock Products Co	Box 1608 Dalton, Ga. 30726	Quarry	Whitfield.
Davidson Mineral Properties, Inc.	Box 458 Lithonia, Ga. 30058	Quarries	DeKalb and Fulton.
Dixie Lime & Stone Co	Box 998 Bridgeboro, Ga. 31744	do	Clayton, Fayette, Mitchell, Monroe.

See footnotes at end of table.

Table 15.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Stone—Continued:			
Georgia Marble Co	3460 Cumberland Pkwy. N.W. Atlanta, Ga. 30303	Quarries	Gilmer and Pickens.
Vulcan Materials Co	Box 7324–A, 1 Office Park Birmingham, Ala.	do	Cobb, Douglas, Fulton, Gwinnett, Muscogee.
Talc (soapstone):			
Southern Talc Co	Box F Chatsworth, Ga. 30705	Mines and mill	Murray.

[1] Also iron.
[2] Also clays.
[3] Also stone.
[4] Also clay and stone.
[5] Also titanium, zircon, and thorium oxide concentrates.

The Mineral Industry of Hawaii

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Hawaii Department of Land and Natural Resources for the collection of mineral data.

By Avery H. Reed [1]

Mineral production in Hawaii in 1974 again established new annual records. Output of construction materials increased 9% over that of 1973.

Total value of mineral production increased 20% to $42 million, a new annual record. The leading producing county was Honolulu with 77% of the total. Leading mineral producing companies were Kaiser Cement & Gypsum Corp. which operated a cement plant and a limestone quarry; Cyprus Hawaiian Cement Corp. with a cement plant and a limestone quarry; Pacific Concrete & Rock Co., Ltd. with a limestone quarry and three basalt quarries; and HC&D, Ltd. with a sand and gravel mine, two basalt quarries, and two pumice mines. These four companies accounted for 72% of the total value of Hawaii's mineral production.

[1] Supervisory physical scientist, Division of Nonmetallic Minerals.

Table 1.—Mineral production in Hawaii [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Portland ---- short tons	453,049	$13,213	487,422	$16,405
Masonry ---- do	15,642	537	14,257	706
Lime ---- do	6,455	238	6,070	221
Pumice ---- do	354,083	611	385,050	792
Sand and gravel ---- thousand short tons	753	2,012	990	2,379
Stone ---- do	7,180	18,466	[2] 7,638	[2] 21,370
Value of items that cannot be disclosed:				
Clays, gem stones, salt (1973), and dimension stone (1974)	XX	70	XX	169
Total	XX	35,147	XX	42,042
Total 1967 constant dollars	XX	25,766	XX	[p] 20,104

[p] Preliminary. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes dimension stone; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Hawaii, by county
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Hawaii	$3,673	$3,687	Stone, pumice, sand and gravel.
Honolulu	27,690	32,229	Cement, stone, lime, clays.
Kauai	908	1,303	Stone, sand and gravel, pumice.
Maui	2,881	4,825	Stone, sand and gravel, pumice, lime, gem stones.
Total [1]	35,147	42,042	

[1] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Hawaii business activity

		1973	1974 p	Change, percent
Total nonagricultural employment	thousands	328.0	333.0	+1.5
Manufacturing	do	24.3	22.8	−6.2
Contract construction	do	26.7	28.0	+4.9
All other industries [1]	do	277.0	282.2	+1.9
Personal income:				
Total	millions	$4,582	$4,970	+8.5
Per capita		$5,525	$5,882	+6.5
Construction activity:				
Number of private and public residential units authorized		17,907	19,761	+10.4
Value of nonresidential construction	millions	$126.2	$162.7	+28.9
Farm marketing receipts	do	$273.2	NA	NA
Mineral production value	do	$35.1	$42.0	+19.7

p Preliminary. NA Not available.
[1] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; services, and government.
Sources: Survey of Current Business; Construction Review; Employment and Earnings; Farm Income Situation; and the U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Kaiser Cement & Gypsum Corp. operated a cement plant near Nanakuli, and Cyprus Hawaiian Cement Corp. operated a cement plant near Ewa, both on Oahu, in Honolulu County. Shipments of portland cement were a record 487,000 tons, an increase of 8%. Shipments of masonry cement were 14,300 tons, 9% below the 1973 record.

Portland cement was used for ready-mix concrete (80%), concrete products (12%), building materials (5%), and other uses.

Raw materials used in portland cement included 590,000 tons of limestone and 84,200 tons of basalt which were quarried on Oahu, 50,200 tons of silica sand, and 22,400 tons of gypsum was imported from Mexico.

The two cement plants consumed 374,000 barrels of fuel oil and purchased 60 million kilowatt hours of electric energy.

Clays.—Pacific Clay Corp. mined common clay in Honolulu County for use in making brick.

Gem Stones.—Gem stones and mineral specimens were collected. Coral was recovered by divers.

Lime.—GasprO, Ltd. and Hawaiian Commercial & Sugar Co. Ltd. produced lime in Honolulu and Maui Counties for sugar refining and finishing lime. Output decreased 6% and was 37% below the 1966 record. Total lime consumption was 6,229 tons.

Pumice and Volcanic Cinder.—Fifteen operators mined a record 385,000 tons of pumice and volcanic cinder at 16 mines for concrete and roads, landscaping, and fill. Output increased 9% and was 2% above the 1972 record. Leading counties were Hawaii and Maui. Leading producers were Volcanite, Ltd., Laupahoehoe Sugar Co., and Hilo Coast Processing Co.; these companies accounted for 59% of the total pumice output. Among the States, Hawaii ranked fourth in production of pumice.

Sand and Gravel.—Nine operators mined almost 1 million tons of sand and gravel at nine mines in Hawaii, Kauai, and Maui Counties for concrete and roads and for other uses. Output increased 31% and was 18% above the 1971 record. Leading producers were HC&D, Ltd., Maui Concrete & Aggregates, Inc., and Louis K. Rego Trucking Co., which together accounted for 93% of the total output.

Stone.—Eight operators crushed a record 5.6 million tons of traprock at 17 quarries for concrete and roads, fill, and other uses. Output increased 14%. Leading counties were Honolulu and Hawaii. Leading producers were Lone Star Industries, Pacific Concrete & Rock Co., Ltd., and HC&D, Ltd.; these companies produced 76% of the total output of crushed basalt.

Nine operators crushed limestone at nine quarries for cement, concrete aggregates, roadbase, and other uses. Output decreased 6% to 1.6 million tons. The leading county was Honolulu. Leading producers were Herbert Tanaka, Cyprus Hawaiian Cement Corp., and Kaiser Cement & Gypsum Corp.; they produced 68% of the total.

Five companies crushed miscellaneous

stone at six quarries for fill, roadbase, and other uses. Output decreased 19% to 359,000 tons. The leading county was Hawaii. The leading producer was Yamada & Sons Inc.

Joe's Moss Rock Inc., James W. Glover, Ltd., R & R Moss Rock, and James Kuwana quarried dimension basalt and miscellaneous stone for rubble and rough blocks.

Total crushed stone production increased 7% to 7.6 million tons valued at $21.4 million, a new record.

Vermiculite.—Vermiculite of Hawaii, Inc. exfoliated vermiculite from Montana at a plant in Honolulu. Output declined 43%.

MINERAL FUELS

Standard Oil Co. of California and Hawaiian Independent Refinery Inc. operated crude oil refineries on Oahu.

Table 4.—Principal producers

Commodity and company	Address	Type of activity	Island
Cement: Cyprus Hawaiian Cement Corp.	1600 Kapiolani Blvd. Honolulu, Hawaii 96814	Cement plant	Oahu.
Kaiser Cement & Gypsum Corp	Permanente Rd. Permanente, Calif. 95014	do	Do.
Clays: Pacific Clay Corp	547 Halekauwila St. Honolulu, Hawaii 96813	Open pit mine	Do.
Lime: GasprO, Ltd	Box 2454 Honolulu, Hawaii 96804	Rotary kiln and continuous hydrator.	Do.
Hawaiian Commercial & Sugar Co. Ltd.	Puunene, Hawaii 96784	do	Maui.
Pumice and volcanic cinder:			
Fong Construction Co., Ltd	237 Dairy Rd. Kahului, Hawaii 96732	Open pit mine	Do.
HC&D, Ltd	Box 190 Honolulu, Hawaii 96810	do	Molokai.
Hilo Coast Processing Co	Pepeekeo, Hawaii 96783	do	Hawaii.
Laupahoehoe Sugar Co	Papaaloa, Hawaii 96780	do	Do.
Volcanite, Ltd	8282 Fort St. Honolulu, Hawaii 96813	do	Do.
Sand and gravel:			
Concrete Industries, Inc	Box 86 Puunene, Hawaii 96784	do	Maui.
HC&D, Ltd	Box 190 Honolulu, Hawaii 96810	do	Molokai.
Maui Concrete & Aggregates, Inc.	8 Central Ave. Wailuku, Hawaii 96793	do	Maui.
Louis K. Rego Trucking Co	Lihue, Hawaii 96766	do	Kauai.
Stone:			
James W. Glover, Ltd	Box 275 Hilo, Hawaii 96720	Open quarry	Hawaii.
Grove Farm Co., Inc	Puhi Rural Station Puhi, Hawaii 96766	do	Kauai.
Hawaiian Bitumuls & Paving Co., Ltd.	Box 2240 Honolulu, Hawaii 96804	do	Oahu.
Cyprus Hawaiian Cement Corp	1600 Kapiolani Blvd. Honolulu, Hawaii 96814	do	Do.
HC&D, Ltd	Box 190 Honolulu, Hawaii 96810	do	Do.
Kaiser Cement & Gypsum Corp	Permanente Rd. Permanente, Calif. 95014	do	Do.
Lone Star Industries	400 Alabama St. San Francisco, Calif. 94110	do	Do.
Pacific Concrete & Rock Co., Ltd.	2344 Pahounui Dr. Honoulu, Hawaii 96819	do	Molokai, Oahu.
Vermiculite (exfoliated):			
Vermiculite of Hawaii, Inc	842–A Mapunapuna St. Honolulu, Hawaii 96819	Exfoliating plant	Oahu.

The Mineral Industry of Idaho

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Idaho Bureau of Mines and Geology for collecting information on all minerals except fuels.

By L. E. Davis [1] and J. G. Bond [2]

The 1974 value of Idaho's mineral production increased 53% to nearly $209 million. This represents an increase of 96% in 2 years and a marked change from the general declining values typifying the early 1970's. Twenty-one mineral commodities were produced; 9 were metallic, and 12 were nonmetallic or industrial minerals. The single highest value was for silver, accounting for 28% of the State's mineral revenue; other major metallic values contributing to the total were zinc 14%, lead 11%, copper 2%, gold 0.2%. Combined, this metallic production equaled $115 million, or 55% of Idaho's output, most of which came from the Coeur d'Alene mining district of Shoshone County. Phosphate production, centered in southeastern Idaho, also was a major contributor to mineral revenues.

The commodities for which values cannot be disclosed, including phosphate, accounted for 35% of the total figure for 1974. Despite the fact that Idaho's mineral production value was less than 1% of the U.S. total, ranking 31st, Idaho was 16th in value of mineral production per capita in 1974. Among the principal producing States, Idaho was first in the output of antimony, abrasive garnet, and silver; second in lead and phosphate rock; and third in vanadium.

Decreased production and increased mineral revenue characterized metallic commodities, as rising prices dominated the setting. Increased interest in gold and selective mining of ores resulted in increased gold output of 7%. Copper, lead, silver, and zinc production declined 22%, 16%, 9%, and 14%, respectively, while values rose 2%, 16%, 68%, and 49%. Overall average price increases between 1973 and 1974 for gold, copper, lead, silver, and zinc, were 63%, 30%, 38%, 84%, and 74% respectively. The increase in phosphate rock value was principally the result of rising prices. The average unit value for sand and gravel was 12% higher.

The long-productive Coeur d'Alene district showed signs of invigoration. Notable was the American Smelting and Refining Co.-Coeur d'Alene mines 'Coeur" project.

[1] State Liaison Officer, Bureau of Mines, Boise, Idaho.
[2] Acting Director, Idaho Bureau of Mines and Geology.

Table 1.—Mineral production in Idaho [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Antimony ore and concentrate short tons, antimony content	322	$406	445	W
Clays [2] thousand short tons	42	227	9	$10
Copper (recoverable content of ores, etc.) short tons	3,625	4,314	2,841	4,393
Gem stones	NA	110	NA	120
Gold (recoverable content of ores, etc.) troy ounces	2,696	264	2,898	463
Lead (recoverable content of ores, etc.) short tons	61,744	20,116	51,717	23,273
Pumice thousand short tons	80	110	108	182
Sand and gravel do	8,393	10,246	7,665	10,484
Silver (recoverable content of ores, etc.) thousand troy ounces	13,620	34,840	12,436	58,572
Stone thousand short tons	2,972	8,096	3,528	9,868
Zinc (recoverable content of ores, etc.) short tons	46,107	19,052	39,469	28,339
Value of items that cannot be disclosed: Barite, cement, fire clay, garnet, gypsum, iron ore, lime, perlite, phosphate rock, tungsten, vanadium, and values indicated by symbol W	XX	38,300	XX	72,854
Total	XX	136,081	XX	208,558
Total 1967 constant dollars	XX	99,761	XX	p 99,732

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes fire clay; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Idaho, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Ada	$1,293	$960	Sand and gravel.
Adams	1,286	777	Copper, silver, sand and gravel.
Bannock	W	W	Cement, stone, sand and gravel.
Bear Lake	62	107	Sand and gravel.
Benewah	547	W	Garnet, stone, sand and gravel, clays.
Bingham	W	W	Phosphate rock, sand and gravel, stone.
Blaine	W	279	Sand and gravel, barite, silver, lead, zinc, gold.
Boise	--	11	Gold, silver, lead, zinc.
Bonner	273	712	Sand and gravel.
Bonneville	1,371	3,396	Stone, sand and gravel, lime, pumice.
Boundary	W	37	Stone, sand and gravel.
Butte	W	W	Gold, silver.
Camas	40	33	Sand and gravel.
Canyon	W	W	Sand and gravel, lime.
Caribou	25,243	53,213	Phosphate rock, vanadium, stone, sand and gravel.
Cassia	415	405	Sand and gravel, stone, clays.
Clark	93	W	Sand and gravel, stone, iron ore, lead, silver, copper.
Clearwater	W	W	Stone, sand and gravel.
Custer	1,231	1,701	Zinc, silver, lead, copper, gold.
Elmore	W	W	Sand and gravel, clays, gold, silver.
Franklin	W	W	Sand and gravel, stone.
Fremont	W	W	Stone, sand and gravel.
Gem	315	499	Sand and gravel.
Gooding	W	W	Do.
Idaho	W	1,350	Stone, sand and gravel, gold, silver, copper, zinc, lead.
Kootenai	1,432	912	Sand and gravel, stone, silver, gold, copper, lead.
Latah	W	W	Stone, clays.
Lemhi	102	W	Gypsum, gold, silver, sand and gravel, copper, lead, zinc.

See footnotes and end of table.

Table 2.—Value of mineral production in Idaho, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Lewis	W	W	Stone.
Lincoln	W	W	Sand and gravel.
Madison	$207	$366	Sand and gravel, stone.
Minidoka	W	619	Lime, sand and gravel, clays.
Nez Perce	W	W	Stone, sand and gravel.
Oneida	W	W	Pumice, perlite.
Owyhee	3	19	Silver, sand and gravel, gold, copper, lead, zinc.
Payette	140	W	Sand and gravel.
Power	30	42	Do.
Shoshone	76,763	W	Silver, zinc, lead, copper, antimony, gold, stone, sand and gravel.
Teton	286	W	Sand and gravel.
Twin Falls	W	810	Lime, sand and gravel.
Valley	W	W	Sand and gravel, tungsten.
Washington	378	513	Stone, sand and gravel, iron ore, gypsum.
Undistributed [2]	24,570	141,795	
Total [3]	136,081	208,558	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Jefferson and Jerome Counties are not listed because no production was reported.

[2] Includes value of mineral production which cannot be assigned to specific counties and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Idaho business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	339	NA	NA
Unemployment	do	19.1	NA	NA
Employment (nonagriculture):				
Construction	do	14.4	14.1	−2.1
Mining	do	3.1	3.6	+16.1
Manufacturing	do	47.2	47.4	+.4
Government	do	56.1	61.0	+8.7
All other	do	128.1	134.4	+4.9
Personal income:				
Total	millions	$3,398	$3,943	+16.0
Per capita		$4,381	$4,934	+12.6
Construction activity:				
New housing units authorized		6,502	5,990	−7.9
Nonresidential building permits issued	thousands	$63.7	$53.2	−16.5
State highway commission:				
Value of contracts awarded	millions	$40.1	$38	−5.2
Cement shipments to and within Idaho	thousand short tons	431	419	−2.8
Farm marketing receipts	millions	$1,116	NA	NA
Mineral production value	do	$136	$209	+53.7

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and the U.S. Bureau of Mines.

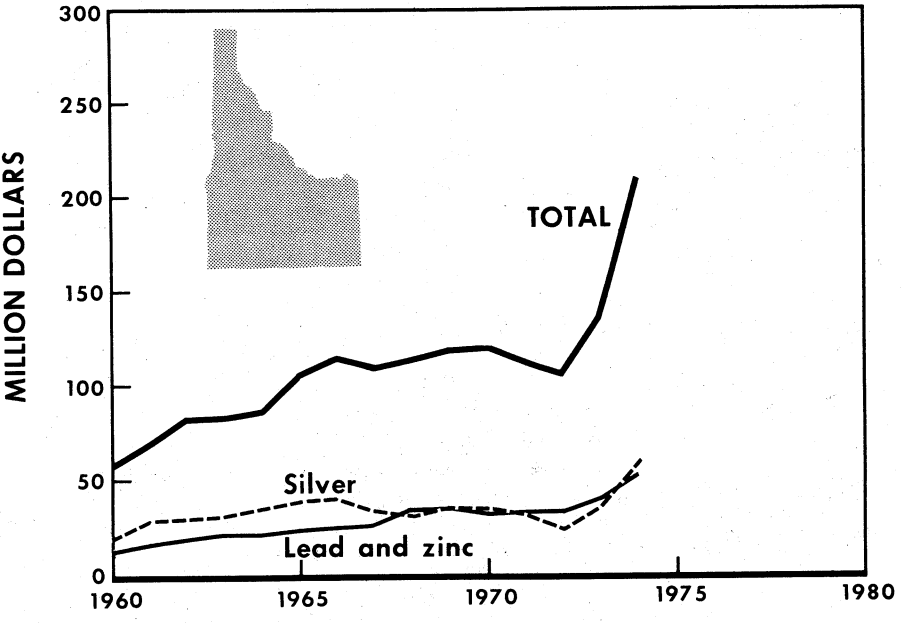

Figure 1.—Value of silver, lead, and zinc, and total value of mineral production in Idaho.

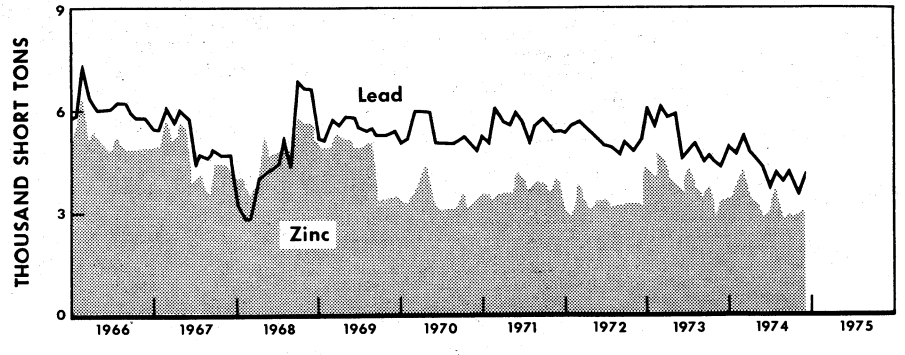

Figure 2.—Mine production of lead and zinc in Idaho, by months, in terms of recoverable metals.

This $10 million investment, to be followed by an additional investment of $10 million, includes a 450-ton-per-day mill with an anticipated annual mine output rate of over 2 million ounces by late 1976. A project of similar magnitude is the Earth Resources Co.-Canadian Superior Oil (U.S.) Ltd. Delamar mine venture. More than $12 million was committed to the development of an open pit mine and mill in the old Delamar-Silver City district, Owyhee County. Indications are that Idaho may become a producer of kyanite; Ethyl Corp. consolidated a block of claims and invested nearly $1.0 million in the Woodrat Mountain area, Idaho County. The Thompson Creek area, Custer County, was an area of activity during 1974; extensive exploratory and early development work continued at the molybdenum property of Tuscorora Mining Co., a division of Cyprus Mines Corp. Cobalt has not been mined in Idaho

for several years; however, the Blackbird mine near Cobalt, Lemhi County, was under study by the Idaho Mining Co. and Federal and State agencies, to identify sources of water contaminants and establish control measures for future mining and milling operations.

Idaho experienced its first major commitments during 1974 in a new mineral resource area—that of geothermal potential. Leases were requested on more than 269,000 acres of State land and more than 1,123,000 acres of Federal land. Drilling will be regulated by the State through the Department of Water Resources; one permit to drill was issued during the year. Drilling equipment for the first stratigraphic test well in the Raft River Geothermal Project began arriving in November. The project is a high-priority experiment by the Energy Research and Development Administration in cooperation with the Raft River Coop. to determine whether low-temperature hot water, possibly 300° F at depth, can be used in generating electricity.

No fossil fuels were produced in Idaho. Three oil and gas drilling permits were issued, but only two wells were drilled to completion, one each in Cassia and Owyhee Counties. Both were dry holes. The third well, in Lewis County, was down only 120 feet when drilling stopped. A drilling permit was issued in 1973 for a well in Teton County. This well was abandoned as a dry hole at 8,402 feet in 1974. The total footage drilled on the three permits issued in 1974 was 19,647 feet. A Rexburg man made application to the Bureau of Land Management for a permit to mine coal in Teton County. The area involved includes several mines that were worked sporadically in previous years for local consumption. At yearend no action had been taken on the application.

Three environmental matters concerned Idaho during 1974—the Bunker Hill smelter lead-contamination study, the phosphate region premining environmental impact study, and the continued designation and withdrawal of Federal recreation and roadless areas from mineral entry. In the lead-contamination study, Federal, State, and industry representatives started a program to identify the source and nature of lead contamination in the vicinity of the Bunker Hill smelter complex, and a multimillion dollar program of correction was begun. The first immediate steps were to reduce the hazards to area residents by providing them with alternate housing or improved sanitary conditions. Extensive plant modifications were studied to meet proposed State and Environmental Protection Agency standards. In the phosphate region, production expanded at a rate that was limited primarily by Federal leasing policies. An 18- to 24-month moratorium on expansion southeast of the Snake River in the Western Phosphate Field inhibited immediate and extensive commitments or expenditures to effectively increase production. The establishment of the more than 2 million acre Sawtooth National Recreation Area in central Idaho and the proposed withdrawal from development by the U.S. Forest Service of numerous roadless areas of over 5,000 acres across the State materially affected the exploration climate in Idaho.

The second regular session of the 42d Idaho Legislature did not pass any legislation with significant impact on the State's mining community. At the Governor's request, the legislature reorganized State agencies into 19 departments. Among the changes, the Idaho Bureau of Mines and Geology was placed under the new Department of Lands, and the Mine Safety Bureau, formerly the State Mine Inspector, became a part of the new Department of Labor and Industrial Services.

A number of Bureau of Mines projects were in progress during 1974. The Spokane Mining Research Center was active in cooperative research studies with various mining companies in the Coeur d'Alene mining district. A complex, three-dimensional finite element study was used to determine ground support requirements and optimum shaft configuration using rock stress and strength data from prior field tests. Field tests were conducted to determine the effectiveness and economics of electrokinetic treatment to dewater and consolidate hydraulic backfill in two cut-and-fill mines in the district. Efforts of the Bureau's Western Field Operations Center were concentrated on field studies of the mineral potential of five areas classified as either Wilderness, National Recreation, and/or Wild and Scenic River Areas. These areas were Pioneer-Boulder (Custer County), Scotchman Peak and Moyie River (Boundary County), Priest River (Bonner and Boundary Counties), and Hells Canyon (Adams County). All but the Hells

Canyon study was completed. Minerals availability (MAS) deposit evaluations were conducted for aluminum, gold, silver, and phosphate. In addition, the Center's Mineral Industry Location System (MILS) continued to develop and exchange mineral property location data with the cooperation of personnel of the Idaho Bureau of Mines and Geology. Another project was the monitoring of the Reclamation for Recreation project in Kellogg. The project involves converting the surface of old tailings ponds into parks and construction attendant facilities.

Operation of the Bureau's citrate process pilot plant at the Bunker Hill Co. smelter, under the supervision of the Salt Lake City Metallurgy Research Center, continued through Phase I into Phase II. The total operating time of Phase I was nearly 1,900 hours, including operating time in fiscal year 1974. The total net sulfur production from the SO_2 flue gas was 22 tons, which when combined with H_2S amounted to a gross sulfur production of 66 tons. Pretesting of the Phase II H_2S generation section of the plant started in September and continued until the sulfur-vaporizing coil plugged, causing a shut down. In late December the plug was removed and operation resumed. At yearend installation of the Phase III gas cooling and cleaning section of the pilot plant was nearly complete.

The Idaho Bureau of Mines and Geology also expanded its program of mineral potential evaluation and concentrated on field studies of localities in central Idaho that bordered Federal classified areas. A strong cooperative effort with Federal agencies was put into preimpact studies of the phosphate area, and into low-impact exploration methods and evaluations in the Owyhee Mountains of southwest Idaho and in the Cabinet Mountains of the panhandle in the north.

Employment in the mineral industry reversed the trend of most Idaho industries. The State's unemployment rate rose 7.5% as compared with 1973, while employment in the mining community was up 16.1%. At yearend, mines in the Coeur d'Alene mining district were seeking 200 experienced miners. The injury record for 1974 was higher than in the previous year. Six fatalities occurred against none in 1973. Five of the six happened at metal mines, four of them underground and one in a mill. The sixth was a blasting accident in a nonmetal open pit operation. Nonfatal injuries were 7% higher than in 1973 with the frequency rate up 6.5%.

Table 4.—Employment and injury experience [1]

Year and industry	Average men working daily	Man-hours worked (thousands)	Number of disabling injuries reported		Frequency [2] (injury rates per million man-hours)	
			Fatal	Nonfatal	Fatal	Nonfatal
1973:						
Metal	1,833	3,584	--	186	--	NA
Nonmetal	599	1,129	--	12	--	NA
Sand and gravel	232	242	--	7	--	NA
Stone	118	92	--	1	--	NA
Total	2,782	5,047	--	206	--	40.82
1974:						
Metal	2,029	3,630	5	204	NA	NA
Nonmetal	643	1,101	--	10	NA	NA
Sand and gravel	387	225	--	5	NA	NA
Stone	147	127	1	2	NA	NA
Total	3,206	5,083	6	221	1.18	43.48

NA Not available.
[1] All data are preliminary.
[2] Only injuries with matching man-hours are included in injury-frequency rate computations.

Source: Mining Enforcement and Safety Administration, U.S. Department of the Interior.

REVIEW BY MINERAL COMMODITIES

METALS

Antimony.—All antimony produced in 1974 was recovered as a byproduct in the treatment of silver ores by the Sunshine Mining Co. The metal was recovered in the company electrolytic plant. Production rose 38%, reversing the downward trend of 1972 and 1973.

Cadmium.—Production dropped about 44%, and value was down 23% compared with 1973. As a byproduct of zinc smelting, the overall decline reflects in part the decline in zinc production for the year. The entire output continued to come from the Bunker Hill Co. smelter complex.

Copper.—Output from 24 mines producing copper in Idaho declined 22% to 2,841 short tons, the value of production showed a very slight increase to $4.4 million due to rising copper prices. Mines of the Coeur d'Alene district, although generally considered as lead-zinc-silver producers, accounted for 82% of the State's production. The Copper Cliff mine, Adams County, completed its first year of sustained production in the recently dormant Seven Devils district and produced 409 short tons from the disseminated copper deposit for a value of $630,000. Expansion of the concentrator to 800 tons per day at Cuprum was begun by the operator, Silver King Mines, Inc.; the mine became an open pit operation when underground caving reached the surface.

Table 5.—Idaho: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county

County	Mines producing [1]		Material sold or treated [2] (short tons)	Gold		Silver	
	Lode	Placer		Troy ounces	Value	Troy ounces	Value
Total:							
1972	19	2	1,894,135	2,884	$169,003	14,250,725	$24,012,469
1973	29	--	1,658,213	2,696	263,693	13,619,824	34,839,515
1974:							
Adams	1	--	79,448	--	--	20,459	96,362
Blaine	1	--	11	1	160	448	2,110
Boise	5	1	57	80	12,780	416	1,959
Clark	2	--	31	--	--	209	985
Custer	6	--	80,373	123	19,647	123,044	579,537
Elmore	1	--	29	10	1,597	74	349
Idaho	3	--	431	95	15,175	815	3,838
Kootenai	1	--	137	15	2,396	1,870	8,808
Lemhi	4	--	1,740	144	23,003	4,611	21,718
Shoshone	11	--	1,593,917	2,419	386,410	12,280,711	57,842,149
Undistributed [3]	3	--	10,078	11	1,757	3,044	14,337
Total	38	1	1,766,252	2,898	462,925	12,435,701	58,572,152

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
Total:							
1972	2,942	$3,012,572	61,407	$18,459,024	38,647	$13,719,649	$59,372,717
1973	3,625	4,313,682	61,744	20,116,130	46,107	19,051,546	78,584,566
1974:							
Adams	409	632,617	--	--	--	--	728,979
Blaine	--	--	3	1,355	1	547	4,172
Boise	--	--	(4)	28	(4)	88	14,855
Clark	(4)	77	9	3,935	(4)	136	5,133
Custer	86	132,369	692	311,226	916	657,869	1,700,648
Elmore	--	--	--	--	--	--	1,946
Idaho	1	1,038	(4)	178	(4)	191	20,420
Kootenai	(4)	472	1	239	--	--	11,915
Lemhi	2	2,449	4	1,841	2	1,293	50,304
Shoshone	2,344	3,623,514	51,008	22,953,631	38,549	27,678,202	112,483,906
Undistributed [3]	(4)	141	1	300	(4)	225	16,760
Total	[5]2,841	4,392,677	[5]51,717	23,272,733	[5]39,469	28,338,551	115,039,038

[1] Operations at old mill or miscellaneous cleanups not counted as producing mines.
[2] Does not include gravel washed.
[3] Includes Butte and Owyhee Counties, combined to avoid disclosing individual company confidential data.
[4] Less than ½ unit.
[5] Data may not add to totals shown because of independent rounding.

Table 6.—Idaho: Mine production of gold, silver, copper, lead, and zinc in 1974, by class of ore or other source material, in terms of recoverable metal

Source	Number of mines	Material sold or treated (thousand short tons)	Gold (troy ounces)	Silver (thousand troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Gold	8	652	180	1	1	(1)	(1)
Gold-silver	4	1,645	135	4	1	(1)	(1)
Silver	7	440,129	748	7,825	1,842	857	571
Copper	2	86,099	82	22	481	--	--
Lead	10	190,000	1,104	2,485	213	18,446	1,607
Lead-zinc	5	1,037,704	616	2,098	302	32,404	36,853
Zinc	2	10,021	6	1	(1)	10	487
Lead cleanup	--	2	3	(1)	--	(1)	--
Total lode material [2]	38	1,766,252	2,874	12,436	2,841	51,717	39,469
Placer	1	--	24	--	--	--	--
Total all sources	39	1,766,252	2,898	12,436	2,841	51,717	39,469

[1] Less than ½ unit.
[2] Data may not add to totals shown because of independent rounding.

Table 7.—Idaho: Mine production of gold, silver, copper, lead, and zinc in 1974, by type of material processed and method of recovery, in terms of recoverable metal

Type of material processed and method of recovery	Gold (troy ounces)	Silver (thousand troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Amalgamation	17	(1)	--	--	--
Smelting of concentrates	2,534	12,420	2,838	51,661	39,463
Direct smelting of—					
Ore	320	16	3	56	6
Cleanup	3	(1)	--	(1)	--
Total	2,874	12,436	2,841	51,717	39,469
Placer	24	--	--	--	--
Grand total	2,898	12,436	2,841	51,717	39,469

[1] Less than ½ unit.

Gold.—Production at 2,898 troy ounces increased 7% to return to the 1972 level of output; but as in 1973, it was sharply rising prices that increased value by 75% to $463,000. Thirty-two mining operations recovered gold in 1974; placer production represented less than 1% of the output. The Coeur d'Alene district (Shoshone County) produce 2,419 ounces, or about 83% of the State's total output. Of this amount 1,026 ounces, or 42% came from the Lucky Friday mine. In addition to Shoshone County, only Custer and Lemhi Counties yielded production in excess of 100 ounces.

Iron Ore.—Minor iron ore production continued in 1974. The tonnage shipped dropped about 50%, and value declined 9%. Two open pit operations, the Birch Creek mine in Clark County and the Iron Mountain mine in Washington County, provided the entire State production. Virtually all output was shipped for use in cement manufacture. A minor quantity from the Birch Creek mine was pelletized with gypsum for agricultural use.

Lead.—Output from Idaho's 30 lead-producing mines decreased 16% during 1974 to 51,717 short tons. The decline in production was countered by a rise in price, so that the total value increased 16% to $23.3 million. As in the past, the Coeur d'Alene district accounted for more than 98% of the total output. The Bunker Hill and Lucky Friday mines plus the Star Unit provided 46,797 tons or 92% of that figure. The Clayton Silver mine, Custer

County, was the only major lead-producing operation outside Shoshone County; its output was 645 tons.

Silver.—Once again Idaho led the United States in silver production; 38 mining operations provided this output. Although total production declined almost 9% to 12.4 million troy ounces, its dollar value, reflecting the strong rising silver market in 1974, increased 68% to $58.6 million. Shoshone County's 11 underground mines accounted for more than 98% of the State's production with 12.3 million ounces. The Sunshine mine, with an output of 3.8 million ounces valued at $18.1 million, regained the leading position as a silver producer, a position it had relinquished after a fire in May 1972. Three other mines in the Coeur d'Alene district—the Galena, Lucky Friday, and Bunker Hill—exceeded 1.0 million ounces in silver production; these four mines combined produced over 87% of the State's output. The Clayton Silver mine, Custer County, and the Copper Cliff mine, Adams County, were two producers elsewhere in the State that should be noted; they produced more than 113,000 and 20,000 ounces, respectively. Two new operations were being developed with capacities and reserves to challenge the leading producers in Idaho; these are the underground "Coeur" project in Shoshone County operated by American Smelting and Refining Co. and Delamar Silver open pit venture in Owyhee County being operated by Earth Resources Co. Both firms anticipated production in excess of 2.0 million ounces annually when in full operation.

Tungsten.—All of Idaho's tungsten production continued to be from the Golden Gate and Juniper properties (Quartz Creek) in the Yellow Pine district, Valley County. The amount of concentrate shipped increased more than threefold in 1974; value jumped more than sevenfold.

Vanadium.—Production of vanadium continued as a byproduct of ferrophosphorus slag derived from phosphate fertilizer operations. All production was from Caribou County. Total recovery declined 13%, but rising prices increased value 11%. The slag was treated both at the Kerr-McGee Corp. plant at Soda Springs, Idaho, and at the Union Carbide Corp. plant at Hot Springs, Ark.

Zinc.—During 1974, 25 operations reported zinc production totaling 39,469 short tons valued of $28.3 million; this represents a production decrease of 14% to about the 1972 level but a value increase of 49% due to rising metal prices. Shoshone County's 12 zinc producers accounted for over 97% of the State's output, with the Bunker Hill mine and Star unit producing over 91%.

NONMETALS

Barite.—All production came from the Manhattan Minerals' Blackhawk mine, Blaine County, under lease to Rocky Mountain Refractories. Both companies are Salt Lake City based. The material was shipped out-of-State and processed for use in well drilling muds.

Cement.—Portland and masonry cement was produced by Idaho Portland Cement Co., Division of Oregon Portland Cement Co., at Inkom, Bannock County. The total tonnage of portland cement sold increased 3%; rising prices increased sales value 23%. Masonry cement value remained constant, but production declined as stock on hand was utilized.

Clays.—Total production from the five producing counties in Idaho dropped markedly in 1974, continuing the decline started in 1973. All fire clays were from deposits in Latah County; A. P. Green Refractories Co. of Troy was the major producer. Common clays were mined in Benewah, Cassia, Elmore, and Minidoka Counties.

Fluorspar.—No production of fluorspar was reported in 1974. Scattered exploration continued at deposits in east-central Idaho with Hanna Mining Co. drilling on the Keystone fluorspar property near Challis. No production was anticipated under present market conditions.

Garnet.—Idaho continued to be one of the major producers of abrasive garnet in the United States. Production from placer operations rose 39% and value rose 65% as demand and market price increased. All production was from Benewah County by the Emerald Creek Garnet Milling Co. and Idaho Garnet Abrasive Co. The latter announced plans for expansion of its plant.

Gem Stones.—The value of gem stone materials collected in Idaho was estimated to have increased in 1974 approximately 9% to $120,000. The U.S. Forest Service established a daily collecting permit procedure for the Emerald Creek deposit near Fernwood, and designated sites were opened

to the public to search for star garnet.

Gypsum.—Output and value dropped 35% and 28% respectively at the State's two active mines, E. J. Wilson and Sons, Lemhi County, and Consumers Co-op Association, Washington County. Except for a small quantity of the Lemhi County material that was pelletized with iron ore for agricultural use, the output was consumed at cement manufacturing plants.

Lime.—Four counties, Bonneville, Canyon, Minidoka, and Twin Falls, reported lime production in 1974. Output declined 28%; value was down 19%. Major producers were the Utah-Idaho Sugar Co. and the Amalgamated Sugar Co.; lime was utilized primarily for beet-sugar processing and water purification.

Perlite.—The Oneida Perlite Corp. mine near Malad, Oneida County, was the sole producer in Idaho. Production and value declined approximately 30%. Most of the output was converted to expanded perlite for use in masonry, insulation, and horticultural aggregate.

Phosphate Rock.—Production continued to increase in southeastern Idaho, rising 23% in quantity and 132% in value. Output was from five mines; four in Caribou County—the Conda mine of J.R. Simplot Co., the Henry mine operated by Monsanto Co., the Wooley Valley mine operated by Stauffer Chemical Co., and the Dry Valley mine operated by Agricultural Products Corp.—and one operation, the Gay mine of J. R. Simplot Co., was in Bingham County. Production generally was limited both by plant capacity and by legal constraints being applied on leased and company-owned properties while a 2-year environmental impact study was conducted by Federal and State agencies. No major exploration or expansion effort is anticipated until 1977; a proposed joint mining and processing venture to be operated by Earth Sciences Inc. northeast of Soda Springs is in abeyance.

Pumice.—Production rose notably during 1974; output and value increased 35% and 65% respectively. Pumice from the Albino property of Amcor, Inc. and the Indian Siding property of Producers Pumice near Idaho Falls was prepared for use as concrete aggregate.

Pumice from Hess Pumice Products' Wrights Creek pit, Oneida County, was processed in the company's Malad plant for use as a cleaning agent, abrasive, and horticultural additive.

Sand and Gravel.—Statewide production declined 9% to 7.7 million short tons; value showed a slight increase of 2% to $10.5 million. Commercial uses for sand and gravel accounted for 68% of the production; the remainder was used in publicly funded projects. Overall, processed sand accounted for 15% of the production, and processed gravel for 66%; the remaining 19% was unprocessed aggregate. The largest single commercial use was in nonresidential and residential construction at 16%. This was followed by unprocessed aggregate and roadbase construction. Of the counties producing aggregate, 18 had an output in excess of 100,000 short tons. Canyon County in southwest Idaho was the leading producer with 1.2 million tons followed by Bonneville in the southeast, Kootenai in the north, Teton in the east, and Ada in the west. All produced over 500,000 tons. Virtually every county had some production, although in a few counties the output was insignificant. A high-grade silica sand was produced in Gem County and shipped for use in making glass.

Table 8.—Idaho: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	8,301	9,917	1,122	2,802
Gravel			5,053	6,616
Unprocessed:				
Sand and gravel			1,490	1,031
Industrial:				
Sand	92	329	W	W
Gravel			W	W
Total	8,393	10,246	7,665	10,449

W Withheld to avoid disclosing individual company confidential data; included with "Construction."

[1] Value data may not be directly comparable to that in tables 1, 9, and 10 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 9.—Idaho: Construction aggregate and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			1,257	2,346
Highway and bridge construction			233	456
Other uses such as dams, waterworks, airports, etc.			396	749
Concrete products (cement blocks, bricks, pipe, etc.)	4,693	6,858	322	820
Bituminous paving (asphalt and tar paving)			318	408
Roadbase and subbase			603	734
Unprocessed aggregate			957	835
Fill	454	397	396	291
Other uses	255	299	420	731
Industrial sand and gravel	92	329	323	764
Total	5,494	7,888	5,225	8,184

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 10.—Idaho: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			W	W
Highway and bridge construction			254	285
Other uses such as dams, waterworks, airports, etc.			153	227
Concrete products (cement blocks, bricks, pipe, etc.)	2,308	2,113	40	51
Bituminous paving (asphalt and tar paving)			522	543
Roadbase and subbase			831	851
Unprocessed aggregate			533	197
Fill	530	176	105	190
Other	61	74	2	5
Total	2,899	2,363	2,440	2,349

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Output increased 19% and value increased 22% to 3.5 million short tons and $9.9 million respectively. Greatest production was in Bonneville County, followed by Idaho, Bannock, Clearwater, Caribou, Kootenai and Benewah Counties; all produced over 0.2 million short tons. Principal uses of crushed and broken stone were for flux, general aggregate, surface trim, riprap, and dense roadbase. Dimension stone output and value was less than 1% of the State's total stone production. Although a high percentage of the State output was traprock, lesser quantities of limestone, travertine, quartzite (silica), and granite were produced.

Table 11.—Principal producers

Commodity and company	Address	Type of activity	County
METALS			
Antimony:			
Sunshine Mining Co	Kellogg, Idaho 83837	Mine and plant	Shoshone.
Copper:			
American Smelting and Refining Co.	Wallace, Idaho 83873	Mine and mill	Do.
Silver King Mines, Inc	Salt Lake City, Utah 84110	do	Adams.
Sunshine Mining Co	Kellogg, Idaho 83837	do	Shoshone.
Gold:			
American Smelting and Refining Co.	Wallace, Idaho 83873	do	Do.
Hecla Mining Co	do	do	Do.

See footnotes at end of table.

Table 11.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
METALS—Continued			
Iron ore:			
C & W Sand & Gravel	Weiser, Idaho 83672	Mine	Washington.
Lead:			
Bunker Hill Co	Kellogg, Idaho 83837	Mine, mill, smelter.	Shoshone.
Hecla Mining Co	do	Mine and mill	Do.
Silver:			
American Smelting and Refining Co.	Wallace, Idaho 83873	do	Do.
Bunker Hill Co	Kellogg, Idaho 83837	do	Do.
Hecla Mining Co	Wallace, Idaho 83873	do	Do.
Sunshine Mining Co	Kellogg, Idaho 83837	do	Do.
Tungsten:			
Electronic Metals, Inc	Yellow Pine, Idaho 83677	Mine	Valley.
Charles Ward	do	Mine and mill	Do.
Vanadium:			
Kerr-McGee Corp.[1]	Soda Springs, Idaho 83276	Plant	Caribou.
Zinc:			
Bunker Hill Co	Kellogg, Idaho 83837	Mine, mill, smelter.	Shoshone.
Day Mines, Inc	Wallace, Idaho 83873	Mine and mill	Do.
Hecla Mining Co	do	do	Do.
NONMETALS			
Barite:			
Rocky Mountain Refractories	Hailey, Idaho 83333	Pit	Blaine.
Cement:			
Idaho Portland Cement Co	Inkom, Idaho 83245	Plant	Bannock.
Clays:			
Burley Brick & Sand Co	Burley, Idaho 83318	Pit and plant	Cassia.
A. P. Green Refractories Co	Troy, Idaho 83871	do	Latah.
Interpace Corp	Ione, Calif. 95640	do	Benewah.
Pullman Brick Co., Inc	Boise, Idaho 83706	do	Ada and Elmore.
Garnet:			
Emerald Creek Garnet Milling Co.	Fernwood, Idaho 83830	Mine and plant	Benewah.
Idaho Garnet Abrasive Co	Kellogg, Idaho 83837	do	Do.
Gypsum:			
E. J. Wilson and Sons	Dubois, Idaho 83423	Pit	Clark.
Peat:			
Idaho Peat Industries Inc	Downey, Idaho 83234	Bog	Bannock.
Perlite (crude and expanded):			
Oneida Perlite Corp	Malad City, Idaho 83252	Pit and plant	Oneida.
Phosphate rock:			
Agricultural Products Corp	Conda, Idaho 83230	Mine and plant	Caribou.
Monsanto Co	Soda Springs, Idaho 83276	do	Do.
J. R. Simplot Co	Pocatello, Idaho 83201	Mine	Bingham.
Stauffer Chemical Co	San Francisco, Calif. 94119	do	Caribou.
Pumice:			
Amcor, Inc	Idaho Falls, Idaho 83401	Pit and plant	Bonneville.
Hess Pumice Products	Malad City, Idaho 83252	Mine and plant	Oneida.
Producer's Pumice	Ammon, Idaho 83401	Mine	Bonneville.
Sand and gravel:			
Teton City Highway Dept	Teton, Idaho 83451	Pit and plant	Teton.
Monroc, Inc	Twin Falls, Idaho 83301	do	Twin Falls.
Idaho Concrete Pipe Co., Inc	Nampa, Idaho 83651	do	Canyon.
Kennaday Paving Co	Idaho Falls, Idaho 83401	do	Bonneville.
Stone:			
Idaho Portland Cement Co	Nampa, Idaho 83651	Quarry and plant.	Canyon.
Monsanto Co	Soda Springs, Idaho 83276	do	Caribou.
Central Pre-Mix Concrete Co	Coeur d'Alene, Idaho 83814	do	Kootenai.
FMC Corp	Pocatello, Idaho 83201	do	Bannock.

[1] Recovered from byproduct ferrophosphorus.

The Mineral Industry of Illinois

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Illinois State Geological Survey, under a memorandum of understanding for collecting information on all minerals except mineral fuels.

By Thomas O. Glover [1] and Ramesh Malhotra [2]

The value of mineral production in Illinois in 1974, $1,149.2 million, increased 39% above 1973's record high of $825.7 million. Mineral fuels continued to account for the major part of the total mineral value, about 75%; nonmetals comprised 24%; and metals accounted for the remainder. Illinois led in the production of fluorspar, tripoli, iron oxide pigments, and expanded perlite, ranked second in output of peat, and was fourth in output of coal.

Coal remained the leading commodity in mineral value, accounting for $582.0 million, or 51% of the State total. Output

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[2] Mineral economist, Illinois Geological Survey.

Table 1.—Mineral production in Illinois [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Portland ---- thousand short tons --	1,572	$36,064	1,460	$41,023
Masonry ---- do ----	88	2,901	69	3,228
Clays [2] ---- do ----	1,758	3,613	1,587	3,744
Coal (bituminous) ---- do ----	61,572	413,309	58,215	582,010
Fluorspar ---- short tons --	160,305	r 11,915	153,698	12,247
Gem stones ----	NA	2	NA	2
Lead (recoverable content of ores, etc.) short tons --	541	176	493	222
Natural gas ---- million cubic feet --	1,638	573	1,436	574
Peat ---- thousand short tons --	72	1,037	96	1,412
Petroleum (crude) -- thousand 42-gallon barrels --	30,669	132,490	27,553	244,395
Sand and gravel ---- thousand short tons --	43,649	62,029	42,705	68,566
Stone ---- do ----	66,653	114,068	63,231	121,763
Zinc (recoverable content of ores, etc.) short tons --	5,250	2,169	4,104	2,947
Value of items that cannot be disclosed: Barite (1974), clays (fuller's earth), copper (1974), lime, natural gas liquids, silver, and tripoli ----	XX	45,306	XX	67,077
Total ----	XX	r 825,652	XX	1,149,210
Total 1967 constant dollars ----	XX	605,285	XX	p 549,552

p Preliminary. r Revised. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers.)
[2] Excludes fuller's earth; included with "Value of items that cannot be disclosed."

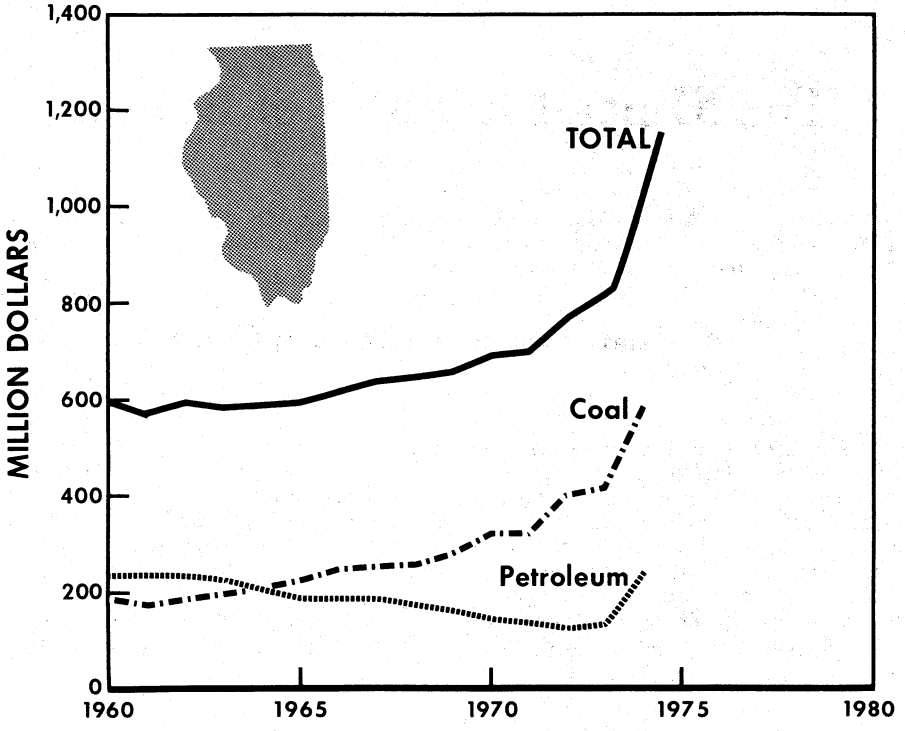

Figure 1.—Value of coal, petroleum, and total value of mineral production in Illinois.

Table 2.—Value of mineral production in Illinois, by county [1 2]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	$3,334	$3,516	Stone, lime, sand and gravel, petroleum.
Alexander	W	W	Tripoli, sand and gravel.
Bond	W	735	Petroleum, sand and gravel, clays.
Boone	650	W	Stone, sand and gravel.
Brown	33	W	Stone, petroleum, clays, sand and gravel.
Bureau	581	904	Sand and gravel.
Calhoun	W	W	Stone.
Carroll	W	422	Do.
Champaign	701	993	Sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Illinois, by county [1 2]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Christian	W	W	Coal, petroleum, stone.
Clark [3]	W	W	Petroleum, stone, sand and gravel.
Clay	W	W	Petroleum, stone.
Clinton	W	W	Petroleum, stone, sand and gravel.
Coles	W	W	Petroleum, stone, sand and gravel, natural gas.
Cook	$53,423	$53,689	Stone, lime, sand and gravel, clays, peat.
Crawford	6,081	9,969	Petroleum, sand and gravel.
Cumberland [3]	110	123	Sand and gravel, stone.
DeKalb	W	W	Stone, sand and gravel.
DeWitt	W	W	Petroleum, sand and gravel.
Douglas	37,202	63,347	Natural gas liquids, coal, stone, petroleum.
DuPage	W	W	Sand and gravel, stone.
Edgar	484	896	Petroleum.
Edwards	1,961	3,521	Do.
Effingham	1,114	2,031	Do.
Fayette	14,785	25,819	Petroleum, stone, sand and gravel, clays.
Ford	628	632	Sand and gravel, stone.
Franklin	45,987	W	Coal, petroleum, stone.
Fulton	W	26,693	Coal, sand and gravel.
Gallatin	W	W	Coal, petroleum, sand and gravel, natural gas.
Greene	W	W	Stone.
Grundy	W	W	Sand and gravel, clays, stone.
Hamilton	4,055	7,202	Petroleum.
Hancock	1,085	1,003	Stone.
Hardin	16,956	19,201	Fluorspar, stone, zinc, lead, barite, copper, silver.
Henderson	W	W	Stone.
Henry	W	W	Do.
Iroquois	W	W	Do.
Jackson	W	W	Stone, coal, sand and gravel.
Jasper	2,840	5,669	Petroleum, sand and gravel.
Jefferson	68,619	W	Coal, petroleum.
Jersey	219	218	Stone.
Jo Daviess	2,214	1,249	Sand and gravel, stone.
Johnson	W	W	Stone, coal.
Kane	10,042	11,755	Sand and gravel, stone, peat.
Kankakee	5,138	6,202	Stone, coal, clays, sand and gravel.
Kendall	692	W	Sand and gravel, stone.
Knox	W	W	Coal, stone, clays.
Lake	W	W	Sand and gravel, peat.
LaSalle	W	28,836	Cement, sand and gravel, stone, clays.
Lawrence	16,674	31,848	Petroleum, sand and gravel.
Lee	W	W	Cement, stone, sand and gravel.
Livingston	W	5,352	Stone, clays, sand and gravel.
Logan	W	W	Sand and gravel, stone.
McDonough	1,054	W	Stone, petroleum, clays.
McHenry	10,073	8,832	Sand and gravel.
McLean	746	205	Do.
Macon	934	1,118	Sand and gravel, petroleum.
Macoupin	W	W	Coal, stone, petroleum.
Madison	3,102	4,110	Stone, petroleum, sand and gravel.
Marion	W	W	Petroleum, stone.
Marshall	59	65	Sand and gravel.
Mason	41	35	Do.
Massac	W	W	Cement, sand and gravel.
Menard	W	W	Stone.
Mercer	W	W	Stone, sand and gravel.
Monroe	W	W	Stone.
Montgomery	W	15,890	Coal, stone, petroleum.
Moultrie	W	W	Petroleum, sand and gravel.
Ogle	W	1,441	Stone, sand and gravel.
Peoria	14,319	12,798	Coal, sand and gravel, stone.
Perry	56,412	87,347	Coal, petroleum.
Pike	W	W	Stone, sand and gravel.
Pulaski	W	W	Clays, stone, sand and gravel.
Putnam	11	--	
Randolph	W	66,418	Coal, stone, petroleum, sand and gravel.
Richland	4,605	9,429	Petroleum.
Rock Island	2,955	W	Stone, sand and gravel.
St. Clair	43,256	35,900	Coal, stone, petroleum.
Saline	21,547	31,195	Coal, petroleum, natural gas.
Sangamon	2,604	3,521	Sand and gravel, petroleum, stone.

See footnotes at end of table.

Table 2.—Value of mineral production in Illinois, by county [1] [2]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Schuyler	W	W	Sand and gravel.
Scott	W	W	Stone, clays, sand and gravel.
Shelby	W	W	Sand and gravel, petroleum, stone.
Stark	W	W	Coal, sand and gravel.
Stephenson	$845	$678	Stone, sand and gravel.
Tazewell	W	W	Sand and gravel, clays.
Union	W	W	Stone, sand and gravel.
Vermilion	W	3,160	Stone, sand and gravel, coal.
Wabash	W	W	Petroleum, coal, sand and gravel.
Warren	W	W	Stone.
Washington	W	W	Petroleum, stone.
Wayne	13,862	25,731	Petroleum.
White	16,260	28,401	Petroleum, sand and gravel.
Whiteside	W	W	Peat, stone, sand and gravel.
Will	14,146	13,606	Stone, sand and gravel.
Williamson	29,092	40,934	Coal, petroleum, natural gas.
Winnebago	2,953	2,989	Stone, sand and gravel.
Woodford	2,026	1,905	Sand and gravel.
Undistributed [4]	288,998	441,683	
Total [5]	825,652	1,149,210	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Cass, Morgan, Piatt, and Pope Counties are not listed because no production was reported.
[2] Value of petroleum is based on an average price per barrel for the State.
[3] Value of petroleum production in Cumberland County is included with Clark County because actual source of production cannot be identified.
[4] Includes some sand and gravel, stone, and petroleum that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.
[5] Data may not add to totals shown because of independent rounding.

of bituminous coal in 1974 was 58.2 million tons, a decrease of 5% in quantity from that of 1973; total value of coal production, however, increased over that of the previous year. Production of crude petroleum was 27.6 million barrels, 3.1 million barrels less than in 1973; in value petroleum accounted for $244.4 million, 21% of the total mineral output of the State. Marketed production of natural gas decreased 12% in quantity and increased less than 1% in value. Production of liquefied petroleum gases increased slightly, while value increased 68%; natural gasoline production decreased 24% while value increased 15%. Production of peat, as measured by sales, increased in quantity and in value.

Among the nonmetallic mineral commodities, stone ranked first in value, followed by sand and gravel, cement, lime, fluorspar, and clays. Combined output of sand and gravel and stone accounted for 17% of the State's total mineral value in 1974. Illinois supplied 76% of the total domestic output of fluorspar. Other nonmetallic minerals and mineral products produced in Illinois were barite, gem stones, and tripoli.

Production of 493 tons of lead and 4,104 tons of zinc, in terms of recoverable metal, represented decreases of 9% and 22%, respectively, from the 1973 figures. Value of lead production increased 26%, and value of zinc production increased 36%. In addition to lead and zinc, small quantities of silver and copper were also recovered in smelter operations.

In 1974, Illinois ranked 11th in value of mineral production among the States.

A sulfur dioxide (SO_2) scrubber project at Southern Illinois University—Carbondale was using the lime-limestone process. According to the director of the project, the plant has been successfully removing SO_2 and particulate matter from flue gases generated during the combustion of high-chlorine (0.26%), medium-sulfur (2.5%) mid-central-U.S. coal. Two open throat venturi and separator units in series comprise this 1,500-cubic-foot-per-minute facility. With proper operation, no significant scaling and no chloride problems occurred in the scrubbing system. SO_2 removal is consistently over 90%, and efficiencies as high as 96% were obtained. Numerous sludge utilization studies were in process, and it appeared that chloride in the sludge causes compressive strength to decrease during curing. Scrubbing liquid surface tension effects are being evaluated, and a preliminary equation relating SO_2 control as a function of surface tension has been developed. The system has been run in both "open" and "closed loop" operating modes.

Governor Dan Walker signed a bill on February 5, 1974, appropriating $1.2 million to the Shawneetown Regional Port District to help purchase and renovate a coal-loading facility at Old Shawneetown. The loading facility will allow coal producers to ship on the Ohio River. The total cost of the project is estimated at $8 million.

The Governor also signed a package of energy legislation on August 19, 1974, authorizing the sale of $70 million in State bonds for Illinois coal development projects.

Universal Oil Products announced a breakthrough in making a petroleumlike liquid from an Illinois coal. The process, perfected at the company's Des Plaines research center, claims to reduce Illinois high-sulfur (3.8%) coal to a synthetic crude containing less than 0.15% sulfur.

Coal-to-gas tests in Scotland using Illinois coal have been very successful according to Peabody Coal Co.

The Tennessee Valley Authority (TVA) contracted with a Canadian firm, David S. Robertson and Associates Ltd., to take over operation of TVA's Eads mine near Belle Rive, Ill., and its Fabius mine in Jackson County, Ala. The Eads mine, which produced over 595,779 tons of coal in 1974, supplies coal to TVA's Joppa plant in Illinois.

The Southern Illinois Power Cooperative announced it was seeking a $450,000 loan to help finance a coal mining arrangement that would give it a guaranteed fuel supply. The money, which the cooperative planned to get from National Rural Electric Cooperative Association and the Rural Electrification Adminstration, would be used to buy a dragline to mine coal at the old Forsythe mine near Energy, Ill. The cooperative uses about 1,000 tons of coal per day and estimates that the remaining reserves at the mine would supply its needs for about 5 years.

Northern Illinois Gas Co. started production at its newly constructed synthetic natural gas (SNG) plant at Minooka, Ill. About 166 million cubic feet per day of gas, half the designed capacity, was delivered through a 10½-mile feeder line to the company's main trunkline for distribution in the Chicago suburban area. The plant uses 32,000 barrels per day of gas liquids and 16,000 barrels per day of naphtha.

Peoples Gas, Light, and Coke Co. announced the starting of site preparation for an SNG plant. The plant will use naphtha as a feedstock to produce 160 million cubic feet per day of SNG. The plant was scheduled for production in 1974–75 season.

The SNG plants earlier announced by Central Illinois Light Co., Continental Oil Co. and Truckline Gas Co. were suspended because of unavailability of feedstock.

Columbia Coal Gasification Corp., which acquired a 50% individualized interest in 35,000 acres of coal reserves in Illinois from Carter Oil Co., a subsidiary of Exxon Corp., estimated a cost of producing gas from Illinois coal of $2.35 per million Btu. The company estimated it would cost $2.62 if West Virginia coals were gasified. Columbia Coal Gasification plans to develop a coal gasification plant in Illinois once an economically and technically sound process is developed.

Southern National Resources Inc., Birmingham, Ala., acquired an option to buy a large coal reserve in the Illinois Basin from Consolidation Coal Co. The coal will be mined by underground methods and will likely be used to supply a coal gasification plant.

The Clow Corp. announced the closing of its Streator plant in Illinois and Somerville plant in New Jersey. The plants produced clay pipes. The company mined clay in Illinois to produce clay pipes at its Streator plant.

Table 3.—Indicators of Illinois business activity

	1973	1974 p	Change, percent
Labor force and employment, annual average:			
Total labor force ---- thousands --	4,903.3	NA	NA
Unemployment ---- do ----	202.0	NA	NA
Employment (nonagricultural):			
Manufacturing ---- do ----	1,342.1	1,332.7	−0.7
Construction ---- do ----	187.2	182.3	−2.6
Mining ---- do ----	22.9	22.7	−.9
Transportation and public utilities ---- do ----	283.0	286.5	+1.2
Wholesale and retail trade ---- do ----	950.3	970.6	+2.1
Finance, insurance, and real estate ---- do ----	243.9	250.0	+2.5
Government ---- do ----	715.8	733.1	+2.4
Personal income:			
Total ---- millions ----	$64,832	$70,534	+8.8
Per capita ----	$5,801	$6,337	+9.2
Construction activity:			
Value of authorized nonresidential private construction millions --	$984.8	$1,002.9	+1.8
Number of private and public residential permits issued ----	66,309	38,258	−42.3
Portland cement shipments to and within Illinois thousand short tons --	4,149	3,593	−13.4
Mineral production value ---- millions --	$825.7	$1,149.2	+39.2

p Preliminary. NA Not available.

Source: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Bituminous).—Illinois continued to rank fourth in the Nation in the production of bituminous coal with an output of 58.2 million tons valued at $582 million, which represented a decrease in tonnage of 5.5% and an increase in value of 40.8% compared with the 1973 levels. Value of bituminous coal production accounted for 51% of the State's total mineral value in 1974. The average value per ton (f.o.b. mine) for Illinois coal continued to rise, and in 1974 the average value per ton was $10.00 compared with $6.71 in 1973.

The utility market continued to be the largest consumer for Illinois coal, and coal's share of this market has been growing steadily since 1957. Until coal gasification and liquefaction plants are developed, a strong Illinois coal industry will remain heavily dependent on its ability to retain its competitive position in the utility fuel market.

Production in Illinois in 1974, excluding mines producing less than 1,000 short tons annually, was reported from 55 mines, the same number as were operating in 1973. Major producing counties, in order of decreasing tonnage, were Perry, Jefferson, St. Clair, Franklin, Randolph, Christian, Williamson, Fulton, Macoupin, and Saline. Underground mine production accounted for 53.7% of the coal produced in the State in 1974, compared with 52.9% in 1973.

Table 4.—Illinois: Bituminous coal production in 1974, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				Production (thousand short tons)				Value (thousands)
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total	
Christian	1	--	--	1	W	--	--	W	W
Douglas	2	--	--	2	2,102	--	--	2,102	W
Franklin	3	--	--	3	W	--	--	W	W
Fulton	--	4	--	4	--	2,503	--	2,503	$26,278
Gallatin	2	1	--	3	W	W	--	W	W
Jackson	--	1	--	1	--	66	--	66	577
Jefferson	3	1	--	4	W	596	--	W	W
Johnson	--	1	--	1	--	5	--	5	42
Kankakee	--	1	--	1	--	W	--	W	W
Knox	--	1	--	1	--	W	--	W	W
Macoupin	1	--	--	1	W	--	--	W	W
Montgomery	1	--	--	1	W	--	--	W	W
Peoria	--	3	--	3	--	W	--	W	W
Perry	--	5	--	5	--	11,146	--	11,146	87,205
Randolph	2	3	--	5	1,572	6,505	--	8,078	63,138
St. Clair	1	1	--	2	W	W	--	W	W
Saline	2	4	--	6	W	W	--	W	W
Stark	--	1	--	1	--	W	--	W	W
Vermilion	1	--	--	1	5	--	--	5	58
Wabash	1	--	--	1	W	--	--	W	W
Williamson	3	5	--	8	W	W	--	3,264	39,159
Undistributed	--	--	--	--	27,576	6,138	--	31,045	362,268
Total[1]	23	32	--	55	31,256	26,960	--	58,215	582,010

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Data may not add to totals shown because of independent rounding.

Development work was in progress in 1974 at four mines. Consolidation Coal Co.'s Burning Star No. 5 strip mine near Desoto will mine both the Harrisburg (No. 5) and the Herrin (No. 6) coal seams. Freeman United Coal Co., Crown No. 2, an underground mine located near Virden, will mine the Herrin (No. 6) coal seam. Inland Steel Coal Co.'s Inland No. 2, an underground mine, will mine the Harrisburg (No. 5) coal seam and will be located near McLeansboro. Monterey Coal Co.'s Monterey No. 2, an underground mine near Albers, will produce coal from the Herrin (No. 6) coal seam.

The Delta strip mine, near Marion, Williamson County, was scheduled to be equipped with more modern mining and preparation plant equipment to attain a 2.6-million-ton-per-year output by 1978. The mine, owned by Amax Coal Co., produced approximately 907,000 tons in 1974.

A new mine, operated by E & B Co., started production in 1974; it operated 215 days and reported a production of 40,776 tons of coal. The mine is located in Williamson County.

In 1974, operations at two mines owned by Peabody Coal Co. and one mine owned by Freeman United Coal Co. were shut down. Eagle No. 1, an underground coal mine operated by Peabody Coal Co. closed permanently on March 4, 1974. The mine employed 257 men and had produced 5,131,198 tons since it opened in 1967. Peabody Coal Co.'s second operation, the Northern mine, near Wilmington in Kankakee County, closed on September 12, 1974. The strip mine opened in 1945 and produced more than 18 million tons of coal during 30 years of operation. Freeman United Coal Co.'s Banner (No. 27) strip mine, near Glasford, Peoria County, was closed in February 1974. The mine employed 75 men and had produced 9,105,352 tons since it opened in 1959.

Table 5.—Illinois: Coal shipments by State of destination and consuming sector, 1970–74
(Thousand tons)

Consuming sector	Wisc.	Minn.	Iowa	Mich.	Mo.	Ind.	Ky.	Other States [1]	Exports and misc.[2]	Ill.	Total
Electric utilities:											
1970	6,115	2,917	2,731	154	5,702	2,667	2,804	1,475	492	25,688	50,745
1971	5,206	2,258	3,043	424	5,934	2,409	3,803	[3] 2,271	4	22,204	47,556
1972	5,526	2,490	3,306	323	7,042	[e] 2,731	3,595	[3] 2,795	--	25,329	53,137
1973	4,599	1,574	2,714	680	8,014	[e] 2,167	2,923	[3] 2,892	51	24,091	49,705
1974	4,134	1,531	2,304	461	9,148	[e] 3,028	2,006	2,409	7	21,828	46,856
Coke and gas plants:											
1970	--	--	--	--	--	2,871	--	--	128	1,618	4,617
1971	--	--	--	--	--	2,589	--	--	213	1,424	4,226
1972	--	--	--	--	--	[e] 2,810	--	--	182	1,288	4,280
1973	--	--	--	--	--	[e] 3,169	--	--	126	1,148	4,443
1974	--	--	--	--	--	[e] 3,361	--	--	237	1,054	4,652
Retail dealers:											
1970	66	29	40	22	79	22	--	--	9	1,015	1,282
1971	50	26	17	18	43	19	--	--	3	723	899
1972	15	27	16	1	79	220	--	--	3	630	991
1973	2	17	14	--	168	43	--	--	2	417	663
1974	4	4	16	2	136	20	--	--	9	291	482
All others:											
1970	1,078	88	1,320	605	1,258	844	--	--	135	5,657	10,985
1971	746	64	965	446	1,156	526	--	--	7	4,189	8,099
1972	793	59	1,130	318	1,553	492	--	--	14	4,084	8,443
1973	645	106	1,151	397	1,367	639	--	--	12	3,419	7,736
1974	556	18	867	473	1,464	513	--	--	29	3,193	7,113
Total:											
1970	7,259	3,034	4,091	781	7,039	6,404	2,804	1,475	764	33,978	67,629
1971	6,002	2,348	4,025	888	7,133	5,543	3,803	2,271	227	28,540	60,780
1972	6,334	2,576	4,452	642	8,674	6,253	3,595	2,795	199	31,331	66,851
1973	5,246	1,697	3,879	1,077	9,549	6,018	2,923	2,892	191	29,075	62,547
1974	4,694	1,553	3,187	936	10,748	6,922	2,006	2,409	282	26,366	59,103

[e] Estimate.
[1] Includes Alabama, Mississippi, Georgia, Florida, and Tennessee (1970–74), Ohio (1974), and North Dakota (1974).
[2] Principally to Mexico.
[3] Includes a minor amount of industrial and/or retail coal.

Source: U.S. Bureau of Mines Bituminous Coal and Lignite Distribution, 1970, 1971, 1972, 1973, and 1974.

Coke.—Production of coke in 1974 was 1,912,000 tons, a decrease of 1.5% from the 1,941,000 tons produced in 1973. The 1974 quantity represented 3.2% of the U.S. production. The Granite City Steel Division of National Steel Corp. produced coke in Madison County. Three other companies—Interlake Steel Corp., a subsidiary of Interlake, Inc.; the Wisconsin Steel Division of International Harvester Co.; and Republic Steel Corp.—produced coke in Cook County. Most of the coke distributed by these companies was used in their own blast furnaces. Illinois coke plants carbonized 3,013,000 tons of coal. Of the 2,992,000 tons of coal received by the State's oven coke plants, 35.4% came from Illinois, 37.5% from Kentucky, 18.7% from West Virginia, 5.9% from Arkansas, 0.8% from Pennsylvania, and 1.7% from Virginia.

About 210,000 tons of coke breeze was recovered at the producing plants, a decrease of 5.8% from the 223,000 tons recovered in 1973. Other byproducts of coke oven operations in the State included coke oven gas, ammonia, tar, and crude light oil.

Natural Gas.—Marketed production of natural gas in 1974 was 1,436 million cubic feet valued at $574,000, a 12.3% decrease from the 1,638 million cubic feet valued at $573,000 of 1973. About 95.6% of the gas was from the Mattoon field in Coles County, and the remainder was from fields in Gallatin, Saline, and Williamson Counties.

According to estimates by the American Gas Association (AGA) proved natural gas reserves in Illinois on December 31, 1974, were 399,414 million cubic feet, compared with 380,525 million cubic feet on December 31, 1973.

Peat.—Illinois produced 95,807 short tons of peat in 1974, 33.9% more than the 71,552 short tons produced in 1973. Production was reported by six companies from Cook, Kane, Lake, and Whiteside Counties. Humus, moss, and reed-sedge peat were sold in bulk and packaged forms.

Ninety percent of all sales were in packaged form. The majority of the peat was used for general soil improvement; a small amount was used for potting soils.

Illinois continued to rank second to Michigan in output of peat in the United States, accounting for 14% of the Nation's total.

Petroleum.—Production in Illinois continued its downward trend for the 12th consecutive year. Output decreased from 30.7 million barrels in 1973 to 27.6 million barrels in 1974, a decline of 10.1%. The value of crude petroleum provided 21% of the total State mineral output value.

According to the American Petroleum Institute (API), proved reserves of crude oil in Illinois were 160,000,000 barrels on December 31, 1974, compared with 152,343,000 barrels on December 31, 1973, an increase of 5%.

Petroleum and Natural Gas Exploration and Development.—The total number of well completions in Illinois increased from 556 wells in 1973 to 795 wells in 1974. Of the 795 wells drilled, 357 were completed as oil wells, 11 as gas wells, and 427 as dry holes. Overall success ratio was 46.3%; of the exploratory wells, 12.7% were completed as oil and gas producers.

Table 6.—Illinois: Cumulative crude oil production 1888–1974, by county

County	Cumulative production, 1888–1974 [1] (thousand barrels)	1974		
		Production (thousand barrels)	Percentage of state total production	Value [2] (thousands)
Adams	184	2	0.0	$15
Bond	7,207	41	.1	308
Brown	231	4	.0	30
Champaign	7	--	--	--
Christian	24,836	290	1.1	2,180
Clark-Cumberland	89,648	598	2.2	4,497
Clay	129,668	1,212	4.4	9,114
Clinton	82,992	513	1.9	3,858
Coles	22,656	169	.6	1,271
Crawford	226,457	1,088	3.9	8,182
DeWitt	2,594	156	.6	1,173
Douglas	3,566	8	.0	60
Edgar	3,480	101	.4	760
Edwards	45,118	397	1.4	2,985
Effingham	15,511	229	.8	1,722
Fayette	384,662	2,846	10.3	21,401
Franklin	69,936	513	1.9	3,858
Gallatin	49,146	521	1.9	3,917
Hamilton	130,709	812	2.9	6,106
Jasper	49,677	637	2.3	4,790
Jefferson	80,709	760	2.8	5,715
Lawrence	382,863	3,513	12.8	26,418
Macon	896	6	.0	45
Macoupin	239	3	.0	23
Madison	17,092	89	.3	669
Marion	400,236	2,944	10.7	22,139
McDonough-Hancock [3]	5,413	33	.1	248
Monroe	2	--	--	--
Montgomery	117	(4)	.0	4
Moultrie	95	2	.0	15
Perry	756	16	.0	120
Randolph	4,285	70	.3	526
Richland	98,774	1,063	3.9	7,994
St. Clair	3,295	28	.1	211
Saline	20,741	208	.8	1,564
Sangamon	2,716	162	.6	1,218
Schuyler	1	--	--	--
Shelby	1,581	29	.1	218
Wabash	105,382	1,012	3.7	7,610
Washington	29,179	704	2.6	5,294
Wayne	283,750	2,901	10.5	21,816
White	273,267	3,152	11.4	23,703
Williamson	1,722	200	.7	1,504
Other [1]	2,373	521	1.9	3,918
Total	3,003,769	27,558	100.0	207,199

[1] 1974 production includes 521,000 barrels that could not be assigned to individual fields or counties.
[2] No oil production reported for Hancock County in 1971–74.
[3] Value calculated at average price of $7.52 per barrel, therefore does not agree with value in table 1.
[4] Less than ½ unit.

Table 7.—Illinois: Oil and gas well drilling completions in 1974, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Adams	1	--	1	--	--	--	2	1,321
Bond	--	1	3	3	--	5	12	15,599
Brown	1	--	2	--	--	1	4	2,749
Champaign	--	--	--	--	--	1	1	292
Christian	18	--	17	3	--	8	46	96,262
Clark	5	--	1	--	--	2	8	8,229
Clay	36	--	22	2	--	4	64	175,811
Clinton	3	--	7	--	--	14	24	40,711
Coles	2	6	--	--	--	1	9	21,615
Crawford	12	--	7	--	--	1	20	24,566
Cumberland	3	--	5	1	--	4	13	47,618
DeWitt	8	--	--	--	--	--	8	5,838
Edgar	5	--	3	--	1	1	10	4,694
Edwards	14	--	12	3	--	3	32	92,075
Effingham	--	--	--	--	--	5	5	14,018
Fayette	5	--	--	--	--	7	12	35,800
Franklin	2	--	4	1	--	3	10	29,189
Gallatin	5	--	5	--	--	1	11	27,026
Hamilton	2	--	1	--	--	2	5	10,304
Hancock	--	--	--	--	--	1	1	518
Jackson	--	--	--	--	--	2	2	6,376
Jasper	15	--	5	--	--	1	21	56,399
Jefferson	1	--	1	--	--	3	5	13,493
Lawrence	29	--	8	--	--	1	38	70,218
Macon	3	--	1	--	--	3	7	15,377
Macoupin	1	--	--	--	--	1	2	2,140
Madison	5	--	3	--	1	6	15	22,249
Marion	14	--	8	1	--	18	41	138,883
Massac	--	--	--	--	--	1	1	275
Montgomery	--	--	--	--	--	4	4	8,649
Morgan	--	--	--	--	--	1	1	1,629
Perry	--	--	--	--	--	2	2	6,808
Pope	--	--	--	--	--	1	1	1,208
Randolph	--	--	--	--	--	10	10	20,596
Richland	22	--	15	1	--	9	47	153,459
St. Clair	--	--	--	--	--	3	3	6,203
Saline	2	--	5	5	1	4	17	49,224
Sangamon	7	--	16	--	--	6	29	49,226
Schuyler	--	--	1	--	--	--	1	770
Shelby	--	--	--	--	--	9	9	22,782
Wabash	28	1	22	--	--	3	54	137,486
Washington	10	--	3	--	--	20	33	80,325
Wayne	46	--	26	1	--	7	80	267,989
White	19	--	21	2	--	4	46	125,356
Williamson	8	--	10	2	--	9	29	80,712
Total	332	8	235	25	3	192	795	1,992,012

[1] Development wells as defined by American Petroleum Institute.
Source: American Petroleum Institute.

Five oilfields, 1 gasfield, 19 extensions to fields and 10 new pay zones were discovered in 1974. Although none of the 1974 discoveries added significantly to reserves in Illinois, one discovery worthy of note was the Lillyville North field in Cumberland County. Of four wells completed during the year three had initial production figures of approximately 500, 600 and 700 barrels of oil per day. The fourth had only 18 barrels of oil per day initial production.

The Illinois State Geological Survey estimated that at least 24 new waterflood projects were started in 1974, as compared with 8 in 1973.

Marathon Oil Co. received permits for two large Maraflood (tertiary recovery) projects. One project is northwest of Robinson, and the second is southwest of Robinson. The approximate total area for these two projects is 400 acres.

Shell Oil Co. drilled two wells at its tertiary recovery project at Benton, and Texaco drilled two observation wells at its tertiary recovery project in Salem Consolidated fields.

Petroleum Refineries.—In 1974, crude oil capacity of petroleum refineries totaled 1,168,150 barrels per calendar day. The Clark Oil Co.'s expansion plan for a refinery at Hartford, Ill., was deferred. The expansion, 45,000 barrels per day, was originally scheduled to be completed in 1974.

NONMETALS

Barite.—Minerva Oil Co. is recovering a primary barite product at its principal mill near Cave in Rock associated with the fluorspar deposits at its No. 1 mine.

Pfizer, Inc., continued to produce ground barite at its East St. Louis plant in St. Clair County.

Cement.—Portland and masonry cements were produced by four companies in 1974. These were the Centex Corp. at its LaSalle Plant, LaSalle County; Marquette Cement Manufacturing Co. at its Oglesby plant, LaSalle County; Medusa Cement Co., a Division of Medusa Corp., at its Dixon plant, Lee County; and Missouri Portland Cement Co. at its Joppa plant, Massac County. Portland cement shipments decreased 7.1% in quantity and increased 13.8% in value; masonry cement shipments decreased 21.7% in quantity and increased 11.3% in value.

Types of portland cement shipped included type I and II (general use and moderate heat), type III (high-early strength), white, waterproof, slag-pozzolan, block, and expansive. Portland cement shipments from mills in the State totaled 1,460,237 tons; masonry cement shipments totaled 69,163 tons. Raw materials used in making portland cement included limestone, slag, clay and shale, fly ash, sand, and gypsum. Disposition of portland cement by type of customer was as follows: Ready-mix concrete companies, 67.0%; concrete product manufacturers, 8.9%; building material dealers, 7.9%; and contractors and other users, 16.2%.

Table 8.—Illinois: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	3	4
Production	1,530,833	1,592,249
Shipments from mills:		
Quantity	1,571,813	1,460,237
Value	$36,064,129	$41,022,966
Stocks at mills, Dec. 31	108,690	176,094

Table 9.—Illinois: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	3	2
Production	84,575	76,950
Shipments from mills:		
Quantity	88,318	69,163
Value	$2,900,675	$3,228,203
Stocks at mills, Dec 31	5,430	13,217

The Illinois Cement Co., a subsidiary of Centex Corp., started production in 1974. The plant is located at LaSalle, in LaSalle County, and replaces an older, smaller plant previously operated by Alpha Portland Cement Co.

Clays.—Total production of fire clay and miscellaneous clay and shale decreased 9.7% in quantity and increased 3.6% in value in 1974. Production of fuller's earth increased 2.7% in quantity and 47.9% in value.

Production of clay and shale was reported from 13 counties. Fire clay was produced by companies in Grundy, McDonough, and Scott Counties.

Fluorspar.—Shipments of finished fluorspar totaled 153,698 tons valued at $12.2 million, a decrease of 4.1% in quantity and an increase of 2.8% in value compared with the 1973 figures. The State continued to be the Nation's leading producer of fluorspar, supplying 76.0% of the output.

Minerva Oil Co. and Ozark-Mahoning Co., with operations in Hardin and Pope Counties, continued to be the dominant producers.

In 1974, production was resumed at two mines—the Lafayette mine, leased from United States Steel by Minerva Oil Co., and the Crystal mine, owned and operated by the Minerva Oil Co. A small heavy-media separation plant at Spar Mountain near Cave in Rock was erected by Robin Hastie and Sons. The plant produced a small tonnage of metspar in 1974.

Cerro Corp. in 1974 conducted exploration drilling on its large optioned and leased lands in both Illinois and western Kentucky.

Gem Stones.—Small quantities of gem materials and mineral specimens continued to be collected in 1974.

Gypsum.—National Gypsum Co. calcined gypsum at its Waukegan plant in Lake County. Output decreased 27.6% in 1974.

Lime.—Illinois ranked eighth in the Nation in lime production. Marblehead Lime Co. and Vulcan Materials Co. produced lime at five plants in Adams and Cook Counties for steel furnaces, refractories, water purification, sewage treatment, and other uses. Output decreased 6% below the 1973 record. The lime was used in Indiana, Illinois, and other des-

tinations. Consumption of lime in Illinois was 1,165,000 tons.

Perlite.—Crude perlite mined outside the State was expanded by five companies with plants in Cook, DeKalb, Lake, and Will Counties. Sales of the expanded product decreased 11.6% in quantity and increased 5.7% in value. The principal use was for insulation board, which accounted for 30% of the total. Other uses included concrete aggregate, filter aid, low-temperature insulation, plaster aggregate, horticultural aggregate, formed products, fillers, and masonry and cavity fill insulation. Illinois continued to lead the country in production of expanded perlite and also in the quantity that producers used and sold.

Sand and Gravel.—Production of sand and gravel in 1974 was 42.7 million tons valued at $68.6 million. Counties from which over 1 million tons was produced were Cook, DuPage, Grundy, Kane, Kendall, Lake, LaSalle, McHenry, Shelby, and Will.

Of the total sand and gravel produced, 67.7% was used as construction aggregate, 18.3% as unprocessed aggregate, and the remainder as industrial sand, as fill, and for other uses. The average value of the total sand and gravel produced was $1.61 per ton, compared with $1.42 per ton in 1973. The State continued to rank fourth in the Nation in both quantity and value of sand and gravel produced.

Western Silica Co., a division of Del Monte Properties Co., acquired the idle plant of Pure Silica Co., located at Troy Grove, in LaSalle County and started production in 1974.

Stone.—Illinois, with a production of 63.2 million tons, continued to rank second only to Pennsylvania in total tonnage of stone produced in the United States. The average value of the stone produced was $1.93 per ton in 1974. Major producing counties, each with production of over 1 million short tons, were Adams, Cook, Hardin, Johnson, Kane, Kankakee, LaSalle, Lee, Livingston, Madison, Montgomery, Randolph, Rock Island, St. Clair, Union, Vermilion, and Will.

Dimension stone, which represented only a small part of the total stone production in the State, was produced in Kane County.

Trucks transported 90.4% of the crushed and broken stone; the remainder was shipped by railroad, waterway, and other means of transportation.

In 1974, J. M. Huber Corp. acquired all the stock of Calcium Carbonate Co., Quincy, Ill. The Calcium Carbonate Co. produced high-purity limestone at Quincy.

Table 10.—Illinois: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	41,712	56,177	16,929	24,288
Gravel			16,992	27,576
Unprocessed: Sand and gravel			6,700	6,979
Industrial:				
Sand	1,937	5,852	2,084	8,788
Gravel			--	--
Total	43,649	62,029	42,705	67,531

[1] Value data may not be directly comparable to those in table 1, 11, and 12 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 11.—Illinois: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction			10,358	14,166
Highway and bridge construction			2,348	3,482
Other uses (dams, waterworks, airports, etc.)			548	788
Concrete products (cement blocks, bricks, pipe, etc.)	35,724	49,767	2,875	5,505
Bituminous paving (asphalt and tar paving)			5,332	8,770
Roadbase and subbase			3,274	5,639
Unprocessed aggregate			6,700	6,979
Fill	4,290	4,404	2,281	3,408
Other uses[2]	1,217	1,537	747	1,218
Industrial sand and gravel	1,937	5,852	2,084	8,738
Total[3]	43,170	61,559	36,547	58,693

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).
[3] Data may not add to totals shown because of independent rounding.

Table 12.—Illinois: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction			68	92
Highway and bridge construction			1,893	3,137
Other uses (dams, waterworks, airports, etc.)			136	192
Concrete products (cement blocks, bricks, pipe, etc.)	475	467	74	113
Bituminous paving (asphalt and tar paving)			1,493	2,287
Roadbase and subbase			2,150	3,492
Unprocessed aggregate			--	--
Fill	3	3	322	511
Other	1	1	22	49
Total	479	470	6,158	9,873

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel

Table 13.—Illinois: Limestone and dolomite sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension total	3	61	3	70
Crushed and broken:				
Bituminous aggregate	5,580	10,394	5,951	12,061
Concrete aggregate (coarse)	11,647	20,492	10,830	20,758
Dense-graded roadbase stone	20,393	34,436	18,488	35,414
Macadam aggregate	2,322	4,077	3,727	7,485
Surface treatment aggregate	6,946	12,442	5,345	10,519
Unspecified construction aggregate and roadstone	5,840	9,088	7,276	13,052
Agricultural purposes[1]	4,533	7,732	5,203	10,039
Cement manufacture[2]	3,002	3,932	3,505	5,222
Flux stone	963	1,775	305	577
Manufactured fine aggregate (stone sand)	W	W	84	239
Mineral fillers, extenders, and whiting[3]	502	2,007	473	2,066
Railroad ballast	489	788	488	814
Riprap and jetty stone	951	1,633	688	1,361
Other uses[4]	3,484	5,210	866	2,086
Total[5]	66,650	114,007	63,229	121,698
Grand total[5]	66,653	114,068	63,231	121,763

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes agricultural limestone, other soil conditioners (1974), and poultry grit and food.
[2] Data include stone used in lime manufacture.
[3] Includes asphalt filler, whiting or whiting substitute, and other fillers or extenders.
[4] Includes stone for building products (1973), chemicals, chemical stone for alkali works (1973), disinfectant and animal sanitation (1973), fill, mine dusting, roofing aggregates, chips and granules, waste material, glass (1974), and uses not specified.
[5] Data may not add to totals shown because of independent rounding.

Table 14.—Illinois: Crushed stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973		1974	
	Quantity	Value	Quantity	Value
Adams	957	W	1,052	W
Bureau	3	6	--	--
Calhoun	--	--	25	W
Carroll	334	420	285	422
Christian	434	664	W	W
Coles	742	1,492	603	1,368
Cumberland	4	8	(1)	(1)
Ford	--	--	4	8
Franklin	--	--	(1)	2
Greene	402	W	385	W
Grundy	--	--	22	47
Hancock	646	1,085	520	1,003
Hardin	2,543	3,546	2,269	3,659
Jackson	366	W	W	W
Jersey	118	219	109	218
Jo Daviess	382	389	303	312
Kane	1,339	2,525	1,349	2,577
LaSalle	W	W	2,249	3,474
Lake	1	1	--	--
Lee	1,758	2,427	1,605	2,655
Livingston	2,231	3,899	2,323	4,776
Massac	W	403	--	--
Montgomery	1,383	2,416	1,072	2,291
Ogle	741	1,192	648	1,176
Pike	559	961	484	884
Randolph	1,470	2,537	1,194	2,468
St. Clair	3,259	5,932	2,448	4,681
Sangamon	10	19	4	15
Scott	215	426	523	994
Stephenson	495	689	325	491
Whiteside	781	1,219	W	W
Will	5,410	9,018	5,906	10,518
Williamson	14	20	--	--
Winnebago	1,102	2,000	958	1,842
Undistributed [2]	38,954	70,555	36,563	75,811
Total[3]	66,653	114,068	[3]63,229	121,693

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Less than ½ unit.
[2] Includes stone produced in the following counties; Boone, Brown (1974), Clark, Clay, Clinton, Cook, DeKalb, Douglas, DuPage, Fayette, Henderson, Henry, Iroquois, Johnson, Kankakee, Kendall, Knox, Logan, McDonough, Macoupin, Madison, Marion, Menard, Mercer, Monroe, Peoria, Pulaski, Rock Island, Schuyler (1973), Shelby, Union, Vermliion, Warren and Washington, and production for which no county breakdown is available (1974).
[3] Data do not add to total shown because of independent rounding.

Sulfur (Recovered Elemental).—Sulfur was recovered by The Anlin Co. of Illinois, a subsidiary of Alaska Interstate Co., at its Hartford refinery in Madison County; by Union Oil Co. of California, Union 76 Div., in Will County; by Marathon Oil Co. at its Robinson refinery in Crawford County; by Mobil Oil Corp. at its new refinery near Joliet in Will County; by Natural Gas Pipeline Co. of America, St. Elmo pipeline, Fayette County; by Natural Gas Pipeline Co. of America, Herscher Pipeline Storage Division, Kankakee County; and by Texaco Inc., Lawrenceville plant, Lawrence County. The quantity and value of sulfur recovered from these sources are not included in the mineral production statistics in table 1 because the recovered sulfur is considered a secondary product. Nationally, Illinois ranked fifth in quantity and fourth in value of recovered sulfur.

Tripoli (Amorphous Silica).—Crude material was recovered from underground mines in Alexander County by Illinois Minerals Co. near Elco, and by Tammsco, Inc. near Tamms. The production of crude material decreased 22.4% in quantity but increased substantially in value. Output of prepared material decreased 5.6% in quantity and increased 7.5% in value. Prepared material was used for abrasives, filler, and other purposes. Of the few States that produce tripoli in the United States, Illinois ranked first in production and value.

Vermiculite.—Crude vermiculite mined outside the State was processed by the W. R. Grace & Co., Construction Products Div., at its plant in Cook County; a new W. R. Grace & Co plant in West Chicago, DuPage County; Mica Pellets, Inc., at its plant in DeKalb County; and Inter-

national Vermiculite Co. at its plant in Macoupin County. Uses were for insulation, aggregate in plaster and concrete, horticulture, and other purposes.

METALS

Iron Oxide Pigments.—Three plants, operating in Adams, Kane, and St. Clair Counties, produced finished (natural and manufactured) iron oxide pigments in 1974. Illinois was the leading producer of finished iron oxide pigments in 1974. Total output for the State (as indicated by sales) in 1974 decreased in quantity, but increased in value over that of the previous year.

Lead and Zinc.—Production of 493 short tons of lead and 4,104 short tons of zinc, in terms of recoverable metal, represented decreases of 8.9% and 21.8%, respectively, from the 1973 figures. In terms of total value, lead production increased 26.1% and zinc production increased 35.9%.

Average weighted yearly prices used to calculate values of lead and zinc were 22.50 cents and 35.90 cents per pound, respectively. These averages compared with 16.26 cents per pound for lead and 20.66 cents per pound for zinc in 1973.

Table 15.—Illinois: Mine production (recoverable) of lead and zinc

	1972	1973	1974
Mines producing: Lode[1]	2	1	--
Material sold or treated (ore):			
Fluorspar (thousand short tons)	346	358	368
Zinc (do)	211	67	--
Production (recoverable):			
Quantity:			
Lead (short tons)	1,335	541	493
Zinc (do)	11,378	5,250	4,104
Value:			
Lead (thousands)	$401	$176	$222
Zinc (do)	4,039	2,169	2,947
Total (do)	4,440	2,345	3,169

[1] Fluorspar operations producing byproduct lead and zinc not included in mine count.

Pig Iron and Steel.—About 7.2 million tons of pig iron valued at $1.0 billion was shipped from Illinois blast furnaces or was consumed by the producing companies, compared with 7.9 million tons valued at $606 million in 1973.

According to the American Iron and Steel Institute, Illinois produced 12.9 million short tons of steel in 1974, compared with 13.4 million short tons in 1973.

Illinois ranked fourth in the production of raw steel in 1974.

Other Metals.—Smelter production of cadmium in Illinois in 1974 increased 72.4% in quantity and 84.0% in value.

Table 16.—Principal producers

Commodity and company	Address	Type of activity	County
Barite (ground): Pfizer, Inc.[1]	2001 Lynch Ave. East St. Louis, Ill. 62201	Plant	St. Clair.
Cement:			
Marquette Cement Manufacturing Co.[2 3]	First American Center Nashville, Tenn. 37238	do	LaSalle.
Medusa Corp.[3]	P.O. Box 5668 Cleveland, Ohio 44101	do	Lee.
Missouri Portland Cement Co.[3]	7751 Carondelet Ave. St. Louis, Mo. 63105	do	Massac.
Clays:			
General Dynamics Corp.[3 4]	300 West Washington St. Chicago, Ill. 60606	do	LaSalle.
Lowes, Inc	North Edward St. Cassopolis, Mich. 49031	do	Pulaski.
Streator Brick Systems, Inc	West End of Ninth St. Streator, Ill. 61364	Pits	LaSalle, Livingston.
U.S. Gypsum Co	101 South Wacker Drive Chicago, Ill. 60606	Pit, plant	Grundy.

See footnotes at end of table.

Table 16.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Coal (bituminous):			
American Metal Climax Inc	105 South Meridian St. Indianapolis, Ind. 46225	Strip and underground mine, plant.	Fulton, Perry, Williamson, Wabash.
Consolidation Coal Co	P.O. Box 218 Pinckneyville, Ill. 62274	---- do	Montgomery, Fulton, Perry, Randolph, Jefferson.
Freeman Coal Mining Corp	300 West Washington Ave. Chicago, Ill. 60606	Underground mine, plant.	Jefferson, Williamson.
Inland Steel Co	30 West Monroe St. Chicago, Ill. 60603	---- do	Jefferson.
Old Ben Coal Co	10 South Riverside Plaza Chicago, Ill. 60606	---- do	Franklin.
Peabody Coal Co	301 North Memorial Dr. St. Louis, Mo. 63102	Strip and underground mines, plant.	Christian, Gallatin, Kankakee, Randolph, St. Clair, Williamson.
Southwestern Illinois Coal Corp.	P.O. Box 14743 St. Louis, Mo. 63178	Strip mine, plant	Perry, Randolph.
Coke:			
Interlake, Inc	310 South Michigan Ave. Chicago, Ill. 60604	Coke ovens	Cook.
International Harvester Co	401 North Michigan Ave. Chicago, Ill. 60611	---- do	Do.
Granite City Steel Div., National Steel Corp.	P.O. Box 367 Granite City, Ill. 62041	---- do	Madison.
Republic Steel Corp	P.O. Box 6778 Cleveland, Ohio 44101	---- do	Cook.
Fluorspar: Minerva Oil Co.[5]	Eldorado, Ill. 62930	Underground mines, mills.	Hardin.
Iron oxide pigments, finished:			
Prince Manufacturing Co	Bowmanstown, Pa. 18030	Plant	Adams.
George B. Smith Chemical Works.	Maple Park, Ill. 60151	---- do	Kane.
Lead and zinc: Ozark-Mahoning Co.[6]	P.O. Box 57 Rosiclare, Ill. 62982	Underground mines, mill.	Hardin.
Lime: Marblehead Lime Co	300 West Washington St. Chicago, Ill. 60606	Kilns	Adams, Cook.
Natural Gas Liquids: National Distillers & Chemical Corp.	99 Park Ave. New York, N.Y. 10016	Plant	Douglas.
Peat:			
Fort Wayne Industries	Rt. 3 Morrison, Ill. 61270	Bog, plant	Whiteside.
Markman Peat Co	Rt. 3 Morrison, Ill. 61270	---- do	Do.
Expanded perlite:			
Filter Products Corp	124 North Buesching Rd. Lake Zurich, Ill. 60047	Plant	Lake.
Johns-Manville Perlite Corp.	P.O. Box 5108 Denver, Colo. 80217	---- do	Will.
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	---- do	Lake.
Silbrico Corp	6300 River Rd. La Grange, Ill. 60525	---- do	Cook.
Petroleum Refineries:			
Amoco Oil Co	200 East Randolph Chicago, Ill. 60601	Refinery	Madison.
Clark Oil & Refining Corp.	8530 West National Ave. Milwaukee, Wis. 53227	---- do	Cook, Madison.
Marathon Oil Co.[7]	539 South Main Findlay, Ohio 45840	---- do	Crawford.
Mobil Oil Co.[7]	P.O. Box 874 Joliet, Ill. 60434	---- do	Will.
Shell Oil Co	One Shell Plaza Houston, Tex. 77002	---- do	Madison.
Texaco, Inc	135 East 42d St. New York, N.Y. 10017	---- do	Lawrence, Will.
Union Oil Co. of California.[7]	P.O. Box 239 Lemont, Ill. 60439	---- do	Cook.

See footnotes at end of table.

Table 16.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel:			
Del Monte Properties Co	400 West Higgins Rd. Park Ridge, Ill. 60068	Pit, plant	LaSalle.
Martin Marietta Aggregates	P.O. Box 789 Cedar Rapids, Iowa 52406	Pits, plants	Ogle, Peoria, Tazewell, Woodford.
Meyer Aggregate	Box 56, Route 2 Algonquin, Ill. 60102	---- do	Kendall, McHenry.
Vulcan Materials Co.[3 8]	P.O. Box 391 La Grange, Ill. 60525	---- do	Kane, Lake, McHenry.
Stone:			
Columbia Quarry Co	P.O. Box 1000 Dupo, Ill. 62239	Quarries, plant, underground mine.	Johnson, Monroe, Pulaski, St. Clair.
Elmhurst-Chicago Stone Co.[4]	400 West First St. Elmhurst, Ill. 61026	Quarry, plant	DuPage.
Industrial Chemicals Div., Allied Chemicals Corp.	P.O. Box 70 Morristown, N.J. 07960	Quarries, plants	Randolph.
Mississippi Lime Co	7 Alby St., Box 247 Alton, Ill. 62002	Underground mine, plant.	Madison.
Moline Consumers Co.[4]	313 16th St. Moline, Ill. 61255	Quarries, plants	Adams, Brown, Hancock, Henry, LaSalle, Pike, Rock Island, Schuyler, Warren.
Sulfur, recovered: The Anlin Company of Illinois.	P.O. 6554 Houston, Tex. 77005	Plant	Madison.
Tripoli, amorphous silica:			
Illinois Minerals Co	218 Tenth St. Cairo, Ill. 62914	Underground mine.	Alexander.
Tammsco, Inc	P.O. Box J Tamms, Ill. 62988	---- do	Do.
Vermiculite, exfoliated:			
International Vermiculite Co.	First and Mound Sts. Girard, Ill. 62640	Plant	Macoupin.
Mica Pellets, Inc.[9]	1120 Oak St. De Kalb, Ill. 60115	---- do	DeKalb.
W. R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	---- do	Cook.

[1] Also iron oxide pigments.
[2] Also clays.
[3] Also stone.
[4] Also sand and gravel.
[5] Also lead and zinc.
[6] Also fluorspar.
[7] Also sulfur (recovered).
[8] Also lime.
[9] Also expanded perlite.

The Mineral Industry of Indiana

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey, Indiana Department of Natural Resources, for collecting information on all minerals except fuels.

By William S. Miska [1]

In 1974, the value of mineral production in Indiana increased 25% over that of 1973, reaching $441 million, another all-time record high for the fifth consecutive year. The increase in value mainly resulted from substantial increases in unit values of individual mineral commodities, especially coal, which offset quantitative decreases in production of abrasives, cement, clays, coal, natural gas, petroleum, sand and gravel, and stone. Peat, gypsum, and lime increased in production.

Mineral production value in the State was divided as follows: Coal, 45%; crushed stone, 15%; crude oil, 10%; sand and gravel, 8%; and all remaining commodities combined, 22%.

Although no metallic ores were mined in the State during 1974, large quantities of pig iron, steel, and aluminum metal were produced.

[1] State Liaison Officer, Bureau of Mines, Bloomington, Ind.

Table 1.—Mineral production in Indiana [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons	1,436	$2,568	1,092	$1,947
Coal (bituminous) ---- do	25,253	153,136	23,726	198,410
Natural gas ---- million cubic feet	276	38	176	25
Peat ---- thousand short tons	51	475	71	946
Petroleum (crude) ---- thousand 42-gallon barrels	5,312	20,823	4,919	42,402
Sand and gravel ---- thousand short tons	27,731	35,015	26,077	35,656
Stone [2] ---- do	32,288	57,652	31,031	64,106
Value of items that cannot be disclosed: Abrasvies (whetstone), cement, gypsum, lime, and stone (sandstone)	XX	81,698	XX	97,198
Total	XX	351,405	XX	440,690
Total 1967 constant dollars	XX	257,615	XX	p 210,738

p Preliminary. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes sandstone; included with "Value of items that cannot be disclosed."

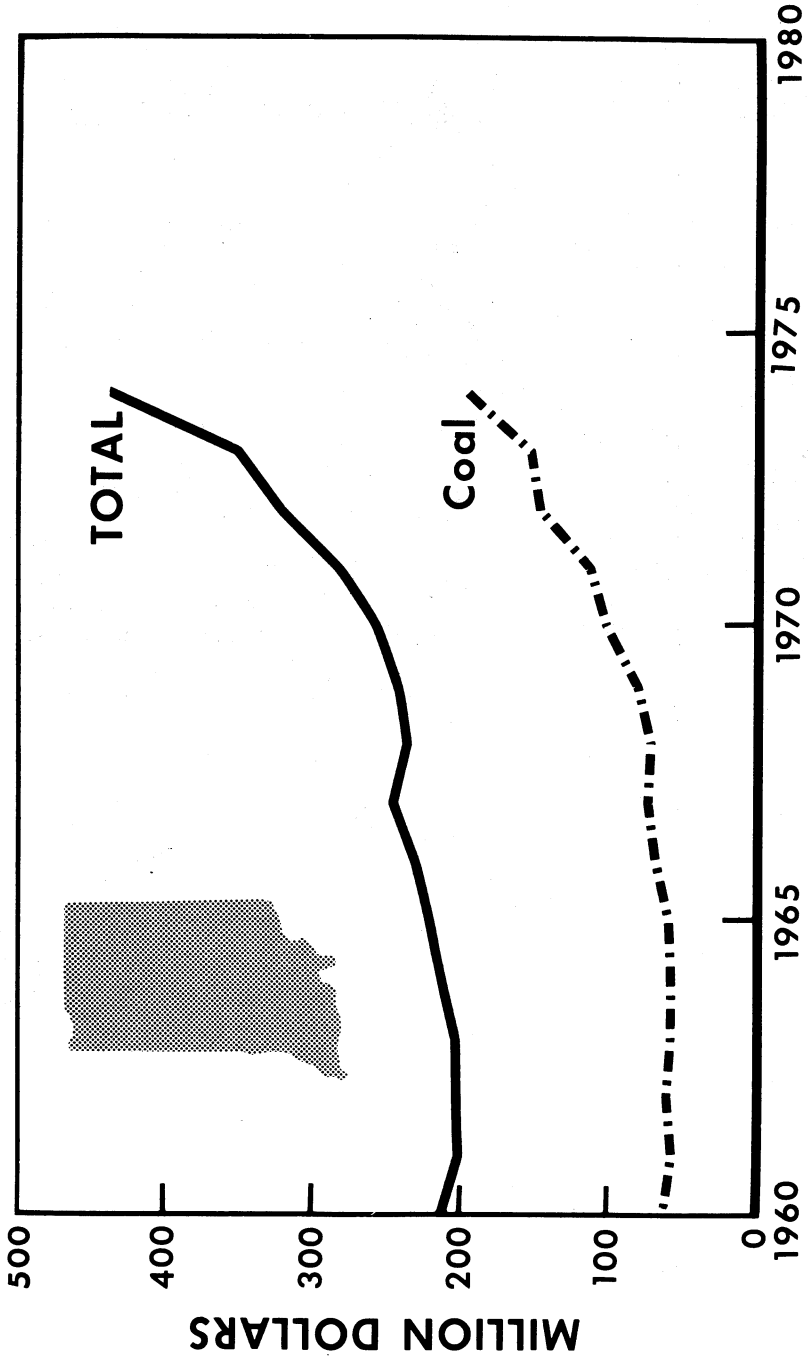

Figure 1.—Value of coal and total value of mineral production in Indiana.

Table 2.—Value of mineral production in Indiana, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Adams	$875	$994	Stone, sand and gravel.
Allen	5,533	5,488	Stone, sand and gravel, peat.
Bartholomew	W	W	Stone, sand and gravel.
Blackford	W	W	Stone, clays.
Boone	W	W	Sand and gravel.
Carroll	W	W	Stone.
Cass	W	12,377	Cement, stone, clays, sand and gravel.
Clark	W	28,351	Cement, stone, sand and gravel, clays.
Clay	--	8,219	Coal, clays.
Clinton	--	W	Sand and gravel.
Crawford	W	W	Stone.
Daviess	102	W	Sand and gravel.
Dearborn	W	W	Do.
Decatur	W	W	Stone.
De Kalb	469	525	Sand and gravel.
Delaware	W	W	Stone, sand and gravel, peat.
Dubois	W	W	Clays.
Elkhart	W	W	Sand and gravel, stone.
Fayette	W	W	Do.
Fountain	W	W	Sand and gravel, coal, clays.
Franklin	W	W	Sand and gravel, stone.
Fulton	W	W	Sand and gravel, peat.
Gibson	W	37	Sand and gravel.
Grant	929	1,792	Stone, sand and gravel, peat.
Greene	7,162	6,904	Coal, sand and gravel, clays.
Hamilton	5,774	6,075	Sand and gravel, stone.
Hancock	W	227	Do.
Harrison	1,260	2,336	Stone, sand and gravel.
Hendricks	W	W	Sand and gravel.
Henry	W	456	Do.
Howard	W	W	Stone, sand and gravel.
Huntington	W	2,164	Stone, sand and gravel, clays.
Jackson	W	W	Sand and gravel, clays.
Jasper	W	W	Stone, sand and gravel.
Jay	W	W	Do.
Jefferson	13	--	
Jennings	W	W	Stone.
Johnson	W	347	Sand and gravel, stone.
Knox	576	W	Coal, sand and gravel.
Kosciusko	W	440	Sand and gravel, stone.
Lagrange	W	W	Do.
Lake	24,741	34,558	Lime, cement, stone, clays, sand and gravel.
La Porte	W	W	Sand and gravel, stone.
Lawrence	W	W	Cement, stone.
Madison	W	W	Stone, sand and gravel.
Marion	5,001	W	Sand and gravel, stone.
Marshall	536	W	Sand and gravel, stone, peat.
Martin	W	W	Gypsum.
Miami	W	W	Sand and gravel, stone.
Monroe	W	7,900	Stone.
Montgomery	W	68	Sand and gravel, clays.
Morgan	W	1,234	Sand and gravel, clays, stone.
Newton	W	W	Stone.
Noble	319	300	Sand and gravel, stone.
Orange	W	W	Stone, abrasives.
Owen	W	W	Stone, sand and gravel.
Parke	552	W	Sand and gravel, clays, coal.
Perry	W	W	Stone.
Pike	W	50,355	Coal.
Porter	W	10	Clays.
Posey	W	W	Sand and gravel, stone.
Pulaski	W	850	Stone, clays.
Putnam	W	W	Cement, stone, sand and gravel.
Randolph	W	W	Stone, sand and gravel.
Ripley	W	W	Stone.
Rush	W	495	Stone, sand and gravel.
St. Joseph	W	1,465	Sand and gravel, stone.
Scott	W	W	Stone.
Shelby	W	1,595	Stone, sand and gravel.
Spencer	2,826	7,127	Coal.
Starke	14	15	Sand and gravel.
Steuben	W	651	Sand and gravel, stone.
Sullivan	27,778	27,963	Coal, sand and gravel, stone.
Switzerland	W	1,924	Sand and gravel, stone.
Tippecanoe	W	1,488	Sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Indiana, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Tipton	--	W	Sand and gravel.
Union	$4	$9	Do.
Vanderburgh	35	4	Stone.
Vermillion	15,706	W	Coal, sand and gravel, clays.
Vigo	1,447	W	Coal, sand and gravel, stone.
Wabash	W	W	Stone, sand and gravel.
Warren	W	W	Sand and gravel, peat.
Warrick	51,204	74,205	Coal.
Washington	W	W	Stone, sand and gravel.
Wayne	W	W	Sand and gravel, stone.
Wells	W	W	Stone, peat.
White	800	560	Stone.
Whitley	W	W	Sand and gravel.
Undistributed [2]	197,748	151,232	
Total [3]	351,405	440,690	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] The following counties are not listed because no production was reported: Benton, Brown, Floyd, and Ohio.
[2] Includes petroleum and natural gas production that cannot be assigned to specific counties and values indicated by symbol W.
[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Indiana business activity

	1973	1974 [p]	Change, percent
Employment and labor force, annual average:			
Total labor force thousands	2,326	NA	NA
Unemployment do	202.0	NA	NA
Employment:			
Manufacturing do	758.2	735.4	−3.0
Construction do	88.7	86.7	−2.3
Mining do	6.9	7.0	+1.4
Transportation and public utilities do	104.6	105.6	+1.0
Wholesale and retail trade do	418.2	418.7	+0.1
Finance, insurance, and real estate do	86.1	87.8	+2.0
Services do	261.6	267.3	+2.2
Government do	303.8	307.7	+1.3
Personal income:			
Total millions	$26,510	$28,053	+5.8
Per capita	$4,998	$5,263	+5.3
Construction activity:			
Building permits:			
Value of authorized nonresidential construction millions	$389.8	$329.2	−15.5
Number of private and public residential units authorized	39,974	22,011	−44.9
State highway commission contracts awarded millions	$146.1	$146.0	−0.1
Portland cement shipments to and within Indiana thousand short tons	1,838	1,730	−5.9
Farm marketing receipts millions	$3,019	NA	NA
Mineral production do	$351.4	$440.7	+25.4

[p] Preliminary. NA Not available.

Source: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and Federal Bureau of Mines.

According to a summary of energy requirements for the mineral extraction and processing industries by individual States in 1973, Indiana's requirements were equivalent to 111 billion kilowatt-hours of electrical energy, which ranked it third in the Nation after Pennsylvania and Ohio. The mining and beneficiating of minerals produced in Indiana accounted for less than 2% of the energy requirements, while nearly 81% was accounted for in the smelting of metals from ores shipped to Indiana plants. Energy requirements for calcining, clinkering, sintering and drying processes accounted for most of the remaining 17%. Coke, which is used for iron smelting, was the largest single source of energy used, accounting for nearly two-thirds of the total, followed by roughly equal amounts of energy from

natural gas, purchased electricity, and coal. The quantities that were required follow: Coke, 9,220,000 short tons, equivalent to about 70 billion kilowatt-hours of electrical energy; natural gas, 19.7 billion cubic feet, equivalent to about 6 billion kilowatt-hours; purchased electricity, 6 billion kilowatt-hours; coal, 769,000 short tons, equivalent to about 6 billion kilowatt-hours; heavy fuel oils, 74,300,000 gallons, equivalent to about 3 billion kilowatt-hours; gasoline and other petroleum products, 37,000,000 gallons, equivalent to about 2 billion kilowatt-hours; and other energy sources equivalent to about 18 billion kilowatt-hours.

Legislation and Government Programs.—During the 1974 session of the Indiana General Assembly the following laws were enacted that amend the 1971 Indiana Code (IC 1971) and directly or indirectly affect the mineral industry:

1. Senate Bill 100, Public Law 51, amends IC 1971, 14–4, by adding a new chapter (ch. 2.2) to authorize Indiana's participation in the Interstate Mining Compact Commission.

2. Senate Bill 66, Public Law 49, amends IC 1971, 13–4–6, to increase strip mining acreage fees from $15 to $30 per acre, to be deposited in the reclamation fund of the Department of Natural Resources; and sets bond to be posted by the operator at $5,000 or $600 per acre, whichever is greater.

3. House Bill 1076, Public Law 109, amends IC 1971, 22–3–7, as amended by Acts 1971, Public Law 354, concerning occupational disease benefits as follows: Increases the maximum weekly benefit for temporary total, temporary partial, and permanent total disability from 60% to 66⅔% of the individual's average wage (maximum average wage is redefined as $135, producing a maximum benefit of $90, and eliminating the variable maximum for dependency status); makes the law mandatory; adds "coal dust" to "silica dust" and "asbestos dust" in allowing compensation if disease occurs within 3 years after exposure; increases total maximum benefits to $45,000; and permits an employer to be represented in third-party lawsuits. The law repeals IC 1971, 22–3–7–4.

4. House Bill 1278, Public Law 29, amends IC 1971, 8–4–10, by adding a new section (section 8) to provide authority for construction of railroad branch tracks across highways or roads.

The following rules and changes in rules to protect the environment were promulgated by the Environmental Management Board (EMB), the Air Pollution Control (APC) Board, and the Stream Pollution Control (SPC) Board; EMB–1, new rule establishing public water supply permit regulations; amendment of APC–3, concerning visible emissions and breakdowns; amendment of APC–13, concerning maximum allowable sulfur oxide emissions; amendment of APC–15, concerning maximum allowable hydrocarbons emissions; amendment of APC–16, concerning allowable carbon monoxide emissions; amendment of APC–17, concerning maximum allowable nitrogen oxide emissions; APC–18, new rule establishing particulate timetables to comply with APC–4R, 5, 6, and 7; APC–20, new rule establishing controls on particulate matter escaping beyond property lines; APC–22, new rule establishing air quality basins and priority ratings for sulfur oxides, particulate matter, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen oxides; SPC–16, new rule establishing requirements for reporting, containment, and cleanup of spills of oil, hazardous and/or otherwise objectionable substances; SPC–17, new rule establishing industrial wastehauler permit regulation; and SPC–18, new rule establishing solid waste management permit regulation, requiring construction and operating permits for sanitary land fills.

The Indiana Natural Resources Commission broke a longstanding policy against allowing stripmining in State forests. The Commission authorized Peabody Coal Co. to strip mine a 32-acre tract in Greene-Sullivan State Forest. The company agreed to give the State 320 acres of land it owned north of the forest and to pay the State a 5% royalty on all coal mined from the 32 acres.

With the approval of the Natural Resources Commission, the Division of Reclamation issued 66 surface mining permits for coal, clay, and shale extraction to 39 companies. The acreage under permit totaled 5,299, of which 99.5% was for coal strip mining. The permits require reclamation of the land for the following uses: 4% for forest land with a maximum grade of 33⅓%; 48% for range land with the same maximum grade; 19% for pasture land with a maximum grade of 25%; and

29% for row crop land with a maximum grade of 8%.

The Indiana Geological Survey published Bulletin 42–J, "The Lime Industry of Indiana". Among other publications released by the Indiana Geological Survey were Occasional Paper 4, "Age and Origin of Stone Quarried Near Fort Wayne in the Mid-1800's" and Occasional Paper 6, "Glossary of Building Stone and Masonry Terms".

In March, the U.S. Department of Labor authorized the Division of Labor to undertake a statewide job safety and health program under provisions of the Occupational Safety and Health Act of 1970.

During 1974, Federal mine inspectors from the Mining Enforcement and Safety Administration conducted 72 regular health and safety inspections and 512 followup inspections at Indiana coal mines. A total of 277 regular inspections and 339 spot inspections also were performed at clay, cement, gypsum, peat, sand and gravel, and stone operations.

State mine inspectors from the Indiana Bureau of Mines and Mining conducted 64 health and safety inspections and 34 spot inspections at coal mines. The State bureau also inspected the two underground gypsum mines in Martin County.

Employment and Injuries.—Employment in Indiana's mineral industries, excluding petroleum and natural gas, totaled 7,601 persons during 1974. Coal industry employment ranked first with 36% of the total; followed by limestone, 34%; sand and gravel, 13%; cement, 6%; gypsum, 4%; clays, 2%; and all remaining mineral industries combined, 5%.

Two fatalities occurred in the nonmetallic mineral industries. Both were at a crushed stone quarry. One resulted from a drowning accident, the other was a haulage-type accident.

A machinery accident at a coal-processing plant resulted in a single fatality in September. There were no other fatalities that were chargeable to the coal industry.

Table 4.—Indiana: Mineral industry employment and injuries in 1974 [1]

Mineral	Number employed	Man-hours	Fatal injuries	Fatal frequency rate (per million man-hours)	Nonfatal disabling injuries	Nonfatal disabling frequency rate (per million man-hours)
Coal:						
Underground	188	394,187	--	--	19	48.20
Surface	2,346	4,999,881	1	0.20	28	5.60
Mills	232	512,014	--	--	3	5.86
Total	2,766	5,905,582	1	.17	50	8.47
Cement:						
Surface	73	243,403	--	--	--	--
Mills	396	821,905	--	--	--	--
Total	469	1,065,308	--	--	--	--
Clays:						
Surface	44	73,707	--	--	--	--
Mills	230	220,746	--	--	--	--
Total	274	294,453	--	--	--	--
Gypsum:						
Underground	55	122,498	--	--	2	16.33
Mills	367	567,562	--	--	--	--
Total	422	690,060	--	--	2	2.90
Lime: Mills	62	105,104	--	--	1	9.51
Limestone and dolomite:						
Underground	26	63,930	--	--	1	15.64
Surface	2,004	1,685,053	2	1.22	44	25.69
Mills	556	943,990	--	--	20	21.19
Total	2,586	2,642,973	2	.76	65	23.08

See footnotes at end of table.

Table 4.—Indiana: Mineral industry employment and injuries in 1974 [1]—Continued

Mineral	Number employed	Man-hours	Fatal injuries	Fatal frequency rate (per million man-hours)	Nonfatal disabling injuries	Nonfatal disabling frequency rate (per million man-hours)
Sandstone: Surface	21	38,616	--	--	3	77.69
Miscellaneous stone:						
Surface	5	2,716	--	--	--	--
Peat: Surface	2	1,090	--	--	--	--
Sand and gravel:						
Surface	994	1,813,841	--	--	22	10.48
Grand total: [2]						
Underground	81	186,428	--	--	3	16.09
Surface	3,143	3,808,426	2	.53	69	16.80
Mills	1,611	2,659,307	--	--	21	7.14
Total	4,835	6,654,161	2	.30	93	12.92

[1] All data are preliminary.
[2] Excludes coal.
Source: Mining Enforcement and Safety Administration.

The National Limestone Institute, Inc. cited 21 Indiana limestone quarries that operated throughout 1974 without a disabling work injury. Each quarry received an inscribed bronze plaque donated by the publishers of Pit and Quarry Magazine. Four quarries operated by Mulzer Crushed Stone Co. and two quarries operated by Berry Materials Corp. received plaques. One plaque each was received by the following companies: Mitchell Crushed Stone Co., Inc.; Bloomington Crushed Stone Co., Inc.; Hy-Rock Products Co.; Newton County Stone Co, Inc.; Meshberger Stone, Inc.; Ralph Rogers & Co.; Western Materials Co.; Berry Materials Corp.; Ohio & Indiana Stone Corp.; France Stone Co.; Irving Materials, Inc.; Cave Stone, Inc.; Mill Creek Stone & Gravel Corp.; May Stone & Sand, Inc.; John W. Karch Stone Co.; and Kixmiller Bros., Inc. Three of the quarries also received special safety certificates for operating 4 or more consecutive years without a disabling work injury. The special awards went to Meshberger Stone, Inc., Columbus quarry for 7 years of accident-free operation; Berry Materials Corp., North Vernon quarry for 7 years of accident-free operation; and Kixmiller Bros., Inc.. Freelandville quarry for 5 years of accident-free operation.

Martin Marietta Aggregates was the only Indiana operator cited in the National Sand and Gravel Association's 1974 safety contest. Certificates of achievement in safety were awarded to the firm's North Terre Haute plant in the class C (plants producing 225,000 to 549,000 tons of sand and gravel) competition and the South Terre Haute plant in the class E (plants producing 60,000 to 169,000 tons) competition which reported no accidents during the contest period.

Louisville Cement Co.'s Logansport plant and Universal Atlas Cement Div. of United States Steel Corp.'s plant at Buffington received safety trophy reawards from the Portland Cement Association. For both plants, it was the ninth year (not consecutive) without a lost-time accident.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasives.—The Hindostan Whetstone Co. produced whetstones from sandstone quarried near Orleans, Orange County. Output decreased 60% in quantity. Abrasives also were manufactured from steel by The Wheelabrator Corp. at Mishawaka in St. Joseph County.

Cement.—Portland cement shipments, comprising 86% of the State's cement output, decreased 312,000 tons below the 1973 shipments, but the value increased 8%. The average mill value of portland cement for all types was $24.16 per ton in Indiana, an increase of $4.28 per ton.

Four companies operated 11 rotary kilns at 2 wet-process and 3 dry-process plants

with a combined annual capacity of 2.8 million tons. Louisville Cement Co. produced cement at Speed in Clark County and at Logansport in Cass County. Lone Star Industries Inc. produced cement at its Greencastle plant in Putnam County, and Lehigh Portland Cement Co. operated its Mitchell plant in Lawrence County. In addition to producing cement, Universal Atlas Cement Division of United States Steel Corp. manufactured heat-resistant calcium aluminate cement in a unique rotary kiln at its Buffington plant.

Type I (general construction use) and Type II (moderately low heat and moderate degree of resistance to sulfate attack) comprised 91% of the portland cement shipped; 6% was Type III (high-early-strength); and all other types combined comprised 3%.

Disposition of portland cement shipped by Indiana manufacturers was as follows: 63% to ready-mix concrete producers; 16% to concrete product manufacturers for concrete block, concrete pipe, precast prestressed concrete, and other concrete products; 10% to highway contractors; 9% to building material dealers; and the remainder to other contractors and for miscellaneous uses. Apparent consumption of portland cement in Indiana during 1974 was 1,730,000 tons, a decrease of 6%.

Masonry cement was manufactured at three of the five plants: Louisville Cement Co. did not produce masonry cement at its Logansport plant nor did Lehigh at its Mitchell plant. Shipments decreased 15% in quantity and increased 16% in value. The average mill value of masonry cement increased $8.34 per ton to $31.31. Apparent consumption of masonry cement in Indiana was 111,000 tons, a decrease of 11%.

In October, Lehigh Portland Cement Co. began onsite construction activity to expand production capacity at its Mitchell plant 50%, to an annual capacity of 750,000 tons by mid-1976. The expansion entails construction of a preheater kiln designed to provide substantial fuel economies, and a 1,500-horse-power cement finish mill. The firm had just completed installation of eight bag-type dust collector units, which took more than a year to install, and are capable of cleaning 65,000 cubic feet of air per minute. Capital expenditures for additional pollution control equipment were expected to account for about 35% of the cost of the multimillion dollar expansion.

At the Speed plant, Louisville Cement Co. replaced a railroad system with a truck-haulage system to transport limestone from the quarry to the plant. At the firm's Logansport plant, installation of dust collectors on the clinker coolers of both kilns neared completion and were expected to be in operation early in 1975.

Clays.—Combined clay and shale output decreased 24% in both quantity and value. About 98% of the production was common clay and shale, and 2% was fire clay. Twenty-three companies operated 28 mines in 16 counties. Six companies produced 77% of the State's clay and shale; Hydraulic-Press Brick Co. in Morgan County, Louisville Cement Co. in Cass and Clark Counties, Log Cabin Coal Co. in Clay County, American Brick Co. in Lake County, C & F Shale Co. in Clay County, and General Shale Products Corp. in Morgan County. Fire clay was produced by S.L. Turner Coal and Clay Co. Inc. in Parke County, McCool Loan Co./Zehner Excavating Co. in Porter County, and H.H. Bartelt in Dubois County.

About 41% of all production was used to manufacture building bricks; 27% was used in making portland cement; and the remainder was used for lightweight aggregate, sewer pipe, drain tile, ceramic tile, and other ceramic uses. Fire clay was used in making refractories.

A new firm, C & F Shale Co., began operations at Brazil in Clay County. Adams Clay Products Co. ceased operations in Morgan County; the company had operated in Indiana for 75 years.

General Refractories Co. announced plans to expand its Gary facility in Lake County to include a clay-alumina specialties plant. The new plant, scheduled for completion late in 1975, reportedly will be able to produce 40,000 tons of mortars, plastics, and castables annually.

Table 5.—Indiana: Clays sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Year	Fire clay		Common clay		Total [1]	
	Quantity	Value	Quantity	Value	Quantity	Value
1970	75	202	1,259	1,936	1,335	2,139
1971	[2]1	[2]5	1,324	2,303	1,325	2,308
1972	W	W	1,419	2,462	[3]1,419	[3]2,465
1973	[2]43	[2]174	1,393	2,394	1,436	2,568
1974	26	118	1,066	1,828	1,092	1,947

W Withheld to avoid disclosure of individual company data; excluded from total.
[1] Data may not add to totals shown because of independent rounding.
[2] Includes a small amount of kaolin.
[3] Includes a small amount of ball clay.

Gypsum.—Crude gypsum production increased 2% but was 5% below the 1972 record. United States Gypsum Co. and National Gypsum Co. operated underground gypsum mines near Shoals, Martin County. National Gypsum Co.'s mine ranked fifth in output in the Nation, and United States Gypsum Co.'s mine was tenth; all of the other gypsum mines ranked among the top 10 producers in 1974 were surface mines.

Both United States Gypsum Co. and National Gypsum Co. calcined gypsum at plants adjacent to their mines in Martin County. United States Gypsum Co. also operated a calcining plant near East Chicago, Lake County, on crude gypsum mined in Michigan and transported by lake carrier. United States Gypsum Co.'s plant in Martin County ranked third in output in 1974, and National Gypsum Co.'s plant in Martin County ranked ninth.

Calcined gypsum production declined 7% in volume. Among the States, Indiana ranked fifth in production of calcined gypsum. The major use of calcined gypsum was for building purposes, mainly the manufacture of wallboard and sheathing.

Lime.—Lime production in Indiana, ranking sixth in the United States, increased 35% in quantity and 99% in value. Marblehead Lime Co. produced quicklime in one of the world's largest lime plants at Buffington, Lake County, and Inland Steel Co. started producing quicklime at its Indiana Harbor Works also in Lake County. Both plants produced lime from limestone quarried in Michigan and transported to Indiana by lake freighters. The new Inland Steel Co. plant has two rotary kilns each with a daily production capacity of 600 tons of lime. Each kiln is 13.5 feet in diameter and 145 feet in length. Lime consumption during 1974 was 1,869,000 tons ranking Indiana third in the Nation. Most of the lime was used by the steel industry in steelmaking furnaces.

Perlite.—Crude perlite mined in New Mexico was expanded at six plants: United States Gypsum Co. at gypsum plants in Lake and Martin Counties; National Gypsum Co. at its gypsum plant in Martin County; Grefco, Inc., near Crawfordsville, Montgomery County; Airlite Processing Corp. near Scottsburg, Scott County; and Chemrock Corp. near Lafayette, Tippecanoe County. Expanded perlite production was 16,212 tons, a 9% increase from the previous year. Expanded perlite sold or used totaled 15,753 tons valued at $1,070,000, an increase of 6% in quantity and 5% in value over sales and uses during 1973. The principal uses for perlite expanded in Indiana were for plaster aggregate and as a filter aid. Smaller quantities were used for insulation and miscellaneous purposes.

Sand and Gravel.—Sand and gravel production in Indiana totaled 26,077,000 tons valued at $35,656,000, a decrease of 6% in quantity and an increase of about 2% in value. About 99% of the total tonnage was construction sand and gravel, and 1% was industrial sand produced for chemical and foundry industry use. Construction sand and gravel accounted for 98% of the total value and industrial sand accounted for 2%. Sand and gravel was mined in 64 counties at 186 locations. Production ranged from less than 6,000 tons in one county to 3.9 million tons in another county. Output exceeded 1 million tons in four counties—Hamilton, Marion, St. Joseph, and Switzerland.

Only 4 operations produced 1 million tons or more each; 5, between 500,000 and 1 million tons each; 30, between 200,000 and 500,000 tons each; 37, between 100,000 and 200,000 tons each; 43, between 25,000 and 100,000 tons each; and 64 less than 25,000 tons. American Aggregates Corp., Martin Marietta Aggregates,

Western Indiana Aggregates Corp., and Irving Materials, Inc. were the largest producers.

About 89% of the sand and gravel was processed in washing or screening plants. The processing was accomplished at 88 stationary plants, 32 portable plants, and 33 dredging units. Trucks hauled 90% of the sand and gravel; most of the remainder was transported by barge and rail.

Table 6.—Indiana: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	27,731	35,015	10,845	13,315
Gravel			12,155	19,280
Unprocessed: Sand and gravel			2,811	1,887
Industrial:				
Sand	W	W	266	804
Gravel			--	--
Total	27,731	35,015	26,077	35,286

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data may not be directly comparable to that in tables 1, 7, and 8 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 7.—Indiana: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	23,628	30,732	5,590	8,223
Highway and bridge construction			622	978
Other uses (dams, waterworks, airports, etc.)			296	418
Concrete products (cement blocks, bricks, pipe, etc)			1,547	2,089
Bituminous paving (asphalt and tar pavnig)			6,876	10,495
Roadbase and subbase			1,210	1,656
Unprocessed aggregate			2,714	1,836
Fill	2,340	2,052	989	1,056
Other uses [2]	1,045	1,539	580	550
Industrial sand and gravel	W	W	266	804
Total	27,013	34,323	20,690	28,105

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 8.—Indiana: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	625	514	156	235
Highway and bridge construction			1,860	2,711
Other uses (dams, waterworks, airports, etc.)			93	134
Concrete products (cement blocks, bricks, pipe, etc.)			24	34
Bituminous paving (asphalt and tar paving)			1,792	2,568
Roadbase and subbase			1,136	2,568
Unprocessed aggregate			96	49
Fill	3	62	165	192
Other	90	116	64	99
Total	718	692	5,386	7,550

[1] Unit value of sand or gravel may be higher than value of construction aggregate.

Of the 25,811,000 tons of construction sand and gravel produced during 1974, 79% was sold or used commercially and 21% was sold or used for publicly funded projects. The principal uses of the material were highway construction and paving, building construction, and fill.

Slag.—About 9 million tons of blast furnace slag and steel furnace slag was produced in Lake and Porter Counties as a waste product from pig iron production and steel refining. Most of the slag was disposed of or used by the iron and steelmaking firms. Some slag was processed and marketed for mineral wool, roofing granules, aggregate, roadbase material, and railroad ballast.

Stone.—Output of stone, comprising mostly crushed limestone and dolomite, decreased 4% in quantity and increased 11% in value. Stone was mined by 81 companies at 148 quarries in 58 counties. Four quarries had an output exceeding 900,000 tons each; 14, between 500,000 and 900,000 tons each; 55, between 100,000 and 500,000 tons each; and 73 less than 100,000 tons each, of which 54 produced less than 25,000 tons each.

Mulzer Crushed Stone Co., Ralph Rogers & Co., France Stone Co., and Irving Bros. Gravel Co., Inc. were the largest producers of crushed limestone and dolomite. Ten companies mined 48,602 tons of marl from 14 quarries in Elkhart, Lagrange, La Porte, Marshall, Noble, St. Joseph, and Steuben Counties. Four companies quarried 114,489 tons of sandstone in Harrison, Lawrence, Putnam, and Morgan Counties.

Dimension stone, while less than 1% of the stone tonnage produced, had 15% of the value in 1974. Output increased 11% in quantity and 37% in value from 1973. Dimension limestone was produced by 16 companies at 19 quarries in Franklin, Lawrence, Monroe, Putnam, and Rush Counties. Victor Oolitic Stone Co. and Indiana Limestone Co. were the largest producers with operations in Monroe and Lawrence Counties. Two companies produced dimension sandstone in Lawrence and Morgan Counties, and one company produced dimension dolomite in Franklin County.

Principal uses for Indiana's stone output were as follows: 68% of total stone tonnage for roadbase and paving materials; 12% for concrete aggregate; 10% for manufacturing portland cement; 6% for agricultural uses; and the remainder for railroad ballast, riprap and jettystone, rough and dressed architectural dimension stone, and miscellaneous chemical and industrial uses. About 87% of the stone was transported by truck, 6% by water, 4% by rail, and 3% by other means.

Table 9.—Indiana: Limestone and dolomite sold or used by producers, by use
(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Rough architectural -- thousand cubic feet --	1,729	2,785	1,695	3,130
Irregular shaped stone	1	27	3	58
Rubble	13	134	13	138
Flagging -- thousand cubic feet --	36	20	51	29
Cut stone -- do --	225	1,948	239	2,241
House stone veneer -- do --	366	708	386	843
Sawed stone [1] -- do --	398	1,205	722	2,904
Total -- thousand short tons --	217	6,828	241	9,342
Crushed and broken:				
Bituminous aggregate	2,281	3,942	2,516	4,819
Concrete aggregate	3,994	6,489	3,644	6,602
Dense graded roadbase stone	8,725	13,770	7,544	13,307
Macadam aggregate	2,589	4,050	3,117	5,605
Surface treatment aggregate	2,240	3,632	1,316	2,448
Unspecified concrete aggregate and roadstone	5,729	9,687	6,583	12,066
Agricultural purposes [2]	1,842	3,265	1,810	3,716
Cement manufacture	3,419	3,638	3,155	4,036
Railroad ballast	402	601	394	653
Riprap and jetty stone	259	602	174	380
Other uses [3]	551	1,099	489	1,069
Total [4]	32,030	50,774	30,741	54,702
Grand total [4]	32,246	57,603	30,982	64,044

[1] Includes small amount of dressed flagging.
[2] Includes agricultural limestone, poultry grit and mineral food.
[3] Includes stone used for filter stone (1973), manufactured fine aggregates, lime manufacture (1973), flux stone, mine dusting, asphalt filler, other fillers (1973), fill, glass, and uses not specified.
[4] Data may not add to totals shown because of independent rounding.

Table 10.—Indiana: Limestone and dolomite sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973		1974		Type of stone produced in 1974
	Quantity	Value	Quantity	Value	
Adams	W	W	W	W	Crushed.
Allen	2,469	4,618	2,224	4,510	Do.
Bartholomew	W	W	W	W	Do.
Blackford	158	270	90	165	Do.
Carroll	W	W	W	W	Do.
Cass	1,167	1,460	1,098	1,892	Do.
Clark	2,616	3,543	2,731	4,358	Do.
Crawford	W	W	W	W	Do.
Decatur	W	W	W	W	Do.
Delaware	707	1,155	790	1,447	Do.
Fayette	--	--	2	3	Do.
Franklin	W	W	W	W	Dimension.
Grant	W	W	W	W	Crushed.
Hamilton	1,765	3,044	1,564	2,940	Do.
Hancock	1	1	3	5	Do.
Harrison	W	W	642	1,196	Do.
Howard	W	W	W	W	Do.
Huntington	W	W	W	W	Do.
Jasper	W	621	W	580	Do.
Jay	W	W	W	W	Do.
Jennings	W	W	W	W	Do.
Johnson	1	2	1	1	Do.
Kosciusko	--	--	22	47	Do.
Lake	W	W	W	W	Do.
La Porte	W	W	--	--	Do.
Lawrence	2,479	5,945	2,405	6,091	Dimension and crushed.
Madison	W	W	W	W	Crushed.
Marion	W	W	W	W	Do.
Marshall	2	5	--	--	Do.
Miami	W	W	230	W	Do.
Monroe	W	W	W	7,900	Dimension and crushed.
Morgan	W	W	W	W	Crushed.
Newton	W	W	W	W	Do.
Orange	746	1,146	598	1,097	Do.
Owen	W	W	W	W	Do.
Perry	W	W	W	W	Do.
Posey	--	--	31	93	Do.
Pulaski	W	W	551	831	Do.
Putnam	3,292	4,764	3,258	5,303	Dimension and crushed.
Randolph	W	W	W	W	Crushed.
Ripley	W	W	W	W	Do.
Rush	W	W	W	W	Dimension and crushed.
Scott	W	W	W	W	Crushed.
Shelby	W	W	W	W	Do.
Spencer	17	43	--	--	Do.
Sullivan	15	44	13	49	Crushed.
Switzerland	75	W	67	185	Do.
Vanderburgh	13	35	1	4	Do.
Vigo	W	W	W	W	Do.
Wabash	W	W	W	W	Do.
Warrick	57	141	--	--	Do.
Washington	W	W	W	W	Do.
Wayne	214	372	5	9	Do.
Wells	W	W	W	W	Do.
White	592	800	350	560	Do.
Total[1]	32,246	57,603	30,982	64,044	

W Withheld to avoid disclosing individual company confidential data; included in "Total."
[1] Data may not add to totals shown because of independent rounding.

Table 11.—Indiana: Calcareous marl production

Year	Number of producers	Short tons	Value
1970	12	23,208	$23,436
1971	12	29,074	26,095
1972	9	26,137	24,171
1973	10	41,241	48,981
1974	10	48,602	62,215

Monon Crushed Stone Co. ceased operations at Monon in White County. Edward Kraemer and Sons took over operation of the Robertson Crushed Stone Co. quarry near DePauw in Harrison County, and opened a new quarry near Salem in Washington County. New quarries were also opened by Mill Creek Stone and Gravel Co. near Bunker Hill in Miami County; Liters Quarry of Indiana near

Watson in Clark County; and Crawford County Stone Co. near Leavenworth in Crawford County.

A unique management/union arrangement to promote greater use of dimension limestone in the construction industry was begun in May. Dimensional stone trade union members in Lawrence and Monroe Counties and quarry and mill operators agreed, during labor negotiations culminated in October 1973, to establish a trust to manage funds and direct the promotional campaign. Monies for the trust fund known as the Indiana Limestone Promotional Trust Fund, are generated by equal hourly contributions from both union workers and quarry and mill operators. The fund's three trustees selected from industry and management and three advisors from the trade unions chose the Indiana Limestone Institute at Bedford to administer the promotional activities. Through July 1975, nearly 3,000 inquiries from potential stone users were generated by mailed brochures and displays financed by the trust.

In November, Indiana Limestone Co. announced that it received two job orders to supply $2.5 million worth of dimension limestone for an office building in Columbus, Ohio, and a classroom building on the University of Texas campus at Austin, Tex. The office building job, calling for 320,000 square feet of stone in 4-inch- thick panels and worth $1.5 million, was the firm's largest order in 10 years. These orders were expected to help keep quarries and mills at a high level of operation well into 1976. The apparent new demand for stone sparked optimism among producers that rising costs of concrete, glass, and metal building materials, all of which require more energy to produce than dimension stone, would improve the competitive position of dimension stone in the building construction industry.

Sulfur.—American Oil Co. and Atlantic Richfield Co. recovered sulfur from crude petroleum at their refineries in Lake County. Sales decreased 17% in volume but increased 7% in value.

MINERAL FUELS

Coal (Bituminous).—Indiana's coal production in 1974, ranking seventh in the Nation, was just 94% of the tonnage produced in 1973, although there was a 30% rise in value. The average value of a ton of coal rose $2.30 to $8.36. More than 99% of the coal was produced at 39 strip mines by 27 companies in 11 counties; the remainder was mined at 2 underground mines and 1 of these, Mt. Pleasant Mining Co.'s Mt. Pleasant mine, ceased operations during October. Thirteen new companies commenced operations and four companies ceased operations during 1974. Peabody Coal Co. was the State's largest producer followed by Amax Coal Co. and Old Ben Coal Co. About 39% of the coal was mined in Warrick County.

About 18.9 million tons of Indiana's coal output was transported by rail or water, including 9.3 million tons by unit train; 4.5 million tons by truck, and 0.3 million tons conveyed to minemouth electric power generating plants.

Strip mine excavation equipment in operation during the year included 59 power shovels, 56 draglines, 7 scrapers, 192 bulldozers, 62 frontend loaders, 2 power brooms, 25 motor graders, 51 overburden drills, and 7 coal drills. The bucket capacities of the 115 power shovels and dragline excavators were as follows: 14 exceeding 50 cubic yards; 14 between 16 and 50 cubic yards; 36 between 6 and 15 cubic yards; and 51 less than 6 cubic yards. Shovels and draglines were powered, as follows: 61 electric; 50 diesel; 3 diesel electric; and 1 gasoline.

Ten mechanical coal cleaning plants produced 19,033,000 tons of salable coal and 4,764,000 tons of refuse.

Coal consumption in Indiana was 43,921,000 tons, of which about 44% came from mines in the State; 22%, from West Virginia, Virginia, and eastern Kentucky; 16%, from Illinois; 8%, from western Kentucky; 5%, from Wyoming; and most of the remainder from Pennsylvania, Montana, Ohio, and Utah. Electric utilities used 58% of the coal consumed in the State; coke and gas plants used 31%; and most of the remainder was used by industrial plants. Despite consuming about twice the tonnage of coal it produces, 20% of Indiana's coal production was shipped to customers in the following States: Kentucky, 7%; Georgia, 5%; Illinois and Wisconsin, 2% each; and the remainder to Ohio, Tennessee, Michigan, Minnesota, and Missouri.

Old Ben Coal Co. made substantial progress in developing its new strip mine, Old Ben 2, in northern Pike County. The

mine is expected to begin production in late 1975, and reach the capacity rate of 3 million tons per year in the second half of 1976. New excavation equipment for the mine includes two 58-cubic-yard draglines to remove overburden, and two diesel electric shovels with 11-cubic-yard dippers to load coal. Eight 108-ton end-dump trucks and a 6-mile-long conveyor will transport coal from the mine's two pits to a new preparation plant. Construction of the preparation plant, with a capacity to clean 1,200 tons per hour, is scheduled for completion in September 1975. The overland conveyor with a capacity to transport 1,250 tons of coal per hour on a 42-inch-wide belt is scheduled for completion in October 1975.

Amax Coal Co.'s new Ayrshire mine in Warrick County produced coal at near-full capacity during 1974, although idled 24 days by the miners' strike in November and December. With annual capacity rated at 2.5 million tons, the Ayrshire mine produced more than 2.4 million tons in 1974, up from 250,000 tons in 1973. The firm's new 1,200-ton-per-hour coal preparation plant at the Chinook mine in Clay County began operation during April.

Brazil Block Coal Co. began construction of a 23-cubic-yard dragline in Clay County. The company announced plans to use the dragline to mine block coal near Center Point.

Peabody Coal Co. agreed to reclaim 34 acres of coal waste piles at an abandoned underground mine located near Terre Haute. The agreement stemmed from a suit against the company filed in Federal District Court by the U.S. Environmental Protection Agency (EPA) in 1972. The $750,000 reclamation project is designed to halt acid mine drainage pollution from the waste piles into two creeks and the Wabash River. Peabody agreed to pay two-thirds of the costs of the project and EPA agreed to pay one-third.

Proponents of a proposed canal to link Mt. Carmel, Ill. on the Wabash River with Mt. Vernon, Ind. on the Ohio River claimed enough coal exists in a 17-county area in southern Indiana and southeastern Illinois to make the proposed Wabash River Canal economically feasible. Projected cost to build the proposed 42-mile-long canal is $1 billion. The area to be served by the canal was estimated to contain 35 billion tons of recoverable coal, most of it deep coal requiring underground mining methods.

Table 12.—Indiana: Bituminous coal production, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines			Production (thousand short tons)			Value (thousands)
	Underground	Strip	Total	Underground	Strip	Total	
Clay	--	7	7	--	1,052	1,052	$7,850
Fountain	--	1	1	--	W	W	W
Greene	--	3	3	--	W	W	W
Knox	--	2	2	--	W	W	W
Owen	--	1	1	--	30	30	251
Parke	--	1	1	--	W	W	W
Pike	1	7	8	W	W	W	50,355
Spencer	--	5	5	--	561	561	7,127
Sullivan	--	3	3	--	3,189	3,189	27,421
Vermillion	--	1	1	--	W	W	W
Vigo	1	--	1	W	--	W	W
Warrick	--	8	8	--	9,261	9,261	74,205
Undistributed	--	--	--	139	9,495	9,634	31,201
Total[1]	2	39	41	139	23,587	23,726	198,410

W Withheld to avoid disclosing company confidential data; included with "Undistributed."
[1] Data may not add to totals shown because of independent rounding.

Coke.—Indiana ranks second in coke production in the Nation after Pennsylvania. Output of coke produced at six plants decreased 3%. During the year 13,743,000 tons of coal was carbonized to produce 9,073,000 tons of coke, a yield of 66.02%. About 64% of the coking coal came from West Virginia, Virginia, and Kentucky; 22%, from Illinois; 11%, from Pennsylvania; and the remainder from several western States. No coking coal was produced in Indiana. The value of coal carbonized was $508,953,000 or $37.03 per ton.

The steel industry consumed 93% of the coke production for making pig iron and steel. The value of 8,414,000 tons of coke used in blast furnaces and steel producing furnaces was $604,490,000. Coke was produced by Inland Steel Co., United States Steel Corp., and Youngstown Sheet & Tube Co. in Lake County; Citizens Gas & Coke Utility in Marion County; Bethlehem Steel Corp. in Porter County; and Indiana Gas & Chemical Corp. in Vigo County. These companies also produced 1,105,000 tons of coke breeze for utilization at agglomeration plants and for other industrial uses.

Startup operations began in August at Inland Steel Co.'s new "C" coke oven battery. The new 56-oven battery with a rated capacity of 2,500 tons per day replaced 146 ovens in 2 older batteries. The "C" battery is the first large installation in the Nation to combine three major technological innovations: Coal preheating, confined coal pipeline charging, and an enclosed structure equipped to capture and scrub emissions during both the charging and pushing cycles. A similar system will be employed in a 3,000-ton-per-day battery the company plans to build by 1980.

Youngstown Sheet & Tube Co. announced plans to construct a new 85-oven coke battery at the Indiana Harbor Works by 1977. When completed the battery reportedly will increase the plant's coke output from 3,500 tons per day to 6,200 tons per day. The new battery will increase the number of coke ovens from 237 to 333.

Peat.—Peat sales increased 39% in quantity and 99% in value. Nine companies produced peat in seven counties. The types of peat produced included moss and reed sedge, most of which was shredded. Two of the nine companies sold peat in packages as well as in bulk form. The peat was used principally for soil conditioning and horticultural use. None was sold for use as fuel.

Petroleum and Natural Gas.—Crude petroleum production declined 7% in quantity but increased 104% in value. Total production from 4,376 wells[2] was 4,919,380 barrels, of which an estimated 2,514,000 barrels was produced by secondary recovery methods. The amount of oil produced by this method declined 5% from the previous year, whereas primary oil production declined 10%. The average value was $8.62 per barrel, an increase of $120% from the previous year, and the total value of Indiana's crude production was $42,402,000.

Spiraling oil prices prompted an increase in drilling activity during 1974, and much of the drilling was centered in areas of known and suspected reefs and overlying structures. The number of holes drilled increased 59% and total footage drilled increased 70%. Of the 397 wells drilled for oil and gas, 169 were exploratory, and 228 were for primary development. The success ratio of exploratory drilling was 14.2%, with 18 oil well discoveries and 6 gas well discoveries. Of these successes, 19 were in Mississippian strata, 2 in Devonian strata, and 1 in the New Albany shale of Mississippian age. Included were 7 new field discoveries (3 oil and 4 gas), 14 new pool discoveries (13 oil and 1 gas), and 3 extensions to existing pools (2 oil and 1 gas).

[2] World Oil. Feb. 15, 1975, p. 106.

Table 13.—Indiana: Crude petroleum production in 1974, by major field

Field	Year-discovered	Area, acres	Location, county	Number of Wells		Production (barrels)
				Producing	Completed	
Black River Consolidated	1950	700	Posey	NA	--	129,558
Coe South	1961	450	Pike	NA	1	136,623
Elnora Central	1972	820	Daviess	NA	33	182,185
Griffin Consolidated	1938	7,520	Gibson, Posey	NA	5	710,042
Heusler Consolidated	1938	2,270	Posey, Vanderburgh	NA	4	198,945
Mt. Carmel Consolidated	1941	2,330	Gibson, Knox	NA	6	139,515
Mt. Vernon Consolidated	1941	2,430	Posey	NA	3	217,796
Plummer	1969	1,180	Greene	NA	4	335,783
Springfield Consolidated	1943	2,680	Posey	NA	3	258,348
Union-Bowman Consolidated (new)	1941	15,870	Gibson, Knox, Pike	NA	12	177,264
Welborn Consolidated	1941	1,880	Posey	NA	--	168,540
Wheatonville Consolidated (new)	1949	2,100	Gibson	NA	1	134,229
Undistributed	XX	XX		NA	71	2,130,552
Total	XX	XX		NA	[1]143	4,919,380

NA Not available. XX Not applicable.
[1] Includes workovers without newly drilled footage.
Source: Petroleum Section, Indiana Geological Survey.

Table 14.—Indiana: Oil and gas wells drilled in 1974 [1]

County	Proved field wells			Exploratory wells			Total	Footage
	Oil	Gas	Dry	Oil	Gas	Dry		
Allen	--	--	1	--	--	--	1	--
Clay	2	--	--	--	--	6	8	11,519
Daviess	35	1	10	--	2	32	80	77,318
Decatur	--	5	--	--	--	--	5	4,473
Delaware	--	1	--	--	--	--	1	912
Dubois	2	--	3	2	2	7	16	21,315
Gibson	33	--	11	2	--	10	56	99,046
Greene	6	2	2	1	--	20	31	27,863
Henry	--	2	--	--	--	--	2	1,826
Huntington	--	--	--	--	--	1	1	1,032
Jackson	--	--	--	--	--	5	5	4,009
Knox	8	--	5	1	--	8	22	37,435
Martin	--	--	--	--	--	6	6	4,849
Orange	--	--	--	--	--	1	1	1,200
Owen	--	--	--	--	1	--	1	1,545
Parke	--	--	--	--	--	1	1	1,220
Perry	--	--	--	--	--	2	2	2,533
Pike	8	--	4	--	--	5	17	22,011
Posey	24	--	24	6	--	11	65	143,216
Rush	--	5	--	--	--	--	5	4,400
Shelby	--	1	--	--	--	--	1	853
Spencer	5	--	7	--	1	7	20	17,257
Sullivan	--	--	--	--	--	3	3	5,512
Vanderburgh	7	--	12	6	--	9	34	71,092
Vermillion	--	--	--	--	--	1	1	1,060
Vigo	--	--	--	--	--	1	1	2,038
Wabash	--	--	--	--	--	1	1	1,116
Warrick	--	--	1	--	--	2	3	5,240
Washington	--	--	--	--	--	6	6	5,458
Wells	--	--	1	--	--	--	1	1,100
Total	[2,3] 130	[3] 17	[3,4] 81	18	6	[3] 145	397	578,448

[1] Does not include service wells (water input, saltwater disposal, water supply, or gas input wells). Also does not include wells drilled in connection with gas storage operations.
[2] Includes oil wells completed in secondary recovery projects.
[3] Includes workovers without newly drilled footage.
[4] Includes dry holes completed in secondary recovery projects.

Source: Petroleum Section, Indiana Geological Survey.

In July the discovery well of a new oil pool in the Munford Hills Field in Posey County was completed at a producing depth of 1,906 feet in a sandstone unit of the Clore limestone (Mississippian). Eight additional wells were completed in the new pool by the end of the year. In the West Hovey Field, also in Posey County, four new pools were discovered—in a Pennsylvania sandstone at a depth of 1,613 feet, in the Degonia sandstone (Mississippian) at 1,743 feet, in the Palestine sandstone (Mississippian) at 1,850 feet, and in a sandstone in the Tar Springs Formation (Mississippian) at 2,069 feet. By the end of the year, 11 wells were completed in these new pools.

Although increased drilling activity in Indiana is expected to result in additional oil and gas discoveries, the chances for the discovery of large new fields is considered poor. The number of major oilfields (fields yielding 100,000 barrels or more oil in at least 1 year) has declined from 25 in 1955, when they accounted for 75% of Indiana's annual production, to 12 in 1974, when they accounted for 57% of the output. Only 6 fields have produced in excess of 100,000 barrels during each year from 1955 to 1974—Griffin Consolidated, Heusler Consolidated, Mt. Vernon Consolidated, Springfield Consolidated, Union-Bowman Consolidated, and Welborn Consolidated. Together these 6 oilfields have accounted for 68% of the 133,723,965 barrels produced in Indiana during the 1955–74 period, and all of these fields were discovered prior to 1944.

Proved oil reserves at the end of 1974 amounted to 24,351,000 barrels, and, because no natural gas liquid reserves were credited to Indiana in 1974, the total liquid hydrocarbon reserves were also 24,351,000.[3]

Natural gas production decreased 36%

[3] American Gas Association, American Petroleum Institute, and Canadian Petroleum Association. Reserves of Crude Oil, Natural Gas Liquids, and Natural gas in the United States and Canada and United States Productive Capacity as of Dec. 31, 1974. V. 29, May 1975.

in quantity and 34% in value. The 176 million cubic feet of natural gas produced in Indiana during 1974 accounted for only 0.03% of the 531,872 million cubic feet of gas used by Indiana consumers. Natural gas consumption in the State was divided as follows: Industrial, 51%; residential, 30%; commercial, 14%; electric utilities, 3%; natural gas pipeline companies and other consumers, 2%.

Proved natural gas reserves at the end of 1974 was 64,141 million cubic feet[4] including native gas and gas injected into underground storage reservoirs.

Seven petroleum refineries were in operation at the beginning of the year with a combined crude oil distillation capacity of 547,000 barrels per calendar day. During the year, Amoco increased its Whiting refinery capacity by 45,000 barrels per day and Gladieux increased its Fort Wayne refinery capacity by 3,000 barrels per day. Mobil Oil Corp. suspended operation of its 47,000-barrel-per-day refinery at East Chicago, and the 4,300-barrel-per-day refinery at Princeton was reopened by a new owner—Crystal-Princeton Refining Co. The seven operating refineries and their capacities at yearend are as follows in barrels per calendar day: American Oil Co., 360,000 and Atlantic Richfield Co., 126,000 both in Lake County; Rock Island Refining Corp., 29,500 in Marion County; Indiana Farm Bureau Coop. Association, Inc., 17,500 in Posey County; Laketon Asphalt Refining, Inc., 8,500 in Wabash County; Gladieux Refining, Inc., 8,500 in Allen County; and Crystal-Princeton Refining Co., 4,300 in Gibson County.

The Whiting refinery with its crude distillation capacity increased 22% to 360,000 barrels per day became the largest refinery in the Amoco Oil Co. system.

METALS

Aluminum.—The Aluminum Company of America (Alcoa) produced aluminum ingot and thin-gage aluminum sheet at its smelter and fabricating operations in Warrick County near Evansville. Alumina was barged to the smelter from Mobile, Ala., and Point Comfort, Tex. Ingot production increased 3% in quantity and 17% in value. Ingot capacity was increased by 25% with the installation of an Alcoa-patented casting system. The system permits molten aluminum to be cast continuously and sawed into 30-foot-long, 15-ton ingots for rolling into thin-gage sheet from which containers are fabricated. The company also expanded aluminum scrap-handling capacity at its Warrick operations to 18 million pounds per month. Alcoa-operated reclamation centers and cooperative collection programs shipped 34 million pounds of all-aluminum cans to Warrick for remelting, compared with 12 million pounds in 1973. Various energy conservation programs were initiated, and operational testing began on a new process developed by Alcoa Laboratories. Called the Alcoa Thermopure Process, it uses waste heat to purify waste water and recovers contaminants which can be reused or burned as fuel.

Pig Iron and Steel.—Inland Steel Co., United States Steel Corp., and Youngstown Sheet and Tube Co. each produced pig iron and steel in Lake County and Bethlehem Steel Corp. produced pig iron and steel in Porter County. The Lake and Porter County plants in northwest Indiana along with iron and steelmaking facilities in adjacent Cook County, Ill. make the southern Lake Michigan area the largest iron and steelmaking center in the world.

Pig iron production in Indiana was 17,001,000 tons; a decrease of 127,000 tons or 1%. The number of blast furnaces in operation decreased from 25 at the end of October to 18 at the end of December reflecting a rapid yearend decline in iron and steel industry activity in response to a general downturn in the national economy.

Pig iron shipments totaled 17,022,000 tons valued at $1,991,438,000 compared with the previous year's shipments of 17,078,000 tons valued at $1,261,281,000. The average value of pig iron increased 58%, from $73.85 per ton in 1973 to $116.99 per ton in 1974.

Steel output reported by the American Iron and Steel Institute was 23,088,000 tons, 23% less than Indiana's 1973 production. Steel was produced in basic oxygen furnace (BOF) shops by each of the four primary producers and in open-hearth furnaces by all but Bethlehem Steel Corp. Steel was also produced from scrap in electric furnaces.

U.S. Steel Corp.'s No. 13 blast furnace at the Gary Works began operation in mid-1974. One of the industry's largest and most advanced ironmaking units, the furnace is designed to produce 8,000 tons

[4] Work cited in footnote 3.

of molten iron daily. Birds nesting on power lines were believed to have triggered a short circuit at an electrical substation supplying power to the Gary Works. The power failure caused significant damage to furnaces and milling equipment and disrupted production schedules during late August and September. At yearend, the 10-furnace No. 4 Open Hearth Shop was shut down, thus marking the end of open-hearth steel production at the Gary Works.

Inland Steel Co. announced plans for a $1 billion expansion program to increase annual steelmaking capacity at its Indiana Harbor Works by 1.8 million tons by 1980, an increase of nearly 25% over the 1974 level. The expansion plans call for a new blast furnace with an initial capacity of 7,000 tons per day, a coke oven battery with daily capacity of 3,000 tons, a second slab casting machine and a 160-inch plate mill. The expansion also calls for major increases in the firm's coal mine operations in Illinois and iron ore production facilities in Minnesota. In August, a second BOF shop was placed in production. Equipped with twin 210-ton furnaces with an annual steelmaking capacity of 2.2 million tons, the new BOF shop replaced the No. 2 Open Hearth Shop which was retired after 58 years of service.

In August, Midwest Steel Division of National Steel Corp. at Portage processed 124,840 tons of steel on its 80-inch continuous pickle line, a world's monthly production record for this type of facility.

Other Metals.—Antimonial lead was recovered by United States Smelting Lead Refinery, Inc., a division of UV Industries, Inc. at its electrolytic refinery in Lake County.

Table 15.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasive Stone: Hindostan Whetstone Co.	Box 501 Bedford, Ind. 47421	Quarry, plant --	Orange.
Cement:			
Lehigh Portland Cement Co.[1 2]	718 Hamilton St. Allentown, Pa. 18105	Plant ----------	Lawrence.
Lone Star Industries Inc.[2] -	One Greenwich Plaza Greenwich, Conn. 06830	---- do --------	Putnam.
Louisville Cement Co.[1 2] --	501 South 2nd St. Louisville, Ky. 40202	---- do --------	Cass, Clark.
United States Steel Corp.[3] -	600 Grant St. Pittsburgh, Pa. 15230	---- do --------	Lake.
Clays:			
American Brick Co -------	6558 West Fullerton Ave. Chicago, Ill. 60635	Pit, plant ------	Do.
General Shale Products Corp.	P.O. Box 96 Mooresville, Ind. 46158	---- do --------	Morgan.
Hydraulic-Press Brick Co -	705 Olive St. St. Louis, Mo. 63101	---- do --------	Do.
The Krick-Tyndall Co ------	Box 450 Findlay, Ohio 45840	---- do --------	Adams.
Log Cabin Coal Co --------	304 South Depot St. Brazil, Ind. 47834	Pits ----------	Clay.
Mineral Resources, Inc ----	7701 Forsyth Blvd. St. Louis, Mo. 63105	Pit ----------	Martin.
S. L. Turner Coal and Clay Co., Inc.	Box 337 Carbon, Ind. 47837	Pit ----------	Parke.
Coal (bituminous):			
Amax Coal Co ----------	430 Big Four Bldg. Indianapolis, Ind. 46225	Strip and underground mines, plant.	Clay, Pike, Sullivan, Warrick.
Old Ben Coal Co ----------	10 South Riverside Plaza Chicago, Ill. 60606	Strip mine ------	Pike.
Peabody Coal Co ---------	301 North Memorial Dr. St. Louis, Mo. 63102	Strip mine, plant.	Green, Sullivan, Vermillion, Warrick.
Coke:			
Citizens Gas & Coke Utility	2020 North Meridian Indianapolis, Ind. 46209	Plant ----------	Marion.
Indiana Gas & Chemical Corp.	1341 Hulman St. Terre Haute, Ind. 47802	---- do --------	Vigo.
Inland Steel Co ----------	3210 Watling St. East Chicago, Ind. 46312	---- do --------	Lake.
The Youngstown Sheet & Tube Co.	Box 900 Youngstown, Ohio 44501	---- do --------	Do.

See footnotes at end of table.

Table 15.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Gypsum:			
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	Underground mine, plant.	Martin.
United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	---- do	Do.
Lime: Marblehead Lime Co	300 West Washington St. Chicago, Ill. 60606	Plant	Lake.
Peat:			
Herb Felger Peat Moss and Black Dirt.	9912 Valantine Rd. Fort Wayne, Ind. 46808	Bog, plant	Allen.
Millburn Peat Co., Inc	Box 297 Otterbein, Ind. 47970	---- do	Warren.
Organic Products Co	225 South Nichols Ave. Apt. 8 Muncie, Ind. 47303	---- do	Delaware.
Ralph Shewman	Rt. 1, Akron, Ind. 46910	---- do	Fulton.
Perlite, expanded:			
Airlite Processing Corp	P.O. Scottsburg Vienna, Ind. 47170	Plant	Tippecanoe.
Chemrock Corp	End of Osage St. Nashville, Tenn. 37208	---- do	Scott.
Grefco, Inc	2111 Enco Drive Oakbrook, Ill. 60521	---- do	Montgomery.
Petroleum refineries:			
American Oil Co.[4]	2400 New York Ave., Box 710 Whiting, Ind. 46394	Refinery	Lake.
Atlantic Richfield Co.[4]	3500 Indianapolis Blvd. East Chicago, Ind. 46312	---- do	Do.
Mobil Oil Corp	3821 Indianapolis Blvd. East Chicago, Ind. 46312	---- do	Do.
Rock Island Refining Corp	P.O. Box 68007 Indianapolis, Ind. 46228	Refinery	Marion.
Roofing granules: H. B. Reed & Co., Inc.	8149 Kennedy Ave. Highland, Ind. 46322	Plants	Lake.
Sand and gravel:			
American Aggregates Corp.[2]	Garst Ave. at Ave. B Greenville, Ohio 45331	Pits, plants	Hamilton, Marion, Wayne.
Hilltop Concrete Corp	Box 11056 Cincinnati, Ohio 45211	---- do	Switzerland.
Irving Materials, Inc.[2]	Box 369 Greenfield, Ind. 46140	---- do	Hamilton, Henry.
Martin Marietta Corp.[2]	11800 Rockville Pike Rockville, Md. 20582	---- do	Hamilton, Marion, Shelby, Vermillion, Vigo.
Nonferrous smelters and refineries:			
Aluminum Company of America.	Newburgh, Ind. 47630	Smelter	Warrick.
American Smelting & Refining Co.	2230 Indianapolis Blvd. Whiting, Ind. 46394	Plant	Lake.
NL Industries, Inc	Beech Grove, Ind. 46107	---- do	Marion.
United States Smelting Lead Refinery, Inc.	5300 Kennedy Ave. East Chicago, Ind. 46312	---- do	Lake.
Stone:			
France Stone Co	Box 1928 Toledo, Ohio 43603	Quarries	Allen, Putnam.
Medusa Corp.[5]	Box 5668 Cleveland, Ohio 44101	Quarries, plants.	Pulaski, White.
Mulzer Crushed Stone Co	Box 248 Tell City, Ind. 47586	Quarries, mine, plants.	Crawford, Perry.
Ralph Rogers & Co., Inc	Box 899 Bloomington, Ind. 47401	---- do	Lawrence, Newton.

[1] Also clays.
[2] Also stone.
[3] Also coke.
[4] Also recovered sulfur.
[5] Also sand and gravel.

The Mineral Industry of Iowa

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey of Iowa for collecting information on all minerals except fuels.

By Joseph C. Arundale,[1] Brinton C. Brown,[2] and Fred Dorheim [3]

Iowa's mineral production value increased in 1974 to reach an alltime high of about $177 million, surpassing the 1973 record by more than 11%. Although tonnage output of most commodities decreased slightly, total value of each commodity except clay increased over that of 1973.

Nonmetallic minerals dominated Iowa's mineral production, accounting for 97% of total value. Coal output was down slightly, but value rose.

[1] Former State Liaison Officer, Bureau of Mines Rolla, Mo.
[2] Former mining engineer, Division of Nonmetallic Minerals.
[3] Geologist, Iowa Geological Survey, Iowa City, Iowa.

Table 1.—Mineral production in Iowa [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Masonry ---- thousand short tons	68	$2,351	65	$2,660
Portland ---- do	2,688	59,574	2,424	64,156
Clays ---- do	967	2,028	960	1,869
Coal (bituminous) ---- do	601	3,279	590	4,591
Gem stones	NA	W	NA	W
Gypsum ---- thousand short tons	1,470	6,324	1,397	7,142
Sand and gravel ---- do	19,950	25,541	17,091	26,104
Stone ---- do	31,541	56,918	32,342	66,119
Value of items that cannot be disclosed: Other nonmetals and values indicated by symbol W	XX	2,785	XX	4,079
Total	XX	158,800	XX	176,720
Total 1967 constant dollars	XX	116,416	XX	p 84,508

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in Iowa, by county

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adair	W	W	Stone.
Adams	W	W	Do.
Allamakee	$328	$904	Stone, sand and gravel.
Appanoose	W	1,480	Stone, clays.
Audubon	W	W	Sand and gravel.
Benton	W	W	Stone, sand and gravel.
Black Hawk	W	W	Do.
Boone	W	619	Sand and gravel.
Bremer	386	W	Stone, sand and gravel.
Buchanan	W	656	Do.
Buena Vista	153	W	Sand and gravel.
Butler	W	W	Stone, sand and gravel.
Calhoun	--	80	Sand and gravel.
Carroll	W	111	Do.
Cass	W	W	Stone.
Cedar	W	510	Stone, sand and gravel.
Cerro Gordo	33,165	37,056	Cement, stone, clays, sand and gravel.
Cherokee	558	407	Sand and gravel.
Chickasaw	W	W	Stone, sand and gravel.
Clarke	W	W	Stone.
Clay	191	200	Sand and gravel.
Clayton	1,475	1,573	Sand and gravel, stone.
Clinton	W	W	Stone, sand and gravel.
Crawford	W	W	Sand and gravel.
Dallas	W	W	Sand and gravel, clays, stone.
Davis	W	W	Stone.
Decatur	W	W	Do.
Delaware	W	675	Stone, sand and gravel.
Des Moines	3,363	3,992	Gypsum, stone, sand and gravel.
Dickinson	241	266	Sand and gravel.
Dubuque	W	1,230	Stone, sand and gravel.
Emmet	15	731	Sand and gravel.
Fayette	W	1,029	Stone, sand and gravel.
Floyd	W	653	Stone, sand and gravel, clays.
Franklin	W	959	Do.
Fremont	W	W	Stone.
Greene	W	434	Sand and gravel.
Grundy	W	W	Stone, sand and gravel.
Guthrie	W	99	Sand and gravel.
Hamilton	W	W	Stone, sand and gravel.
Hancock	W	W	Sand and gravel, stone.
Hardin	W	W	Stone, sand and gravel.
Harrison	926	972	Do.
Henry	W	421	Do.
Howard	227	410	Stone.
Humboldt	W	W	Stone, sand and gravel.
Ida	--	31	Sand and gravel.
Iowa	W	W	Do.
Jackson	477	526	Stone, sand and gravel.
Jasper	W	W	Sand and gravel, stone.
Jefferson	W	W	Stone.
Johnson	W	2,013	Stone, sand and gravel.
Jones	2,502	2,923	Do.
Keokuk	W	W	Stone, clays.
Kossuth	215	121	Sand and gravel.
Lee	778	W	Stone, sand and gravel.
Linn	W	3,774	Do.
Louisa	W	W	Stone.
Lucas	W	W	Coal.
Lyon	350	703	Sand and gravel.
Madison	W	5,228	Stone, clays.
Mahaska	1,499	W	Coal, stone, sand and gravel.
Marion	1,511	1,772	Stone, coal, sand and gravel, gypsum.
Marshall	W	W	Stone, sand and gravel.
Mills	W	W	Stone.
Mitchell	836	W	Stone, sand and gravel.
Monona	166	86	Sand and gravel.
Monroe	W	W	Coal, stone.
Montgomery	W	W	Stone.
Muscatine	W	W	Stone, sand and gravel.
O'Brien	236	188	Sand and gravel.
Osceola	W	W	Do.
Page	W	W	Stone, sand and gravel.
Palo Alto	W	W	Sand and gravel.
Plymouth	733	600	Do.
Pocahontas	W	W	Stone, sand and gravel.
Polk	21,247	23,505	Cement, sand and gravel, clays.

See footnotes at end of table.

Table 2.—Value of mineral production in Iowa, by county—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Pottawattamie	W	W	Stone, sand and gravel.
Poweshiek	W	W	Stone.
Ringgold	W	--	
Sac	W	$841	Sand and gravel.
Scott	$19,578	21,857	Cement, stone, lime, clays.
Shelby	W	W	Sand and gravel.
Sioux	1,246	999	Do.
Story	1,300	1,431	Sand and gravel, stone, clays.
Tama	W	W	Sand and gravel.
Taylor	W	W	Stone.
Union	W	W	Do.
Van Buren	W	1,279	Stone, sand and gravel.
Wapello	W	977	Coal, sand and gravel, clays, stone.
Warren	W	W	Sand and gravel, clays.
Washington	W	W	Stone.
Wayne	288	W	Do.
Webster	6,132	7,053	Gypsum, stone, sand and gravel, clays.
Winnebago	W	W	Peat, sand and gravel.
Winneshiek	1,069	1,481	Stone, sand and gravel.
Woodbury	190	223	Sand and gravel, clays.
Worth	W	W	Stone, sand and gravel.
Wright	W	322	Sand and gravel.
Undistributed [1]	57,420	43,319	
Total [2]	158,800	176,720	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes some sand and gravel (1973) and stone that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[2] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Iowa business activity

		1973	1974 [p]	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	1,294.0	NA	NA
Unemployment	do	37.0	NA	NA
Employment:				
Manufacturing	do	240.2	248.4	+3.4
Construction	do	45.0	48.9	+8.7
Mining	do	2.9	3.0	+3.4
Transportation and public utilities	do	54.8	55.7	+1.6
Finance, insurance, and real estate	do	45.5	46.7	+2.6
Wholesale and retail trade	do	238.0	241.3	+1.4
Services	do	165.2	169.5	+2.6
Government	do	183.6	185.3	+.9
Personal income:				
Total	millions	$15,308	$15,137	−1.1
Per capita		$5,347	$5,302	−.8
Construction activity:				
Value of nonresidential construction	millions	$215.9	$187.5	−13.2
New housing units authorized		11,656	11,822	+1.4
State highway commission contracts awarded	millions	$118.5	$128.0	+8.0
Portland cement shipments to and within Iowa	thousand short tons	1,744	1,763	+1.1
Mineral production value	millions	$158.8	$176.7	+11.3

[p] Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and U.S. Bureau of Mines.

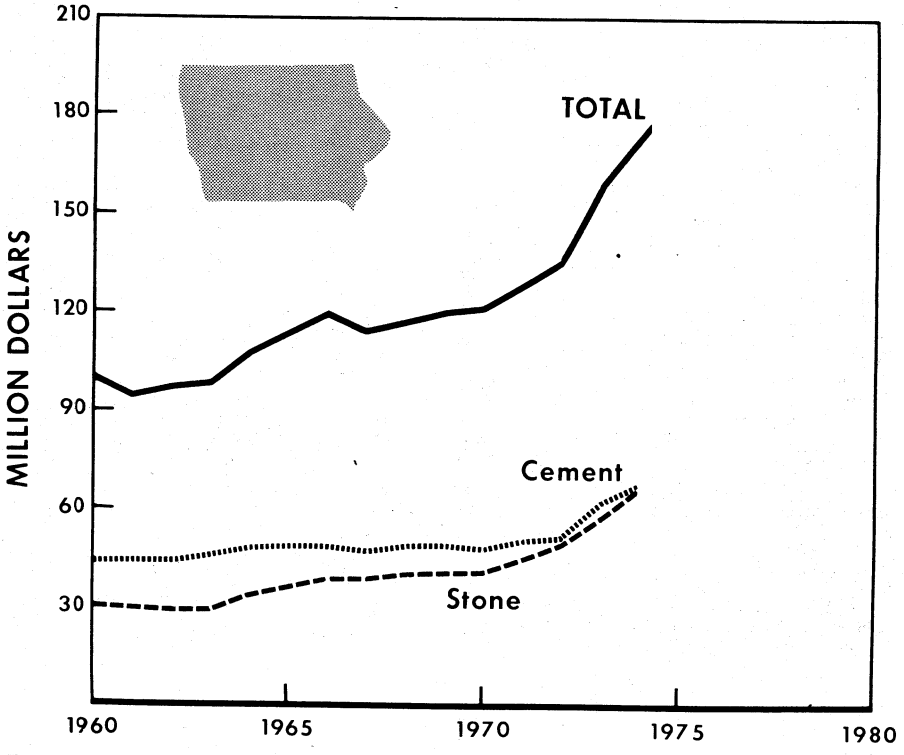

Figure 1.—Value of cement, and stone, and total value of mineral production in Iowa.

Legislation and Government Programs.—Establishment of an Energy Policy Council, a legislative proposal by the Governor, was approved by the Iowa General Assembly. Although the Governor had originally requested authority to establish, in addition, a new Department of Energy Management, the legislature approved only a temporary Energy Policy Council using borrowed employees during its 3-year lifespan. The bill gave the council broad powers during an energy emergency to limit the hours of government agencies, business firms, and other institutions. It established a system to allocate available energy and fuels, and to restrict and control the use of vehicles. The Council will monitor energy use, project future needs, determine the economic and environmental impact of meeting these needs, and evaluate alternative energy sources and uses. It will assemble energy information, using subpoenas if necessary, provide quarterly reports to the Governor and legislature, propose legislation, conduct education programs, and allocate State-owned energy supplies.

The Energy Policy Council announced that it would decide on the future of nuclear power generation in the State. An initial report of the Council's staff on the question of a nuclear moratorium was reviewed by the Council. The report made no specific recommendations on nuclear power in Iowa, but did point out that Iowa's short-term energy needs would have to be filled either by nuclear power or by coal generating plants. The Council was also told that even if the State pressed for zero energy growth, as proposed by the council in an earlier report on the State's energy needs, the need to replace old powerplants will necessitate considering the nuclear issue. Opponents of nuclear power told the Council that both economic and safety considerations made nuclear power impractical and potentially dangerous. The Iowa Utilities Association said that utilities are required to make extensive safety studies before they build a nuclear plant and that nuclear power generation is cheaper than coal-fired generation.

A bill to give industry a property tax break for installing federally ordered pollution-control facilities after September 23 was passed by the Iowa Legislature and signed into law. This law provided a 10-year exemption from property tax for equipment and property improvements designed primarily to prevent or abate air or water pollution. Backers contended that most States exempt pollution control equipment from taxation and that Iowa industry would be placed at a competitive disadvantage. Opponents argued that industries should pay for their own pollution control instead of passing the cost on to other taxpayers. The Department of Environmental Quality drew up two sets of rules—for air and water pollution—to implement the act. Industry had until January 10 to file for the exemptions. Officials of the Department of Environmental Quality said hundreds of industries could benefit from the legislation. The Governor, who previously had questioned the bill because "certain elements of society might be given an undue advantage..," said he intended to establish a research group to determine what changes or modifications in the law, if any, should be made.

Legislation that would eventually allow the State to prevent certain developments on "prime farm land" and other land of "critical concern" passed the Iowa House. The measure—called by some legislators "the most important bill ever to be considered"—would create a 13-member State land-use policy commission, and commissions on the county level. The bill also would establish statewide criteria for land planning and provide for formulation of a "State land-use plan," which would be reviewed by the legislature in 1976 before taking effect. The bill was being considered by the Senate.

The Governor told a newly created Iowa Task Force on Energy Education and Conservation that huge energy problems confront Iowa, the Nation, and the world and it will take a "vast conservation effort to solve them." The task force was charged with getting accurate information about the energy situation to the public and educating it on how to cut down on energy waste.

Governor Ray and State Geologist Dr. Samuel J. Tuthill were named to the Natural Resources and Environmental Management Committee of the National Governors Conference. The Committee is charged with developing energy, natural resource, and environmental policy for the Governors Conference. Dr. Tuthill, the Governor's Science Adviser and Iowa State Geologist since 1969, resigned that position effective April 1 to become Science Adviser on Energy to the chairman of the President's Energy Council.

Employment.—The energy crisis was reported as beginning to take its toll of jobs and wages as the State Employment Service said "significant layoffs attributed to the crisis were felt around the State." A trucker's strike sparked violence, shipping problems, and layoffs in other industries. A procedure for monitoring unemployment attributable to the 1974 coal strike was set up by the Employment Service Division of the Iowa Employment Security Commission.

Late in 1974, the Aluminum Co. of America (Alcoa) reduced its work force by 200 workers at its Davenport Works (leaving about 3,000 employed) because of a "downward trend in business conditions."

Energy.—The "energy crisis" of 1973 continued to plague Iowa into 1974. Armed with Federal allocation regulations that they helped formulate, Iowa's officials were striving to control the State's critical and varied energy problems.

Gasoline dealers protested the 1-cent increase permitted by the Federal Energy Office (FEO) as "blatant tokenism" and threatened shutdowns. The Internal Revenue Service was ordering many Iowa firms to roll back fuel prices or refund overcharges. Revenue from motor vehicle fuel taxes was down nearly 20% from 1973, threatening to crimp Iowa's roadbuilding program. Rural areas were reportedly hard hit by rising propane prices. FEO announced that it was reducing fuel allocation by 2% in Iowa. All this caused increased inconveniences and heightened concern for the fuel outlook when farmers started back into the fields in the spring of 1974.

By late 1974 refineries were delivering more gasoline in Iowa than in the same months of 1973, but growth in demand eroded much of the benefit. Estimates showed there were about 8% more vehicles on Iowa highways and agricultural planting was up 22%; the State Allocation Office said that, "With all that growth,

only conservation has gotten us by." At yearend, Iowa's Energy Council director was predicting that the agribusiness in the State would have few problems with fuel supplies in the winter of 1974–75. Agriculture uses about 5% of the energy utilized in Iowa, and the outlook for petroleum products was better than it had been in previous months.

Iowa Power & Light Co. (IPL) warned large users of natural gas that they should begin thinking of converting to electrical power by 1978. The suggestion was made because Northern Natural Gas Co., which supplies natural gas to IPL and other utilities in Iowa, has told the Federal Power Commission (FPC) it will have no natural gas for sale to large-volume interruptible customers in 1978. IPL officials said they felt they had "a responsibility to tell our customers what Northern had filed," but they viewed the figures with "skepticism," calling the predictions "pessimistic" and "unduly bleak." However, officials of IPL said that if all interruptible customers switch to electric power, IPL might not be able to meet the demand. Customers were urged to start seeking alternative fuel supplies, the IPL suggested that some of the large-volume customers consider joining the utility in building a storage facility that would hold up to a year's supply of fuel oil.

With both the Federal and State governments moving toward large-scale energy conservation measures, Iowa motorists were told by the Iowa Gasoline Dealers Association to expect difficulty finding gasoline. The dealers met to devise a master plan to cope with an allocation program that they expected to hit the State. The plan provided that dealers throughout the State balance their working hours and days of service so that no area of Iowa would be without an open pump. The dealers said that motorists would not find many gas stations open at night or on weekends.

Governor Ray and his top energy advisers met in Washington, D.C., with Federal Energy Administration officials to push a six-point energy policy: "(1) Reduce level of foreign crude oil imports; (2) stabilize the investment climate in this country; (3) strive to create a national energy policy that the people believe in; (4) make energy available to people in low and middle incomes at a price they can afford; (5) use fossil fuels to the best possible purposes, such as natural gas for home heating rather than electrical generation; and (6) emphasize research and development on new energy sources but don't focus today's policies on them." The Governor also registered his objection to increasing gasoline taxes to drive down consumption.

The Governor protested proposed new fuel regulations after his advisers informed him of unacceptable aspects of the draft regulations. Several "Iowa suggestions" were included in the redrafting of the Federal energy regulations: The addition of home heating to the priority list, the adoption of a modified "Iowa plan" for fuel oil allocation by the States, and the shelving of a plan to require local boards to handle emergency shortages. The "Iowa plan" for fuel allocation permitted a State to receive a set-aside supply of oil and to administer its own program for handling emergencies.

The Governor was pressing for development of Iowa's coal resources in an effort to hold down electric rates, find an alternate for natural gas, and improve Iowa's economy. He included in his legislative program for 1974 a proposal by the Iowa State Geologist, involving State purchase of a coal reserve, developing an experimental coal mine, research on coal extraction and mined-land reclamation, and coal beneficiation. The Governor likened the project to "a research farm for miners."

In response to the energy shortage and hopes by State government that Iowa coal can be increasingly utilized, the Iowa Geological Survey (IGS) initiated a project to determine the character, extent, and quantity of coal in the State. Coal was found in seven of the first eight holes drilled in southeast Iowa, but not enough was yet known to reach conclusions. As part of a national program, the Federal Bureau of Mines contracted with IGS to survey the strippable coal reserves in five selected south-central Iowa counties. Tonnage calculations were to be made by staff of IGS and graduate students from University of Iowa.

A member of the Iowa Legislative Council, which consists of key members of the legislature and is its executive arm, suggested that the council consider using solar energy for heating and cooling at least part of the present and proposed expansion of the capitol complex in Des

Moines. The request was made after the chairman of the Capitol Planning Commission told the council that the commission had been notified that natural gas will not be available for the capitol complex after 1980.

Northern Natural Gas Co. announced plans to build a $20 million liquefied natural gas (LNG) plant and storage unit near Ventura. Construction was expected to commence in the spring of 1975, with the plant ready for service in the 1977–78 heating season. The plant, with a storage capacity of 616,000 barrels of LNG, would liquefy gas from April to October, and from November to March would vaporize gas for transmission to utility firms in Iowa and other states.

Iowa-Illinois Gas and Electric Co. announced it was increasing natural gas rates to 182,000 customers because of a 15% rise in rates charged by its supplier, Natural Gas Pipeline Co. of America. The rate increase was estimated to cost the average residential heating customer about $1.50 per month more, averaged over a 12-month period. Rate schedules approved by the Iowa State Commerce Commission permit the utility to pass on the increased cost of gas to its customers.

An FPC decision to cut natural gas supplies of Iowa fertilizer plants was called "frightening." The Iowa Secretary of Agriculture called on the Federal Government to channel more natural gas to the manufacture of nitrogen. At yearend, Iowa farmers were facing a severe shortage of nitrogen fertilizer. Iowa farmers indicated their intentions to plant 13 million acres of corn in 1975, the most since 1960. The Iowa Crop and Livestock Reporting Service reported that only 91% of Iowa's 11.7 million acres of corn harvested last year had been fertilized, compared with 94% the previous year. The average Iowa cornfield received about 102 pounds of nitrogen, 62 pounds of phosphate, and 64 pounds of potash per acre in 1974, compared with 109 pounds of nitrogen, 60 pounds of phosphate, and 55 pounds of potash in 1973. The report showed that only 11% of Iowa's 7 million acres of soybeans were fertilized in 1974, compared with 16% in 1973.

With farmers throughout Iowa reporting shortages and soaring prices of fertilizers, the Iowa Senate approved a resolution to send a delegation to Washington to complain about the fertilizer situation. The resolution was defeated in the House by opponents who said it would "accomplish nothing that couldn't be handled by the Iowa congressional delegation." The Senate summarily passed another resolution that did not require House approval.

Garner, Iowa, was expected to be the marketing end of a new nitrogen products pipeline from Alberta Province, Canada, where the "world's largest nitrogen fertilizer complex" was planned near Calgary. Announcement of the $400 million project was made by Farmland Industries, Alberta Ammonia, Ltd., and Western National Gas, Ltd. Capacity of the 1,200-mile pipeline was expected to be about 1.5 million tons of nitrogen products annually.

The State's new Energy Policy Council began meeting on a regular basis; its first meeting was an orientation to consider Iowa's energy distribution system and the State's energy data bank, and a discussion of the State's energy needs.

The Energy Policy Council began considering the best ways to spend the $3 million subsidy appropriated by the last session of the legislature. The subsidy was deemed necessary to improve the State's transportation system to an acceptable standard and also as an energy conservation effort. The 1974 program was seen as the first year of a continuing State program.

According to statistics gathered by the Iowa Geological Survey, the use of primary energy by schools, hospitals, farms, and industry in Iowa did not even come close to the quantity used by Iowans to run their cars and heat their homes. This and other surprising information was gathered by the survey—the first time such data had been compiled for Iowa—and was contained in a report titled "Energy Facts for Iowa."

Iowa State University at Ames proposed to its regents that the Institute for Atomic Research be broadened in scope to include all areas of energy research in a new Energy and Minerals Resources Research Institute. The new institute was proposed as a mechanism to bring together all the disciplines that can contribute to solving the State's energy problems.

Another major coal-fired electric-generating plant was planned for central Iowa by Iowa Southern Utilities Co. Company officials said the plant, to be built near

Ottumwa at a cost approaching $500 million, would begin operation in 1981 and generate more than 700,000 kilowatts.

The question as to whether Iowa should prohibit the construction of any more nuclear powerplants in the State was debated in public hearings on a proposal to declare a 5-year moratorium on such plants. Iowa had only one nuclear plant, but there were two such plants already operating on the State's border rivers and a third one ready to go. In addition, plans were announced for a fourth. In the background of the debate were reports that IPL has been looking for a central Iowa location for another such plant.

Two of Iowa's largest electric power utilities announced the planned construction of a second nuclear powerplant. IPL and Iowa Electric Light & Power Co. had not selected a specific location or the size of the unit, but it was expected to have a generating capacity of about 1 million kilowatts. The intended inservice date was said to be no earlier than March 1983. Iowa Electric completed the Duana Arnold Energy Center near Palo with a 550,000-kilowatt capacity. That plant was tested at 75% of capacity and accredited as a source of power at just over 60% of capacity. The cost of the Palo plant originally was estimated at $107 million, and the final cost was estimated at $241 million.

The chairmen of the Iowa Senate and House Energy Committees proposed a State agency to control the kind of fuel that major new industries in Iowa may be permitted to use. Bills were drafted proposing fuel-choice regulation by the Energy Policy Council. The bills would also give the Council power to require energy-saving features in construction of new private and public buildings and to regulate the location of nuclear powerplants in the State.

Faced with lower consumption of electric power and tight financial markets, Iowa's six major stockholder-owned power utilities were carefully reconsidering their plans for new power facilities. The six utilities had planned to spend more than $1 billion on construction during 1975–80. Those plans were based on two assumptions: One, that the utility companies would be able to raise most of the needed cash in the stock and bond markets; and, two, that Iowans would consume more and more power.

Environment.—After a radiation seminar studied the problem of radioactive waste transportation and burial, the Iowa Solid Waste Disposal Commission began formulating rules for handling such wastes. Iowa was one of the few States without such rules.

The air in Des Moines was cleaner in 1974 than it was 5 years earlier, public health officials said. Particulate matter in the air was only about half what it was in 1970. Only 2 days in 1974 exceeded the EPA recommended carbon monoxide level, compared with 58 days in 1973.

The Iowa Air Quality Commission gave Lehigh Portland Cement Co. until November 1 to finish installing dust-control equipment at its plant at Mason City, but ordered the company to curtail cement production by 20% starting August 15. The commission said no more extensions would be granted. The company was supposed to have completed a $1.5 million pollution control system by April 30, but got the deadline extended because of delays in materials deliveries.

Eleven Iowa limestone quarries entered a "quarry beautification contest" started by the Iowa Limestone Producers Association. The objective of the new contest was to beautify mining sites and reduce criticism of mining activities by environmentalists and others. Photographs were taken of the sites entered in the contest, to be compared with photographs taken of the same sites a year later.

The Iowa Air Quality Commission approved a temporary variance for IPL to burn coal instead of fuel oil in boilers at the utility plant in Des Moines.

Another round of hearings before three Iowa regulating agencies began in the controversy over disposing of heated water from the Quad-Cities nuclear generating station on the Mississippi River near Cordover, Ill. Two years earlier, operators of the plant and Iowa regulatory agencies came to an agreement that allowed the use of two huge diffuser pipes in the bed of the Mississippi River to dispose of hot water while a closed-cycle cooling canal was being built. The utilities operating the plant later asked for an extension of the agreement contending that the heated water had not damaged the river and that operation of the canal would require some 70,000 kilowatts of electric power per year, which would increase the price of electricity to customers.

A variety of organizations—ranging from athletic booster clubs to city police departments—were cashing in on a State program that paid $1 per mile for towing abandoned cars to a central point and $1 per day for storage of the cars until they can be disposed of. The Office of Planning and Programming administered the fund, which was financed by 1% of all license fees. The junk cars were sold to car crushers who paid from $5 to $10 for each junked car.

Corn can be grown on strip-mined land according to initial conclusions of a research project by the University of Iowa Department of Geology. Yield on a 1-acre test plot in Mahaska County equaled the crop average for the county. The project was designed to develop a method that would permit the upper layers of dirt removed in strip mining to be saved and later replaced over the remaining spoils so that the land could once again be used to grow a cash crop such as corn. Fieldwork began at the Hull conservation site (mined-land reclamation) 4 miles west of Oskaloosa. The plot was bulldozed to an almost level condition, and the spoil was then covered with a wedge of dirt ranging from zero to 36 inches in thickness. The idea was to find the minimal depth of dirt that could support a corn crop. Findings indicate that a dirt cover of between 12 and 18 inches is enough to produce a competitive crop yield. Based on 1973 data, the cost of reclaiming strip-mined land to grow corn by using a 12-inch dirt cover would be comparable to the cost of existing methods of restoring stripped land to other production uses, according to the researchers. The economics of such an undertaking are complicated by other variables, such as the price of coal, value of farmland, and cash returns from crops. The final answer on economic feasibility will be determined through large-scale experiments, which the researchers hope to conduct.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Portland cement shipments decreased slightly in quantity but increased in total value Five companies operated 19 kilns at 2 dry-process and 3 wet-process plants; these facilities had a combined annual capacity of about 2¾ million tons. Northwestern States Portland Cement Co. and Lehigh Portland Cement Co. operated dry-process plants near Mason City. Martin Marietta Cement Co. produced cement at Buffalo near Davenport. Marquette Cement Manufacturing Co. and Penn-Dixie Cement Corp. produced cement near West Des Moines. Most of these companies have been modernizing their facilities and installing new-technology environmental control systems and equipment.

Clays.—Output of common clay and shale decreased slightly, as did the total value of clay produced in the State. Twelve companies operated 17 clay and shale mines scattered throughout the State. Five companies produced 75% of the clay and shale from nine pits. Iowa clay was used in most of the standard clay products such as face brick, cement, sewer pipe, and draintile.

Gypsum.—Iowa was the fourth-ranking State in quantity of gypsum produced in 1974. Shipments of crude gypsum totaled about the same as in 1973.

Gypsum was mined by United States Gypsum Co. at an underground mine near Sperry in Des Moines County and by United States Gypsum Co., National Gypsum Co., Georgia-Pacific Corp., and The Celotex Corp., Division of Jim Walter Corp., at four open pit mines near Fort Dodge in Webster County. Each of these companies calcined gypsum at plants near the mine.

Lime.—Although output of lime remained nearly constant, the total value increased significantly. Linwood Stone Products Co. mined limestone near Buffalo in Scott County and produced quicklime and hydrated lime for commercial use.

Sand and Gravel.—Production of sand and gravel was down, but total value increased. Sand and gravel were produced in 75 counties by 228 operators. Sand and gravel producers reported operating 69 stationary plants, 98 portable units, and 52 dredges. Most of the sand and gravel was washed and screened.

Table 4.—Iowa: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	19,950	25,541	7,875	11,868
Gravel			8,202	12,241
Unprocessed: Sand and gravel			819	940
Industrial:				
Sand	W	W	195	1,012
Gravel			--	--
Total	19,950	25,541	17,091	26,084

W Withheld to avoid disclosing individual company confidential data; included with "Construction" (1973).

[1] Value data may not be directly comparable to those in tables 1, 5, and 6 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 5.—Iowa: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	14,355	19,115	3,187	5,287
Highway and bridge construction			895	1,677
Other uses (dams, waterworks, airports, etc.)			170	319
Concrete products (cement blocks, bricks, pipe, etc.)			863	1,510
Bituminous paving (asphalt and tar paving)			3,606	4,300
Roadbase and subbase			1,028	1,621
Unprocessed aggregate			769	924
Fill	1,929	1,597	661	885
Other uses [2]	2,377	3,662	127	247
Industrial sand and gravel	W	W	195	1,012
Total [3]	18,660	24,373	11,501	17,732

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

[2] Includes railroad ballast and miscellaneous (1973).

[3] Data may not add to totals shown because of independent rounding.

Table 6.—Iowa: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	1,155	932	63	76
Highway and bridge construction			1,626	3,167
Other uses (dams, waterworks, airports, etc.)			15	29
Concrete products (cement blocks, bricks, pipe, etc.)			52	99
Bituminous paving (asphalt and tar paving)			1,734	1,934
Roadbase and subbase			2,015	2,998
Unprocessed aggregate			49	15
Fill	2	1	19	29
Other uses	132	234	16	25
Total [2]	1,290	1,168	5,589	8,372

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

[2] Data may not add to totals shown because of independent rounding.

Stone.—Output of stone in Iowa continued to increase in quantity and value. Most of the stone produced was crushed limestone and dolomite. Stone was quarried by 34 companies and 5 municipal highway departments at 341 quarries in 67 counties.

Principal uses for Iowa stone output were as follows: 61% for road base and paving materials; 11% for manufacturing portland cement; 12% for concrete aggregate; 10% for agricultural uses; and 6% for lime, riprap and jetty stone, fill, railroad ballast, rough and dressed architectural dimension stone, and miscellaneous chemical and industrial uses.

Iowa producers of crushed stone expected to be affected by the Iowa Highway Commission's new 5-year plan, which called for only about half as much roadbuilding between 1975 and 1980 as in the last 5 years. However, commissioners and staff engineers have proposed a gasoline tax increase to boost highway construction.

Table 7.—Iowa: Limestone[1] sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974			Type of stone produced in1974
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Allamakee	13	209	219	15	478	860	Crushed and broken.
Benton	2	45	72	2	50	98	Do.
Buchanan	13	382	614	12	315	592	Do.
Butler	7	360	525	6	W	W	Do.
Cerro Gordo	5	W	W	9	2,238	3,620	Do.
Delaware	6	W	W	9	380	567	Do.
Dubuque	10	560	853	15	793	1,222	Dimension and crushed and broken.
Fayette	14	W	W	13	564	951	Crushed and broken.
Floyd	3	W	284	5	253	511	Do.
Franklin	4	164	260	5	211	429	Do.
Fremont	2	181	328	3	W	W	Do.
Howard	9	W	217	8	206	410	Do.
Jackson	7	W	401	5	W	W	Dimension and crushed and broken.
Jasper	1	141	W	1	W	W	Crushed and broken.
Jones	30	W	2,433	29	1,504	2,785	Dimension and crushed and broken.
Keokuk	3	437	W	3	W	W	Crushed and broken.
Linn	8	1,125	2,004	8	1,374	2,768	Do.
Madison	9	2,496	4,987	9	2,131	5,163	Do.
Mahaska	3	292	W	1	W	W	Do.
Mills	3	228	W	2	W	W	Do.
Monroe	1	174	W	1	W	W	Do.
Montgomery	2	378	W	2	W	W	Do.
Scott	7	2,159	3,812	8	2,158	4,111	Do.
Van Buren	5	W	W	5	523	W	Do.
Wayne	1	144	288	1	W	W	Do.
Webster	3	W	W	3	556	W	Do.
Winneshiek	16	565	917	21	769	1,293	Do.
Undistributed[2]	138	21,416	38,570	140	17,839	40,737	
Total[3]	325	31,459	56,785	341	32,342	66,119	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] "Limestone" used generally to include dolomite.

[2] Includes Adair, Adams, Appanoose, Black Hawk, Bremer, Cass, Cedar, Chickasaw, Clarke, Clayton, Clinton, Dallas, Davis, Decatur, Des Moines, Grundy, Hamilton, Hancock, Hardin, Harrison, Henry, Humboldt, Jefferson, Johnson, Lee, Louisa, Marion, Marshall, Mitchell, Muscatine, Page, Pocahontas, Pottawattamie, Poweshiek, Ringgold (1973), Story, Taylor, Union, Wapello, Washington, and Worth Counties and production for which no county breakdown is available.

[3] Data may not add to totals shown because of independent rounding.

Table 8.—Iowa: Limestone and dolomite sold or used by producers, by use
(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Rough stone:				
Irregular shaped stone	1	33	(1)	5
Rubble	4	55	W	W
Flagging	W	W	W	W
Dressed stone:				
Cut stone thousand cubic feet	1	5	1	6
Sawed stone do	W	W	W	W
House stone veneer do	19	70	23	88
Construction	5	124	6	104
Other uses [2]	2	61	7	188
Total (thousand short tons)	13	348	15	391
Crushed and broken:				
Bituminous aggregate	2,075	3,929	1,953	4,328
Concrete aggregate	3,797	8,205	3,929	9,839
Dense graded roadbase stone	4,972	8,882	7,804	14,758
Macadam aggregate	131	239	W	W
Surface treatment aggregate	5,438	9,516	7,602	15,472
Unspecified construction aggregate and roadstone	7,500	12,779	2,249	4,110
Agricultural purposes [3]	2,005	4,991	3,322	8,086
Cement manufacture	3,890	4,767	3,489	5,390
Riprap and jetty stone	277	451	383	721
Railroad ballast	W	W	827	1,290
Other [4]	1,360	2,680	769	1,733
Total [5]	31,445	56,437	32,327	65,728

W Withheld to avoid disclosing individual company confidential data.
[1] Less than ½ unit.
[2] Includes rough blocks, uses not specified, and any use with symbol W in dimension stone.
[3] Includes agricultural limestone, poultry grit, and mineral food.
[4] Includes crushed and broken stone for fill, flux stone, filter stone (1973), lime manufacture, manufactured fine aggregate (stone sand), mineral fillers, extenders, whiting, refractory stone (1973), roofing aggregates, chips and granules, terrazzo and exposed aggregate, uses not specified, and figures where symbol W appears in crushed and broken stone.
[5] Data may not add to totals shown because of independent rounding.

MINERAL FUELS

Coal.—Production of coal held steady, but unit values increased.

In June an appropriation of $3 million was provided by the Iowa Legislature for research on the feasibility of expanding the coal mining industry in the State. A 3-year project was authorized to be supervised by the Energy and Minerals Resources Research Institute at Iowa State University. In the first months of the project, a working administrative structure was set up, liaison to groups in industry and government was established, information channels were developed, and 20 research and demonstration projects were funded. The funds appropriated were to cover work through June 30, 1977. As finally approved, the bill and the appropriated funds supported an effort to provide basic information and to do research on technically sound, economically feasible, and environmentally acceptable methods of locating, mining, reclaiming, beneficiating, marketing, and utilizing Iowa coal that may lead to further development of Iowa's coal resources.

Nearly half the available funds were to be spent on cleaning Iowa coal, including sulfur removal. Other large efforts were planned in strip mining and land reclamation technologies and demonstration projects, exploration, and economic analysis of Iowa's particular coal situation. A portable, moderate-cost "coal refining research facility" was being designed, and large-scale experiments on coal cleaning were expected to commence in 1975. Coal produced from this project was expected to be sold and used in Iowa.

Table 9.—Iowa: Bituminous coal production in 1974, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				Production (thousand short tons)				Value (thousands)
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total	
Lucas	1	--	--	1	W	--	--	W	W
Mahaska	--	3	--	3	--	108	--	108	$924
Marion	--	2	--	2	--	W	--	W	W
Monroe	1	--	--	1	W	--	--	W	1,810
Wapello	--	1	--	1	--	W	--	W	W
Undistributed	--	--	--	--	379	103	--	482	1,857
Total	2	6	--	8	379	211	--	590	4,591

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

The Director of the Iowa State University Energy and Mineral Resources Research Institute made the first annual report to the Iowa Legislature on the Iowa Coal Project. Legislators were told that the researchers were optimistic about the use of Iowa coal, claiming that a large part of Iowa coal could be washed to an acceptable 3% sulfur content and that the surface-mined land could be reclaimed for about 50 cents per ton of coal mined. The report suggested that high transportation costs for western coals may make local coals economic.

METALS

Aluminum.—Aluminum Co. of America (Alcoa) operated a large aluminum rolling mill at Davenport.

Ferroalloys.—Kemco Division of Foote Mineral Co. operated electric arc furnaces at Keokuk to produce ferrosilicon and silvery pig iron.

Molybdenum.—AMAX began constructing a new molybdenum conversion plant near Fort Madison. The facility was expected to be producing high-purity molybdenum compounds in 1975. A new molybdenum concentrate roasting plant for the same location was also being planned.

Table 10.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Lehigh Portland Cement Co.[1]	Young Bldg. 718 Hamilton St. Allentown, Pa. 18105	Plant	Cerro Gordo.
Marquette Cement Manufacturing Co.[1 2]	First American Center Nashville, Tenn. 37238	do	Polk.
Martin Marietta Corp.[1 2 3]	11300 Rockville Pike Rockville, Md. 20852	do	Scott.
Northwestern States Portland Cement Co.[1 2]	12 Second St., NE. Mason City, Iowa 50401	do	Cerro Gordo.
Penn-Dixie Cement Corp.[2]	60 East 42d St. New York, N.Y. 10017	do	Polk.
Clays and shale:			
Carter-Waters Corp	2440 Pennway Kansas City, Mo. 64100	Pits and plants	Appanoose.
Harsco Corp	P.O. Box 556 Ottumwa, Iowa 52501	do	Cerro Gordo, Dallas, Keokuk, Mahaska, Polk, Wapello.
Coal (bituminous):			
Big Ben Coal Co	Route 3 Chariton, Iowa 50049	Underground mine.	Lucas.
Lovilia Coal Co	Route 2 Melrose, Iowa 52569	do	Monroe.
Star Coal Co	802 Lincoln St. Pella, Iowa 50219	Strip mines	Mahaska.
Ferroalloys: Foote Mineral Co.	320 Concert St. Keokuk, Iowa 52632	Plant	Lee.

See footnotes at end of table.

Table 10.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Gypsum:			
The Celotex Corp	1500 North Dale Mabry Tampa, Fla. 33607	Open pit mine and plant.	Webster.
National Gypsum Co.[4]	325 Delaware Ave. Buffalo, N.Y. 14202	do	Do.
United States Gypsum Co.[4]	101 South Wacker Dr. Chicago, Ill. 60606	Open pit and underground mines and plant.	Des Moines and Webster.
Lime: Linwood Stone Products Co.[2]	Route 2 Davenport, Iowa 52804	Plant	Scott.
Peat:			
Eli Colby Co	P.O. Box 248 Lake Mills, Iowa 50450	Bog and plant	Winnebago and Worth.
Colby Pioneer Peat Co	P.O. Box 8 Hanlontown, Iowa 50444	do	Do.
Expanded perlite: Georgia-Pacific Corp.[5]	900 Southwest Fifth Ave. Portland, Oreg. 97204	Plant	Webster.
Sand and gravel:			
L. G. Everist, Inc	302 Paulton Bldg. Sioux Falls, S. Dak. 57102	Pit and plant	Sioux.
G. A. Finley, Inc	Harlan, Iowa 51537	do	Audubon, Crawford, Dallas, Pottawattamie, Sac, Shelby.
Hallett Construction Co.[2]	P.O. Box 13 Boone, Iowa 50036	do	Boone, Cherokee, Franklin, Iowa, Marshall, Osceola, Page, Polk, Sac, Story, Winnebago.
Maudlin Construction Co	P.O. Box 134 Webster City, Iowa 50595	do	Various.
Sankey Sand and Gravel Inc.	Britt, Iowa 50423	do	Hancock.
Van Dusseldorp Sand and Gravel Inc.	P.O. Box 156 Colfax, Iowa 50054	do	Jasper and Marion.
Stone:			
Alpha Crushed Stone Inc	P.O. Box 267 Marion, Iowa 52302	Quarries and plants.	Clinton.
B. L. Anderson, Inc	327 Guaranty Bldg. Cedar Rapids, Iowa 52400	do	Linn and Jones.
Kaser Construction Co	3111 Ingersol Des Moines, Iowa 50312	do	Jasper, Keokuk, Mahaska, Marion, Mills, Montgomery, Poweshiek, Washington.
Medusa Corp.[3]	P.O. Box 5668 Cleveland, Ohio 44101	do	Des Moines, Jefferson, Lee, Van Buren.
The River Products Co	220 Savings & Loan Bldg. Iowa City, Iowa 52240	Quarries, underground mines, plants.	Johnson, Louisa, Washington.
Schildberg Construction Co., Inc.	P.O. Box 358 Greenfield, Iowa 50849	Quarries and plants.	Adair, Adams, Cass, Madison, Pottawattamie, Union.
Welp & McCarten, Inc.[3]	522 South 22d St. Fort Dodge, Iowa 50501	do	Black Hawk, Howard, Humboldt, Webster, Worth.

[1] Also clays.
[2] Also stone.
[3] Also sand and gravel.
[4] Also expanded perlite.
[5] Also gypsum.

The Mineral Industry of Kansas

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the State Geological Survey of Kansas for collecting information on all minerals except fuels.

By William G. Carrico [1] and Pieter Berendsen [2]

Kansas mineral production by value during 1974 reached a record $889.4 million, an increase of 37.6% above the 1973 value of $646.3 million. This increase was largely attributed to price increases. Natural gas liquids and petroleum production value combined accounted for 67% of the total mineral value; petroleum alone contributed 55% to the total. However, decreased quantitative production occurred in most commodity groups. Some of the more important mineral commodities produced in Kansas that decreased in production were natural gas, sand and gravel, stone, cement, and coal.

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Table 1.—Mineral production in Kansas [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Masonry ---- thousand short tons	73	$2,068	64	$2,203
Portland ---- do	2,026	42,172	1,940	46,940
Clays ---- do	1,169	1,490	1,311	1,785
Coal (bituminous) ---- do	1,086	7,979	718	5,463
Helium:				
Crude ---- million cubic feet	1,539	18,468	W	W
High purity ---- do	[2] 416	8,736	[2] 499	11,477
Lime ---- thousand short tons	10	199	28	535
Natural gas ---- million cubic feet	893,118	138,521	886,782	147,206
Natural gas liquids:				
Natural gasoline and cycle products, thousand 42-gallon barrels	5,993	17,685	6,630	24,810
LP gases ---- do	24,463	53,819	24,402	78,818
Petroleum (crude) ---- do	66,227	281,465	61,691	490,984
Salt [3] ---- thousand short tons	1,397	23,460	1,367	27,007
Sand and gravel ---- do	13,261	12,663	11,687	13,388
Stone ---- do	[4] 18,334	[4] 33,601	[4] 17,869	34,869
Value of items that cannot be disclosed: Diatomite (1974), gypsum, salt (brine), pumice, stone (dimension), and values indicated by symbol W	XX	3,973	XX	3,913
Total	XX	646,299	XX	889,398
Total 1967 constant dollars	XX	473,802	XX	[p] 425,206

[p] Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Helium measured at 14.7 pounds per square inch absolute at 70° F.
[3] Excludes salt in brine; included with "Value of items that cannot be disclosed."
[4] Excludes dimension stone; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Kansas, by county [1 2]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Allen	$10,967	$12,938	Cement, stone, clays, natural gas.
Anderson	W	427	Stone.
Atchison	W	W	Do.
Barber	7,029	8,378	Petroleum, natural gas, gypsum, natural gas liquids, sand and gravel.
Barton	14,582	24,780	Petroleum, sand and gravel, clays, natural gas.
Bourbon	W	1,184	Stone, coal.
Butler	W	W	Petroleum, stone.
Chase	171	W	Stone, petroleum, sand and gravel.
Chautauqua	W	W	Stone, natural gas.
Cherokee	W	1,480	Coal, stone, clays, sand and gravel.
Cheyenne	169	174	Sand and gravel.
Clark	W	W	Natural gas, petroleum, sand and gravel.
Clay	W	W	Stone, sand and gravel.
Cloud	W	W	Clays, sand and gravel, stone.
Coffey	824	426	Stone.
Comanche	631	1,089	Natural gas, petroleum, sand and gravel.
Cowley	8,738	16,111	Petroleum, stone, sand and gravel, natural gas.
Crawford	3,642	W	Coal, stone, clay.
Decatur	2,567	4,562	Petroleum, sand and gravel.
Dickinson	369	947	Stone, sand and gravel, petroleum.
Doniphan	W	549	Stone.
Douglas	W	W	Sand and gravel, stone.
Edwards	1,829	2,359	Petroleum, natural gas, sand and gravel.
Elk	W	1,593	Stone, natural gas, sand and gravel.
Ellis	24,067	41,123	Petroleum, sand and gravel, stone.
Ellsworth	34,775	49,255	Natural gas, petroleum, salt, clays, natural gas, sand and gravel.
Finney	W	W	Petroleum, natural gas liquids, sand and gravel.
Ford	W	763	Natural gas liquids, sand and gravel, petroleum, natural gas.
Franklin	W	886	Stone, clays.
Geary	W	W	Stone, sand and gravel.
Gove	2,009	4,172	Petroleum, sand and gravel.
Graham	13,239	W	Do.
Grant	W	W	Natural gas liquids, petroleum, sand and gravel.
Gray	W	W	Sand and gravel.
Greeley	3	3	Do.
Greenwood	W	12,947	Petroleum, stone, sand and gravel.
Hamilton	W	W	Natural gas, sand and gravel, petroleum.
Harper	2,512	3,952	Natural gas liquids, petroleum, natural gas, sand and gravel.
Harvey	1,658	2,623	Petroleum, sand and gravel, natural gas liquids, natural gas.
Haskell	13,251	11,646	Petroleum, natural gas, helium, sand and gravel.
Hodgeman	5,563	9,594	Petroleum, sand and gravel.
Jackson	66	92	Stone, sand and gravel.
Jefferson	575	W	Stone.
Jewell	W	W	Do.
Johnson	W	W	Stone, sand and gravel.
Kearny	805	1,411	Petroleum, natural gas liquids, sand and gravel, natural gas.
Kingman	12,459	20,306	Petroleum, natural gas liquids, natural gas, sand and gravel.
Kiowa	4,061	6,682	Petroleum, natural gas, sand and gravel.
Labette	1,185	W	Stone.
Lane	955	W	Petroleum, sand and gravel.
Leavenworth	W	W	Stone.
Lincoln	W	W	Stone, sand and gravel.
Linn	W	W	Coal, stone, sand and gravel.
Logan	274	W	Petroleum, sand and gravel.
Lyon	884	1,572	Do.
McPherson	6,810	11,884	Petroleum, clays, natural gas, sand and gravel.
Marion	2,322	3,338	Petroleum, stone, natural gas, sand and gravel.
Marshall	1,480	1,414	Gypsum, sand and gravel, stone.
Meade	4,524	5,388	Petroleum, natural gas, sand and gravel.
Miami	596	512	Stone.
Mitchell	2	W	Sand and gravel.
Montgomery	8,562	10,080	Cement, stone, clays.
Morris	1,201	W	Petroleum, stone, sand and gravel.
Morton	22,939	30,838	Petroleum, natural gas, helium, natural gas liquids, sand and gravel.
Nemaha	92	59	Stone, sand and gravel.
Neosho	13,263	13,666	Cement, stone, sand and gravel, clays.
Ness	12,377	22,123	Petroleum, sand and gravel.
Norton	1,263	2,149	Petroleum, sand and gravel, pumice.
Osage	W	W	Stone.
Osborne	165	W	Petroleum.
Ottawa	3	5	Sand and gravel.
Pawnee	3,631	5,376	Petroleum, natural gas, sand and gravel.
Phillips	7,425	13,211	Petroleum, sand and gravel.
Pottawatomie	281	455	Stone, petroleum, sand and gravel.
Pratt	3,264	5,417	Petroleum, natural gas, sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Kansas, by county [1] [2]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Rawlins	$2,056	W	Petroleum, sand and gravel.
Reno	19,806	$25,210	Salt, petroleum, sand and gravel, natural gas.
Republic	104	W	Sand and gravel.
Rice	21,828	32,363	Petroleum, salt, stone, sand and gravel, natural gas.
Riley	W	1,632	Stone, petroleum, sand and gravel.
Rooks	W	25,263	Petroleum, sand and gravel.
Rush	6,514	8,453	Petroleum, helium, natural gas.
Russell	22,762	39,656	Petroleum, sand and gravel, natural gas.
Saline	W	W	Petroleum, sand and gravel.
Scott	7,737	11,888	Natural gas liquids, helium, petroleum, natural gas, sand and gravel.
Sedgwick	9,241	12,766	Petroleum, natural gas liquids, sand and gravel, salt.
Seward	30,828	24,228	Natural gas liquids, petroleum, natural gas, helium, sand and gravel.
Shawnee	W	W	Stone, sand and gravel.
Sheridan	1,702	2,715	Petroleum, sand and gravel.
Sherman	W	W	Lime, petroleum, sand and gravel.
Smith	--	1	Sand and gravel.
Stafford	11,834	21,653	Petroleum, natural gas, sand and gravel.
Stanton	W	W	Petroleum, natural gas.
Stevens	W	3,268	Petroleum, natural gas, sand and gravel.
Sumner	W	10,714	Do.
Thomas	167	296	Petroleum, sand and gravel.
Trego	3,003	5,248	Do.
Wabaunsee	1,729	2,810	Petroleum.
Wallace	W	W	Diatomite, sand and gravel.
Washington	W	W	Sand and gravel, stone.
Wichita	W	W	Sand and gravel.
Wilson	8,357	9,123	Cement, stone, clays, coal.
Woodson	W	--	
Wyandotte	W	16,367	Cement, stone, sand and gravel.
Undistributed [3]	238,631	265,804	
Total [4]	646,299	889,398	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Brown County is not listed because no production was reported.

[2] Values of petroleum and natural gas are based on an average price per barrel and cubic foot for the State.

[3] Includes some sand and gravel (1973), stone, petroleum, and natural gas that cannot be assigned to specific counties and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Kansas business activity

	1973	1974 [p]	Change, percent
Employment and labor force, annual average:			
Total civilian labor force ---- thousands	1,002.1	NA	NA
Unemployment ---- do	31.6	NA	NA
Employment:			
Nonagricultural:			
Construction ---- do	36.1	37.7	+4.4
Mining ---- do	9.7	10.1	+4.1
Manufacturing ---- do	160.7	167.2	+4.0
Services ---- do	118.9	125.8	+5.8
Finance, insurance, and real estate ---- do	34.3	36.4	+6.1
Wholesale and retail trade ---- do	180.2	182.4	+1.2
Transportation and public utilities ---- do	54.5	56.1	+2.9
Government ---- do	166.5	165.9	—.4
Personal income:			
Total ---- millions	$12,088	$12,272	+1.5
Per capita	$5,328	$5,406	+1.5
Construction activity:			
Building permits, total private nonresidential ---- millions	$144.2	$170.4	+18.2
Cement shipments to and within Kansas thousand short tons	1,153	1,175	+1.9
Farm marketing receipts ---- millions	$4,372	NA	NA
Mineral production value ---- do	$646.3	$889.4	+37.6

[p] Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

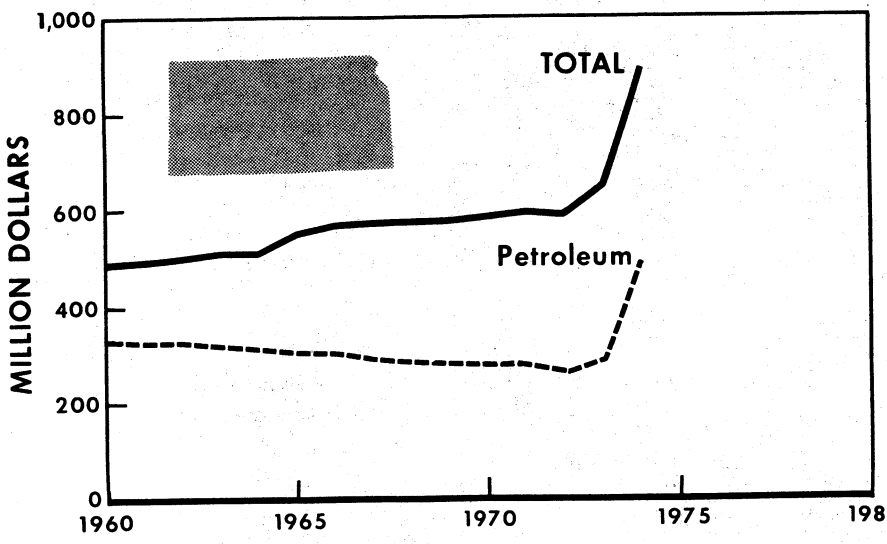

Figure 1.—Value of petroleum and total value of mineral production in Kansas.

Trends and Developments.—Despite a decrease in the total production of crude petroleum, there were indications that the rate of decrease may be slowed temporarily. Price increases for crude petroleum may lead to increased production, and with the anticipated lifting of price controls on domestically produced crude, a modest increase in production is anticipated.

The production of natural gas should remain at a relatively stable level in the near future, owing to anticipated higher prices. The industry contributes 17% to the total value of Kansas mineral production.

Crude helium production slowed to a trickle, owing to Federal Government actions. Helium is a relatively scarce commodity which is cheaply produced as a byproduct of natural gas. Prior to 1973, most of the crude helium produced was stored underground in the Cliffside field, Texas, operated by the Bureau of Mines. During 1974, about 1.2 billion cubic feet of crude helium was extracted from natural gas; 95% of this helium was either vented to the atmosphere or returned to the natural gas stream.

Coal production fell sharply with the closing of the Pittsburg and Midway Coal Mining Co.'s mine 19 in Cherokee County in May 1974. It was the largest coal mine in the State, accounting for about 55% of the total coal output in 1973. Another factor contributing to the low production figure was a 4-week miners' strike in November. Production may increase during the coming years because regional demand for local coal as an energy source undoubtedly will occur. Most energy-consuming industries in Kansas depend upon natural gas, and several manufacturers were forced to curtail operations for a limited time in 1974. Alternative ways to satisfy their fuel requirements are actively sought by management, and one alternative may be to switch to coal.

Contracts awarded by the Kansas Highway Commission for all road systems in 1974 totaled $106.7 million, a drop of $6.4 million below the record set in 1973. This included construction of interstate and primary State highways, country secondary roads, and bridges, as well as maintenance of these facilities. At the end of 1974, almost 96% of the interstate highway system was open to traffic; 17 miles were under construction, and the remaining 20 miles were in the right-of-way acquisition or preliminary-engineering stage. Work on the final 9.4 miles of I–35 east of Emporia was progressing with the opening expected in late 1976 or early 1977. Work con-

tinued on uncompleted interstate sections in the Wichita and Kansas City areas. Under the Federal aid bridge replacement program, 86 bridges on Federal aid secondary roads have been replaced, 19 more than in any other State.

Construction work was started on the Kansas Power and Light Co. coal-fired powerplant 7 miles northwest of St. Marys in Pottawatomie County. When finished, it will consist of four steam-generating units, each having a capacity of 700 megawatts.

The Nuclear Regulatory Commission has not issued a permit for the proposed Wolf Creek Nuclear Power Plant, to be built for the Kansas City Power and Light Co. near Burlington, Kans. Scheduled completion has been delayed for 1 year to 1982. Cost of the project has soared from $550 million in February 1973 to $818 million in late 1974.

To satisfy our energy demands, economical and nonpolluting methods to transport large amounts of low-sulfur coal over long distances are actively being considered. Officials of Energy Transportation, Inc., Fort Collins, Colo., held several meetings in the State to discuss tentative plans for the construction of a 38-inch-diameter coal-carrying pipeline to supply Wyoming coal to White Bluff, Ark. The section of the pipeline cutting diagonally across Kansas from Rawlins County in the northwest to Sumner County in the south-central part of the State would be 275 miles long.

No lead-zinc mining has occurred in Kansas since 1969. Exploration has continued at a modest pace and seemed to have increased appreciably in 1974. The activity centered around Oswego in Labette County, just west of the old Tri-State district.

Employment.—After several years of gradually declining employment in the mining and crude petroleum industries, a noteworthy reversal of the trend took place during 1974. The Employment Security Division of the Kansas Department of Labor reported a total employment in these industries of 10,050 persons, up from 9,700 in 1973. Employment in the crude petroleum area increased to 8,400 persons, compared with 8,000 in 1973. However, almost 100 jobs were lost in the coal mining industry, where the total is down to 290 persons.

Statistics of the Workman's Compensation Commission show 771 injuries in the mining and crude petroleum industries; this compares with 541 injuries during 1973. Nine fatalities occurred during 1974.

Legislation and Government Programs.—The Kansas Institute for Mineral Resource Research completed a study on the feasibility of recovering thin shallow-cover coal seams in flat terrain employing new mining methods with a minimum of damage to the environment. The study was funded by the Ozarks Regional Commission and evaluated three mining methods: Strip mining, auger strip mining, and longwall strip mining. It was concluded that longwall strip mining has the potential of being the most economical method, mainly because of decreased reclamation costs. The Kansas Geological Survey also received a grant from the Federal Bureau of Mines to evaluate the coal reserves of the State.

During 1974, sampling of groundwater was started as part of a cooperative program between the Kansas Geological Survey and the U.S. Geological Survey involving a 5-year study of the baseline chemical quality of irrigation waters in western Kansas. During the first year, samples were collected from Greeley, Wichita, Scott, and Lane Counties and the southern half of Wallace County.

A preliminary study of marketing and distribution systems by the State's petroleum industry was completed by the Kansas Geological Survey. The study was supported by a grant from the Federal Energy Administration.

During 1974, Kansas awarded a 1-year initial grant to the Kansas Geological Survey and two departments at the University of Kansas (chemical and petroleum engineering, and geology). The objectives are to bring existing tertiary oil recovery technology to the independent oil producers. Part of the study will focus on methods and applications to special problems of recovery in Kansas oilfields. The whole program was antitcipated to last from 3 to 5 years. A cooperative program between Cities Service Oil Co. and the Energy Research and Development Administration (ERDA) involving a field demonstration test of micellar-polymer flooding in the El Dorado field of Butler County was initated. The study will last from 4 to 6 years at an estimated cost of $7

million, of which Cities Service Oil Co. will contribute 60%. The purpose of the project is to run comparative field and laboratory tests on two combinations of micellar and polymer fluids, to determine their effectiveness in additional oil recovery as well as this economic feasibility.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Carbon Black.—The Columbian Division of Cities Service Co. decreased production in 1974 by 10.8%; value of the output at the Hickok plant in Grant County increased by 43.9%. Prices at yearend had not kept pace with rapidly escalating costs, most of which were in carbon black feedstocks. Major uses of carbon black are rubber compounding, inks, and paint.

Coal.—Strip mining production in 1973 totaled 1,086,000 short tons, with a total value of $7,979,000 and an average value of $7.35 per short ton. Production for 1974 from seven operating strip mines was 718,000 short tons, with a total value of $5,463,000 and an average value of $7.61 per short ton.

The Mined Land Reclamation Board approved the application of Lamb Coal Co. to reopen the old Dunbar mine in Wilson County. The mining permit requires that the land be restored to its original state after strip mining. The company plans to do core drilling and "pattern" the entire area. Exploratory cuts have disclosed a vein of good-quality coal ranging in thickness from 27 to 34 inches. Lamb Coal Co. expects to employ 20 persons the first few months, with anticipation of about 70 employees after beginning operations. Initial production is estimated at 11,000 tons monthly, with anticipated production in the range of 50,000 tons.

Kansas officials have been consulted on tentative plans to build a 38-inch, 275-mile coal-carrying pipeline across the State. The pipeline running from Wyoming to a new power-generating station near Little Rock, Ark., would carry coal slurry, a mixture of ground coal and water. Construction probably will not start for at least 3 years. Plans for the underground pipeline would include three or four pumping stations in Kansas, which reportedly would deliver about 48 tons of coal per minute.

Helium.—A total of 499 million cubic feet of high-purity helium valued at about $11,477,000 was produced at plants in Morton, Rush, and Scott Counties in 1974. Crude helium production declined significantly, and was produced in Haskell County.

Natural Gas.—Marketed natural gas totaled 886,782 million cubic feet in 1974, compared with 893,118 million cubic feet in 1973. Natural gas value rose to $147,206,000 from $138,521,000 in 1973. Average wellhead value increased from 15.5 cents per thousand to 16.6 cents per thousand.

The quantity of natural gas in million cubic feet delivered to consumers, by type of consumer, for 1974 and 1973 follows: 1974—residential 93,363, commercial 50,194, industrial including refinery fuel and carbon black production 164,768, electric utilities 165,479, and others 3,267; 1973—residential 96,468, commercial 48,902, industrial including refinery fuel and carbon black production 173,549, electric utilities 176,174, and others 3,772.

The American Gas Association (AGA) reported that natural gas reserves totaled 11,705 billion cubic feet at yearend, a decrease of 17 billion cubic feet from 1973 reserves. According to AGA, revisions and extensions totaled 868 billion cubic feet. The ultimate recovery of natural gas as estimated to December 31, 1974, was 33,394 billion cubic feet. Associated dissolved natural gas amounted to 3,337 billion cubic feet and accounted for 10.0% of total ultimate recovery; for nonassociated natural gas the figures were 30,057 billion cubic feet or 90.0%.

Underground natural gas reservoir capacity reported by AGA was 121,232 million cubic feet from 17 reservoirs. Gas in storage on December 31, 1974, was 114,192 million cubic feet.

Natural Gas Liquids.—Production of natural gas liquids including ethane in 1974 was 31,032,000 barrels. Liquid petroleum gas accounted for 20,767,000 barrels, ethane for 3,635,000 barrels, and natural gasoline and cycle products for 6,630,000 barrels. Kansas was the fifth largest producing State and accounted for 5% of the U.S. total.

Total value rose to $103,628,000 from $71,504,000 in 1973. The average price per barrel in 1974 for liquefied petroleum gas and ethane was $3.23, an increase of $1.03 over 1973. The average price of natural gasoline and cycle products increased to $3.74 per barrel; that of plant condensate was $5.88 in 1974.

Koch Industries, Inc., was enlarging its gas liquids plant at Medford, Okla., by approximately 25,000 barrels daily. The company is also expanding the capacity of the pipeline from Medford to Conway, Kans., approximately 30,000 barrels daily by looping the present line. The additional pipeline to Conway, in McPherson County, will be 117 miles long and 8 inches in diameter.

The opening of a propane storage facility in an abandoned salt mine near Little River, in Rice County, will provide a common warehouse, renting storage space to the propane trade. Commercial operation of the venture was not scheduled to begin until early 1975. The facility will boost underground liquefied petroleum gas storage to nearly 40 million barrels.

Proved reserves of natural gas liquids at yearend 1974, as estimated by AGA, totaled 394,419,000 barrels. Nonassociated reserves totaled 386,892 barrels and associated dissolved reserves totaled 7,527,000 barrels. Revisions and extensions added 37,317,000 barrels to reserves, whereas new fields and new reservoirs in old fields added 522,000 barrels. The reserves in 1974 represent an increase of 7,121,000 barrels when compared with reserves totaling 387,298,000 barrels in 1973.

Petroleum.—Production in 1974 of crude oil (including lease condensate) was 61,691,000 barrels, 4,536,000 barrels below the 1973 output, making Kansas the eighth largest producing State. Petroleum value, the largest contributor to the dollar value of mineral production, continued to rise owing largely to price increases. The value of petroleum attained $490,984,000, a 74.4% increase over that of 1973. The average unit value increased from $4.25 to $7.96 per barrel.

The five leading counties and their production in barrels were Ellis 5,132,000, Russell 4,978,000, Rooks 3,173,000, Rice 3,019,000, and Barton 3,077,000. Production from these counties totaled 19,379,000 barrels, or 31% of the total output.

The two leading producing fields with annual production in excess of 1 million barrels were Bemis-Shutts and Hall-Gurney. Combined production represented 6.1% of the State's output.

The estimated proved crude oil reserves as of December 31, 1974 were 395,107,000 barrels according to the American Petroleum Institute, a decrease of 5,982,000 barrels from that of 1973, for a 1.5% decline. New fields and pools added oil reserves of 1,585,000 barrels, compared with 2,464,000 barrels in 1973. Revisions and extensions added 52,615,000 barrels, compared with 11,819,000 barrels in 1973.

Studies at the Kansas Geological Survey [3] show 14,713,000 barrels of the State's 1973 production was recovered from 1,402 enhanced recovery projects. Secondary and tertiary oil recovery operations furnished 22% of 1973 production. The number and types of projects used were 1 inert gas, 1 air-repressuring, 3 fireflood, 330 pressure maintenance, 283 dump flood, and 784 controlled waterflood operations. Production from enhanced recovery projects for 1974 was 13,334,000 barrels, or 22% of the State's total from 1,358 reported enhanced recovery projects. These projects were made up of 1 airflood, 1 fireflood, 366 pressure maintenance, 264 dump flood, and 726 waterflood operations.

[3] Oros, M. O., and D. K. Saile. Enhanced Oil Recovery Operations in Kansas, 1973–74. Kansas Geol. Survey Energy Resources Series 3, 1974.

Table 4.—Kansas: Crude oil production, indicated demand, and stocks in 1974, by month

(Thousand 42-gallon barrels)

Month	Production	Indicated demand	End-of-month stocks originating within Kansas
January	5,127	4,830	6,458
February	4,947	4,789	6,616
March	5,339	5,494	6,461
April	5,304	4,983	6,782
May	5,400	5,633	6,549
June	5,063	5,237	6,375
July	5,302	6,016	5,661
August	5,182	4,702	6,141
September	4,987	5,335	5,793
October	5,185	4,674	6,304
November	4,859	4,916	6,247
December	4,996	5,249	5,994
Total:			
1974	61,691	61,858	XX
1973	66,227	65,670	XX

XX Not applicable.

Table 5.—Kansas: Crude oil production, by county

(Thousand 42-gallon barrels)

County	Production	County	Production
Barber	510	Morton	2,277
Barton	3,077	Ness	2,777
Butler	2,402	Norton	269
Chase	4	Osborne	37
Clark	43	Pawnee	609
Comanche	38	Phillips	1,651
Cowley	1,893	Pottawatomie	16
Decatur	571	Pratt	642
Dickinson	6	Rawlins	426
Edwards	178	Reno	824
Ellis	5,132	Rice	3,019
Ellsworth	958	Riley	90
Finney	1,220	Rooks	3,173
Ford	15	Rush	614
Gove	523	Russell	4,978
Graham	2,792	Saline	190
Grant	87	Scott	119
Greenwood	1,589	Sedgwick	643
Hamilton	2	Seward	585
Harper	204	Sheridan	338
Harvey	311	Sherman	18
Haskell	1,382	Stafford	2,684
Hodgeman	1,202	Stanton	12
Kearny	99	Stevens	318
Kingman	2,096	Sumner	1,309
Kiowa	705	Thomas	21
Lane	378	Trego	646
Logan	67	Wabaunsee	353
Lyon	197	Miscellaneous Eastern Kansas stripper counties	e 2,819
McPherson	1,461		
Marion	359	Total	61,691
Meade	446		
Morris	287		

e Estimated.

Source: State of Kansas Corporation Commission.

Table 6.—Kansas: Crude petroleum production, by field [1]
(Thousand 42-gallon barrels)

Field [2]	1973	1974	Cumulative to Dec. 31, 1974
Bemis-Shutts	2,149	1,933	218,408
Chase-Silica	1,272	1,185	250,429
El Dorado	1,204	1,085	279,932
Hall-Gurney	2,071	1,821	127,244
Kraft-Prusa	917	866	117,824
Trapp	1,466	1,332	207,023
Other fields [3]	57,148	53,469	NA
Total [3]	66,227	61,691	NA

NA Not available.
[1] Fields with annual production in excess of 1 million barrels.
[2] Breakdown for individual fields from the Oil and Gas Journal Annual Forecast and Review.
[3] Bureau of Mines figures.

Drilling Activities.—In 1974, industry drilled a total of 2,690 oil and gas wells, 637 more wells than in 1973. Development wells totaled 1,843, and exploratory wells reached 847; 1,378 resulted in oil or gas recovery, and 1,312 were dry. Drilling activity brought forward 989 new oil wells and 389 gas wells. Approximately 49% of the development oil wells and 19% of the development gas wells were completed as successful producers; dry wells accounted for the remaining 32%. Cowley County ranked first with 132 wells, 99 production and 33 exploratory. Cowley, Ness, Coffey, and Woodson Counties accounted for 16% of the wells drilled.

Footage drilled in 1974 was 7,936,269 feet, 1,163,303 feet more than 1973. Footage drilled in Cowley, Ness, Coffey, and Woodson Counties totaled 1,228,780 feet, or 15% of the footage drilled.

Table 7.—Kansas: Oil and gas well drilling completions, by county

County	Proved field wells			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Allen	60	1	14	--	--	--	75	60,690
Anderson	53	--	2	--	--	5	60	52,679
Atchison	--	--	--	--	--	1	1	1,620
Barber	5	2	7	2	1	6	23	103,182
Barton	29	3	35	3	1	7	78	262,040
Bourbon	7	1	3	--	--	4	15	8,463
Brown	--	--	--	--	--	2	2	5,866
Butler	23	1	17	1	--	9	51	131,705
Chase	--	1	3	--	--	3	7	16,454
Chautauqua	29	6	17	--	--	11	63	87,106
Cherokee	--	--	--	--	--	32	32	20,318
Clark	--	5	3	--	--	9	17	98,442
Clay	2	--	--	1	--	--	3	6,547
Coffey	47	--	17	1	--	30	95	182,331
Comanche	3	5	5	--	2	8	23	116,984
Cowley	62	8	29	5	2	26	132	387,350
Crawford	3	21	1	--	--	--	25	7,628
Decatur	2	--	6	1	--	5	14	49,043
Dickinson	--	--	--	--	--	2	2	5,894
Doniphan	--	--	--	--	--	10	10	16,392
Douglas	1	1	--	--	--	--	2	1,090
Edwards	1	2	2	1	1	5	12	53,685
Elk	15	--	7	1	--	7	30	55,018
Ellis	24	--	18	1	--	12	55	196,089
Ellsworth	14	2	8	--	--	7	31	92,530
Finney	15	8	4	--	--	3	30	127,129
Ford	--	--	4	--	1	3	8	40,294
Franklin	8	2	1	--	--	1	12	9,668
Geary	--	--	--	--	--	1	1	1,983
Gove	5	--	7	5	--	16	33	134,936
Graham	22	--	20	--	--	30	72	272,112

See footnote at end of table.

Table 7.—Kansas: Oil and gas well drilling completions, by county—Continued

County	Proved field wells			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Grant	1	21	--	1	--	1	24	80,810
Greeley	--	10	3	--	--	2	15	43,894
Greenwood	27	--	13	1	--	18	59	120,909
Hamilton	--	10	1	--	--	2	13	42,143
Harper	16	9	12	2	2	17	58	252,601
Harvey	2	6	2	1	--	8	19	60,801
Haskell	--	4	1	2	1	--	8	28,100
Hodgeman	15	--	8	3	--	23	49	223,031
Jackson	--	--	--	--	--	1	1	3,520
Johnson	3	7	1	--	1	2	14	9,608
Kearny	2	44	3	1	--	3	53	162,557
Kingman	3	5	11	3	1	20	43	182,245
Kiowa	7	19	17	1	4	22	70	317,882
Labette	--	1	7	--	--	49	57	40,159
Lane	6	--	13	8	--	17	44	198,975
Linn	1	--	3	--	--	--	4	2,230
Logan	2	--	--	1	--	2	5	23,390
Lyon	6	--	1	1	--	8	16	36,986
McPherson	6	4	9	2	3	10	34	100,009
Marion	8	1	1	--	--	1	11	31,095
Meade	2	7	11	1	2	15	38	212,748
Miami	19	11	4	--	1	--	35	19,005
Mitchell	--	--	--	--	--	2	2	8,294
Montgomery	44	1	3	--	--	--	48	41,460
Morris	4	--	3	--	--	9	16	43,326
Morton	1	17	6	--	--	4	28	116,302
Neosho	54	9	4	--	1	--	68	53,951
Ness	27	--	34	15	--	48	124	552,434
Norton	1	--	4	--	--	3	8	29,088
Osage	--	--	--	--	--	4	4	8,286
Osborne	4	--	1	--	--	--	5	15,061
Pawnee	5	6	7	2	1	10	31	114,354
Phillips	10	--	4	1	--	--	15	53,078
Pottawatomie	--	--	1	--	--	--	1	3,517
Pratt	12	1	9	3	1	11	37	143,928
Rawlins	2	--	6	1	--	8	17	74,659
Reno	2	--	9	--	--	8	19	63,976
Rice	4	8	11	2	2	5	32	99,485
Riley	7	--	2	--	--	--	9	16,244
Rooks	4	--	13	2	--	14	33	117,053
Rush	2	1	6	2	1	5	17	63,446
Russell	37	--	18	2	--	6	63	199,151
Saline	2	--	1	--	--	--	3	10,130
Scott	1	2	1	1	--	4	9	36,135
Sedgwick	1	1	1	--	--	4	7	24,608
Seward	1	6	9	--	2	6	24	137,387
Sheridan	--	--	3	1	--	17	21	83,097
Sherman	2	--	1	--	--	--	3	14,490
Stafford	23	4	35	2	--	11	75	281,705
Stanton	--	23	3	--	--	2	28	86,052
Stevens	1	39	1	--	--	1	42	131,655
Sumner	7	8	14	3	1	20	53	182,946
Thomas	--	--	--	1	--	3	4	17,581
Trego	2	--	10	8	--	21	41	165,186
Wabaunsee	--	--	1	--	--	4	5	14,288
Wichita	--	--	--	--	--	1	1	5,250
Wilson	21	2	1	--	--	--	24	22,734
Woodson	54	--	22	2	--	9	87	106,665
Wyandotte	--	--	1	--	1	--	2	1,301
Total	891	356	596	98	33	716	2,690	7,936,269

Source: American Petroleum Institute.

Pipeline Mileage.—Beginning January 1, 1971, Kansas had a total of 16,013 miles of petroleum pipelines in place. Of this aggregate, gathering lines registered 6,100 miles, product lines 5,976 miles, and crude trunk lines 3,937 miles. For a 3-year period ending January 1, 1974, pipeline mileage laid amounted to 500 miles of new pipe and 635 miles of old pipe; 1,241 miles of pipe was taken up. Miles of lines under construction comprised gathering lines 6,207, product lines 5,577, and crude trunk lines 4,123, indicating a decrease of 106, or 15,907 miles of pipe in place. The ca-

pacity of all crude oil pipelines on January 1, 1974, reached 4,348,000 barrels, 72,000 barrels more than in 1971; product pipelines declined 239,000 barrels from 1971 to 2,163,000 barrels.

Refineries.—Total receipts of domestic crude oil decreased in 1974 to 125,008,000 barrels. Pipelines transported 122,496,000 barrels, and rail and trucks shipped 2,512,000 barrels. Intrastate receipts totaled 56,932,000 barrels; 55,867,000 was transported through pipelines, and 1,065,000 was shipped by rail tank cars and trucks. Interstate receipts totaled 68,076,000 barrels and were received from Oklahoma 23,600,000, Wyoming 20,068,000, Texas 18,537,000, and others 5,871,000. Pipelines delivered 66,629,000 barrels, and rail tank car and trucks delivered 1,447,000 barrels. Foreign receipts from Canada totaled 9,047,000 barrels. Shipments of domestic crude oil from Kansas to Illinois comprised 3,706,000 barrels; Indiana 3,348,000; Oklahoma 3,517,000; and others 948,000; totaling 11,519,000 barrels, 635,000 barrels more than 1973.

Opening and closing stocks, refinery fuel use, and losses resulted in a positive change of 204,000 barrels. Total crude oil processed at refineries was 123,851,000 barrels in 1974.

CRA, Inc., at Coffeyville expanded production capacity by installing larger pumps, heat exchangers, and a new furnace. The plant's capacity increased from 42,000 to 48,000 barrels per day. North American Petroleum Corp. reopened the Scott City plant, modified it, and expanded capacity to 10,000 barrels per day. Skelly Oil Co. completed major expansion projects at El Dorado. Crude oil throughput capacity increased to about 79,000 barrels per day.

Consumption of fuels by Kansas refineries in 1974 was reported as follows:

Fuel	Quantity	Btu equivalent [1] (billion Btu)
Distillate fuel oil ---- thousand barrels	1	6
Residual fuel oil ---- do	865	5,438
Liquefied petroleum gas ---- do	222	890
Natural gas ---- million cubic feet	33,761	34,808
Refinery gas ---- do	31,782	31,464
Petroleum coke ---- thousand short tons	333	10,030
Purchased electricity ---- million kilowatt-hours	668	2,279
Total Btu equivalent	XX	84,915

XX Not applicable.
[1] Conversion factors: Distillate, 5,825,000 Btu per barrel; residual, 6,287,000 Btu per barrel; LPG, 4,011,000 Btu per barrel; natural gas, 1,031 Btu per cubic foot; refinery gas, 990 Btu per cubic foot; petroleum coke, 30,120 Btu per short ton; purchased electricity, 3,412 Btu per kilowatt-hour.

Kansas' 11 operating refineries had a total throughput of 149,011,000 barrels in 1973, and 146,222,000 in 1974, yielding the following finished petroleum products:

	Thousand barrels	
	1973	1974
Motor gasoline	85,877	84,441
Aviation gasoline	346	391
Jet fuel	4,241	4,293
Liquefied refinery gas and ethane	4,594	3,916
Kerosine	444	330
Distillate fuel oil	36,788	36,288
Residual fuel oil	3,044	2,938
Petrochemical feedstocks	1,605	498
Special naphtha	108	1,109
Lubricating oil	1,482	1,470
Petroleum wax	35	414
Petroleum coke	4,972	4,326
Asphalt and road oil	7,251	6,399
Still gas	4,263	3,547
Miscellaneous products	233	178
Processing gain	−6,272	−4,316

Percent of refinery yields of the major petroleum products from crude and unfinished oil reruns follow:

	1973	1974
Gasoline, total [1]	54.0	54.1
Kerosine	0.3	0.3
Jet fuel, total	3.1	3.2
Distillate fuel oil	26.9	27.1
Residual fuel oil	2.2	2.2
All other products	13.5	13.1

[1] Based on total gasoline output minus input of natural gas liquids.

Table 8.—Kansas: Capacity of petroleum refineries in Kansas: Jan. 1, 1975

(Barrels per calendar day)

Company	Location	Crude oil distillation: Operating	Crude oil distillation: Shutdown	Cracking, reforming, coking, and alkylation: Type of process	Charge, operating and shutdown	Gasoline output: Operating	Gasoline output: Shutdown	Other products
American Petrofina Co. of Texas	El Dorado	25,000	--	CC	11,500	6,500	--	Asphalt.
				CR	4,000	3,500	--	
				A	2,500	2,000	--	
APCO Oil Corp	Arkansas City	46,230	--	CC	9,200	5,900	--	Do.
				CR	6,500	5,720	--	
				H	3,000	3,000	--	
				A	3,750	2,300	--	
CRA, Inc	Coffeyville	48,338	--	CC	14,500	7,300	--	Asphalt, coke, lubricants, wax.
				CR	8,600	7,500	--	
				C	8,500	1,400	--	
				A	6,100	3,500	--	
Do	Phillipsburg	20,500	--	CC	7,000	4,700	--	Asphalt.
				CR	5,300	4,700	--	
				A	2,500	1,400	--	
Derby Refining Co	Wichita	27,982	--	CC	10,176	5,700	--	Coke.
				CR	4,800	4,176	--	
				C	3,800	985	--	
				A	4,032	2,782	--	
Mid-America Refining Co., Inc	Chanute	3,000	--	--	--	--	--	Asphalt.
Mobil Oil Corp	Augusta	50,000	--	CC	19,900	10,500	--	Do.
				CR	20,000	8,200	8,200	
				TC	3,900	1,050	--	
				A	3,500	3,500	--	
National Cooperative Refinery Association	McPherson	54,150	--	CC	19,000	11,970	--	Coke.
				CR	6,650	5,850	--	
				C	16,150	1,940	--	
				A	9,050	5,700	--	
North American Petroleum Corp	Shallow Water	10,000	--	--	--	--	--	Asphalt.
Phillips Petroleum Co	Kansas City	85,000	--	CC	32,000	16,000	--	Do.
				CR	16,000	15,000	--	
				A	8,200	7,500	--	
Skelly Oil Co	El Dorado	78,731	--	CC	29,301	17,704	--	Coke.
				CR	20,380	16,536	--	
				C	11,160	2,443	--	
				A	10,284	6,505	--	

[1] CC—catalytic cracking, CR—catalytic reforming, H—hydrocracking, C—Coking, TC—thermal cracking, A—alkylation.

NONMETALS

Cement.—Shipments from five counties, Allen, Montgomery, Neosho, Wilson, and Wyandotte, were reported at 2,004,000 tons and valued at $49,142,523. Portland cement accounted for 97% of production. Disposition of portland cement by type was ready-mix concrete 74%, concrete product manufactures 7%, building material 7%, and other uses 12%.

Table 9.—Kansas: Portland cement salient statistics
(Thousand short tons)

	1973	1974
Number of active plants	5	5
Production	2,036	1,996
Shipments from mills:		
Quantity	2,026	1,940
Value (thousands)	$42,172	$46,940
Stocks at mills, Dec. 31	19	13

Table 10.—Kansas: Masonry cement salient statistics
(Thousand short tons)

	1973	1974
Number of active plants	5	5
Production	70	58
Shipments from mills:		
Quantity	73	64
Value (thousands)	$2,068	$2,203
Stocks of mills, Dec. 31	19	13

Clay.—Production of clay and shale increased 12% in volume and 20% in value above the 1973 figures. Production was 1,311,000 tons and value was $1,785,000 in 1974. Of the total output, 502,000 tons, an increase of 23%, was consumed in the manufacture of brick, 421,000 tons in cement, and 388,000 tons for lightweight aggregates, flue lining, structural and drain tile, and sewer pipes.

Gypsum.—Output of the National Gypsum Co. and Georgia-Pacific Corp. in Barber and Marshall Counties for gypsumboard products, portland cement, and other uses declined 10%. Output of calcined gypsum declined 11%.

Lime.—The producer of lime in Kansas was the Great Western Sugar Co. in Sherman County. The total output of 27,612 tons, a record, was used in sugar refining at the company's Goodland plant. The total consumption of lime in Kansas was 94,290 tons.

Perlite.—Lite Weight Products, Inc., located in Wyandotte County, produced and sold expanded perlite. Production in 1974 declined 35%; however, value increased 4%. Major uses of perlite were horticultural aggregates 51%, and masonry and cavity fill insulation 36%. Plaster aggregates, concrete aggregates, filter aids, low-temperature insulation, and fertilizers made up the other 13%.

Pumice.—Production declined by 21% in 1974. Chinchilla dusting powder was the major use of pumice.

Salt.—Seven salt producers operated in Ellsworth, Reno, Rice, and Sedgwick Counties. The quantity of salt produced (excluding brine) was 1,367,000 tons with a value of $27,007,000; this was a 2% decrease in quantity but a 15% increase in value. Kansas has an abundant supply of salt. The growth of the salt industry depends on demand for chlorine and caustic soda within the chemical industry and for use in road ice and snow removal.

Table 11.—Kansas: Evaporated and rock salt sold or used by producers
(Thousand short tons and thousand dollars)

Year	Evaporated salt		Rock salt	
	Quantity	Value	Quantity	Value
1970	670	15,178	560	3,028
1971	676	15,847	564	2,865
1972	723	17,207	646	3,355
1973	782	19,914	615	3,547
1974	778	23,127	589	3,880

Sand and Gravel.—Production from 153 mines decreased 12%, but value rose to $13,388,000, a 6% increase. Most sand and gravel is used in a combined state by the construction industry, and has an increased value because a blend product commands a higher price per ton.

Leading counties for sand and gravel sold or used were Douglas, Reno, Sedgwick, Shawnee, and Wyandotte.

Table 12.—Kansas: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	13,261	12,663	8,055	8,612
Gravel			1,935	2,993
Unprocessed: Sand and gravel			1,494	818
Industrial:				
Sand	W	W	203	918
Gravel			--	--
Total	13,261	12,663	11,687	13,341

W Withheld to avoid disclosing individual company confidential data; included with "Construction" (1973).

[1] Value data may not be directly comparable to that in tables 1, 13, and 14 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 13.—Kansas: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	7,607	8,267	2,856	3,734
Highway and bridge construction			504	520
Other uses			166	289
Concrete products			534	611
Bituminous paving			760	1,005
Roadbase and subbase			567	613
Unprocessed aggregate			562	320
Fill	2,464	1,641	1,019	855
Other uses [2]	1,004	1,029	153	185
Industrial sand and gravel	W	W	203	918
Total	11,075	[3] 10,938	7,324	9,050

W Withheld to avoid disclosing individual company confidential data; included with "Other uses" (1973).

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes miscellaneous (1973).

[3] Data do not add to total shown because of independent rounding.

Table 14.—Kansas: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	2,048	1,579	53	66
Highway and bridge construction			1,643	1,844
Other uses			W	W
Concrete products			393	484
Bituminous paving			584	690
Roadbase and subbase			632	623
Unprocessed aggregate			932	498
Fill	29	22	70	71
Other	109	123	55	62
Total	2,186	[2] 1,725	4,362	4,338

W Withheld to avoid disclosing individual company confidential data; included with "Concrete products."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Data do not add to total shown because of independent rounding.

Table 15.—Kansas: Sand and gravel sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Barber	2	W	W	1	17	12
Barton	3	250	212	3	177	157
Chase	1	8	8	1	10	2
Cherokee	--	--	--	2	W	W
Cheyenne	3	W	169	3	140	174
Clark	1	42	25	1	28	17
Clay	1	90	100	1	W	W
Comanche	1	42	31	3	27	12
Cowley	5	318	268	4	320	313
Decatur	1	9	3	1	23	17
Dickinson	1	W	111	1	W	124
Douglas	2	645	695	2	W	W
Edwards	2	W	W	2	W	W
Elk	1	10	4	1	W	W
Ellis	3	151	169	3	162	228
Gove	1	37	27	1	37	9
Graham	1	24	13	1	W	W
Grant	1	20	15	1	23	6
Gray	2	W	W	2	W	W
Greeley	1	8	3	1	7	3
Greenwood	--	--	--	1	W	W
Hamilton	1	27	27	1	46	23
Harvey	1	95	W	1	125	83
Haskell	1	53	20	2	W	42
Hodgeman	1	95	50	1	68	27
Jackson	1	8	3	1	7	3
Jewell	1	7	4	--	--	--
Johnson	2	W	W	1	W	W
Kearny	2	W	W	2	W	W
Lane	1	37	27	1	W	W
Leavenworth	1	14	19	--	--	--
Lincoln	1	105	78	1	W	68
Linn	--	--	--	1	32	64
Logan	2	11	9	1	W	W
Lyon	--	--	--	1	29	4
McPherson	1	30	23	1	6	3
Meade	1	38	28	1	W	W
Mitchell	1	5	2	1	W	W
Morris	1	6	3	1	W	W
Morton	--	--	--	1	68	300
Nemaha	1	83	81	1	3	2
Neosho	1	W	W	2	W	W
Ness	1	129	95	1	72	19
Norton	2	32	29	1	6	7
Osborne	1	44	32	--	--	--
Ottawa	1	4	3	1	19	5
Pawnee	3	127	W	3	118	136
Phillips	2	91	74	2	96	95
Rawlins	--	--	--	2	4	W
Reno	8	616	450	6	529	469
Republic	1	113	104	1	W	W
Rush	1	30	28	--	--	--
Russell	2	77	59	1	40	35
Saline	2	262	W	2	W	W
Scott	1	36	28	1	32	31
Sedgwick	12	2,770	1,814	11	2,410	2,161
Seward	3	114	W	3	W	182
Shawnee	6	577	572	6	612	719
Sheridan	2	30	22	1	51	25
Sherman	3	62	96	1	W	7
Smith	--	--	--	1	1	1
Stevens	1	21	8	1	34	25
Thomas	4	134	136	3	98	129
Trego	4	128	122	3	W	106
Wallace	1	21	25	1	29	37
Wyandotte	6	1,679	2,110	8	1,756	3,148
Other counties [1]	37	3,901	4,629	35	4,428	4,359
Total [2]	158	13,261	12,663	153	11,687	13,388

W Withheld to avoid disclosing individual company confidential data; included with "Other counties."

[1] Includes Cloud, Ellsworth, Finney, Ford, Geary, Harper, Kingman, Kiowa, Marion, Marshall, Pottawatomie, Pratt, Rice, Riley, Rooks, Stafford, Sumner, Washington, and Wichita Counties.

[2] Data may not add to totals shown because of independent rounding.

Stone.—Stone sold or used by producers totaled 17,869,000 tons in 1974. Crushed limestone comprised 97% of the total. Principal uses and percent of increase or decrease were raw material in preparing cement, 1.4% increase; concrete aggregate, 7.6% decrease; and dense-graded roadbase stone, 0.2% increase. Methods of transportation and shipment were trucks 16,588,000 tons, railroads 738,000 tons, and waterways 543,000 tons.

Table 16.—Kansas: Crushed and broken stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	2,509	5,178	1,907	4,165
Concrete aggregate	3,198	7,236	2,956	7,437
Dense graded roadbase stone	3,198	5,782	3,203	6,058
Macadam aggregate	315	473	299	457
Surface treatment aggregate	2,543	4,494	2,552	5,013
Unspecified construction aggregate and roadstone	1,606	3,048	1,593	2,605
Agricultural limestone	540	805	562	1,046
Cement manufacture	3,349	5,017	3,395	5,814
Railroad ballast	101	225	W	W
Riprap and jetty stone	726	880	944	997
Other uses [1]	247	462	457	766
Total [2]	18,334	33,601	17,869	34,357

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes stone used in filter stone (1974), lime manufacture, fill (1974), ferrosilicon (1973), whiting (1973), and uses not specified.
[2] Data may not add to totals shown because of independent rounding.

Table 17.—Kansas: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone, total [1]	W	W	W	$513
Crushed and broken:				
Limestone	17,658	$32,254	17,335	33,244
Undistributed [2]	676	1,347	534	1,112
Total crushed and broken stone [3]	18,334	33,601	17,869	34,357

W Withheld to avoid disclosing individual company confidential data.
[1] Data represent limestone.
[2] Includes sandstone, quartzite, and other stone.
[3] Data may not add to totals shown because of independent rounding.

Sulfur.—Recovering it as a byproduct of refining crude petroleum, three companies produced and sold 9,346 long tons of sulfur with a value of $218,292 in 1974. The three companies were Skelly Oil Co., Butler County; CRA, Inc., Montgomery County; and Phillips Petroleum Co., Wyandotte County.

Table 18.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Ash Grove Cement Co.[1 2]	1000 Ten Main Center Kansas City, Mo. 64105	Plant and quarry.	Neosho.
General Portland Cement Co.[1]	4400 Republic National Bank Tower Dallas, Tex. 75201	---- do ----	Wilson.
Lone Star Industries, Inc.[2]	1 Greenwich Plaza Greenwich, Conn. 06830	---- do ----	Wyandotte.
The Monarch Cement Co.[1 2]	Humboldt, Kans. 66740 --	---- do ----	Allen.
United States Steel Corp.[1 2]	600 Grant St. Pittsburgh, Pa. 15230	---- do ----	Montgomery.
Clays:			
Excelsior Clay Products, Inc	342 North Waco Wichita, Kans. 67202	Mine and plant -	Wilson.
Coal:			
Clemens Coal Co.[1] ----	Box 62299 Pittsburgh, Kans. 66762	Strip mine ----	Crawford.
Pittsburgh & Midway Coal Mining Co.	Ten Main Center Kansas City, Mo. 64105	---- do ----	Cherokee and Linn.
Gypsum:			
Georgia-Pacific Corp ----	900 SW. Fifth Ave. Portland, Oreg. 97204	Quarry and plant.	Marshall.
National Gypsum Co ----	325 Delaware Ave. Buffalo, N.Y. 14202	---- do ----	Barber.
Helium:			
Cities Services Cryogenics, Inc.	Scott City, Kans. 67871 --	Plant ----	Scott.
Gardner Cryogenics, Inc --	Elkhart, Kans. 67950 ----	---- do ----	Morton.
Kansas Refined Helium Co	Otis, Kans. 67565 ----	---- do ----	Rush.
National Helium Corp ----	Liberal, Kans. 67901 ----	---- do ----	Seward.
Lime:			
The Great Western Sugar Co.	Box 5308 Denver, Colo. 80217	---- do ----	Sherman.
Petroleum refineries:[3]			
Pumice:			
BASF Wyandotte Corp ----	1609 Biddle Ave. Wyandotte, Mich. 48192	Mine and plant -	Norton.
Salt:			
American Salt Corp ----	3142 Broadway Kansas City, Mo. 64111	Wells and underground mine.	Rice.
Carey Salt Co ----	1800 Corey Blvd. Hutchinson, Kans. 67501	---- do ----	Reno.
Morton Salt Co ----	110 North Wacker Dr. Chicago, Ill. 60606	Wells ----	Do.
Vulcan Materials Co ----	Box 6 Countryside, Ill.	---- do ----	Sedgwick.
Sand and gravel:			
American Sand and Materials Co.	448 South 26th St. Kansas City, Kans. 66105	Pits ----	Wyandotte.
Builders Sand Co ----	78th and Holiday Dr. Kansas City, Kans. 66106	Pits and dredge -	Do.
Lawrence Sand Co ----	P.O. Box 490 Lawrence, Kans. 66044	Pits ----	Douglas.
Miles Sand, Inc ----	4857 North Meridian Wichita, Kans. 67204	Dredge ----	Sedgwick.
Smith Sand Co ----	1206 East Fulton Garden City, Kans. 67846	Pit ----	Finney.
Superior Sand Co., Inc ---	6500 West 21st, Route 7 Wichita, Kans. 67212	Dredge ----	Sedgwick.
Stone:			
N. R. Hamm Quarries, Inc	P.O. Box 425 Herrington, Kans. 67449	Quarries ----	Various.
Killough-Clark, Inc ----	P.O. Box 263 Ottawa, Kans. 66067	---- do ----	Do.
Martin Marietta Corp ----	11300 Rockville Pike Rockville, Md. 20852	---- do ----	Do.
Midwest Minerals, Inc ----	Box 7 Girard, Kans. 66743	---- do ----	Do.
Reno Construction Co ----	Box 4278 Overland Park, Kans. 66204	Quarry ----	Johnson.
Thompson Strauss Quarries	7000 Holiday Dr. Kansas City, Kans. 66106	---- do ----	Wyandotte.

[1] Also clays.
[2] Also stone.
[3] Elsewhere in chapter (Table 8).

The Mineral Industry of Kentucky

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey of Kentucky for collecting and disseminating information on all minerals produced from mines, quarries, and wells.

By William T. Boyd [1] and Preston McGrain [2]

The total value of mineral production in Kentucky increased 120% in 1974 to a record $2.56 billion. The more than doubling in value reflected the State's continuing first place in coal production and the marked increase in coal prices, especially during the latter part of the year.

During 1974, a record total of over 137 million tons of bituminous coal was produced from 1,789 surface and underground mines. For the fourth consecutive year surface coal production surpassed that from underground mining, and in 1974 production at surface operations was about 73.7 million tons.

Legislation and Government Programs.—The U.S. Geological Survey in cooperation with the Kentucky Geological Survey continued the aerial geologic mapping program. During the year 35 additional 7.5-minute quadrangle maps were produced, and the total of 496 maps produced during this program covers nearly 70% of the State.

The Kentucky Geological Survey published four reports on geology and mineral resources of selected areas.[3]

[1] State Liaison Officer, Bureau of Mines, Frankfort, Ky.

[2] Assistant state geologist, Kentucky Geological Survey, Lexington, Ky.

[3] Davis, R. W., R. O. Pleubuch, and H. M. Whitman. Hydrology and Geology of Deep Sandstone Aquifers of Pennsylvanian Age in Part of the Western Coal Field Region, Kentucky. Kentucky Geol. Survey, ser. 10, Rept. Inv. 15, 1974, 26 pp.

Dever, G. R. Jr. High-Carbonate Rock in the High Bridge Group (Middle Ordovician), Boone County, Kentucky. Kentucky Geol. Survey, ser. 10, Inf. Circ. 22, 1974, 35 pp.

Geological Society of Kentucky. Late Cenozoic Features of the Middle Ohio River Valley. Kentucky Geol. Survey, 1974, 25 pp.

Hutcheson, D. W. (ed.), A Symposium on the Geology of Fluorspar. Kentucky Geol. Survey, ser. 10, Spec. Pub. 22, 1974, 107 pp.

Table 1.—Mineral production in Kentucky [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays [2] thousand short tons	1,083	$1,961	848	$1,477
Coal (bituminous) do	127,645	986,654	137,197	2,340,961
Natural gas million cubic feet	62,396	21,839	71,876	35,938
Petroleum (crude) thousand 42-gallon barrels	8,687	34,515	7,837	68,340
Sand and gravel thousand short tons	10,331	14,627	8,710	12,887
Stone do	[3] 38,205	[3] 70,912	84,542	66,632
Zinc (recoverable content of ores, etc.) short tons	278	113	--	--
Value of items that cannot be disclosed: Cement, clay (ball), fluorspar, lime, natural gas liquids, and stone (quartzite, 1973)	XX	34,141	XX	36,975
Total	XX	1,164,762	XX	2,563,210
Total 1967 constant dollars	XX	853,887	XX	[p] 1,225,727

[p] Preliminary. XX Not applicable.

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

[2] Excludes ball clay; included with "Value of items that cannot be disclosed."

[3] Excludes quartzite; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Kentucky, by county [1 2]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adair	W	$1,799	Petroleum, stone.
Allen	$525	616	Stone, petroleum.
Anderson	W	W	Stone.
Ballard	4	3	Sand and gravel.
Barren	W	W	Stone, petroleum.
Bath	--	W	Petroleum.
Bell	29,706	72,332	Coal, petroleum.
Boone	W	W	Sand and gravel, stone.
Bourbon	W	W	Stone.
Boyd	1,179	4,662	Coal, stone, clay, petroleum.
Boyle	W	W	Stone.
Breathitt	47,702	73,996	Coal, petroleum.
Breckinridge	W	W	Stone, petroleum, sand and gravel.
Bullitt	W	W	Stone, clays.
Butler	W	W	Coal, petroleum, stone.
Caldwell	W	2,193	Stone.
Calloway	98	125	Sand and gravel.
Campbell	W	--	
Carlisle	W	W	Clays, sand and gravel.
Carroll	--	29	Stone.
Carter	3,409	11,336	Coal, stone, clays.
Casey	W	287	Stone, petroleum.
Christian	5,011	6,007	Stone, coal, petroleum.
Clay	3,899	17,053	Coal, petroleum.
Clinton	W	W	Stone, petroleum.
Crittenden	W	W	Stone, fluorspar.
Cumberland	W	W	Petroleum, stone.
Daviess	9,597	W	Coal, petroleum, sand and gravel.
Edmonson	W	W	Stone, coal, petroleum.
Elliott	1,585	12,239	Coal, petroleum.
Estill	W	W	Petroleum.
Fayette	W	W	Stone.
Fleming	W	W	Do.
Floyd	39,209	W	Coal, natural gas liquids, petroleum, sand and gravel.
Franklin	W	W	Stone.
Fulton	W	W	Sand and gravel.
Gallatin	W	W	Do.
Garrard	420	W	Stone.
Graves	3,030	2,974	Clays, sand and gravel.
Grayson	W	W	Stone.
Green	W	W	Stone, petroleum.
Greenup	W	2,856	Coal, stone, clays, petroleum.
Hancock	586	2,030	Sand and gravel, petroleum, coal, clays.
Hardin	1,997	2,233	Stone.
Harlan	124,054	W	Coal, stone.
Harrison	W	W	Stone.
Hart	W	505	Stone, petroleum, sand and gravel.
Henderson	W	15,361	Petroleum, coal, sand and gravel.
Henry	W	W	Stone.
Hickman	1	1	Sand and gravel.
Hopkins	66,788	111,880	Coal, petroleum, clays.
Jackson	W	W	Coal, stone.
Jefferson	21,009	19,130	Cement, stone, sand and gravel, clays.
Jessamine	W	W	Stone.
Johnson	6,579	31,194	Coal, petroleum.
Knott	36,044	97,022	Do.
Knox	6,582	36,041	Do.
Laurel	W	W	Coal, stone, petroleum.
Lawrence	2,584	25,033	Coal, petroleum.
Lee	W	W	Petroleum, coal, stone.
Leslie	19,851	69,680	Coal, petroleum.
Letcher	W	134,571	Coal, petroleum, stone.
Lewis	W	W	Clays, sand and gravel.
Livingston	14,170	14,943	Stone, sand and gravel.
Logan	W	W	Stone, petroleum.
Lyon	--	3	Sand and gravel.
McCracken	W	W	Do.
McCreary	8,006	22,019	Coal, petroleum.
McLean	9,482	10,487	Do.
Madison	W	W	Stone.
Magoffin	6,452	30,976	Coal, petroleum.
Marion	W	W	Stone.
Marshall	(3)	961	Stone, sand and gravel.
Martin	41,032	103,822	Coal, sand and gravel, petroleum.
Mason	W	W	Sand and gravel, stone.
Meade	W	8,024	Natural gas liquids, stone.
Menifee	W	W	Stone.
Mercer	12	W	Do.

See footnotes at end of table.

Table 2.—Value of mineral production in Kentucky, by county [1] [2]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Metcalfe	W	W	Stone, petroleum.
Monroe	W	W	Do.
Montgomery	W	W	Stone.
Morgan	W	W	Coal, stone, petroleum.
Muhlenberg	$134,486	W	Coal, petroleum, stone.
Nelson	W	W	Stone.
Nicholas	423	$480	Do.
Ohio	46,368	W	Coal, stone, petroleum.
Oldham	W	2,270	Stone, sand and gravel.
Owsley	1,570	8,721	Coal, petroleum.
Pendleton	W	11,004	Lime, stone.
Perry	48,494	139,939	Coal, petroleum.
Pike	W	533,083	Coal, stone, petroleum.
Powell	W	367	Petroleum, stone, clay.
Pulaski	W	10,046	Coal, stone, petroleum.
Rockcastle	W	W	Stone, coal.
Rowan	W	W	Stone, clay.
Russell	22	11	Petroleum.
Scott	W	W	Stone.
Simpson	W	W	Stone, petroleum.
Taylor	W	W	Stone.
Todd	W	W	Stone, petroleum.
Trigg	390	424	Stone.
Trimble	W	W	Sand and gravel.
Union	51,391	W	Coal, petroleum, sand and gravel.
Warren	1,665	W	Stone, petroleum.
Washington	W	W	Stone.
Wayne	W	W	Coal, stone, petroleum.
Webster	13,625	W	Coal, petroleum.
Whitley	W	W	Coal, clay, petroleum.
Wolfe	W	W	Petroleum, stone, coal.
Undistributed [4]	355,730	912,451	
Total [5]	1,164,762	2,563,210	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Bracken, Clark, Grant, Kenton, Larue, Lincoln, Owen, Robertson, Shelby, Spencer, and Woodford.

[2] Values for petroleum are based on an average price per barrel for the State.

[3] Less than ½ unit.

[4] Includes natural gas, some sand and gravel that cannot be assigned to specific counties, and values indicated by symbol W.

[5] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Kentucky business activity

	1973	1974 [p]	Change, percent
Employment and labor force, annual average:			
Total nonagricultural employment ---- thousands --	1,039.3	1,069.9	+2.9
Mining ---- do ----	31.6	38.3	+21.2
Contract construction ---- do ----	56.8	54.5	−4.0
Service ---- do ----	155.3	162.6	+4.7
Government ---- do ----	197.3	203.3	+3.0
Manufacturing ---- do ----	286.5	291.5	+1.7
Personal income:			
Total ---- millions --	$11,648	$12,925	+11.0
Per capita ----	$3,500	$3,850	+10.0
Construction activity:			
Housing units, private and public:			
Number ----	14,938	8,791	−41.2
Value of nonresidential construction ---- millions --	$157.2	$125.0	−20.5
Cement shipments to and within Kentucky:			
Portland ---- thousand short tons --	1,150	1,019	−11.4
Masonry ---- do ----	114	101	−11.4
Farm marketing receipts ---- millions --	$1,355.4	NA	NA
Mineral production value ---- do ----	$1,164.8	$2,563.2	+120.1

[p] Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; and U.S. Bureau of Mines.

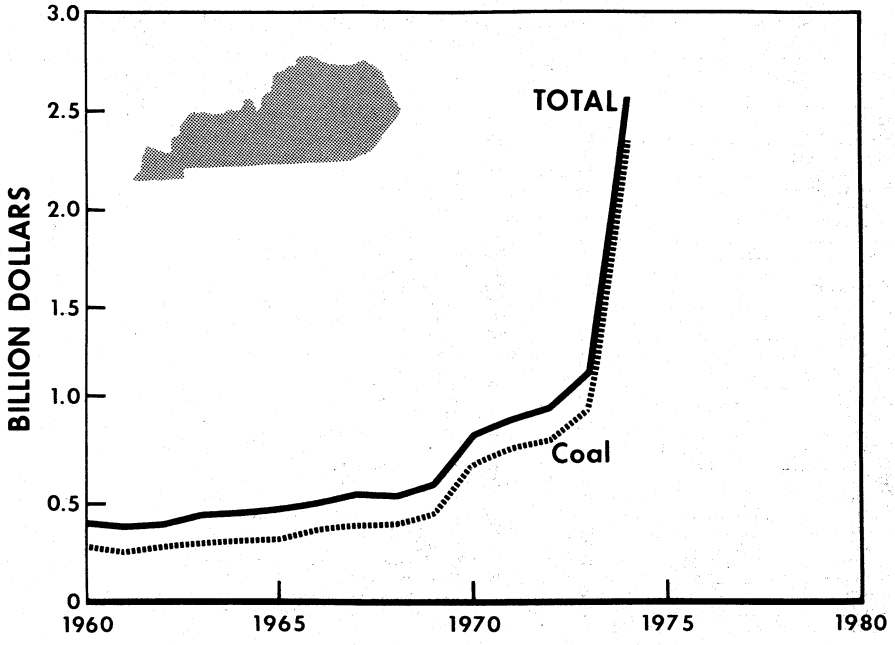

Figure 1.—Value of coal and total value of mineral production in Kentucky.

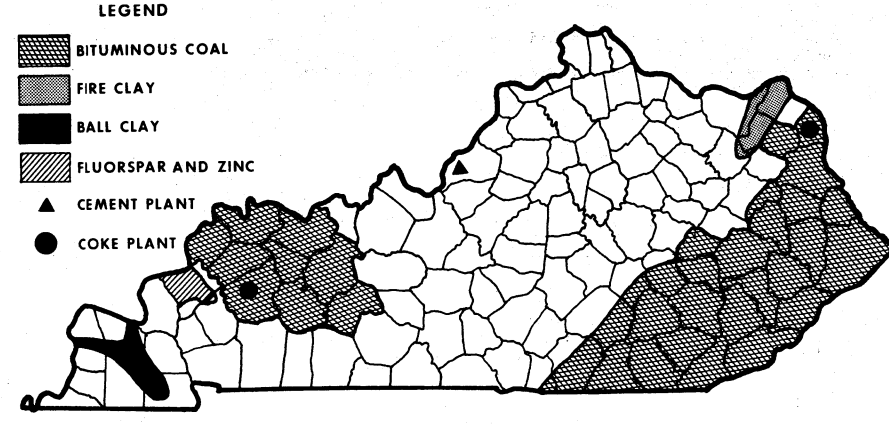

Figure 2.—Mineral resources and mineral industries of Kentucky.

The Bureau of Mines continued the cooperative study with the University of Kentucky and Beth-Elkhorn Corp. on short-wall recovery of medium-thick coalbeds. A long-range cooperative investigation was started between the Bureau of Mines, the Tennessee Valley Authority (TVA), the U.S. Forest Service and a selected coal company to document water quality changes and soil erosion problems created by three different surface mining methods.

The Environmental Protection Agency and the State's Division of Strip Mine

Reclamation started a $1.5 million cooperative study to evaluate various strip-mining methods and develop techniques for using acid water from western Kentucky surface mine pits for irrigation purposes. The State received a National Aeronautics and Space Administration grant for determining the feasibility of using satellite photographs to detect illegal surface mining. The Forest Service and TVA developed an agreement for evaluating TVA-owned mineral resources on 130,000 acres of the Daniel Boone National Forest.

Earlier legislation requiring strip mine operators to obtain written consent of surface owners before mining was declared unconstitutional by the State Court of Appeals.

The Appalachian Research Commission, the National Institute of Occupational Safety and Health, and the State Bureau of Health started a $1.2 million program for the diagnosis and treatment of black lung disease among local coal miners.

Twenty-two coal companies joined in a class action lawsuit regarding the constitutionality of Federal legislation requiring coal companies to assume responsibility for black lung benefits paid to former employees.

Legislation was enacted changing distance requirements between shallow wells and adjacent properties and permitting condemnation procedures against adjacent property owners who refuse to pool oil and gas resources. An Oil and Gas Conservation Commission was created that would have authority to regulate distances between all deep-drilled holes.

FMC, Island Creek Co. and the Bureau of Mines began a study to develop and demonstrate an inherently safe conventional mining system at the Jenny mine near Prestonsburg.

Economic Indicators.—Per capita personal income increased 10% in 1974 to a total of $3,850. Although Kentucky ranked 43d nationally in per capita income, it was 6th in the 12-State Southeast region. Farm market receipts increased 29.3% in 1974; this sizable increase reflected significant improvements in the tobacco and cattle-raising industries. Mineral production value and employment increased substantially since Kentucky led the nation in coal production, was second in production of ball clay, and was third in fluorspar production.

Trends and Developments.—Kentucky continued to show a greater increase (7.5%) in coal production than the surrounding coal-producing States in Appalachia. West Virginia production decreased 11%, and Pennsylvania production increased only 5%. Several factors contributed to this wide production variation: (1) Most mines in West Virginia and Pennsylvania have contracts with the United Mine Workers (UMW) and were closed during labor negotiations in November and December, while only a few mines in Kentucky were directly affected; and (2) the average number of miners working per day increased in Kentucky (27,975 to 37,045).

Kentucky had a record low number (20) of fatal accidents during the year.

The Aluminum Co. of America announced plans to build a large rolling mill in Meade County on a 6,000-acre site.

Western Kentucky farmers located near a large TVA coal-burning powerplant claimed that increased sulfur dioxide emissions caused widespread damage to their crops and pasture lands. TVA agreed to assess these damages and reimburse the farmers. Widespread concern over possible prolonged UMW strikes and resulting large coal purchases by domestic utilities and foreign coal buyers caused abnormally high price fluctuations for "spot market" coal purchases.

Shortages in trained manpower, railroad gondolas, and roof-bolting materials continued to hamper coal production. Personnel shortages in both State government and the coal industry were being alleviated somewhat by hiring women as strip mine inspectors and laborers in some underground mines.

The State licensed 679 new underground mines and 1,058 new surface mines. Legislation increased reclamation bonds to $1,500 per acre on lands difficult to reclaim. Nearly 31,000 acres of mined lands were reclaimed by planting trees and grasses. A private study indicated that blasting practices near natural gas lines needed urgent revision. Fifteen counties have enacted a franchise tax on local coal production. The University of Kentucky is making a cooperative study with Island Creek Co. on possible utilization of coal

mine refuse. TVA announced plans for investing $23 million in a new mine to recover the 35 million tons of coal owned by TVA in western Kentucky. Kentucky experienced a marked increase in oil and gas activities, and 1,160 drilling permits were issued compared with 980 in 1973.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Bituminous).—Coal production increased 7.5% in 1974, and its total value increased almost 137% compared with 1973 data. Production was over 137 million tons, surpassing the peak year of 1973 by more than 9.5 million tons. This production was valued at $2.34 billion for an average of $17.06 per ton, compared with $7.73 per ton in 1973. During the year, coal was produced at 1,789 mines operating in 42 counties. Muhlenberg and Pike Counties continued to lead in production by producing 21.9 and 21.2 million tons, respectively.

In eastern Kentucky 1,684 mines in 30 counties produced 85.4 million tons of coal valued at $1.9 billion. In 1973, 1,362 mines in 28 counties produced 73.9 million tons valued at $9.03 per ton. The number of surface (strip and auger) mines increased from 778 in 1973 to 910 in 1974, and production from these operations increased from 33.4 million tons in 1973 to 44.8 million tons in 1974. Underground mining activity also increased from 584 operations in 1973 producing 40.6 million tons to 774 operations in 1974 producing 40.5 million tons.

With the record expansion of underground mining, the use of both conventional and continuous mining equipment increased markedly in Eastern Kentucky. This was estimated to include 441 cutting machines, which undercut 17.8 million tons; 565 handheld hole drills; 254 mobile coal drills; 462 rotary drills; and 69 percussion rock drills. Some 378 mobile loading machines were used to load 16.9 million tons produced at conventional mine sites. Two hundred and eighteen continuous-mining machines were used to produce 18.9 million tons of the underground production. This increased production was transported by 219 trolley-type locomotives, 18 battery-powered locomotives, 767 shuttle buggies and rubber-tired tractors, 897 cable-type shuttle cars, 166 battery-type shuttle cars, and 897 gathering conveyors.

The eastern Kentucky surface mining industry used 41 draglines and power shovels along with 514 bulldozers and 427 front-end loaders. Reportedly, 24.3 million short tons were mechanically cleaned at 43 preparation plants.

In western Kentucky 105 mines in 12 counties produced over 51.8 million tons of coal valued at over $462 million. In 1973, 81 mines in 11 counties produced 53.7 million tons having a value of $5.93 per ton. The number of surface coal mining units increased from 55 in 1973 to 76 in 1974, and production from these operations decreased from 31.3 million tons in 1973 to 28.9 million tons in 1974. Underground mining activity increased slightly from 26 mines in 1973 producing 22.3 million tons to 29 mines in 1974 producing 23.0 million tons.

In the western Kentucky underground mines, equipment included 111 cutting machines, 111 mobile and handheld drills, 118 mobile loading machines, 5 continuous-mining machines, 270 cable-type shuttle cars, and 40 battery-powered shuttle cars. No hand-loaded production was reported.

Surface mining equipment included 73 power shovels of various dipper capacities along with 58 draglines. Other equipment included 328 bulldozers, 146 front-end loaders, 22 carry-all scrapers, and 8 coal drills.

Table 4.—Kentucky: Bituminous coal production, by type of mine and county, 1974

(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines					Production (thousand short tons)					Value (thousands)
	Underground	Strip	Auger	Strip-auger	Total	Underground	Strip	Auger	Strip-auger	Total	
EASTERN											
Bell	17	10	--	21	48	915	2,214	--	1,107	4,236	$72,329
Boyd	--	2	--	3	5	--	W	--	W	193	4,580
Breathitt	1	21	1	23	46	W	4,059	W	1,401	5,555	73,874
Carter	1	13	--	11	25	W	297	--	W	552	9,771
Clay	22	1	--	20	43	W	W	--	444	772	16,991
Elliott	--	6	--	5	11	--	486	--	201	687	11,983
Floyd	109	10	6	35	160	2,918	359	206	2,066	5,549	102,055
Greenup	--	3	--	--	3	--	W	--	--	W	W
Harlan	74	--	9	44	127	8,212	--	159	1,918	10,289	270,772
Jackson	--	3	--	3	6	--	22	--	31	53	1,273
Johnson	4	10	--	22	36	140	580	--	600	1,320	29,705
Knott	73	5	2	28	108	3,311	W	W	1,185	4,594	96,954
Knox	6	27	--	39	72	30	683	--	793	1,506	36,018
Laurel	4	11	--	35	50	76	274	--	681	1,030	22,902
Lawrence	1	6	1	9	17	W	435	W	734	1,182	23,967
Lee	1	6	--	3	10	W	W	--	160	257	4,458
Leslie	23	10	1	34	68	1,667	W	W	1,226	3,104	69,648
Letcher	92	7	12	33	144	3,583	99	197	1,643	5,522	129,880
Magoffin	--	4	2	16	22	--	W	W	946	1,265	29,800
Martin	16	15	1	17	49	2,353	3,048	2	1,264	6,666	103,470
McCreary	3	2	--	3	8	699	W	--	W	871	22,017
Morgan	--	8	--	6	14	--	245	--	430	675	13,597
Owsley	--	2	--	6	8	--	W	--	W	317	8,715
Perry	30	3	--	53	86	2,173	232	--	3,024	5,429	138,028
Pike	281	23	38	91	433	13,675	1,734	861	4,979	21,249	531,815
Pulaski	2	2	--	2	6	W	W	--	W	454	8,799
Rockcastle	1	1	--	2	4	W	W	--	W	35	605
Wayne	1	1	--	2	4	6	W	--	W	46	877
Whitley	12	8	--	49	69	215	212	--	1,326	1,754	40,857
Wolfe	--	1	--	1	2	--	W	--	W	W	W
Undistributed	--	--	--	--	--	539	1,524	121	639	192	2,914
Total [1]	774	221	73	616	1,684	40,509	16,503	1,546	26,798	85,356	1,878,647

See footnotes at end of table.

Table 4.—Kentucky: Bituminous coal production, by type of mine and county, 1974—Continued

(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines					Production (thousand short tons)					Value (thousands)
	Underground	Strip	Auger	Strip-auger	Total	Underground	Strip	Auger	Strip auger	Total	
WESTERN											
Butler	1	9	--	--	10	W	W	--	--	263	2,193
Christian	--	4	--	--	4	--	215	--	--	215	1,692
Daviess	--	1	--	--	1	--	W	--	--	W	W
Edmonson	--	1	--	--	1	--	W	--	--	W	W
Hancock	--	1	--	--	1	--	W	--	--	W	W
Henderson	2	--	--	--	2	W	--	--	--	W	W
Hopkins	11	19	--	--	30	5,787	4,294	--	--	10,081	107,671
McLean	--	4	--	--	4	--	887	--	--	887	6,889
Muhlenberg	5	14	--	--	19	4,719	17,194	--	--	21,913	162,778
Ohio	3	20	--	--	23	3,051	5,007	--	--	8,057	69,595
Union	6	--	--	--	6	6,903	--	--	--	6,903	66,174
Webster	1	3	--	--	4	1,675	8	--	--	1,684	W
Undistributed	--	--	--	--	--	852	1,247	--	--	1,836	45,324
Total [1]	29	76	--	--	105	22,988	28,853	--	--	51,841	462,314
Grand total	803	297	73	616	1,789	63,497	45,356	1,546	26,798	137,197	2,340,961

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Data may not add to totals shown because of independent rounding.

Table 5.—Kentucky: Oil and gas well drilling completions in 1974, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Adair	12	--	13	1	--	12	38	50,887
Allen	--	--	4	--	--	4	8	3,498
Barren	1	--	6	1	--	1	9	4,080
Bath	--	--	--	--	--	2	2	3,535
Bell	--	--	--	--	1	--	1	3,119
Boyd	--	--	--	1	--	--	1	3,407
Breathitt	--	--	1	--	--	--	1	1,555
Breckinridge	--	--	3	--	--	1	4	7,227
Butler	2	--	3	--	--	--	5	2,743
Caldwell	--	--	--	--	--	1	1	1,027
Carlisle	--	--	--	--	--	2	2	3,545
Carter	--	1	--	--	--	--	1	1,779
Casey	--	--	--	--	--	1	1	1,834
Christian	2	1	3	--	--	2	8	7,010
Clark	--	1	--	--	--	--	1	1,463
Clay	--	6	6	--	--	4	16	23,707
Clinton	--	--	1	--	--	3	4	5,435
Cumberland	8	--	10	7	--	7	32	23,955
Daviess	25	--	16	--	--	3	44	67,934
Elliott	--	--	--	--	1	2	3	15,824
Estill	5	--	--	--	--	--	5	3,980
Floyd	--	--	2	--	--	1	3	17,671
Grayson	--	8	1	--	3	--	12	16,135
Green	20	--	--	--	--	--	20	10,136
Hancock	2	--	5	--	--	4	11	10,088
Hardin	--	1	--	--	--	3	4	3,859
Hart	2	--	2	1	--	2	7	8,404
Henderson	8	[redacted]	17	--	--	--	27	49,832
Hopkins	9	1	10	--	--	14	34	77,640
Jackson	--	--	2	--	--	1	3	2,697
Johnson	--	1	--	--	1	2	4	13,514
Knott	1	6	1	--	1	1	10	23,186
Knox	2	5	4	--	--	1	11	17,515
Larue	--	--	--	--	--	1	1	798
Laurel	--	--	--	--	--	2	2	1,428
Lawrence	1	7	1	--	1	1	11	23,809
Lee	20	--	--	--	--	--	20	21,086
Leslie	--	10	2	--	--	2	14	37,930
Letcher	1	10	1	--	1	--	13	43,497
Lincoln	--	--	1	--	--	--	1	320
Logan	--	--	1	--	--	7	8	10,218
McCreary	--	--	--	--	--	1	1	750
McLean	2	7	9	--	--	1	19	33,281
Magoffin	4	1	4	--	2	--	11	13,984
Marion	--	--	1	--	--	--	1	125
Martin	--	6	1	--	--	--	7	9,884
Metcalfe	3	--	6	--	--	5	14	6,379
Monroe	1	--	3	--	--	9	13	8,614
Morgan	--	1	1	--	--	2	4	16,064
Muhlenberg	6	2	6	3	2	13	32	49,936
Ohio	11	1	12	--	1	3	28	22,318
Owsley	--	--	--	--	--	1	1	770
Perry	4	7	6	3	1	--	21	63,464
Pike	3	18	1	--	--	--	22	57,741
Pulaski	--	--	2	--	--	1	3	1,175
Russell	3	--	3	4	--	3	13	13,045
Simpson	3	--	2	--	--	2	7	3,784
Taylor	1	--	--	--	--	--	1	468
Todd	--	--	--	--	--	2	2	1,195
Union	3	--	3	--	--	1	7	14,025
Warren	1	--	1	1	--	4	7	3,935
Wayne	--	--	1	--	--	2	3	6,121
Webster	3	--	6	--	--	1	10	20,699
Whitley	2	4	12	2	5	3	28	42,192
Total	171	107	196	24	20	140	658	1,017,256

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Natural Gas.—Natural gas production showed a surprising increase, from 62,396 million cubic feet in 1973 to 71,876 million cubic feet in 1974, and had an estimated value of 50 cents per million cubic feet. The number of producing wells increased from 7,224 in 1973 to 7,307 in 1974.

Petroleum.—Even though 236 new wells were completed during the year, oil production continued to decline from 8.7 million barrels in 1973 to 7.8 million barrels, a 10% decrease. Since 1969 production has decreased 39.5% from 12.9 million barrels.

NONMETALS

Cement.—The Kosmos cement plant, subsidiary of Flintkote Co., located in Jefferson County was the State's only cement plant. Most of the production was used for ready-mix purposes. Raw materials used included limestone, clay, gypsum, and iron-bearing materials. Both production and value data are withheld to protect the confidentiality of company data.

Clays.—Two companies mined ball clay from 4 operations. This clay was mined, processed, and packaged or shipped in bulk to manufacturers of pottery ware and floor and wall tile, or for use as paper filler, refractory ware, and firebrick.

Fluorspar.—Cerro Spar Co. began operating at its new mine-mill complex in Crittenden County, and the Minerva Oil Co. continued operations at the Keystone mine. The Calvert City Chemical Co. operated a small flotation plant in southern Crittenden County near Mexico, Ky. Production data were withheld.

Graphite.—Graphite was produced in Fulton County for use in electrodes, but production data were withheld.

Lime.—The Black River Mining Co. produced quicklime in Pendleton County for steel furnaces and other uses. Production decreased from that of 1973. The company is adding a new limekiln plus storage and shipping facilities to its plant located at Carntown, Ky.

Table 6.—Kentucky: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	10,331	14,627	6,522	9,479
Gravel			1,875	3,013
Unprocessed: Sand and gravel			264	192
Industrial:				
Sand	W	W	49	202
Gravel			--	--
Total	10,331	14,627	8,710	[2] 12,886

W Withheld to avoid disclosing individual company confidential data; included with "Construction" (1973).
[1] Value data may not be directly comparable to those in tables 1, 7, and 8 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.
[2] Data do not add to total shown because of independent rounding.

Table 7.—Kentucky: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	9,481	13,491	3,519	5,294
Highway and bridge construction			232	445
Other uses (dams, waterworks, airports, etc.)			139	234
Concrete products (cement blocks, bricks, pipe, etc.)			382	670
Bituminous paving (asphalt and tar paving)			1,081	1,454
Roadbase and subbase			1,530	2,232
Unprocessed aggregate			264	192
Fill	507	481	98	173
Other uses [2]	215	428	174	272
Industrial sand and gravel	W	W	49	202
Total	10,203	14,400	7,468	11,168

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 8.—Kentucky: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			--	--
Highway and bridge construction			689	910
Other uses (dams, waterworks, airports, etc.)			321	407
Concrete products (cement blocks, bricks, pipe, etc.)	128	227	--	--
Bituminous paving (asphalt and tar paving)			161	279
Roadbase and subbase			71	123
Unprocessed aggregate			--	--
Fill	--	--	--	--
Other	--	--	--	--
Total [2]	128	227	1,242	1,719

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Data may not add to totals shown because of independent rounding.

Stone.—Operations at 118 quarries produced 34.5 million tons of stone valued at $66.6 million. The Dravo Corp. started construction of a $46 million underground mine and processing facilities near Maysville, Ky.

Table 9.—Kentucky: Crushed limestone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value
Allen	1	223	372	1	217	351
Bourbon	1	191	W	1	215	W
Boyd	--	--	--	1	15	38
Caldwell	2	W	W	2	923	2,193
Carroll	--	--	--	1	9	29
Carter	4	1,337	2,515	3	748	1,251
Casey	1	W	W	1	W	246
Christian	3	W	W	4	W	3,201
Clinton	1	W	W	1	348	W
Cumberland	1	W	W	1	51	W
Edmonson	1	99	151	2	123	194
Garrard	1	178	420	1	121	W
Greenup	1	W	W	1	W	100
Hardin	5	1,183	1,997	5	1,201	2,233
Harlan	1	486	850	1	W	W
Hart	1	163	W	1	118	W
Jefferson	5	2,819	4,910	4	W	W
Livingston	4	W	W	5	6,148	W
Marion	1	118	W	1	101	W
Marshall	--	--	--	2	640	960
Mason	--	--	--	1	2	4
Mercer	1	6	12	2	W	W
Metcalfe	2	117	W	1	89	W
Monroe	1	W	W	1	125	W
Morgan	3	436	804	2	W	W
Nicholas	1	W	423	1	320	480
Oldham	3	1,102	1,891	3	786	1,432
Pike	1	W	W	1	362	891
Powell	1	W	90	1	W	150
Pulaski	4	1,355	2,537	3	675	1,243
Trigg	1	W	390	1	257	424
Warren	4	926	1,576	4	633	1,130
Undistributed [1]	58	27,468	51,976	58	20,220	49,687
Total [2]	114	38,205	70,912	118	34,447	66,237

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes Adair, Anderson, Barren, Boone, Boyle, Breckinridge, Bullitt, Butler, Campbell (1973), Crittenden, Estill (1973), Fayette, Fleming, Franklin, Grayson, Green, Harrison, Henry, Jackson, Jessamine, Laurel, Lee, Letcher, Logan, Madison, Meade (1973), Menifee, Montgomery, Muhlenberg, Nelson, Ohio, Pendleton, Rockcastle, Rowan, Scott, Simpson, Taylor, Todd, Washington, Wayne, and Wolfe Counties.
[2] Data may not add to totals shown because of independent rounding.

Table 10.—Kentucky: Crushed limestone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	4,004	7,410	3,176	6,165
Concrete aggregate	4,633	8,040	3,736	6,904
Dense graded roadbase stone	12,498	22,891	10,353	19,208
Macadam aggregate	964	1,695	721	1,340
Surface treatment aggregate	1,726	2,975	1,041	1,978
Unspecified construction aggregate and roadstone	5,002	9,283	5,984	11,623
Agricultural purposes [1]	1,868	3,652	2,239	4,779
Riprap and jetty stone	415	797	387	733
Railroad ballast	2,332	5,218	3,765	7,529
Other uses [2]	4,763	8,951	3,046	5,984
Total [3]	38,205	70,912	34,447	66,237

[1] Includes data for agricultural limestone, other soil conditioners, poultry grit and mineral food.
[2] Includes stone used in fill, filter stone (1974), cement and lime manufacture, flux stone, mine dusting, other fillers, acid neutralization, building products, drain fields, manufactured fine aggregates (1973), and uses not specified.
[3] Data may not add to totals shown because of independent rounding.

METALS

Aluminum.—The Aluminum Co. of America acquired property and announced plans for constructing a large rolling mill in Meade County.

Zinc.—The American Smelting and Refining Co. executed a letter of contract intent for constructing a 180,000-ton-per-year, $160 million metal refinery near Stevensport, Breckinridge County.

Table 11.—Principal producers

Commodity and company	Address	Type of activity	County
Aluminum (primary):			
Anaconda Aluminum Co	P.O. Box 1654 Louisville, Ky. 40201	Smelter	Henderson.
National-Southwire Aluminum Co.	P.O. Box M Hawesville, Ky. 42348	do	Hancock.
Cement: The Flintkote Co. [1]	Dixie Highway Kosmosdale, Ky. 40272	Plant	Jefferson.
Clays:			
Kentucky-Tennessee Clay Co.	P.O. Box 77 Mayfield, Ky. 42066	Mines and plants	Graves.
Old Hickory Clay Co	P.O. Box 271 Paducah, Ky. 42351	Mines	Do.
Coal:			
Amax Coal Co	150 South Meridan St. Indianapolis, Ind. 46225	Strip mine	Muhlenberg.
Beth-Elkhorn Corp	701 East Third St. Bethlehem, Pa. 18016	Underground mines.	Letcher and Pike.
Island Creek Co	Wheelwright, Ala. 41669	Underground mines.	Floyd, Hopkins, Muhlenberg, Pike, Union.
Peabody Coal Co	301 North Memorial Dr. St. Louis, Mo. 63102	Underground and strip mines.	Muhlenberg, Ohio, Union.
Pittsburg and Midway Coal Mining Co.	10 Main Center Kansas City, Mo. 64105	do	Hopkins and Muhlenberg.
United States Steel Corp	525 William Penn Place Pittsburgh, Pa. 15230	Underground and auger mines.	Harlan.
Coke: Allied Chemical Corp	40 Rector St. New York, N.Y. 10006	Plant	Boyd.
Ferroalloys: Airco Alloys and Carbide.	P.O. Box 217 Calvert City, Ky. 42029	do	Marshall.
Fluorspar: Calvert City Chemical Co.	P.O. Box 305 Calvert City, Ky. 42029	Underground mine.	Crittenden.
Graphite (artificial):			
Carborundum Co	Hickman, Ky. 42050	Plant	Fulton.
Iron (pig):			
Armco Steel Corp	Middletown, Ohio 45042	do	Boyd.
Interlake, Inc	9th & Lowell Sts. Newport, Ky. 41071	do	Campbell.

See footnotes at end of table.

Table 11.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Lime: Black River Mining Co	Route 1 Butler, Ky. 41006	Plant	Pendleton.
Natural gas:			
Inland Gas Co	340 17th St. Ashland, Ky. 41101	Gas wells	Various.
Kentucky-West Virginia Gas Co.	Second National Bank Bldg. Ashland, Ky. 41101	do	Do.
Wiser Oil	P.O. Box 192 Sistersville, W. Va. 26175	do	Do.
Texas Gas Transmission Co	Owensboro, Ky. 42301	do	Do.
Columbia Gas Transmission	Charleston, W. Va. 25325	do	Do.
Perlite (expanded):			
W. R. Grace & Co.[2]	62 Whittemore Ave. Cambridge, Mass. 02140	Plant	Campbell.
Grefco, Inc	P.O. Box 35 Florence, Ky. 41042	do	Kenton.
Petroleum (crude):			
Ashland Oil and Refining Co.[3]	1409 Winchester Ave. Ashland, Ky. 41101	Wells	Various.
Har-Ken Oil Co	P.O. Box 616 Owensboro, Ky. 42301	do	Do.
Humble Oil & Refining Co	2010 West Ohio St. Evansville, Ind. 47712	do	Do.
Sun Oil Co	P.O. Box 5026, Lawnsdale Evansville, Ind. 47715	do	Do.
Sand and gravel:			
Evansville Materials, Inc	624 N.W. Riverside Dr. Evansville, Ind. 47708	Dredge	Henderson.
Ingram Materials, Inc	P.O. Box 1049 Nashville, Tenn. 37202	do	Livingston.
Martin Marietta Corp.[4]	P.O. Box 120 Mercersburg, Pa. 17236	do	Boone, Jefferson, Oldham.
Nugent Sand Co	P.O. Box 6072 Louisville, Ky. 40206	do	Jefferson.
E. T. Slider, Inc	P.O. Box 6041 Louisville, Ky. 40206	Pit	Do.
Stone:			
Kentucky Stone Co	400 Sherburn La. Louisville, Ky. 40207	Underground mines, quarries, and plants.	Various.
Reed Crushed Stone Co., Inc	P.O. Box 35 Gilbertsville, Ky. 42044	Quarry and plant.	Livingston.
Three Rivers Rock Co	P.O. Box 218 Smithland, Ky. 42081	do	Do.

[1] Also clays.
[2] Also exfoliated vermiculite.
[3] Also a refinery in Boyd County.
[4] Also stone.

The Mineral Industry of Louisiana

By Owen W. Jones [1] and Leo W. Hough [2]

Louisiana mineral production totaled a record $8.15 billion in 1974, 40% higher than in 1973, the previous record value year. Louisiana continued its second-place ranking in value of domestic mineral production. Value of each individual commodity was higher even though all commodities, except salt, sulfur, and stone, were produced in smaller quantities than in 1973. Crude oil, natural gas, and natural gas liquids accounted for 96.4% of total mineral production value, which in turn largely accounted for the 40% increase in value. Despite the new value record, declining petroleum and natural gas production in the face of increased demand indicates a problem for the Louisiana mineral industry in the near future.

[1] State Liaison Officer, Bureau of Mines, Baton Rouge, La.

[2] State Geologist, Louisiana Geological Survey, Baton Rouge, La.

Table 1.—Mineral production in Louisiana [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons	979	$1,329	770	$1,425
Lime ---- do	897	16,801	796	17,665
Natural gas ---- million cubic feet	8,242,423	1,846,303	7,753,631	2,380,365
Natural gas liquids:				
Natural gasoline and cycle products thousand 42-gallon barrels	47,906	167,037	35,860	234,954
LP gases ---- do	102,701	253,671	108,439	423,996
Petroleum (crude) ---- do	831,524	3,327,702	737,324	4,811,772
Salt ---- thousand short tons	13,152	66,211	13,543	76,960
Sand and gravel ---- do	13,748	21,165	12,341	27,781
Stone [2] ---- do	10,802	21,309	10,940	24,046
Sulfur (Frasch) ---- thousand long tons	3,329	W	3,426	W
Value of items that cannot be disclosed: Cement, gypsum, stone (miscellaneous), and values indicated by symbol W	XX	98,082	XX	147,614
Total	XX	5,819,610	XX	8,146,578
Total 1967 constant dollars	XX	4,266,356	XX	p 3,895,656

p Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Shell only; miscellaneous stone included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Louisiana, by parish [1 2]

(Thousands)

Parish	1973	1974	Minerals produced in 1974, in order of value
Acadia	$123,828	$166,835	Natural gas liquids, natural gas, petroleum.
Allen	6,299	8,620	Petroleum, natural gas, natural gas liquids, sand and gravel.
Ascension	57,893	86,885	Natural gas liquids, petroleum, natural gas, salt.
Assumption	33,245	44,260	Natural gas, petroleum.
Avoyelles	3,374	5,535	Petroleum, natural gas.
Beauregard	8,101	11,547	Petroleum, sand and gravel, natural gas liquids, natural gas.
Bienville	W	17,879	Natural gas, petroleum, clays.
Bossier	21,360	33,679	Petroleum, natural gas, natural gas liquids.
Caddo	24,186	35,622	Petroleum, natural gas, natural gas liquids, clays.
Calcasieu	68,070	91,675	Petroleum, natural gas liquids, natural gas, lime, salt, stone.
Caldwell	2,626	W	Natural gas.
Cameron	385,437	589,063	Natural gas, petroleum, natural gas liquids, salt.
Catahoula	8,313	15,640	Petroleum, sand and gravel, natural gas.
Claiborne	25,751	34,552	Petroleum, natural gas, natural gas liquids.
Concordia	16,379	23,321	Do.
De Soto	9,972	15,601	Natural gas, petroleum.
East Baton Rouge	18,706	20,360	Cement, lime, petroleum, sand and gravel, natural gas, clays.
East Carroll	W	260	Sand and gravel, petroleum.
East Feliciana	W	W	Sand and gravel.
Evangeline	14,828	20,383	Petroleum, natural gas, natural gas liquids.
Franklin	2,278	2,361	Petroleum, natural gas.
Grant	3,617	7,914	Sand and gravel, petroleum, natural gas.
Iberia	329,511	432,670	Petroleum, natural gas, salt, natural gas liquids.
Iberville	59,521	73,077	Petroleum, salt, natural gas, natural gas liquids.
Jackson	1,261	1,314	Natural gas, petroleum.
Jefferson	387,934	526,343	Petroleum, natural gas, sulfur, natural gas liquids, salt.
Jefferson Davis	47,680	62,233	Natural gas, petroleum, natural gas liquids, sand and gravel.
Lafayette	16,637	21,751	Do.
Lafourche	439,940	582,091	Petroleum, natural gas, sulfur, natural gas liquids.
La Salle	22,774	34,770	Petroleum, natural gas, sand and gravel.
Lincoln	12,932	13,262	Natural gas, natural gas liquids, petroleum, clays.
Livingston	W	--	
Madison	467	W	Sand and gravel.
Morehouse	10,448	13,125	Natural gas, petroleum.
Natchitoches	41,557	58,306	Petroleum, natural gas, natural gas liquids, clays.
Orleans	24,771	29,875	Cement, stone, lime, natural gas, petroleum.
Ouachita	7,273	11,146	Natural gas, sand and gravel, petroleum, natural gas liquids.
Plaquemines	1,250,134	1,682,763	Petroleum, natural gas, sulfur, natural gas liquids, salt.
Pointe Coupee	22,306	33,706	Petroleum, natural gas liquids, natural gas, clays.
Rapides	6,817	8,166	Petroleum, sand and gravel, natural gas.
Red River	220	427	Natural gas, sand and gravel, petroleum.
Richland	29,953	47,631	Petroleum, natural gas liquids, natural gas.
Sabine	717	1,357	Petroleum, natural gas.
St. Bernard	63,840	90,183	Natural gas liquids, petroleum, natural gas, clays.
St. Charles	94,853	129,800	Petroleum, natural gas liquids, natural gas.
St. Helena	W	W	Sand and gravel, clays.
St. James	13,360	24,391	Petroleum, natural gas, natural gas liquids.
St. John the Baptist	7,149	9,770	Petroleum, natural gas.
St. Landry	43,311	52,705	Petroleum, natural gas, natural gas liquids.
St. Martin	69,312	95,802	Petroleum, natural gas, salt, natural gas liquids, clays.
St. Mary	633,573	961,699	Petroleum, natural gas, natural gas liquids, salt, stone, lime.
St. Tammany	W	12,405	Stone, sand and gravel, clays.
Tangipahoa	W	W	Sand and gravel, petroleum, clays.
Tensas	3,350	4,721	Petroleum, natural gas, natural gas liquids.
Terrebonne	901,082	1,196,121	Petroleum, natural gas, natural gas liquids, sulfur, salt.
Union	839	2,906	Petroleum, natural gas, sand and gravel.
Vermilion	364,674	506,944	Natural gas, petroleum, natural gas liquids, sand and gravel.
Vernon	W	--	
Washington	W	1,748	Sand and gravel.
Webster	31,885	40,866	Natural gas, natural gas liquids, petroleum, sand and gravel.
West Baton Rouge	6,426	8,556	Petroleum, natural gas, clays.

See footnotes at end of table.

Table 2.—Value of mineral production in Louisiana, by parish [1] [2]—Continued
(Thousands)

Parish	1973	1974	Minerals produced in 1974, in order of value
West Feliciana	W	W	Sand and gravel.
Winn	$3,705	$5,012	Petroleum, stone, gypsum, natural gas.
Undistributed [3]	35,134	136,952	
Total [4]	5,819,610	8,146,578	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Values for petroleum and natural gas (1974) are based on an average price per barrel for the State.
[2] No production was reported for West Carroll Parish.
[3] Includes some petroleum, sand and gravel (1973), and natural gas (1974) that cannot be assigned to specific parishes and values indicated by symbol W.
[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Louisiana business activity

	1973	1974 [p]	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands	1,342.4	NA	NA
Unemployment ---- do	58.6	NA	NA
Employment:			
Contract construction ---- do	87.5	89.1	+1.8
Mining ---- do	53.1	54.1	+1.9
Manufacturing ---- do	186.9	185.9	−.5
Total all industries [1] ---- do	845.5	862.6	+2.0
Personal income:			
Total ---- millions	$14,795	$16,223	+9.6
Per capita	$3,950	$4,310	+9.1
Construction activity:			
Total private nonresidential buildings ---- millions	$337.9	$315.1	−6.7
Highway construction contracts awarded ---- do	$169	$190	+12.4
Cement shipments to and within Louisiana thousand short tons	2,410	2,426	+.7
Farm marketing receipts ---- millions	$1,181.6	NA	NA
Mineral production value ---- do	$5,819.6	$8,146.6	+40.0

[p] Preliminary. NA Not available.
[1] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; services; and government.

Sources: Employment and Earnings; Survey of Current Business; Construction Review; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

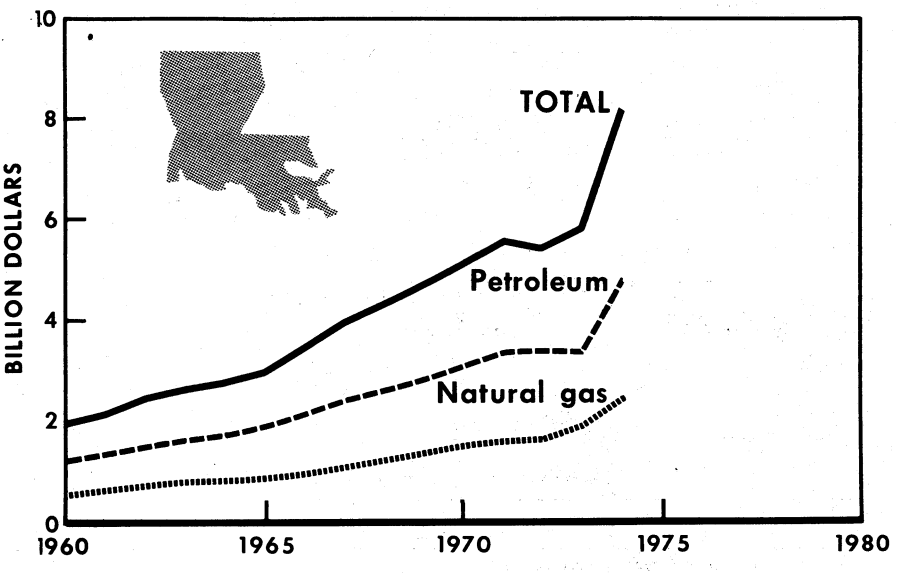

Figure 1.—Value of petroleum, natural gas, and total value of mineral production in Louisiana.

Trends and Developments.—Plans for construction of new plants and expansion of existing plants continued at a high level. The Louisiana Department of Commerce and Industry approved ad valorem tax exemption applications on a total of $1.054 billion for construction, an 88% gain over the 1973 figure of $561.2 million. Gains were reported in seven of the eight industrial categories. The sole decline occurred in the category of stone, glass, or clay products. Chemicals and refining, the largest single category, represented nearly half of the total. Mineral-related industries (petrochemicals; refining and chemical; metals and machinery; stone, clay, and glass products; and electric power) investments were $950 million, or 90% of the total.

Louisiana oil wells continued to produce at maximum capacity during the energy and fuel shortage of 1974, but production fell far short of demand and declining production rates due to reservoir depletion without corresponding new oil discoveries aggravated this situation.

Energy Company of Louisiana (ECOL) began construction on a $300 million, 200,000-barrel-per-day refinery. The refinery site is on the east bank of the Mississippi River, 35 miles upstream from New Orleans. At the ground-breaking ceremonies, John C. Sawhill, head of the Florida Energy Administration, said the oil embargo at the end of 1973 brought home the unpleasant fact that the Nation did not have even enough refinery capacity to process the crude oil we could obtain during the embargo. U.S. refinery output falls about 3 million barrels per day short of demand, he said.

Electric utilities, although planning nuclear-powered electricity generation, also began building coal-fired generators to be fueled by low-sulfur western coal brought into the State by unit train from Wyoming and Montana.

The Atomic Energy Commission approved construction of a Louisiana Power and Light Co. nuclear powerplant at Taft, 20 miles upriver from New Orleans. The company planned to begin construction as soon as equipment and personnel could be assembled. The 1,165,000-kilowatt unit, dubbed Waterford 3, will help meet the energy needs of the New Orleans metropolitan area.

In December Congress approved and

the President signed the Superport Bill, prospectively a very important piece of legislation for the State of Louisiana. The State's drive for the Superport has been directed by the Louisiana Deep Draft Harbor and Terminal Authority, organized in 1972. Through fiscal year 1975 the authority will have spent approximately $1.5 million. Of this total, all major costs such as legal fees and environmental studies can be recovered from the licensees. Thus, for substantially less than $1 million, the State should obtain a facility which studies indicate will create 35,000 jobs by 1981.

Governor Edwards was elected Chairman of the 30-State Interstate Oil Compact Commission (IOCC) at its meeting in Phoenix, Ariz., in December. Commission representatives commended Edwards for his leadership and concern for oil and gas business policies. He has been extremely critical of high-energy-usage States and areas whose policies discourage refinery locations, superports, offshore and onshore leasing and drilling, pipelines, etc.

The U.S. Army Corps of Engineers began a study of the feasibility of providing deep-draft Mississippi River navigation between Baton Rouge and Natchez. At present, a 12- by 300-foot barge channel is maintained above Baton Rouge. The desired result of the new program would be establishment of a deepwater port at Natchez and industrialization of the reaches of the river between Natchez and Baton Rouge.

Legislation and Government Programs.—In accordance with the Federal Petroleum Allocation Regulations, the State Conservation Commission added an Allocation Division to administer both the State set-aside hardship-fuel program, and the allocation, under Federal rules, of fuel for nonwholesale purchasers.

Marketing of oil produced from State land remained an issue. Governor Edwards challenged a Federal ruling that cost Louisiana an estimated $130 million. He announced that he planned to work with other oil-producing States to fight the Federal Energy Administration (FEA) ruling that placed State-owned crude oil under price control. The Cost-of-Living Council had previously ruled that the FEA could not regulate these prices. At the time of the original ruling in 1963, the amount of State-owned oil exempt from price control was relatively small, but the State in leasing its lands for commercial oil production had included the option of accepting a cash royalty or of taking the royalty in actual oil. The new Federal ruling meant this oil must be sold for approximately $5 per barrel rather than the uncontrolled price of $10. On May 1, a Los Angeles Federal Court ruled that California was exempt from the price ceiling. The FEA appealed this decision, and Louisiana joined California and the City of Long Beach in defending against the appeal. In July, a special U.S. Court of Appeals overturned the original court decision, and the State-owned oil was ruled to be subject to Federal price control.

In 1969 the U.S. Supreme Court appointed a special master to make recommendations as to where the Louisiana coastline should be. The Court had ruled in 1960 that the United States owns seabottoms beyond 3 miles seaward of the coastline. Since that time, there has been a continuing dispute over establishment of the coastline, and every islet, headland, bay, or even shifting sandspit exposed by low tide had an influence. The special master's report submitted in August would give the United States authority over most of the remaining disputed production offshore from Louisiana.

Environment.—Louisiana, Texas, Florida, Alabama, and Mississippi vehemently objected to a West Virginia chemical plant dumping toxic waste into the Gulf of Mexico. The DuPont chemical plant at Belle, W. Va., said it must ship plant waste to the Gulf of Mexico because there was no waterway to the Atlantic Ocean from the plantsite. The Environmental Protection Agency (EPA) approved the dumping, and 40,000 tons of waste were barged from West Virginia to New Orleans. Strong objection by the Gulf States caused approval to be withdrawn, and the waste was put into storage. The stored waste presents a continuing risk of discharge as a result of corrosion, equipment failure, hurricane, or other disaster.

In similar vein, a Dutch incinerator ship, leased by Shell Oil Co. to burn chlorinated hydrocarbon waste from the company's Deer Park, Tex., plant, completed an EPA-approved test burn while cruising in the Gulf of Mexico. This test had been strongly opposed by Louisiana officials who said, "The Gulf of Mexico is too important to us on the Gulf Coast

to use it as an incineration site, just as we have already argued it is too important to be used as an open dump."

A Gulf South Research Institute project to be funded by Federal, State, and private industry money was begun to research the feasibility of eliminating the water pollution potential from ammonia production processes by the Louisiana chemical industry. The new technology expected would eliminate water pollution by continuously recycling contaminants and waste products through the production process until they are totally consumed.

Exxon Company, U.S.A., let a $13 million contract for engineering and constructing part of a waste-water-treatment facility at its Baton Rouge refinery. The entire project is expected to cost $30 million. The $13 million segment involves biological oxidation as a final-treatment step for all effluent water from the refinery, including contaminated rainwater runoff.

Kaiser Aluminum & Chemical Corp. put into operation a filtration and storage system to handle spent bauxite at their Gramercy plant. This has stopped discharge of red mud into the Mississippi River. The plant at Baton Rouge will not have this type of disposal system until at least mid-1976. The new disposal method is approved by the EPA and by the Louisiana Stream Control Commission. The spent bauxite is pumped over a 200-acre sandbed enclosed by 30-foot-high levees. The alkaline water in the spent bauxite filters through the sandbed to underground drainpipes which collect the liquid and return it to the plant where it is neutralized.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

The value of mineral fuel production totaled $7.851 billion in 1974, a 40% increase from the 1973 value. Fuels represented more than 96% of the entire value of mineral production in Louisiana. At yearend, the State listed 30,966 productive wells (30,615 in 1973) as follows: North Louisiana—11,955 oil and 5,261 natural gas wells; south Louisiana—onshore 8,248 oil and 3,427 natural gas wells, and offshore 1,515 oil and 560 natural gas wells in Zone I and an area of disputed ownership. In addition, the U.S. Geological Survey reported 6,650 producible oil completions and 2,959 producible gas completions in the Louisiana Outer Continental Shelf (OCS).

Leasing Activity.[3]—In north Louisiana, leasing activity continued at a very rapid pace, with both independent and major companies taking large lease blocks. The Hosston and Cotton Valley sediments in the central and western parishes and the Smackover Formation in the northern parishes were the areas of greatest activity. Lease bonuses ranged from $10 to $75 per acre and averaged $25 per acre.

In the gulf coast area, onshore leasing activity was down slightly, with activity concentrated in the Miocene trend of the coastal parishes. No significant finds have been made in the Cretaceous trend, and activity declined. In the Oligocene trend, an oldtime oil boom seemed to be underway at Jennings. The discovery well was within the town of Jennings, and individual town lots became important. In the Miocene trend, Vermilion, Cameron, and northern Lafourche Parishes were sites of intense activity on seismic prospects around both old and new fields. Leasing prices ranged from $1 per acre to more than $300 per acre.

Offshore there were 3 Federal lease sales offering 206 tracts in March, 258 in July (off Texas and Louisiana), and 297 in October. The March sale brought recordmaking total high bids of $2.2 billion with an average price per acre of $4,264. There were no bids on 92 of the tracts, and the Bureau of Land Management (BLM) rejected the high bid on 23 of the 114 tracts that did receive bids.

The July sale involved leases that had not received bids in previous sales, or had received bids lower than estimated value, which were rejected by BLM. Of the 215 tracts that had received no previous bids, 26 did receive bids. Of the 43 tracts whose bids had previously been rejected, 20 failed to receive bids this time.

The October sale offered both wildcat and drainage tracts. High bids totaled $1.4 billion. Royalty bidding was offered for the first time as an experiment. Each of

[3] Adapted from the American Association of Petroleum Geologists Bulletin, v. 59, No. 8, August 1975.

10 royalty tracts had a fixed cash bonus of $25 per acre, plus the royalty bid. Eight of these tracts drew bids, with royalty ranging from 51.8% to 82.2%.

The State of Louisiana offered 14 offshore tracts in June. A Chevron combine bidding on a 2,026-acre tract in the South Pass area bid a record State sale high of $21.7 million and 16.6% royalty.

Geophysical Activity.[4]—In north Louisiana, geophysical activity increased from 226 crew-weeks in 1973 to 332 crew-weeks in 1974. The Lower Cretaceous trend received 65 crew-weeks in Sabine Parish and 39 in Natchitoches Parish. A total of 33 crew-weeks was reported in the Jurassic trend in Morehouse Parish. De Soto Parish had 27 crew-weeks; Claiborne Parish had 20.

In the gulf coast area, geophysical activity was up 5% from 1973, rising from 517 crew-weeks to 541 crew-weeks. On Marsh Island, Sun Oil Co. paid $14 million for a geophysical option to shoot on the Russell Sage Game Refuge. Two crews shot for 65 weeks on the island. Two-thirds of all activity was concentrated in the coastal parishes.

Offshore there was an 8% increase in geophysical activity. Most of the 372 crew-weeks were utilized in the Main Pass, Eugene Island, Vermilion, East Cameron, and West Cameron areas evaluating tracts acquired in March and October 1974.

Exploration and Development Drilling.—The American Petroleum Institute (API) is the source of the drilling and completion statistics published in the Minerals Yearbook. These statistics include data from both the area under State jurisdiction and the OCS area under Federal control. According to the API, 2,770 wells were drilled in Louisiana in 1974, including 653 offshore wells. Total onshore footage drilled was 14.1 million feet. Average depths follow: North Louisiana wells, 3,858 feet; south Louisiana wells, 10,115 feet; and offshore wells, 9,511 feet. Overall average depth was 7,328 feet.

In the 26 parishes of north Louisiana, a total of 1,171 wells was drilled, 43% more than the 821 drilled in 1973. Exploration drilling totaled 219 wells, 52% more than the 144 drilled in 1973. Of the exploratory wells, 30 (14%) were completed successfully. Development drilling totaled 952 wells, of which 318 were completed as oil wells and 436 were completed as gas wells for a success ratio of 79%. The most active areas of development drilling were the old Monroe gasfield and the old Caddo-Pine Island oil- and gasfield.

Onshore in the 33 parishes of southern Louisiana, a total of 946 wells was drilled. There were 276 exploratory wells, of which 15 were completed as oil wells, 38 as gas wells, and 223 as dry holes. The success ratio was 19%. The 670 development wells included 271 completed as oil wells, 152 completed as gas wells, and 247 dry holes for a 63% success ratio. Offshore development drilling accounted for a total of 502 wells, down 178 wells (26%) compared with 1973. Of the offshore development wells, 212 were completed as oil wells, 140 as gas wells, and 150 as dry holes. The success ratio was 70%. Offshore exploratory drilling accounted for 151 wells, down 57 wells from 1973. Of these exploratory wells, only 1 was completed as an oil well and 1 as a gas well; the other 149 were dry holes. The success ratio was 1.3%.

For the State, there were 2,124 developmental wells, down 68 from the 2,192 drilled in 1973. A total of 646 exploratory wells was drilled in 1974, down 66 from the 712 drilled in 1973. Of the 2,770 wells drilled in 1974, 825 were completed as oil wells, 789 were completed as gas wells, and 1,156 were dry. The State success ratio was 58%, up 1% from 1973.

New field discoveries and extensions added substantially to the reserves in north Louisiana and will increase development drilling in the area. A 20,359-foot presalt test well was drilled in the Cotton Valley field. The well penetrated salt at 11,732 feet with the base at 15,321 feet. Nonproductive sandstones and red shales were found below the salt. "The fact that the well was dry below the salt on a well-defined producing structural feature was disappointing."[5]

In the Louisiana gulf coast and offshore area, important new fields discovered were South Timbalier Block 37, Eugene Island Block 367, Jennings Townsite, Raccoon Lake, North Vinton, Northwest Johnson's Bayou, and Hopedale Lagoon.

The reduced exploration effort in the gulf coast area reflected shortages of drilling rigs, tubular goods, and trained per-

[4] Work cited in footnote 3.
[5] Work cited in footnote 3.

sonnel. Oil companies could not find enough rigs to test the offshore acreage they had leased. In April, there were only 45 rigs working in the Gulf of Mexico. Due to the energy crisis, there was a big increase in gulf leasing, but most of the rigs had gone to foreign jobs following a series of offshore mishaps which created oil pollution and stopped lease sales for 2 years. Rig owners, faced with the economic necessity of keeping these mutli-million-dollar rigs working, contracted work in other areas of the world. The shortage of drill pipe and casing had been an added deterrent to drilling.

Table 4.—Louisiana: Oil and gas well drilling completions in 1974, by parish

Parish	Development wells			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
NORTH LOUISIANA								
Bienville	1	18	3	--	2	2	26	241,556
Bossier	23	12	3	--	--	11	49	225,438
Caddo	172	12	24	--	2	7	217	573,069
Caldwell	--	4	7	--	7	24	42	129,338
Catahoula	10	--	15	--	--	28	53	264,547
Claiborne	7	--	9	3	--	8	27	232,499
Concordia	10	--	28	3	--	25	66	411,154
De Soto	3	22	29	--	3	5	62	266,676
East Carroll	--	--	--	1	--	7	8	50,538
Franklin	1	--	2	--	--	3	6	34,050
Grant	--	--	1	--	--	1	2	13,632
Jackson	--	--	1	--	2	1	4	36,598
La Salle	39	7	36	--	--	19	101	347,314
Lincoln	--	2	1	--	1	1	5	36,720
Madison	--	--	--	--	--	2	2	35,417
Morehouse	2	89	4	--	--	3	98	243,980
Natchitoches	--	--	--	--	--	2	2	13,268
Ouachita	--	126	4	--	1	4	135	378,562
Red River	10	--	6	--	2	1	19	78,612
Richland	2	1	2	--	--	2	7	33,636
Sabine	--	2	1	--	1	5	9	73,969
Tensas	5	1	6	1	--	5	18	145,207
Union	--	127	5	--	1	3	136	366,448
Webster	--	13	7	--	--	4	24	168,102
West Carroll	--	--	--	--	--	1	1	6,921
Winn	33	--	4	--	--	15	52	110,365
Total	318	436	198	8	22	189	1,171	4,517,616

Table 4.—Louisiana: Oil and gas well drilling completions in 1974, by parish—Continued

Parish	Development wells			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
SOUTH LOUISIANA								
Acadia	9	10	15	--	2	11	47	432,607
Allen	--	1	4	--	--	2	7	54,736
Ascension	2	1	2	--	--	--	5	46,192
Assumption	1	3	4	1	3	7	19	265,481
Avoyelles	--	--	3	1	--	3	7	52,494
Beauregard	1	1	5	3	--	7	17	200,024
Calcasieu	5	3	15	1	--	13	37	341,094
Cameron	13	10	14	--	3	23	63	586,297
East Baton Rouge	1	--	--	--	--	1	2	20,558
Evangeline	1	--	3	1	1	7	13	161,052
Iberia	6	8	7	--	2	13	36	414,966
Iberville	19	--	16	1	--	5	41	315,387
Jefferson	5	6	9	--	--	4	24	284,883
Jefferson Davis	1	3	5	2	2	14	27	285,060
Lafayette	--	4	4	1	1	2	12	159,893
Lafourche	25	14	19	2	4	13	77	871,942
Livingston	--	--	--	--	--	1	1	9,800
Orleans	--	--	--	--	--	2	2	19,763
Plaquemines	57	18	35	--	2	10	122	862,977
Pointe Coupee	--	--	--	--	1	--	1	9,230
Rapides	1	--	3	--	--	1	5	32,784
St. Bernard	--	--	--	--	--	3	3	27,237
St. Charles	14	6	6	--	1	11	38	385,821
St. James	--	1	--	--	1	1	3	37,205
St. John the Baptist	--	--	2	--	--	2	4	43,315
St. Landry	8	3	2	--	1	9	23	195,359
St. Martin	10	4	14	1	2	5	36	374,239
St. Mary	48	14	17	--	2	8	89	867,955
Tangipahoa	--	--	--	--	--	1	1	11,971
Terrebonne	42	30	14	1	5	24	116	1,390,110
Vermilion	2	12	25	--	5	18	62	748,832
Vernon	--	--	--	--	--	2	2	28,993
West Baton Rouge	--	--	4	--	--	--	4	35,585
Total	271	152	247	15	38	223	946	9,568,842
Offshore wells	212	140	150	1	1	149	653	6,210,937
State total	801	728	595	24	61	561	2,770	20,297,395

Source: American Petroleum Institute.

Carbon Black.—Production was 1,193 million pounds, a 1.2% decrease from 1973 output. Total value of production was $131.8 million, or 11.05 cents per pound. Louisiana continued to rank second after Texas and accounted for 35.2% of the total national production. Texas and Louisiana together accounted for 77.5% of total production in the United States.

Table 5.—Louisiana: Carbon black production and value
(Million pounds and million dollars)

Year	Quantity	Value
1970	982	70.6
1971	1,079	78.2
1972	1,078	78.8
1973	1,208	96.8
1974	1,193	131.8

In Louisiana natural gas used in production of carbon black totaled 23.668 million cubic feet, up 11% from 1973. This figure includes gas used for fuel as well as gas used as raw material. Liquid hydrocarbon usage was 175.5 million gallons, down 6% from 1973.

At yearend 1974, the nine furnace plants in the State had a total capacity of 3,962,000 pounds per day. The three plants in St. Mary Parish accounted for most of the State production. Other plants are located in Avoyelles, Calcasieu, Evangeline, Ouachita (two plants), and West Baton Rouge Parishes.

Lignite.—The Louisiana Geological Survey began a survey to determine extent and quality of lignite deposits in Louisiana. A coring program was carried on in the

Dolet Hills area of northwest Louisiana near the town of Mansfield. Core analyses were being made by the Bureau, at the Pittsburgh Energy Research Center, through a cooperative agreement made with the Louisiana Geological Survey.

Natural Gas.—Marketed production of natural gas in Louisiana decreased 5.9% from 8.242 trillion cubic feet to 7.754 trillion cubic feet, but value increased from $1.85 billion to $2.38 billion. This represents an average wellhead price change from 22.4 cents per thousand cubic feet (Mcf) to 30.7 cents per Mcf. Louisiana was the second-ranked producing State with 36% of total U.S. production. Gas well completions during the last 5 years according to the API are shown in the following tabulation:

Year	North	South	Offshore	Total
1970	157	232	150	539
1971	237	200	184	621
1972	451	234	133	818
1973	269	284	231	784
1974	458	190	141	789

The number of well completions decreased in south Louisiana and also in the offshore area. The numerous completions in north Louisiana were largely due to drilling for stripper production in the Old Monroe and Caddo-Pine Island fields because of the increased price of both oil and gas.

According to the American Gas Association (AGA), natural gas discoveries, extensions, and revisions added 2.6 trillion cubic feet to natural gas reserves; in the same period 7.7 trillion cubic feet was produced for a reserve of 64.052 trillion cubic feet. The natural gas reserve has decreased every year since 1968 when the AGA reserve at yearend was 88.016 trillion cubic feet. Most of the Louisiana natural gas reserve is offshore in the Outer Continental Shelf area.

Comparison of the proved reserves at the end of 1973 and 1974 is shown in table 6. Productive capacity for natural gas in Louisiana follows:

	Capacity [1] (MMcfd)
Nonassociated gas	21,601
Associated gas (dissolved)	2,752
Total	24,353

[1] At 14.73 psia and 60° F, during the heating season (90 days) immediately following Dec. 31, 1974.

Source: American Gas Association.

At the end of 1974 Louisiana had six dry-gas storage reservoirs. Total capacity of the six storage reservoirs was 257,297 million cubic feet. Stored gas on that date totaled 174,883 million cubic feet.

Table 6.—Louisiana: Estimated proved recoverable reserves of crude oil, natural gas liquids, and natural gas

Commodity	Proved reserves, Dec. 31, 1973	Changes in proved reserves due to net revisions, extensions, and discoveries in 1974	Proved reserves Dec. 31, 1974 (API production deducted)	Changes from 1973 (percent)
Crude oil ____ thousand barrels	4,576,826	288,873	4,226,514	−7.7
Natural gas liquids ____ do	1,992,537	123,326	1,882,381	−5.5
Natural gas ____ million cubic feet	69,151,613	2,614,619	64,052,445	−7.4

Source: American Gas Association, American Petroleum Institute, and the Canadian Petroleum Association. Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada; and United States Productive Capacity as of December 31, 1974. V. 29, May 1975.

Table 7.—Louisiana: Natural gas data
(Million cubic feet)

Year	Withdrawals			Disposition			
	From gas wells	From oil wells	Total	Marketed production [1]	Value at wells (thousands)	Repressuring	Vented and wasted [2]
1970	6,811,334	1,264,823	8,076,157	7,788,276	$1,503,137	133,792	154,089
1971	7,011,666	1,306,885	8,318,551	8,081,907	1,632,545	133,080	103,564
1972	6,924,204	1,235,559	8,159,763	7,972,678	1,626,426	123,418	63,667
1973	7,347,732	1,143,462	8,491,194	8,242,423	1,846,303	146,680	102,091
1974	7,037,239	882,571	7,919,810	7,753,631	2,380,365	134,607	31,572

[1] Marketed production plus quantities used in repressuring, vented, and wasted.
[2] Partly estimated. Includes waste on producing properties and residue blown to the air.

Table 8.—Louisiana: Marketed production, interstate shipments, and total consumption of natural gas in selected producing States, in 1974 [1]
(Billion cubic feet)

State	Marketed production	Receipts	Deliveries	Net receipts (+) or deliveries (−)	Change in underground storage	Transmission loss and unaccounted for	Consumption
Louisiana	7,754	973	6,499	−5,526	2.8	21.8	2,203
Oklahoma	1,639	1,452	2,367	−916	−8.3	8.6	723
Texas	8,171	537	3,766	−3,230	−.6	29.3	4,912
Total	17,564	2,962	12,632	−9,672	−6.1	59.7	7,838

[1] Data may not add to totals shown because of independent rounding.

Nearly 2,203 billion cubic feet of natural gas was consumed in Louisiana in 1974, a 14-billion-cubic-foot decline from the 2,217 billion cubic feet used in 1973. Consumption was equal to 28.4% of production. Louisiana accounted for 35.9% of total U.S. marketed production. The three States of Texas, Louisiana, and Oklahoma furnished 81.3% of the total 21.6 trillion cubic feet of marketed production in the United States. Estimated daily productive capacity in Louisiana at the end of 1974 was 21,601 million cubic feet per day (MMcfd) of nonassociated natural gas, and 2,752 MMcfd of associated (dissolved) natural gas for a total capacity of 24,353 MMcfd, 51% of which was from offshore in the Gulf of Mexico.

Table 9.—Louisiana: Quantity and value of natural gas delivered to consumers and other in-State consumption of natural gas

	Number of consumers (thousands)		Quantity (million cubic feet)		Value (thousand dollars)	
	1973	1974	1973	1974	1973	1974
Delivered to consumers:						
Residential	893	904	93,072	91,844	90,559	102,865
Commercial	68	69	28,730	29,211	19,450	23,369
Industrial	XX	XX	1,085,216	1,091,472	410,212	687,627
Electric utilities	XX	XX	355,023	343,617	104,377	168,372
Other consumers	XX	XX	30,788	28,886	10,947	11,554
Total	XX	XX	1,592,829	1,585,030	635,545	993,787
Extraction loss:						
Natural gas processing	XX	XX	206,833	194,329	73,219	102,994
Lease and plant fuel	XX	XX	336,832	347,098	78,819	97,187
Pipeline fuel	XX	XX	80,198	76,236	19,568	21,346
Total natural gas consumption	XX	XX	2,216,692	2,202,693	807,151	1,215,314
Marketed natural gas production	XX	XX	8,242,423	7,753,631	1,846,303	2,380,365
In-State use as percent of production and value	XX	XX	26.9	28.4	43.7	51.1

XX Not applicable.

Natural Gas Liquids.—Louisiana continued to rank second after Texas in natural gas liquids production. Production in 1974 was 144.3 million barrels. Output of natural gasoline and cycle products dropped sharply (25.1%); liquefied petroleum gases (LPG) output increased 5.6%. Average value of LPG (including ethane) was $3.91 per barrel; average value of natural gasoline and cycle products was $6.55 per barrel.

According to an Oil and Gas Journal survey[6], there were 122 natural gas processing plants in Louisiana at yearend 1974, with a total capacity of 23,112.2 MMcfd. Natural gas throughput at these plants averaged 18,299.1 MMcfd, representing a plant capacity utilization of 79.2%. Total plant capacity, total throughput, and capacity utilization were all less than in 1973.

The AGA and API estimated the natural gas liquids reserve at the end of 1974 totaled 1.8?2 billion barrels. This was 5.5% less than in 1973, making 1974 the sixth consecutive year that reserves declined. Louisiana accounted for 29.6% of the Nation's total natural gas liquids reserve.

Consumption of the liquefied petroleum gases and ethane segment of natural gas liquids decreased 2% in 1974, as shown in the following tabulation:

Sector	Consumption (thousand barrels)		Percent change
	1973	1974	
Residential and commercial	3,223	2,981	−7.5
Internal combustion engine fuel	933	830	−11.0
Industrial [1]	r 3,168	3,178	+.3
Miscellaneous uses [2]	354	536	+51.4
Total	r 7,678	7,525	−2.0

r Revised.
[1] Includes refinery fuel.
[2] Includes secondary recovery of petroleum, agricultural uses, and use as substitute natural gas feedstock.

Petroleum.—Louisiana ranked second in petroleum production, accounting for 23% of the U.S. total. Crude oil production rates declined for the third consecutive year. Production of 737.3 million barrels in 1974 (2.02 million barrels per day) represented a 11.3% decline from 1973 production. Increased productivity due to new findings failed to keep pace with the rate of decline of productivity of old reserves, and even though nearly all oil

[6] Oil and Gas Journal. Survey of Gas Processing Plants. V. 73, No. 28, July 14, 1975, pp. 76–77.

wells were operated at their maximum efficient rate, the shortfall between demand and productivity continued to increase. More exploration, more drilling, and more enhanced-recovery projects are the only apparent means to narrow this widening supply gap.

According to API statistics, the crude oil reserve at yearend totaled 4,227 million barrels, down 350 million barrels from 1973. Additions to reserves based on reevaluation of known reservoirs, extensions of known fields, and discoveries of new fields and reservoirs amounted to 289 million barrels, only 39.2% of the amount lost by production.

The National Stripper Well Association survey for the year ending January 1, 1974, credits Louisiana with 12,649 stripper wells, which produced 7.3 million barrels of oil or 0.9% of total production. Productivity decline of stripper wells should not appreciably affect the State's productive capacity in the immediate future.

According to a Bureau of Mines survey, there were 22 refineries operating in Louisiana with a total operating capacity of 1,755,800 barrels per calendar day at yearend 1974. This was an increase of 58,350 barrels per day, 36,000 barrels of which were accounted for by the one additional refinery—the small Toro Petroleum Co. plant at Port Allen, West Baton Rouge Parish. Louisiana refining capacity was 87% of the daily crude production.

Table 10.—Louisiana: Crude oil production, indicated demand, and stocks in 1974, by month
(Thousand 42-gallon barrels)

Month	Production	Indicated demand	End of month stocks originating within State
January	67,184	65,875	29,811
February	61,527	59,074	32,261
March	65,927	66,996	31,193
April	63,730	63,962	30,961
May	64,587	66,229	29,321
June	61,103	60,012	30,411
July	62,466	63,225	29,653
August	62,496	62,318	29,831
September	57,899	58,215	29,516
October	59,003	57,705	30,812
November	58,456	58,424	30,844
December	52,996	54,444	29,398
Total:			
1974	737,324	735,979	XX
1973	831,524	833,900	XX

XX Not applicable.

Table 11.—Louisiana: Number of producing oil wells and average production per well per day

Year	Approximate number of producing wells, Dec. 31	Average production per well per day [1] (barrels)
1970	27,934	86.7
1971	28,829	93.6
1972	e 27,762	89.3
1973	e 28,869	80.5
1974	e 28,368	70.6

e Estimated.
[1] Based on the average number of wells during the year.

Table 12.—Louisiana: Production of crude petroleum, by district and selected fields
(Thousand 42-gallon barrels)

District and field [1]	1973	1974
Gulf coast onshore: [2]		
Avery Island	1,839	1,252
Bay de Chene	6,590	5,464
Bay Ste. Elaine	6,254	4,804
Bayou Sale	2,816	2,793
Black Bay West	8,036	7,068
Caillou Island	25,613	18,023
Cote Blanche Island	5,482	6,982
Delta Farms	997	916
Garden Island Bay	10,384	8,403
Golden Meadow	2,027	2,256
Grand Bay	5,755	3,934
Hackberry East	1,647	1,753
Hackberry West	3,100	2,944
Iowa	1,244	1,250
Jennings	261	280
Lafitte	8,211	5,727
Lake Barre	5,420	4,613
Lake Pelto	4,069	3,110
Lake Salvador	2,432	1,662
Lake Washington	6,965	6,488
Leeville	3,156	2,419
Paradis	4,277	4,057
Quarantine Bay	3,946	3,523
Romere Pass	2,727	2,218
Timbalier Bay	(3)	7,985
Venice	9,456	4,400
Vinton	5,078	2,994
Weeks Island	3,478	6,446
West Bay	8,363	6,679
West Cote Blanche Bay	10,288	7,880
Other fields	194,974	163,049
Total	354,885	301,372
Gulf coast offshore: [2]		
Bay Marchand Block 2 (including onshore)	32,561	32,632
Eugene Island Block 126	4,663	4,429
Eugene Island Block 175	9,873	8,059
Eugene Island Block 276	6,322	4,687
Eugene Island Block 330	(3)	19,747
Grand Isle Block 16	18,936	13,156
Grand Isle Block 43	20,732	20,999
Grand Isle Block 47	4,684	3,972
Main Pass Block 35	2,456	2,155
Main Pass Block 41	14,808	10,396
Main Pass Block 69	10,924	7,973
Main Pass Block 306	6,652	5,573
Ship Shoal Block 204	5,369	5,732
Ship Shoal Block 207	6,964	6,223

See footnotes at end of table.

Table 12.—Louisiana: Production of crude petroleum, by district and selected fields—Continued
(Thousand 42-gallon barrels)

District and field [1]	1973	1974
Gulf coast offshore: [2]—Continued		
Ship Shoal Block 208	11,262	10,559
South Marsh Island Block 73	5,353	5,020
South Pass Block 24 (including onshore)	16,740	15,223
South Pass Block 27	13,366	11,568
South Pass Block 62	8,666	6,446
South Pass Block 65	12,088	10,105
Timbalier Bay Block 21	(3)	9,449
West Delta Block 30	24,626	22,586
West Delta Block 58	8,176	10,035
West Delta Block 73	9,348	7,654
Other fields	182,306	142,738
Total	436,875	397,116
Northern:		
Caddo-Pine Island	3,076	3,348
Delhi	6,290	6,583
Haynesville (Ark., La.)	1,788	1,644
Homer	(3)	318
Rodessa (La., Tex.)	329	351
Other fields	28,281	26,592
Total	39,764	38,836
Grand total	831,524	737,324

[1] Breakdown for individual fields from the Oil and Gas Journal.
[2] Some fields include offshore and onshore production.
[3] Included in "Other fields."

Petrochemicals.—According to the Louisiana Department of Commerce and Industry, the petrochemical, chemical, and refining industry accounted for $522.8 million, or 49.5% of the total investment funds qualifying for industrial tax exemption in 1974.

Wittco Chemical Corp. was constructing a new polybutylene plant at Taft in St. Charles Parish. The plant, adjacent to an existing Wittco facility which produces chemical stabilizers for polyvinyl chloride, is the Nation's first commercial plant to produce polybutylene. Capacity is 50 million pounds per year.

Expansion construction at Taft will double the capacity of the existing olefins facility at the Union Carbide petrochemical complex, and a new 500-million-pound-per-year ethylene-oxide plant will be opened. Construction is expected to cost $270 million and require 3 years. The new plant is designed to meet expanded demand for ethylene glycol for antifreeze and for fiber use.

A $14 million plant for producing insecticides was begun at the Ciba-Geigy facility at St. Gabriel. It will be dependent on the petrochemical industry for distillate materials used in the manufacture of its products.

Construction of the "world's largest" higher alkylamines plant at St. Gabriel was announced by Air Products and Chemicals, Inc. The new facility will cost more than $10 million and will produce 100 million pounds per year of ethyl, propyl, and butyl amines.

First Mississippi Corp. announced plans for a new ammonia plant at Donaldsonville with a capacity of 1,150 short tons per day. Plant production, expected in late 1977, will increase total company ammonia capacity by some 75%.

NONMETALS

Value of nonmetals production was a new record, $295 million; the previous high was $289 million in 1968. Value was 31% greater than in 1973 and comprised 3.6% of the State's total mineral value.

Barite.—Crude barite, from Arkansas, Missouri, and foreign countries, was crushed and ground in Louisiana plants for use as a weighting material in well-drilling fluids. Three grinding plants operated at New Orleans, one at Lake Charles, and one at Morgan City. Output of ground barite was 559,436 short tons valued at $18.8 million.

Cement.—Ideal Basic Industries, Inc., Baton Rouge; Louisiana Cement Co., Division OKC Corp., New Orleans; and Lone Star Industries, Inc., New Orleans, all produced portland cement. Louisiana Cement also produced masonry cement, and Lone Star sold masonry cement. Portland cement accounted for nearly 99% of the total production. Ready-mix companies, highway and other contractors, and concrete products manufacturers used the bulk of portland cement production. Raw materials used in making portland cement included shells, limestone, clay, sand, gypsum, and iron ore. All plants used natural gas in their kilns. At the end of 1974, Ideal Basic Industries announced that it would cease production of cement at its Baton Rouge plant at the end of March 1975. The plantsite will be used as a distribution terminal. For several years, Ideal has supplemented its Baton Rouge production with cement transferred

from its plants at Mobile, Ala., Houston, Tex., Ada, Okla., and Okay, Ark. This practice will continue, and the volumes will be increased to offset the former Baton Rouge production. The company will continue to distribute cement from its New Orleans and Lake Charles terminals.

The company had hoped to continue production at Baton Rouge until a proposed 1.5-million-ton-per-year plant could be completed near Mobile, but according to the president of the firm, "Because of the very large investment required to upgrade pollution control facilities to meet air quality standards, the rapidly escalating cost of natural gas, and the need for completely upgrading and modernizing the plant, continued operation of the facility on a profitable basis would be impossible."

Clays.—Output of common clay and shale was 770,300 tons valued at $1.43 million. Average unit value was $1.85 per ton. Eleven companies operated 15 pits in 12 parishes. Principal producing parishes in descending order of production were Pointe Coupee, West Baton Rouge, and St. Bernard. Clay output was consumed in manufacturing cement, lightweight aggregate, and heavy building brick.

The Louisiana Geological Survey continued sampling clay resources of Louisiana for testing and evaluation. A cooperative agreement between the Louisiana Geological Survey and the Bureau of Mines authorized testing of the samples at the clay test laboratory of the Bureau's Metallurgy Research Laboratory in Tuscaloosa, Ala. The Louisiana Geological Survey published Clay Resources Bulletin No. 3, "Occurrence, Test Data and Evaluation of Clay for Making Structural Clay Products."

Table 13.—Louisiana: Clays sold or used by producers
(Thousand short tons and thousand dollars)

Year	Quantity	Value
1970	1,080	1,575
1971	1,073	1,606
1972	1,000	1,454
1973	979	1,329
1974	770	1,425

Gypsum.—Winn Rock, Inc., mined gypsum in Winn Parish. The product was used as a retarder in portland cement. Output increased 26%, but was 16% below the 1972 record. United States Gypsum Co. and National Gypsum Co. calcined gypsum in Jefferson and Orleans Parishes. Output decreased 3%.

Lime.—Allied Chemical Corp. in East Baton Rouge Parish, Olin Corp. in Calcasieu Parish, Pelican State Division of S. I. Lime Co. in St. Mary Parish, and United States Gypsum Co. in Orleans Parish produced lime. Output decreased 11% to 796,000 tons and was 22% below the 1970 record. Most of the lime was consumed in Louisiana and Alabama. Consumption of lime in Louisiana was 808,000 tons, principally for use in chemical plants, aluminum smelters, and water purification facilities. Pelican State Division of S. I. Lime Co. was building a new hydrator unit in 1974, to be completed in 1975.

Perlite and/or Expanded Vermiculite.—Perlite produced outside Louisiana was expanded by Filter Media Co. of Louisiana, Inc., at Reserve, St. John the Baptist Parish. This company is one of the principal producers of filter materials. Principal uses were for filter aids, concrete aggregate, and low-temperature insulation. This plant's vermiculite exfoliating facility was inactive in 1974. The W. R. Grace & Co. plant in Orleans Parish discontinued production of expanded perlite products in 1974, but did produce exfoliated vermiculite mainly for concrete aggregate, fireproofing, block insulation, horticulture, and soil conditioning.

Salt.—Salt sold or used was 13,543,000 tons valued at $76,960,000, or $5.68 per ton. This quantity was an increase of 3%; the price per ton was an increase of 12.9%. Louisiana ranked first in the United States and accounted for 29% of the U.S. total. Twelve companies produced salt at 16 operations in 10 parishes. Of these, 10 operations produced brine only, 3 produced both evaporated and rock salt, 2 produced rock salt only, and 1 produced evaporated salt only. Evaporated salt averaged $38.47 per ton, rock salt $6.41, and brine salt $3.73.

Louisiana State University (LSU) Institute for Environmental Studies began studying the feasibility of using salt domes for disposal of radioactive wastes. Union Carbide Corp., which operates the Oak Ridge National Laboratory, was financing the study. Dr. Joseph D. Martinez, director of the institute, said that rock salt, both

bedded and domal deposits, has properties that make it potentially useful for such storage. It is impermeable and behaves as a plastic in response to earth movement, so that fissures and faults are rarely found in salt deposits. These characteristics should insure containment of liquids or gases stored within the salt mass.

Table 14.—Louisiana: Salt sold or used by producers
(Thousand short tons and thousand dollars)

Year	Evaporated salt		Rock salt		Brine		Total [1]	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1970	270	7,888	5,581	32,459	7,733	24,507	13,584	64,854
1971	275	9,399	5,794	32,976	7,283	25,574	13,352	67,950
1972	269	8,840	6,142	34,032	7,104	24,592	13,514	67,464
1973	285	9,976	5,411	30,065	7,456	26,170	13,152	66,211
1974	296	11,386	6,024	38,641	7,223	26,932	13,543	76,960

[1] Data may not add to totals shown because of independent rounding.

Salt domes are common in the gulf coast region. LSU has been a center for saline studies for many years, and much of the early work regarding salt domes was done at LSU.

The coastal salt domes were considered by the Energy Research and Development Administration (ERDA) as sites for H-bomb explosions to produce steam in leached salt cavities. Steam from previously introduced water would be piped to surface generating plants, and the cooled water would be returned to the salt cavity. This proposal drew much opposition from the affected States, and the proposal was withdrawn.

The Louisiana Offshore Oil Port (LOOP), a group of companies planning to build the proposed Louisiana Superport, plans to store imported oil in the Clovelly salt dome near Galliano.

Cargill, Inc., completed repairs at the Belle Isle mine number two shaft, which had caved in, in March 1973. The mine was put back into production in January after large volumes of concrete had been placed around the bottom of the shaft to prevent further caving into the mine. Plans were made to redrill the same shaft and line it with reinforced concrete to the bottom of the shaft.

Sand and Gravel.—Production was 12.3 million short tons, a 10% decline from 1973. Average unit value increased to $2.25 per short ton. A total of 60 companies operated 66 plants in 22 parishes. Approximately 10% of total production was from 33 plants producing less than 100,000 tons per year, 60% was from 28 plants producing between 100,000 and 500,000 tons per year, and 30% was from 5 plants producing between 500,000 and 1 million tons per year. Leading parishes in descending rank of production were St. Helena, Webster, East Baton Rouge, Washington, and Grant. These five parishes produced 50% of the State's output of sand and gravel.

Table 15.—Louisiana: Sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Year	Commercial		Government-and-contractor		Total sand and gravel [1]	
	Quantity	Value	Quantity	Value	Quantity	Value
1970	17,746	21,527	410	836	18,155	22,363
1971	18,823	23,861	405	631	19,228	24,492
1972	18,538	26,255	383	740	18,920	26,996
1973	13,676	21,128	72	37	13,748	21,165
1974 [2]	9,297	21,938	3,044	5,843	12,341	27,781

[1] Data may not add to totals shown because of independent rounding.
[2] Commercial production used on government-funded projects was moved from columns 1–2 to columns 3–4 in 1974. Value data may not be directly comparable to that in table 16 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 16.—Louisiana: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	13,482	19,777	4,046	7,989
Gravel			7,040	16,623
Unprocessed: Sand and gravel			973	1,443
Industrial:				
Sand	266	1,388	282	1,648
Gravel			--	--
Total	13,748	21,165	12,341	27,703

[1] Value data may not be directly comparable to that in tables 1, 15, 17 and 18 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 17.—Louisiana: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	12,314	18,626	4,733	11,212
Highway and bridge construction			470	854
Other uses (dams, waterworks, airports, etc.)			210	366
Concrete products (cement blocks, bricks, pipe, etc.)			1,438	3,559
Bituminous paving (asphalt and tar paving)			602	1,306
Roadbase and subbase			391	1,069
Unprocessed aggregate			964	1,440
Fill	566	522	77	167
Other uses [2]	530	592	130	317
Industrial sand and gravel	266	1,388	282	1,648
Total	13,676	21,128	9,297	21,938

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 18.—Louisiana: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	--	--	W	W
Highway and bridge construction			1,228	2,333
Other uses (dams, waterworks, airports, etc.)			W	W
Concrete products (cement blocks, bricks, pipe, etc.)			82	164
Bituminous paving (asphalt and tar paving)			1,022	2,359
Roadbase and subbase			678	965
Unprocessed aggregate			34	22
Fill	37	11	W	W
Other uses	34	25	--	--
Total [2]	72	37	3,044	5,843

W Withheld to avoid disclosing individual company confidential data. "Nonresidential and residential construction" and "Other uses (dams, waterworks, airports, etc.)" included with "Highway and bridge construction"; "Fill" included with "Unprocessed aggregate."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Data may not add to totals shown because of independent rounding.

Stone.—Production was principally oyster and clam shell dredged from dead shell beds in gulf coast area lakes and bays. The only true stone quarry presently in operation in Louisiana is in Winn Parish, where Winn Rock, Inc., quarries the anhydrite cap rock overlying the Winnfield intrusive salt dome.

Total output of stone was 10.9 million short tons valued at $24.0 million, or $2.20 per short ton. Most of the production was used for roadwork as roadbase, roadstone, and aggregate for concrete and bituminous road construction; and for cement and lime manufacture. Shell was produced in St. Mary, Orleans, St. Tammany, and Calcasieu Parishes. Nineteen operations by eight different companies made up the shell dredging industry.

Sulfur.—Louisiana Frasch sulfur production ranked second to that of Texas. Five plants produced 3,308,500 long tons, down slightly from 1973. Sales were 3,426,000 long tons, slightly above those of 1973. Louisiana production was 42% of the U.S. total. Sulfur stocks at yearend were approximately 90% of beginning stocks.

During 1974 sulfur was recovered from sour crude oil at four refineries. Recovered sulfur totaled 69,850 long tons valued at $1.9 million.

Continued strong demand for phosphate fertilizers kept the sulfur market strong, and prices were increased several times during the year. Quoted prices were at new highs, exceeding the highs of 1968, although in terms of constant 1968 dollars, they were about the same.

Freeport Minerals Co. announced intentions to reactivate the Caminada mine, which was shut down when sulfur prices declined in 1969 soon after its opening. Reactivation of this operation is contingent on a satisfactory supply of natural gas. Freeport also announced plans for a new sulfur exploration program on the Louisiana coast and offshore in the Gulf of Mexico.

Strong demand for sulfur appears to be the future outlook, especially in the fertilizer market. Supplies should be adequate, although stocks in Louisiana decreased about 10% during the year.

Table 19.—Louisiana: Sulfur produced and shipped from Frasch mines
(Thousand long tons and thousand dollars)

Year	Production	Shipments	
		Quantity	Value [1]
1970	3,636	3,660	90,488
1971	3,616	3,646	W
1972	3,534	3,765	W
1973	3,311	3,329	W
1974	3,308	3,426	W

W Withheld to avoid disclosing individual company confidential data.
[1] F.o.b. mine or plant.

METALS

Aluminum.—Kaiser Aluminum & Chemical Corp. produced alumina at its Gramercy and North Baton Rouge plants, and aluminum at its reduction plant at Chalmette. Ormet Corp. produced alumina at its Burnside plant. Bauxite used by both companies was from out-of-State sources.

Consolidated Aluminum Corp. (CONALCO) at Lake Charles received alumina from out-of-State sources and reduced it to metallic aluminum. The CONALCO plant also produced calcined coke for electrodes used in the production of aluminum.

Jamaica, source of the bauxite for the two Kaiser alumina plants, increased both the production levy and the royalty on bauxite production retroactive to January 1, 1974. The cost of bauxite to the company went from approximately $2 per ton in 1973 to $14 per ton in 1974.

Conoco Chemicals, a subsidiary of Continental Oil Co., announced plans to build a high-purity alumina plant with a capacity of 40 million pounds per year at Conoco Chemicals' Lake Charles complex. The plant was expected to go onstream in late 1976. The facility will produce Catapal SB, a highly active high-purity form of alumina used as a catalyst support in refining and petrochemical catalytic applications that is expected to become short in supply.

The Kaiser plant at Baton Rouge was given a 1-year extension by the Louisiana Stream Control Commission, for implementation of a spent-bauxite facility.

Nickel.—American Metal Climax, Inc. (AMAX) continued renovation of the

Port Nickel refinery at Braithwaite, 20 miles downriver from New Orleans. The plant will use a sulfuric acid leach process to refine nickel-copper matte from Bamangwato Concessions, Ltd., Botswana. The renovated plant is expected to have a capacity of 80 million pounds of nickel per year plus cobalt, 20,000 tons of copper per year, and ammonium sulfate as a byproduct.

In 1974 the price of nickel was increased three times to meet cost increases. Refined nickel at the beginning of the year was $1.53 per pound; at yearend it was $2.01 per pound.

Table 20.—Principal producers

Commodity and company	Address	Type of activity	Parish
Aluminum:			
Consolidated Aluminum Corp.	P.O. Box LL Lake Charles, La. 70601	Plant	St. Bernard.
Kaiser Aluminum & Chemical Corp.	P.O. Box 1600 Chalmette, La. 70043	do	Calcasieu.
Carbon black:			
Ashland Chemical Co	P.O. Box 1503 Houston, Tex. 77005	do	St. Mary.
Cabot Corp	125 High St. Boston, Mass. 02110	do	St. Mary and Evangeline.
Columbian Carbon Co	380 Madison Ave. New York, N.Y. 10017	do	Ouachita, Avoyelles, St. Mary.
Continental Carbon Co	P.O. Box 22085 Houston, Tex. 77027	do	Calcasieu.
Sid Richardson Carbon & Gasoline Co.	1200 Fort Worth National Bank Building Fort Worth, Tex. 76102	do	West Baton Rouge.
Thermatomic Carbon Co., Inc.	245 Park Ave. New York, N.Y. 10017	do	Ouachita.
Cement:			
Ideal Basic Industries, Inc.[1 2]	821 17th St. Denver, Colo. 80202	do	East Baton Rouge.
Lone Star Industries, Inc	1 Greenwich Plaza Greenwich, Conn. 06830	do	Orleans.
OKC Corp.[1 2]	Box 10426 Dallas, Tex. 75207	do	Do.
Clays:			
Big River Industries, Inc	P.O. Box 66377 Baton Rouge, La. 70806	Mine and plant	Pointe Coupee.
Kentwood Brick & Tile Manufacturing Co., Inc.	Drawer F Kentwood, La. 70444	do	St. Helena.
Gypsum:			
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	Plant	Jefferson.
United States Gypsum Co.[3]	101 South Wacker Dr. Chicago, Ill. 60606	do	Orleans.
Winn Rock, Inc.[2]	P.O. Box 790 Winnfield, La. 71483	Mine	Winn.
Lime:			
Allied Chemical Corp.[4]	Box 1219R Morristown, N.J. 07960	Plant	East Baton Rouge.
Olin Corp	P.O. Box 2896 Lake Charles, La. 70601	do	Calcasieu.
Natural gas and petroleum[5]			
Salt:			
Cargill, Inc	Cargill Bldg. Minneapolis, Minn. 55402	Underground mine.	St. Mary.
Diamond Crystal Salt Co	916 Riverside Ave. St. Clair, Mich. 48079	do	Iberia.
The Dow Chemical Co	Midland, Mich. 48640	Brine wells	Iberville.
International Salt Co	Clarks Summit, Pa. 18411	Underground mine.	Iberia.
Morton Salt Co	110 North Wacker Dr. Chicago, Ill. 60606	do	Do.
PPG Industries, Inc	P.O. Box 1000 Lake Charles, La. 70604	do	Calcasieu.
Sand and gravel:			
Braswell Sand & Gravel Co., Inc.	P.O. Box 798 Minden, La. 71055	Plant	Webster.
Gifford-Hill & Co., Inc	P.O. Box 47127 Dallas, Tex. 75247	Plant and dredge.	Jefferson Davis, Tangipahoa, Webster.

See footnotes at end of table.

Table 20.—Principal producers—Continued

Commodity and company	Address	Type of activity	Parish
Sand and gravel—Continued			
Louisiana Sand and Gravel Co.	P.O. Box 963 Baton Rouge, La. 70800	Plant and dredge.	East Baton Rouge.
Louisiana Industries Inc	P.O. Box 188 Pollock, La. 71467	Pit, plant, dredge.	Grant and Ouachita.
Standard Gravel Co., Inc	Rt. 4, Box 17 Franklinton, La. 70438	---- do --------	Washington.
Stone:			
Ayers Materials Co., Inc	P.O. Box 382 Harvey, La. 70058	Dredge ----------	St. Tammany.
Lake Charles Dredging & Towing Co.	Lafayette, La. 70501 ----	---- do --------	St. Mary.
Louisiana Materials Co	P.O. Box 8214 New Orleans, La. 70122	---- do --------	St. Tammany.
Southern Industries, Inc	P.O. Drawer 946 Mobile, Ala. 36601	---- do --------	Orleans.
Sulfur, native:			
Freeport Minerals Co	161 East 42d St. New York, N.Y. 10017	Frasch process	Jefferson and Terrebonne.
Texas Gulf, Inc	200 Park Ave. New York, N.Y. 10017	---- do --------	Lafourche.
Sulfur, recovered:			
Cities Service Oil Co	P.O. Box 300 Tulsa, Okla. 74102	Refinery --------	Calcasieu.
Exxon Co., U.S.A	P.O. Box 551 Baton Rouge, La. 70821	Plant ----------	East Baton Rouge.
Vermiculite, exfoliated:			
W. R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	---- do --------	Orleans.

[1] Also clays.
[2] Also stone.
[3] Also lime.
[4] Also salt.
[5] Most major companies and many smaller companies operate in Louisiana. Commercial directories contain listings of operators.

The Mineral Industry of Maine

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Bureau of Geology of Maine (formerly the Geological Survey of Maine) for collecting information on all minerals except fuels.

By Robert W. Holliday [1]

The value of minerals produced in 1974 was at a new high, exceeding the record-breaking value of minerals produced in 1973 by about 9 percent. Tonnage and value of clays, stone, copper, and lead all increased relative to that of 1973, while zinc decreased.

A continuing program of exploration drilling at Kerramerican, Inc.'s Black Hawk mine near Blue Hill focused on delineation of deeper nonferrous mineralization south of the shaft.

Hanna Mining Co. (Knox Mining Corp.) completed a 2-year drilling program at yearend in the nickel-copper area near Union in Knox County. Research on the metallurgical problems was continuing.

Silver Stack Mining Co. of Montreal announced that drilling had been completed at its Big Hill property in Pembroke and indicated 713,000 tons of ore averaging 4.56 ounces of silver per ton, 1.62% zinc, and 0.58% lead.[2]

Callahan Mining Co. ended its exploration effort in Maine as the consortium agreement with New Jersey Zinc and Superior Oil Co. expired at the end of 1973. Louisiana Land and Exploration Co. and Superior Oil continued the program, centered mainly near the New Hampshire-Canada-Maine juncture.

International Paper Company, with 1 million acres in Maine, continued a program of geological reconnaissance, geochemical work, and some drilling. Drilling continued at the Square Lake site, where copper-silver mineralization has been reported.

In Oxford County, Plumbago Mining explored for pegmatite minerals, particularly tourmaline.

[1] State Liaison Officer, Augusta, Maine.
[2] Northern Miner. Silver Stack-Soquem drill 25,000 feet. V. 60, No. 36, Nov. 21, 1974, p. 28.

Table 1.—Mineral production in Maine [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons --	41	$74	146	$183
Copper (recoverable content of ores, etc.) short tons --	1,107	1,317	1,522	2,353
Lead ---- do ----	204	66	279	126
Peat ---- thousand short tons --	5	177	4	194
Sand and gravel ---- do ----	13,583	10,304	8,755	10,673
Stone ---- do ----	1,212	3,329	1,491	4,255
Zinc (recoverable content of ores, etc.) short tons --	19,640	8,115	10,425	7,485
Value of items that cannot be disclosed ----	XX	10,111	XX	11,079
Total ----	XX	33,493	XX	36,348
Total 1967 constant dollars ----	XX	24,554	XX	p 17,382

p Preliminary. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in Maine, by county
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Androscoggin	W	W	Sand and gravel, clays.
Aroostook	$848	W	Sand and gravel, stone.
Cumberland	2,922	$2,972	Sand and gravel, stone, clays.
Franklin	219	W	Sand and gravel.
Hancock	10,491	10,507	Zinc, copper, sand and gravel, lead, peat, silver, stone, clays.
Kennebec	W	W	Sand and gravel, stone.
Knox	11,350	13,615	Cement, stone, sand and gravel, clays.
Lincoln	285	--	
Oxford	88	209	Sand and gravel.
Penobscot	1,414	W	Sand and gravel, stone.
Piscataquis	W	W	Do.
Sagadahoc	W	--	
Somerset	W	683	Sand and gravel.
Waldo	W	W	Do.
Washington	W	W	Sand and gravel, peat.
York	934	W	Sand and gravel, stone.
Undistributed [1]	4,941	8,363	
Total [2]	33,493	36,348	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes gem stones, some sand and gravel (1973) and stone (1973) that cannot be assigned to specific counties, and values indicated by symbol W.
[2] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Maine business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	423.8	428.6	+1.1
Unemployment	do	25.1	29.2	+16.3
Employment:				
Construction	do	19.3	19.4	+0.5
Manufacturing	do	105.1	105.1	--
Services [1]	do	53.8	56.3	+4.6
Government	do	71.8	74.8	+4.2
Other [2]	do	105.5	108.0	+2.4
Personal income:				
Total	millions	$4,196	$4,648	+10.8
Per capita		$4,040	$4,439	+9.9
Portland cement shipments to and within Maine	thousand short tons	278	257	−7.6
Mineral production value	thousands	$33,493	$36,348	+8.5

p Preliminary.
[1] Includes mining.
[2] Includes transportation and public utilities; wholesale and retail trade; and finance, insurance, and real estate.

Sources: Survey of Current Business; Employment and Earnings; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

Consumption, Trade, and Markets.—Governmental policies tended to place the mineral industry of Maine at a disadvantage relative to Canadian producers. Despite a distance handicap, duty-free Canadian peat moss was sold in Maine and was hauled over Maine highways to points south. Agricultural lime imported from Canada has largely supplanted Maine lime in the Aroostook County potato area. In Portland, Canadian cement undersold cement produced at the Martin-Marietta plant in Thomaston. This plant reported a $2 million loss for the year because of soaring fuel cost and a price ceiling imposed by the Canadian competition.

Concentrate produced at the State's only operating metal mine must be shipped out-of-State for smelting. New chapters were added to the decade-long effort to build an oil refinery in Maine and a history of the long struggle was published.[3]

[3] Bradford, P.A. Fragile Structures, A Story of Oil Refineries, National Security and the Coast of Maine. Harpers Magazine Press. New York, N.Y. 1975.

Trends and Developments.—Applications to build an oil refinery at Eastport and another at Sanford were under consideration at yearend by the Department of Environmental Protection. A large dam on the upper St. John River was under study by the Corps of Engineers, and Passamaquoddy Bay tidal power as an energy source was again under discussion. A second atomic powerplant was in the planning stage and an oil-fired electrical generating plant at Cousins Island was under construction.

Sobin Chemicals, Inc., planned a $26 million dollar expansion of its Orrington plant to meet increasing demands for chlorine and caustic soda.

With increased population and substantial industrial growth virtually certain, production of Maine's construction minerals—clay, limestone, granite, slate, and sand and gravel—will necessarily increase over the next several years. Growth can be slowed only by a complete breakdown in the fuel supply system, and even this might be ameliorated by the very real possibility of a wood-based methanol industry.

The State was dealt a blow by the United States Supreme Court decision denying State ownership of offshore lands.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Following a $20 million reconstruction completed in 1973, the Martin-Marietta cement plant at Thomaston reported a $2 million loss in 1974 because of the increased cost of fuel, which rose from $3.20 per barrel in January 1973 to $11.60 per barrel in February 1974. In addition, the cost of electric power increased 10 percent. Costs could not be passed on to consumers because Canadian cement producers, aided by subsidies, were selling in New England at less than the Thomaston plant's cost of production.

Clays.—Production of clay for use in brick manufacture declined slightly relative to the preceding year because of the decline in housing starts. One plant employed a tunnel kiln, one used beehive kilns, and three plants used the old stove kiln that produces a premium ornamental brick.

Gem Stones.—Dumps and pegmatite outcrops in Oxford and other southern counties opened up by a century of intermittent mining for feldspar, mica, and quartz were searched by tourists and rockhounds. Plumbago Mining Co. continued to produce tourmaline from a pegmatite on Newry Mountain near Rumford in Oxford County where an important pocket was discovered in 1972.

Perlite.—Crude perlite was expanded by the Chemrock Corp. at its plant between Thomaston and Rockland. The principal use for this product in Maine was as a filtering medium in the production of carragheen from seaweed. Carragheen is used as a filler in ice cream and other food products.

Sand and Gravel.—Although production decreased 36% compared with that of the preceding year, value increased 4%. The average value per ton was $1.22 compared with 76 cents in 1973.

Counties that produced more than 1 million tons of sand and gravel were Aroostook, Cumberland, Kennebec, and Penobscot. Most of the output was used for highway construction. The State highway commission produced paving sand and gravel in almost all counties by contract work and by the commission's own crews.

The fiscal 1976 and 1977 highway and bridge improvement program was budgeted at nearly $70 million, with bridge replacement, safety, and advance engineering given priority. One study estimated that needed improvement on all secondary roads in the State would require 1 billion dollars. Construction of an I–95 section between Topsham and West Gardiner (17.5 miles) and another section north of Bangor were in progress. I–295, a limited access route through Portland, was completed.

A mapping study of the surficial geology covering 1,200 square miles in northwestern Maine was conducted under direction of the State Bureau of Geology as part of the physical resources inventory for the Land Use Regulation Commission.

Table 4.—Maine: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	13,583	10,304	4,003	4,009
Gravel			4,030	5,037
Unprocessed: Sand and gravel			722	453
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	13,583	10,304	8,755	9,499

W Withheld to avoid disclosing individual company confidential data; included with "Construction."

[1] Value data may not be directly comparable to that in tables 1, 5, and 6 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 5.—Maine: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction	3,252	3,772	606	1,106
Highway and bridge construction			152	327
Other uses (dams, waterworks, airports, etc.)			65	217
Concrete products (cement blocks, brick, pipe, etc.)			325	656
Bituminous paving (asphalt and tar paving)			489	832
Road base and subbase			168	313
Unprocessed aggregate			722	453
Fill	920	351	217	145
Other uses [2]	611	571	57	137
Industrial sand and gravel	W	W	W	W
Total	4,783	4,694	2,801	4,186

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes miscellaneous (1973).

Table 6.—Maine: Construction aggregate sold or used for publicly funded projects by producer

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Nonresidential and residential construction	8,466	5,029	554	753
Highway and bridge construction			1,753	2,454
Other uses (dams, waterworks, airports, etc.)			742	757
Concrete products (cement blocks, bricks, pipe, etc.)			--	--
Bituminous paving (asphalt and tar paving)			1,181	1,299
Road base and subbase			805	757
Unprocessed aggregate			--	--
Fill	6	2	739	377
Other	328	579	180	90
Total	8,800	5,610	5,954	6,437

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Crushed granite, quartzite, and traprock were produced in Cumberland County, primarily for use as concrete aggregate. Limestone for use as agricultural lime, poultry feed, concrete aggregate, cement manufacture, and as a chemical for paper manufacture was quarried and crushed in Knox County.

Lime Products Corp. in Union obtained a permit from the State to open a second limestone quarry. The company produces chemical lime for the paper industry, agricultural lime, and aggregate.

Rockland-Rockport Lime Co. at yearend offered its 75-year-old quarrying and limestone processing plant for sale. The offer included 240 acres of limestone quarries, a recently built crushing and screening plant, and 13 acres in Rockland with 1,500 feet of deepwater frontage. This plant, the Lime Products Corp. in Union, and the Martin-Marietta Cement plant in Thomaston represent the last vestiges of a lime-burning industry that at the turn of the century dominated the market for mortar and plaster along the entire east coast.

The John Swenson Granite Co., Inc., produced dimension stone from the Franklin Quarry, Hancock County, and the High Pine Quarry near North Berwick in York County. The "buff" granite from the Franklin quarry was for use in the Federal Office Building, Detroit, Mich.

Throughout 1974, the Portland-Monson Slate Co. in Monson, Piscataquis County, continued sinking a new shaft for production of the firm's black slate. The shaft, about 12 feet by 12 feet in section, is being sunk in a manner that permits recovery and use of the slate. Final depth is expected to be about 700 feet, where conventional mining will resume. This is a modified cut-and-fill method. The slate is used for floor tile, electrical fixtures, and other uses.

METALS

At Blue Hill, Hancock County, Kerramerican, Inc., operated the Black Hawk mine, the only metal mine in the State. The zinc and copper concentrates were shipped out-of-State by truck and rail for smelting. The zinc concentrate went to Bartlesville, Okla., and the copper concentrate to Gaspé, Quebec. Minor silver values were carried in the concentrate. Although zinc production declined during the year, copper output increased and the overall value increased. According to the annual report of Denison Mines, Ltd., which owns 32.5% of the stock in Black Hawk, the mine showed a profit of $1,534,000 in 1974, more than twice that of 1973. A ventilation shaft and a new decline were planned for more convenient access to the Mammoth copper zone. Surface drilling south of the shaft in the Carlton zone continued at yearend in a study of the feasibility of deeper mining. In October, the company was granted a license to discharge an average of 378,000 gallons per day of concentrator process water and surface runoff.

National Metal Converters, Inc., of Leeds, produced about 50,000 tons of scrap in its automobile shredding plant. During the year, the company began producing steel billets and reinforcing bar from scrap at a melting facility in Windham.

MINERAL FUELS

Peat.—Production of peat was only slightly lower than in the preceding year despite adverse weather conditions that shortened the season. Quality sphagnum moss was produced by three firms: Acadia Peat Corp., Penobscot; International Peat Moss Co., Inc., Jonesport; and Eric Kelly Peat Moss Co., Centerville. Acadia Peat Corp. installed a blacktop drying pad as an auxiliary to its thermal drying process.

There was no coal, petroleum, or natural gas production in Maine and fuel supply was an overriding concern. Imported petroleum products provided 80% to 90% of the energy consumed in 1974. Hydroelectric power and the Maine Yankee Atomic Power Co. plant, which began operating in 1972, accounted for virtually all of the remainder, as coal usage was down to an estimated 25,000 tons in 1974. The price of coal rose to $70 per ton, transportation during part of the year was slow, and coal terminal facilities in Maine were mostly obsolete. Several coal dealers closed down during the year.

A single company, Northern States Gas Co., distributes natural gas in Portland and as far north as the Lewiston-Auburn district. The Portland Pipeline Co. unloaded 162,467,749 barrels of crude oil for pipeline transmission to a Montreal refinery in 1974.

Central Maine Power Co. began construction of a 600,000-kilowatt oil-fired unit on Cousins Island. The next nuclear

plan presumably is to be on Sears Island in Penobscot Bay.

At yearend, two applications for oil refinery permits were under consideration by the State Department of Environmental Protection. They were filed by The Pittston Co. at Eastport and the New England Energy Co. (NEECO) at Sanford.

Table 7.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Martin Marietta Cement Co., a division of Martin Marietta Corp.[1]	277 Park Ave. New York, N.Y. 10017	Plant	Knox.
Clays:			
Dennis Brick Co., Inc	Mt. B Washington St. Auburn, Maine 04210	Pit	Androscoggin.
Lachance Bros. Brick Co	R.F.D. No. 2 Gorham, Maine 04038	Pit	Cumberland.
Morin Brick Co	Danville, Maine 04223	Pit	Androscoggin.
Royal River Brick Co., Inc	Box 191 Gray, Maine 04039	Pit	Cumberland.
Peat:			
Acadia Peat Corp	Penobscot, Maine 04476	Bog	Hancock.
Eric Kelly Peat Moss Coal Co.	Centerville, Maine 04649	Bog	Washington.
International Peat Moss Co., Inc.	430 Trapelo Rd. Belmont, Mass. 02178	Bog	Do.
Perlite (expanded): Chemrock Corp.	End of Osage St. Nashville, Tenn. 37208	Plant	Knox.
Sand and gravel:			
Blue Rock Industries[2]	58 Main St. Westbrook, Maine 04092	Pit	Androscoggin, Cumberland, Franklin.
Donald J. Gurney Inc	R.F.D. No. 1 West River Rd. Waterville, Maine 04901	Pit	Somerset.
George C. Hall Contracting	P.O. Box 506 Rockland, Maine 04841	Pit	Knox.
Lane Construction Co.[2]	P.O. Box 121 Calais, Maine 04619	Pit and mill.	Penobscot.
Lewiston Crushed Stone Co., Inc.	South Ave. Lewiston, Maine 04240	Pit	Androscoggin.
Harold C. MacQuinn, Inc	Hulls Cove, Maine 04644	Pit	Hancock.
Portland Sand and Gravel Co., Inc.	Gray Rd. Cumberland, Maine 04021	Pit	Cumberland.
Warren Bros. Co	P.O. Box 209 Fairfield, Maine 04937	Pit	Cumberland, Kennebec, Somerset, York.
Stone:			
Granite, dimension:			
The John Swenson Granite Co., Inc.	North State St. Concord, N.H. 03301	Quarry	York and Hancock.
Limestone, crushed:			
Lime Products Corp	P.O. Box 357 Union, Maine 04862	---- do	Knox.
Rockland-Rockport Lime Co.	Box 449 Rockland, Maine 04841	---- do	Do.
Miscellaneous stone:			
Cook Concrete Co	150 Causeway St. Boston, Mass. 02114	---- do	Cumberland.
Hughes Brothers, Inc	P.O. Box 565 Bangor, Maine 04401	---- do	Penobscot.
Slate, dimension: Portland Monson Slate Co.	Monson, Maine 04464	Underground mine.	Piscataquis.
Zinc: Kerramerican, Inc.[3]	P.O. Box D Blue Hill, Maine 04614	---- do	Hancock.

[1] Also clay and stone.
[2] Also stone.
[3] Also copper, lead, and silver.

The Mineral Industry of Maryland

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Maryland Geological Survey for collecting information on all minerals in the State.

By Joseph A. Sutton [1]

The value of mineral production in the State of Maryland in 1974 was 31% greater than that of 1973. This increase in value was primarily due to inflated prices rather than to greater mining activity. Of the major minerals, only coal showed an increase in tonnage; all others showed lower production in 1974.

Mineral production value in the State was divided as follows: Coal, 28%; stone, 28%; sand and gravel, 17%; gem stones, lime, natural gas, peat, cement, ball clay, and talc accounted for the remainder.

The value of bituminous coal output, the leading mineral commodity, totaled $48.6 million.

Statistics on lime production were revealed for the first time in 1974. The value of the finished lime was only 0.3% of the State's total mineral output value.

[1] Liaison Officer—Delaware and Maryland, State Liaison Program.

Table 1.—Mineral production in Maryland [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays [2] ---------- thousand short tons --	897	$1,973	884	$2,066
Coal (bituminous) ---------- do ----	1,789	13,644	2,337	48,630
Gem stones ----------	NA	8	NA	8
Lime ---------- thousand short tons --	W	W	23	527
Natural gas -------- million cubic feet --	298	69	133	32
Peat ---------- thousand short tons --	2	29	3	45
Sand and gravel ---------- do ----	12,845	29,625	11,690	29,386
Stone ---------- do ----	18,585	46,732	18,072	47,630
Value of items that cannot be disclosed: Cement, ball clay, and talc ----------	XX	39,827	XX	44,556
Total ----------	XX	131,907	XX	172,880
Total 1967 constant dollars --------	XX	96,701	XX	p 82,671

p Preliminary. NA Not available. XX Not applicable.
W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes ball clay; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Maryland, by county [1]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Allegany	$4,440	W	Coal, stone.
Anne Arundel	2,836	$2,819	Sand and gravel.
Baltimore [2]	26,528	25,125	Stone, sand and gravel, clays.
Calvert	19	--	
Caroline	W	--	
Carroll	21,991	W	Cement, stone, clays.
Cecil	7,277	8,406	Stone, sand and gravel.
Charles	W	W	Sand and gravel.
Dorchester	290	368	Do.
Frederick	17,973	19,329	Cement, stone, clays, lime, stone.
Garrett	11,554	W	Coal, stone, sand and gravel, peat.
Harford	993	W	Sand and gravel, clay, stone, talc.
Howard	W	W	Stone.
Kent	W	51	Clays.
Montgomery	W	W	Stone.
Prince Georges	13,621	13,525	Sand and gravel, clays, stone.
St. Marys	W	--	
Washington	W	W	Cement, stone, clays.
Wicomico	W	W	Sand and gravel.
Worcester	27	396	Do.
Undistributed [3]	24,357	102,859	
Total [4]	131,907	172,880	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Queen Annes, Somerset, and Talbot Counties are not listed because no production was reported.
[2] Includes Baltimore City.
[3] Includes some natural gas, gem stones, and values indicated by symbol W.
[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Maryland business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands	1,734	NA	NA
Unemployment ---- do	60.0	NA	NA
Employment: [1]			
Manufacturing ---- do	256.7	255.4	−0.5
Transportation and public utilities ---- do	80.2	81.3	+1.4
Trade ---- do	345.3	346.9	+.5
Finance, insurance, and real estate ---- do	77.7	79.3	+2.1
Mining ---- do	1.7	1.7	--
Contract construction ---- do	105.2	103.1	−2.0
Services ---- do	270.7	278.6	+2.9
Government ---- do	275.4	285.6	+3.7
Payroll-average weekly earnings: Manufacturing	$170.91	$184.34	+7.9
Personal income:			
Total ---- millions	$22,185	$24,077	+8.5
Per capita	$5,446	$5,881	+8.0
Construction activity:			
Cement shipments to and within Maryland thousand short tons	1,654	1,490	−9.9
Mineral production value ---- thousands	$131,907	$172,880	+31.1

p Preliminary. NA Not available.
[1] Excludes Federal employment in Maryland and Virginia sectors of the Washington Standard Metropolitan Statistical Area.

Sources: Survey of Current Business; Employment and Earnings; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

Employment and Injuries.—Final 1973 statistics and preliminary data for 1974 on business activity of the State are given in table 3. Data on injuries that occurred in the mineral industry in 1974 were available only for the coal mining industry.[2] There were no lost-time accidents during the 697,707 man-hours of exposure at coal mines in the State, but there was one fatality, which was the result of a haulage accident that occurred at a strip mine.

Legislation and Government Programs.—The State of Maryland reached a $400,000

[2] Maryland Bureau of Mines. Fifty-Second Annual Report Calendar Year 1974. Pp. 16–17.

out-of-court settlement with two firms that would end the strip mining of coal on State-owned park and forest land in the western part of the State. The agreement was approved by the Board of Public Works, which agreed to purchase the mineral rights under about 6,000 acres of the Savage River State Forest. The agreement also ended the possibility of deep mining of the coal reserves.

Laws enacted at the 1974 regular session of the General Assembly of Maryland were as follows: An amendment to Section 7–510(a) of the Maryland Strip Mining Law (Annotated Code of Maryland, Natural Resources Article, Title 7, Subtitle 5) which removed the maximum limit on revegetation bonds to allow the Land Reclamation Committee to establish a bond requirement reflecting actual estimate costs of reclamation; and an amendment to Section 7–205(a) of the Natural Resources Article to increase the size of the Land Reclamation Committee, and matters relating thereto.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Production of portland and masonry cement decreased during 1974. However, the unit value of both cements increased. Cement plants were located in Carroll, Frederick, and Washington Counties.

Clay.—Production of clays except ball clay decreased 1.4% in tonnage. There were 9 companies operating 11 pits in 7 counties during the year. Approximately 86% of the clay production went into the manufacture of fire brick and concrete block. The remaining 14% of the clay went into the manufacture of ceramic tile, common brick, and pottery.

Frederick County produced over half of the clay of the entire State. Other major clay-producing counties were as follows, in the order of output: Prince Georges, Washington, Carroll, Baltimore, and Kent.

Gem Stones.—Production of semiprecious stones was limited to small quantities collected by dealers and amateur collectors. The total value of such stones was estimated at $8,000 in 1974.

Gypsum.—United States Gypsum Co. and National Gypsum Co. calcined gypsum in Baltimore County. Output increased 13% but was 3% below the 1973 record.

Lime.—S. W. Barrick & Sons, Inc., produced 23,000 tons of lime in Frederick County for use in agriculture. The lime was used in Maryland, Virginia, Delaware, and Pennsylvania. Consumption of lime in Maryland was 481,600 tons.

Peat.—Production of peat in Maryland increased in 1974 to 3,000 short tons valued at $45,000. The peat obtained was humus and reed sedge and was sold in both bulk and packaged form for soil improvement.

Perlite.—Relatively small amounts of perlite were expanded during 1974 at a plant located in Baltimore County. The average mill value of the perlite was $65.32 per short ton.

Sand and Gravel.—Production of sand and gravel decreased 1.2 million tons to 11.7 million tons, reflecting the decrease in construction activity. Commercial sand and gravel production accounted for 76% of total output. The average unit value of the commercial product was $2.47 per ton, 15 cents higher than in 1973. The major part of commercial sand and gravel went into building and highway construction; the remainder was used for fill and miscellaneous purposes.

The five top-ranking counties, in the order of production of sand and gravel, were Prince Georges, Cecil, Baltimore, Anne Arundel, and Charles.

Table 4.—Maryland: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	12,845	29,625	6,624	16,004
Gravel			4,455	12,209
Unprocessed: Sand and gravel			611	914
Industrial:				
Sand	W	W	--	--
Gravel			--	--
Total	12,845	29,625	11,690	29,127

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data may not be directly comparable to that in tables 1 and 5 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 5.—Maryland: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction	10,507	24,525	5,001	13,335
Highway and bridge construction			228	637
Other uses such as dams, waterworks, airports, etc.			163	405
Concrete products (cement blocks, bricks, pipe, etc.)			1,862	4,650
Bituminous paving (asphalt and tar paving)			642	1,812
Roadbase and subbase			306	486
Unprocessed aggregate	--	--	581	960
Fill	1,105	2,113	129	196
Other uses[2]	1,132	2,914	W	W
Industrial sand and gravel	W	W	--	--
Total	12,744	29,552	8,912	21,981

W Withheld to avoid disclosing individual company confidential data; included with "Other uses" (1973); included with "Unprocessed" (1974).
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Stone.—Stone production, which included both crushed and dimension stone, decreased 3% in tonnage in 1974. The unit value of stone increased $12.00, but the increase was not enough to allow stone to continue to be the leading mineral commodity in the State. In value, Baltimore County was by far the leading area for stone production, followed in order by Frederick, Montgomery, Cecil, and Washington Counties. About 95% of this stone was transported by truck to its point of usage. Over 70% of all stone produced in Maryland went to aggregates of all kinds; 14% went to cement manufacture; nearly 10% went to roadbase stone, and the remaining 6% was utilized in miscellaneous applications such as lime manufacture and riprap stone.

Dimension stone made up less than 1% of the total stone tonnage and value. The average unit value of dimension stone was more than 11 times that of crushed stone. Of the total stone production, 74% was limestone, and the remaining 26% was divided among traprock, granite, sandstone, oystershell, quartzite, and marble.

Crushed and broken stone was produced in 11 counties. Dimension stone was produced in four counties. Nineteen of the 38 quarries produced both crushed and dimension stone.

Talc.—Talc was mined by one relatively small producer in Harford County, and the material was used to make electrical insulators and roofing materials.

Vermiculite (Exfoliated).—W. R. Grace & Co., Prince Georges County, processed vermiculite for use primarily in horticulture, loosefill insulation, and concrete aggregate.

MINERAL FUELS

Coal (Bituminous).—Production of bituminous coal in 1974 increased to 2,337,000 tons, about 31% greater than that of 1973. The unit value of the coal also increased about 2.6 times to bring the total value of Maryland's coal to $48.6 million. Of the 62 mines in the State, 28 were in Allegany County and 34 were in Garrett County. One of these mines was underground, 6 were auger-type mines, and 55 were open pit mines.

Bituminous coal was mined from five basins in the extreme western portion of Maryland. About 51% of the production came from the George's Creek Basin, 32% from the Potomac Basin, and 17% from the Casselman, and the lower and upper Youghiogheny Basins.

Production-wise, the strip mines of the State produced 93% of the coal; underground mines produced 4%; and the remaining 3% came from auger mines.

A State law passed in 1969 continued to be effective in regulating mining and in promoting the reclamation of strip-mined land. In 1974, 81% of the mined land was backfilled and 73% was replanted.

A report was issued by the Federal Bureau of Mines that defines the coal reserve base for coalbeds having a depth range compatible with economic recovery.[3] The coal reserve base in those States east of the Mississippi River, minable by underground methods, was estimated for coalbeds greater than 28 inches in thickness to a maximum depth of 1,000 feet, and through the application of computer techniques, the tonnages were compiled and reported by State, county, coalbed, and rank.

Coke and Coal Chemicals.—Bethlehem Steel Corp. produced coke for its internal use at Sparrows Point. Byproducts recovered from the distillation of coal included oven coke gas, ammonia, crude light oil, benzene, toluene, xylene, oven coke tar, and other minor components in addition to the primary product, coke.

Natural Gas and Petroleum.—There was a 55% decrease in the volume of natural gas produced.

There were two small petroleum refineries near Baltimore that convert crude oil into asphalt products. Most of the petroleum products sold in the State were refined on the gulf coasts of Texas and Louisiana.

A profile of the Maryland Petroleum industry was prepared by the Maryland Energy Policy Office.[4] The report points out how fuel oils and gasoline enter the State, how and where petroleum products are consumed, and changes that have occurred in the consumption pattern of fuel oils and gasoline.

The Baltimore Canyon, a deep eliptical trough located off the coasts of New York, New Jersey, Delaware, Maryland, Virginia, and North Carolina, was targeted for oil exploration. A proposed leasing schedule released by the Secretary of the Interior showed the Baltimore Canyon trough to be the first area on the Atlantic Outer Continental Shelf to be considered for leasing. The leasing procedure was to begin with the call for nominations in November and end with a sale proposed for December 1975. But the first phase of this process, in which oil companies were asked where they would like to drill, was stopped until the Supreme Court decides the case in which the Atlantic States are claiming ownership of offshore oil rights.

METALS

Aluminum.—No bauxite or other aluminum ore was mined in Maryland, but there was a significant production of metallic aluminum at two facilities in the State, Eastalco Aluminum Co. (Howmet Corp.) in Frederick County, and Tomke Aluminum Co. in Baltimore County. At the Eastalco plant, projects to control fluoride fumes from the potline in operation were substantially completed in 1974, and construction of a second 87,000-ton-per-year potline, started early in 1974, was scheduled for completion in 1975.

Copper.—Two copper refineries produced metal in Maryland using raw materials obtained from outside the State, American Smelting and Refining Co. (ASARCO) in Baltimore, and Kennecott Refining Corp. at Hawkins Point, Anne Arundel County. The ASARCO plant operated at a somewhat lower level in 1974 and was to be completely phased out in 1975 as ASARCO's new 420,000-ton-per-year Amarillo plant comes onstream.

Iron and Steel.—There was no mining of iron ore in Maryland in 1974, but the

[3] U.S. Bureau of Mines. The Reserve Base of Bituminous Coal and Anthracite for Underground Mining in the Eastern United States. BuMines IC 8655, 1974, 428 pp.

[4] Maryland Energy Policy Office. Profile of the Maryland Petroleum Industry. Maryland Energy Policy Officer, Baltimore, Md., 1974, 72 pp.

Bethleham Steel Corp. of Sparrows Point produced pig iron, raw steel, and semifabricated steel products from imported ore.

Construction of a 500-ton-per-day coke pellet pilot plant for producing coke pellets was substantially completed at the Sparrows Point plant. The pellets are produced by a new enclosed coking process that reduces air and water pollution. Several full-scale blast furnace tests were conducted with the new coke pellets during the year. If tests results with the new coke pellets continue to be successful, a full-scale plant could be placed in operation by 1980.

Lead.—Lead, lead alloys, and other alloys and products were produced at three plants using primary metals and scrap as raw materials.

Table 6.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Portland:			
Alpha Portland Cement Co.[1]	15 South 3d St. Easton, Pa. 18042	Plant	Frederick.
Lehigh Portland Cement Co.[2]	718 Hamilton St. Allentown, Pa. 18101	do	Carroll.
Portland and masonry: Marquette Cement Manufacturing Co.[1]	First American Center Nashville, Tenn. 37238	do	Washington.
Masonry: M.J. Grove Lime Co.[1]	Frederick, Md. 21701	do	Frederick.
Clays:			
Baltimore Brick Co	501 St. Paul Pl. Baltimore, Md. 21202	Pits	Baltimore and Frederick.
Cyprus Industrial Materials Co.	555 South Flower St. Los Angeles, Calif. 90071	Pit	Baltimore.
Victor Cushwa & Sons, Inc	201 West Potomac St. Williamsport, Md. 21795	Pit	Washington.
Coal:			
Buffalo Coal Co	P.O. Box 275 Bayard, W. Va. 26707	5 Strip	Garrett.
Grafton Coal Co	P.O. Box 188 Mt. Lake Park, Md. 21550	3 Strip	Do.
Moran Coal Co., Inc	Drawer E Westernport, Md. 21562	Strip	Do.
Winner Brothers Coal Co., Inc.	Box 300 Frostburg, Md. 21532	5 Strip	Allegany.
Gypsum (calcined):			
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	Plant	Baltimore.
United States Gypsum Co	101 South Walker Dr. Chicago, Ill. 60606	do	Do.
Finished iron oxide pigments (natural and manufactured):			
Minerals Pigments Corp	7011 Muirkirk Rd. Beltsville, Md. 20705	do	Prince Georges.
Lime: S. W. Barrick & Sons, Inc.	Woodsboro, Md. 21798	do	Frederick.
Peat: Garrett County Processing & Packaging Corp.	R.F.D. #1 Accident, Md. 21520	Bog	Garrett.
Petroleum refineries:			
Amoco Oil Co	910 South Michigan Ave. Chicago, Ill. 60680	Refinery	Baltimore.
Chevron Asphalt Co	Baltimore, Md. 21200	do	Do.
Sand and gravel:			
Campbell Sand and Gravel, Inc.	4911 Calvert Rd. College Park, Md. 20740	Pit	Prince Georges.
Charles County Sand and Gravel Co., Inc.	P.O. Box 322 Waldorf, Md. 20601	Pit	Charles.
Contee Sand & Gravel Co., Inc.	P.O. Box 460 Laurel, Md. 20810	Pit	Prince Georges.
Lone Star Industries, Inc	P.O. Box 277 Upper Marlboro, Md. 20870	Pit	Do.
Silver Hill Sand and Gravel Co.	4714 St. Barnabas Rd., S.E. Washington, D.C. 20031	Pit	Do.
A. H. Smith Co	Branchville Rd. Branchville, Md. 20721	Pit	Do.
York Building Products Co., Inc.	P.O. Box 1708 York, Pa. 17405	Pit	Cecil.

See footnotes at end of table.

Table 6.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Stone:			
Arundel Corp	501 St. Paul Pl. Baltimore, Md. 21202	Quarries	Baltimore, Harford, Howard.
Martin-Marietta Aggregates [1]	66 Long Clove Rd. Congers, N.Y. 10920	Quarry	Washington.
Maryland Materials, Inc	P.O. Box W North East, Md. 21901	---- do	Cecil.
Rockville Crushed Stone, Inc	P.O. Box 407 Rockville, Md. 20850	---- do	Montgomery.
D. M. Stoltzfus & Sons, Inc	Talmage, Pa. 17580	Quarries	Cecil and Harford.
Talc and Soapstone: Harford Talc Co.	P.O. Box 527 Bel Air, Md. 21014	Quarry	Harford.

[1] Also stone.
[2] Also clay and stone.

The Mineral Industry of Massachusetts

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Department of Public Works of the Commonwealth of Massachusetts for collecting information on all minerals except fuels.

By William R. Barton [1] and Joseph A. Sinnott [2]

Massachusetts' mineral production, dominated by stone and sand and gravel, increased 4% in value in 1974 from that of the previous year. Although output of the dominant commodities decreased in quantity their unit value increased, and together they represented 91% of the total value of mineral products reported from Massachusetts. The unit value increases were a reflection of nationwide inflation, because tonnage of mineral product actually decreased 7% in 1974 from 1973.

As part of a general reorganization of State Government, a unified Office of Environmental Affairs was created. The new office was to be completely functional on July 1, 1975, and was to include all of the functions of the existing Department of Natural Resources as well as selected units to be transferred from other State agencies. The Division of Mineral Resources also was to be abolished on July 1, 1975.

On August 14, 1974, Governor Sargent signed into law the "Massachusetts Berkshire Scenic Mountains Act of 1974" (General Laws Chapter 842). Under the new law, cities and towns in the Berkshires may designate certain regions as mountainous and adopt regulations in those regions to protect watershed resources and to preserve the scenic qualities of the environment (depending upon the individual watershed, mountains are defined as those with crests from 1,500 feet to 1,800 feet, or higher). In the mountainous regions, activities such as mining, excavation, construction, clearing, and fill would be subjected to rigorous controls.

"Environmental Resources," the magazine of the Massachusetts Department of Natural Resources, carried, as the feature article in the November-December 1974 issue, a story on the mines and mineral wealth of the State. The informative three-page article was titled: "Massachusetts Minerals—Notes from the Underground."

The Bureau of Mines published a report on land utilization by the mining industry that showed Massachusetts well above the national average. Massachusetts ranked ninth in mine land use, with 0.4% of the land so utilized. The national average was only 0.16%. Percentage of mined land reclaimed was 27.6%, below the national average of 40.0%.[3]

The annual Massachusetts Solid Waste Management Conference was held in Newton, Mass. The general conclusion was that legislation lags behind technology in the resource recovery field. As one participant put it: "Nothing happens in the legislature until a problem becomes a disaster." Alden Cousins, Director of the Massachusetts Solid Waste Bureau, announced that planning had begun on the first regional resource recovery facility. It will be located in the Lawrence-Haverhill area but an exact site has not been selected. The Bureau of Mines was the cosponsor with the Massachusetts Institute of Technology of a second recycling conference. Held at the Massachusetts Institute of Technology (MIT)

[1] Geologist, Liaison Office, Newmarket, N. H.
[2] Massachusetts State Geologist, Boston, Mass.
[3] Paone, J., J. L. Morning, and L. Giorgetti. Land Utilization and Reclamation in the Mining Industry 1930–71. BuMines IC 8642. 1974. 61 pp.

in Cambridge, the subject discussed was: "Energy Conservation and Recycling in the Aluminum Industry."

Massachusetts Municipal Wholesale Electric Co. and Clean Communities Corp. announced tentative plans to erect a $35 million powerplant fueled by trash in Danvers in 1978. The 100-megawatt plant will include facilities to extract noncombustible components for recycling to industry. The extraction facility will be designed by Raytheon Services Corp., and will be based in part on Bureau of Mines raw refuse technology.

Foster-Forbes Glass Co. began full operations at its new glass container manufacturing plant in Milford. The $16 million plant imported all of its glass raw materials by rail. It received its major raw material, glass sand, from Newport, N.J. Other materials were brought from Solvay, N.Y., Green River, Wyo., Beaver Dam, Va., Warner, Penn., the Bahamas and Saskatchewan, Canada. Raw material needs may double by 1978, when an additional glass machine is projected on-line.

A daily average of 1,516 employees worked a total of 2,332,373 man-hours in the Massachusetts minerals industry in 1974, compared with 1,369 persons who worked 2,825,991 man-hours in 1973.

Table 1.—Mineral production in Massachusetts [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons	217	$404	218	$379
Gem stones	NA	5	NA	5
Lime ---- thousand short tons	W	W	170	4,972
Peat ---- do	2	78	3	85
Sand and gravel ---- do	18,743	26,910	17,334	26,565
Stone ---- do	8,580	28,738	8,103	30,103
Total	XX	[2]59,682	XX	62,109
Total 1967 constant dollars	XX	43,753	XX	[p]29,701

[p]Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2]Includes value of items that cannot be disclosed and items indicated by symbol W.

Table 2.—Value of mineral production in Massachusetts, by county
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Barnstable	$1,218	$1,417	Sand and gravel.
Berkshire	10,419	12,374	Stone, lime, sand and gravel.
Bristol	5,421	4,463	Sand and gravel, stone.
Dukes	62	W	Sand and gravel.
Essex	4,646	6,178	Stone, sand and gravel.
Franklin	W	W	Sand and gravel, stone.
Hampden	3,816	W	Stone, sand and gravel.
Hampshire	W	W	Sand and gravel, stone.
Middlesex	16,147	16,201	Stone, sand and gravel.
Nantucket	--	--	
Norfolk	7,352	W	Sand and gravel, stone, clays.
Plymouth	834	W	Sand and gravel, clays, stone.
Suffolk	637	545	Stone.
Worcester	5,732	5,988	Sand and gravel, stone, peat.
Undistributed [1]	3,398	14,944	
Total	59,682	[2]62,109	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1]Includes gem stones, some sand and gravel which cannot be assigned to specific counties, and values indicated by symbol W.
[2]Data does not add to total shown because of independent rounding.

Table 3.—Indicators of Massachusetts business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	2,565	2,641	+3.0
Unemployment	do	171	213	+24.6
Employment (nonagricultural):				
Manufacturing	do	618.7	617.5	−0.2
Construction	do	108.8	106.5	−2.1
Transportation and public utilities	do	122.7	123.3	+0.5
Wholesale and retail trade	do	522.2	529.2	+1.3
Finance, insurance, and real estate	do	134.3	136.1	+1.3
Services [1]	do	490.6	508.8	+3.7
Government	do	344.2	349.5	+1.5
Personal income:				
Total	millions	$30,551	$33,242	+8.8
Per capita		$5,268	$5,731	+8.8
Construction activity:				
Cement shipments to and within Massachusetts	thousand short tons	1,511	1,232	−18.5
Highway construction contracts awarded	millions	$95.0	NA	NA
Mineral production value	thousands	$59,682	$62,109	+4.1

p Preliminary. NA Not available.
[1] Includes mining.

Sources: Survey of Current Business; Employment and Earnings; Area Trends in Employment and Unemployment; Roads and Streets; New England Economic Indicators; and U.S. Bureau of Mines.

Table 4.—Worktime and injury experience in the Massachusetts mineral industry [1 2]

Year	Average number of men working daily	Man-hours worked (thousands)	Number of injuries		Injury rates, frequency per million man-hours	
			Fatal	Nonfatal	Fatal	Nonfatal
1973	1,369	2,825,991	3	35	1.06	10.97
1974	1,516	2,332,373	1	32	.43	12.43

[1] All data are preliminary.
[2] Data supplied by Mining Enforcement & Safety Administration.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasives.—Artificial abrasives were produced in Worcester County by the Norton Co.

Cement.—Cement is not produced in Massachusetts. In 1974, preliminary data indicated that domestic producers shipped 1,188,146 tons of finished portland cement and 44,468 tons of prepared masonry cement into the State. These were decreases from the equivalent 1973 figures of 1,460,169 tons and 51,223 tons, respectively.

Clay and Shale.—Common clay and shale production in 1974 increased slightly compared with 1973. The principal producers of brick and common clay products were K-F Brick Co., Inc. (Susquehana Corp.) at Middleboro, and Stiles & Hart Brick Co. at Bridgewater. The latter firm also shipped some carloads of raw clay to destinations throughout the United States and Canada, because S&H clay is the standard clay of the National Horseshoe Pitching Association. The Masslite Division of Plainville Corp. produced expanded lightweight aggregate from shales of the Carboniferous Narragansett Basin.

Gypsum.—United States Gypsum Co. calcined gypsum from Canada at Charlestown (Boston) in Suffolk County. Output declined 15% from the record year of 1973.

Graphite.—Small quantities of synthetic graphite products were reportedly produced by two firms in Massachusetts. Approximately the same quantity was produced in 1974 as was produced in 1973.

Lime.—Pfizer, Inc. and Lee Lime Corp. produced lime in Berkshire County for food products, precipitated calcium carbonate, mason's lime, sewage treatment, and

other uses. Output increased substantially in 1974, but was still below the 1969 record. The lime was used in New York, Massachusetts, Connecticut, and other States. Consumption of lime in Massachusetts was 62,090 tons, compared with 65,920 tons in 1973.

Perlite (Expanded).—Crude perlite mined outside the State was expanded at two plants in Suffolk County that sold the product mainly for lightweight aggregate, low-temperature insulation, masonry and cavity fill insulation, and horticultural aggregate.

Sand and Gravel.—Total sand and gravel production in 1974 decreased about 7% in quantity and 2% in value from 1973. The $26.6 million of sand and gravel produced accounted for 43% of the total mineral value in the State, making it the second leading mineral commodity produced.

Sand and gravel was reportedly produced in all counties in the State except Suffolk. The leading counties were: Middlesex, Worcester, and Norfolk. Building and paving markets (construction aggregate) consumed the major portion of the production. Small quantities of sand were used for fill, molding, blast, and filtration. Besides building and paving, gravel was used for railroad ballast and fill.

Table 5.—Massachusetts: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	18,544	26,112	6,140	10,689
Gravel			5,976	12,285
Unprocessed:				
Sand and gravel			5,218	3,535
Industrial:				
Sand	199	798	W	W
Gravel			--	--
Total	18,743	26,910	17,334	26,509

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data may not be directly comparable to that in tables 1, 6, and 7 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 6.—Massachusetts: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction	12,446	19,293	4,815	10,536
Highway and bridge construction			432	956
Other uses such as dams, waterworks, airports, etc.			278	646
Concrete products (cement blocks, bricks, pipe, etc.)			1,098	2,069
Bituminous paving (asphalt and tar paving)			1,281	2,133
Roadbase and subbase			1,142	1,798
Unprocessed aggregate	--	--	5,216	3,535
Fill	2,113	1,377	773	813
Other uses[2]	2,692	2,804	446	822
Industrial sand and gravel	199	798	W	W
Total	17,450	[3]24,271	15,481	23,308

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast, miscellaneous (1973).
[3] Data does not add to total shown because of independent rounding.

Table 7.—Massachusetts: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	1,215	2,575	243	406
Highway and bridge construction			302	670
Other uses such as dams, waterworks, airports, etc.			85	143
Concrete products (cement blocks, bricks, pipe, etc.)			85	93
Bituminous paving (asphalt and tar paving)			509	974
Roadbase and subbase			440	602
Unprocessed aggregate	--	--	W	W
Fill	55	32	55	112
Other	23	32	134	257
Total	1,293	2,639	1,853	3,257

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Stone production decreased 6% in tonnage but increased 5% in value in 1974. Stone, valued at $30.1 million, was the leading mineral commodity in Massachusetts in 1974, contributing 48% of the State's total mineral production value.

Dimension stone production increased 7% in tonnage but decreased 6% in value compared with 1973, while crushed and broken stone decreased 6% in tonnage but increased 7% in value in 1974 with the previous year.

Stone, produced at 36 quarries in 11 of the 14 counties, included basalt, granite, limestone (marble), dolomite (marble), sandstone, and miscellaneous stone. Basalt was the most important stone in both quantity and value. Crushed and broken stone accounted for 99% of the total stone output in 1974.

Crushed and broken stone producers were the quantity leaders in the stone field. They included John S. Lane & Son, Inc., Ashland Oil & Refining Co., Inc., and Lynn Sand & Stone Co. The value leaders, however, were H. E. Fletcher Co., a producer of granite dimension stone, and Pfizer, Inc., a producer of ground limestone (marble) products. Both products have much higher unit value than stone for construction aggregate.

Crushed basalt was produced in nine counties. Essex County led in both value and quantity. The value of crushed basalt accounted for 54% of the total value of stone. The crushed basalt was used mainly for construction aggregate; other uses were riprap, railroad ballast, and filter stone.

Granite, sold as crushed and dimension stone, was quarried in 4 counties. Norfolk County led in value and quantity of granite produced. Granite was the second highest valued stone produced in the State. The chief use for cut granite was for curbing; other uses were rubble, irregular-shaped stone, paving blocks, cut stone, and house stone veneer. Crushed granite was used mainly for construction aggregate; smaller quantities were used for roadbase stone and railroad ballast.

Limestone (marble) was quarried in Berkshire County. The chief uses of crushed limestone in descending order were lime, construction aggregate, asphalt fill, whiting, poultry grit, agricultural limestone, other filter, and flux stone.

Crushed miscellaneous stone was quarried in Norfolk and Worcester Counties.

Massachusetts Broken Stone Co. was refused permission to run a new rail siding into its Weston plant. Because this prevented direct rail shipments to the Weston crusher from an ancillary quarry in Berlin, the Berlin quarry was closed.

Roofing Aggregate.—Output of rhyolite to make roofing granules increased moderately. The rhyolite was quarried in Norfolk County and, for statistical purposes, is classified as "other" stone.

Table 8.—Massachusetts: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total	74	5,674	79	5,355
Crushed and broken stone:				
Bituminous aggregate	3,541	8,067	3,133	9,246
Concrete aggregate	500	1,199	479	986
Dense graded roadbase stone	738	1,615	706	1,617
Macadam aggregate	118	275	93	230
Surface treatment aggregate	97	277	133	300
Unspecified construction aggregate and roadstone	2,026	4,679	1,964	4,756
Agricultural purposes [1]	172	995	216	1,476
Railroad ballast	232	413	342	783
Riprap and jetty stone	107	215	61	136
Roofing aggregates, chips, and granules	W	W	160	320
Other [2]	976	5,331	786	4,898
Crushed total [3]	8,506	23,064	8,023	24,748
Grand total [3]	8,580	28,738	8,103	30,103

W Withheld to avoid disclosing individual company confidential data; included with "Other."
[1] Includes agricultural limestone, other soil conditioners, poultry grit, and mineral food.
[2] Data includes stone used for filter stone, manufactured fine aggregate, lime manufacture, fill (1974), flux stone, asphalt filler, whiting, drain fields (1973), and other uses not specified.
[3] Data may not add to totals shown because of independent rounding.

Vermiculite.—The quantity and value of the vermiculite processed in Massachusetts during 1974 decreased 5% and increased 1%, respectively, over 1973 totals. W. R. Grace & Co. in Hampshire County exfoliated vermiculite mined outside the State. The material was used mainly as insulation; other uses in order of production were concrete aggregate, soil conditioning, and plaster.

MINERAL FUELS

Anthracite.—In January, the Massachusetts State Geologist filed a bill in the legislature asking for $100,000 to drill three holes to test anthracite deposits in the Narragansett Basin. The legislature did not authorize the expenditure, but public interest in the possible coalfield increased during the year. The Bureau of Mines analyzed three specimens of anthracite picked from old mine refuse banks in Mansfield (the only specimens obtainable). Analyses indicated a low sulfur anthracite with Btu values (moisture free basis) ranging from 11,360 to 12,380. The Federal Energy Administration began to urge investigation of the anthracite as warranted owing to high New England energy costs. At yearend, the Massachusetts anthracite remained essentially unexplored, but plans for comprehensive investigations were being formulated by several groups ranging from private firms to universities.

Peat.—Reed-sedge peat was mined by Sterling Peat Co. in Worcester County. Tonnage and value increased in 1974. The peat was used mainly by nurserymen, landscapers, and greenhouse owners.

Petroleum.—The energy crisis found several Massachusetts cities vying for the honor of becoming a refinery site. At Dracut, 67% of the voters turned out for a referendum and approved, in principle, construction of an oil refinery in the town. More than 85% of the votes cast favored the concept of a refinery that would receive its crude through a pipeline from the coast.

The Massachusetts Port Authority (MASSPORT) funded a study by Raytheon to select sites for a deepwater supertanker terminal. Newburyport was the site favored by MASSPORT, but more than 6,000 northshore residents signed a petition opposing such a development.

In the spring, Digicon, Inc. resumed seismic surveys of Georges Bank for a consortium of 48 oil companies. More than 10,000 miles of seismic lines were run, and several favorable structures were located. The potential reservoirs are at least 130 miles off the coast and are beneath 550 feet of water.

Numerous legislative and civic meetings debated the advisability of Georges Bank oil drilling. In general, business leaders favored drilling while environmentalists had reservations about it.

METALS

Gold.—The old (1890–1906) Sheldonville gold mine near Wrentham was dewatered for exploration by the property owner, Five Star Mining Co. An old shaft was cleaned out to enter the old workings and a new incline was started. The firm tried to interest Canadian mining companies in a joint exploratory venture, but at yearend the property was inactive.

Silicon.—Tyco Laboratories in Waltham, Mass. reported developing a new process to make "ribbon" silicon which they claimed should make cheap solar energy possible for general use in 7 to 10 years.

Table 9.—Principal producers

Commodity and company	Address	Type of activity	County
Clays:			
Susquehanna Corp., K-F Brick Co., Inc.	River St. Middleboro, Mass. 02346	Pit	Plymouth.
Plainville Corp., Masslite Div.[1]	P.O. Box 327 Walpole, Mass. 02081	Pit	Norfolk.
Stiles & Hart Brick Co	Box 367 Bridgewater, Mass. 02324	Pit	Plymouth.
Gypsum calcined:			
United States Gypsum Co.[2]	101 South Wacker Dr. Chicago, Ill. 60606	Plant	Suffolk.
Lime:			
Lee Lime Corp.[3]	Marble St., Lee, Mass. 01238	do	Berkshire.
Pfizer, Inc.[3]	260 Columbia St. Adams, Mass. 01220	do	Do.
Peat: Sterling Peat Co	Sterling Junction, Mass. 01565	Bog	Worcester.
Perlite, expanded: Whittemore Products, Inc.	35 Harrison St. Roslindale, Mass. 02131	Plant	Suffolk.
Roofing Granules: Bird & Son, Inc	49 Washington St. East Walpole, Mass. 02032	do	Norfolk.
Sand and gravel:			
J. J. Cronin Co	P.O. Box 176 North Reading, Mass. 01864	Pit	Middlesex.
Glenview Sand and Gravel Corp	152 Steadman St. Chelmsford, Mass. 01824	Pit	Do.
Hyannis Sand and Gravel Co	Box 96 Hyannis, Mass. 02601	Mine and mill	Barnstable.
J. L. Construction Co	5 Cypruss Dr. Burlington, Mass. 01803	do	Middlesex.
Marshfield Sand and Gravel Inc	Clay Pit Rd. Marshfield, Mass. 02050	Plant	Norfolk.
Merrimack Materials, Inc	Yemma Rd. Groveland, Mass. 01830	Pit	Essex.
Namasket Construction Co	Box 296 Middleboro, Mass. 02341	Pit	Plymouth.
San-Vel Contracting Co	Route 2, Ayer Rd. Littleton, Mass. 01460	Pit	Middlesex.
Scavone Construction Co	2 Elm St. Auburn, Mass. 01501	Pit	Worcester.
A. A. Will Sand & Gravel Corp	Turnpike St. Canton, Mass. 02021	Pit	Norfolk.
Worcester Sand & Gravel Co	182 Holden St. Shrewsbury, Mass. 01545	Pit	Worcester.
Stone:			
Essex Bituminous Concrete Corp.	Russell St. West Peabody, Mass. 01960	Quarry	Essex.
H. E. Fletcher Co	West Chelmsford, Mass. 01863	do	Middlesex and Worcester.
John S. Lane & Son, Inc	P.O. Box 125 Westfield, Mass. 01085	do	Hampden and Hampshire.
Lee Lime Corp	Marble St. Lee, Mass. 01238	do[1]	Berkshire.
Lynn Sand & Stone Co	30 Danvers Rd. Swampscott, Mass. 01907	do	Essex.
Old Colony Crushed Stone Co	P.O. Box 230 Quincy, Mass. 02169	do	Norfolk.
Simeone Stone Corp	1185 Turnpike St. Stoughton, Mass. 02072	do	Do.

See footnotes at end of table.

Table 9.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Stone—Continued			
Trimount Bituminous Products Co.	1840 Revere Beach Parkway Everett, Mass. 02145	Quarry	Essex.
Warren Bros. Co., Division of Ashland Oil & Refining Co.	430 Howard St. Brockton, Mass. 02402	do	Bristol.
Vermiculite, exfoliated:			
W. R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	Plant	Hampshire.

[1] Also sand and gravel.
[2] Also expanded perlite.
[3] Also stone.

The Mineral Industry of Michigan

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey Division of the Michigan Department of Natural Resources under a memorandum of understanding for collecting information on all minerals except coal and liquid fuels.

By Edward C. Peterson [1] and Esther A. Middlewood [2]

Higher prices and increased production of mineral fuels, principally petroleum and natural gas, raised the value of Michigan's raw mineral output to $1.04 billion in 1974, 32% above the 1973 figure and a record high, exceeding $1 billion for the first time. Although production of petroleum commodities showed a sharp increase, nonmetals continued to be the most important products in terms of value, accounting for $518 million, or 49.8% of the State's total mineral output. Metals were valued at $320 million, accounting for 30.8% of the total, while mineral fuels were valued at $202 million, or 19.4% of the total. Nationally, Michigan continued to be an important producer of a number of commodities, including iron ore, calcium-magnesium chloride, cement, sand and gravel, lime, gypsum, bromine, salt, and peat. The State is the sole domestic producer of iodine.

A downturn in the construction industry resulted in decreased production of cement, sand and gravel, lime, and gypsum. Although production of both iron ore and copper dropped slightly, their values increased owing to higher prices.

Significant developments in the mineral industry in 1974 included the startup of Cleveland-Cliffs Iron Co.'s new Tilden mine and pelletizing facility near Ishpeming and initial shipment of iron ore pellets in late December. In another project, Cleveland-Cliffs continued work on the Empire complex near Negaunee, where production capacity was being expanded from 3.4 million to 5.2 million tons of pellets annually. Expected startup was early 1975. Homestake Copper Co., a wholly owned subsidiary of Homestake Mining Co., continued on schedule with a project near Calumet to justify development of native copper deposits on the Keweenaw Peninsula.

For the sixth consecutive year, a record number of oil and gas discoveries were made in Michigan, and there is no indication that the trend of activity will diminish in the near future.

At yearend, a crew was stripping an area near Williamston in preparation to startup of a small strip coal mine. Not since 1952, when the last active mine closed, has Michigan had an active coal operation. Production is expected to begin early in 1975, with the coal sold locally to an electric generating facility.

[1] State Liaison Officer, Bureau of Mines, Lansing, Mich.
[2] Clerical assistant, Bureau of Mines Liaison Office, Lansing, Mich.

Table 1.—Mineral production in Michigan [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Portland thousand short tons	6,242	$123,442	5,903	$140,513
Masonry do	247	6,185	217	6,309
Clays do	2,151	3,304	2,161	4,074
Copper (recoverable content of ores, etc.) short tons	72,221	85,943	67,012	103,601
Gem stones	NA	8	NA	8
Gypsum thousand short tons	1,882	8,538	1,482	7,258
Iron ore (usable) thousand long tons, gross weight	12,389	180,194	11,602	213,598
Lime thousand short tons	1,545	26,055	1,528	30,036
Magnesium compounds short tons, MgO equivalent	455,501	41,790	503,281	53,302
Natural gas million cubic feet	44,579	17,495	69,133	34,843
Natural gas liquids:				
Natural gasoline thousand 42-gallon barrels	372	1,189	466	3,089
LP gases do	691	2,529	849	5,383
Peat thousand short tons	232	2,172	244	3,811
Petroleum (crude) thousand 42-gallon barrels	14,614	59,413	18,021	154,746
Salt thousand short tons	4,818	53,732	4,445	62,055
Sand and gravel do	62,407	73,972	60,027	82,617
Silver (recoverable content of ores, etc.) thousand troy ounces	850	2,175	643	3,028
Stone thousand short tons	45,886	60,494	47,479	72,748
Value of items that cannot be disclosed:				
Bromine, calcium-magnesium chloride, and iodine	XX	40,392	XX	59,048
Total	XX	789,022	XX	1,040,067
Total 1967 constant dollars	XX	578,432	XX	p 497,360

p Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in Michigan, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Alcona	$139	$134	Sand and gravel.
Alger	W	88	Do.
Allegan	1,293	1,823	Sand and gravel, petroleum, natural gas, stone, peat.
Alpena	50,072	66,819	Cement, stone, clays, sand and gravel.
Antrim	W	785	Petroleum, clays, sand and gravel, natural gas.
Arenac	W	2,271	Petroleum, stone, sand and gravel.
Baraga	W	126	Sand and gravel.
Barry	W	845	Sand and gravel, petroleum, stone.
Bay	12,840	11,632	Cement, petroleum, sand and gravel, lime.
Benzie	20	23	Sand and gravel.
Berrien	W	4,487	Do.
Branch	W	355	Sand and gravel, stone.
Calhoun	5,705	11,752	Petroleum, natural gas, sand and gravel, stone.
Cass	W	W	Sand and gravel, stone.
Charlevoix	W	W	Cement, stone, sand and gravel.
Cheboygan	W	179	Stone, sand and gravel.
Chippewa	W	W	Do.
Clare	1,596	3,107	Petroleum, sand and gravel, natural gas.
Clinton	W	W	Sand and gravel, clays.
Crawford	W	5,689	Petroleum, natural gas, sand and gravel.
Delta	W	223	Sand and gravel.
Dickinson	31,469	W	Iron ore, sand and gravel, stone.
Eaton	1,322	3,388	Natural gas, stone, sand and gravel, petroleum, peat.
Emmet	12,991	13,957	Cement, stone, sand and gravel, clays.
Genesee	1,101	692	Sand and gravel, petroleum.
Gladwin	1,095	2,182	Petroleum.
Gogebic	W	162	Sand and gravel.
Grand Traverse	2,651	12,221	Petroleum, natural gas, sand and gravel.
Gratiot [2]	8,535	9,343	Magnesium compounds, calcium chloride, salt, sand and gravel, petroleum, bromine, natural gas.

See footnotes at end of tables.

Table 2.—Value of mineral production in Michigan, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Hillsdale	$10,754	$19,146	Petroleum, natural gas liquids, natural gas, sand and gravel.
Houghton	W	332	Sand and gravel, stone.
Huron	W	W	Stone, sand and gravel, lime, petroleum.
Ingham	8,925	21,036	Petroleum, natural gas, natural gas liquids, sand and gravel, peat.
Ionia	W	397	Sand and gravel.
Iosco	W	W	Gypsum, sand and gravel.
Iron	W	5,164	Iron ore, sand and gravel.
Isabella	W	1,905	Petroleum, sand and gravel.
Jackson	4,348	6,793	Petroleum, natural gas, sand and gravel, stone.
Kalamazoo	W	W	Sand and gravel, stone.
Kalkaska	10,496	39,028	Petroleum, natural gas, cement.
Kent	5,880	6,011	Sand and gravel, gypsum, petroleum, peat, natural gas.
Keweenaw	134	23	Sand and gravel.
Lake	436	778	Petroleum, sand and gravel.
Lapeer	2,172	3,749	Peat, sand and gravel, petroleum, calcium chloride, natural gas.
Leelanau	W	871	Sand and gravel.
Lenawee	382	W	Sand and gravel, clays.
Livingston	4,260	W	Sand and gravel, natural gas.
Luce	95	44	Sand and gravel.
Mackinac	W	14,097	Stone, sand and gravel.
Macomb	W	2,922	Sand and gravel, natural gas, petroleum.
Manistee	35,883	45,993	Magnesium compounds, salt, sand and gravel, bromine, petroleum, stone.
Marquette	W	171,177	Iron ore, sand and gravel, stone.
Mason	36,508	50,278	Magnesium compounds, calcium chloride, lime, bromine, petroleum, sand and gravel, natural gas.
Mecosta	W	971	Sand and gravel, petroleum, peat, natural gas.
Menominee	213	46	Sand and gravel.
Midland	28,893	43,570	Bromine, calcium chloride, magnesium compounds, salt, petroleum, iodine.
Missaukee	3,023	W	Petroleum, natural gas, sand and gravel.
Monroe	26,542	28,925	Cement, stone, clays, sand and gravel, petroleum, peat.
Montcalm	622	1,082	Petroleum, sand and gravel.
Montmorency	59	W	Sand and gravel.
Muskegon	W	W	Sand and gravel, salt, petroleum.
Newaygo [3]	W	W	Sand and gravel, petroleum.
Oakland	14,898	W	Sand and gravel, natural gas, peat, stone.
Oceana	458	W	Sand and gravel, petroleum.
Ogemaw	3,330	4,457	Petroleum, sand and gravel, natural gas.
Ontonagon	88,410	W	Copper, silver, sand and gravel, stone.
Osceola	2,640	4,413	Petroleum, natural gas liquids, sand and gravel.
Oscoda	16	W	Sand and gravel, petroleum.
Otsego	11,853	38,235	Petroleum, natural gas, sand and gravel.
Ottawa	4,752	6,424	Sand and gravel, petroleum, clays, natural gas, stone.
Presque Isle	25,736	31,328	Stone, sand and gravel, petroleum.
Roscommon	1,372	3,130	Petroleum, natural gas, sand and gravel.
Saginaw	W	2,714	Sand and gravel, clays, lime, petroleum.
St. Clair	23,854	30,990	Salt, petroleum, natural gas, sand and gravel.
St. Joseph	W	W	Sand and gravel, stone, peat.
Sanilac	W	W	Peat, sand and gravel, lime.
Schoolcraft	W	W	Stone, sand and gravel.
Shiawassee	W	1,202	Sand and gravel, peat, clays, petroleum.
Tuscola	W	W	Sand and gravel, petroleum, lime.
Van Buren	122	706	Sand and gravel, petroleum.
Washtenaw	2,112	2,248	Do.
Wayne	68,638	69,235	Cement, lime, salt, stone, sand and gravel, clays, petroleum.
Wexford	W	1,017	Sand and gravel, petroleum, natural gas.
Undistributed [4]	230,376	227,854	
Total [5]	789,022	1,040,067	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Values of petroleum and natural gas (1974) are based on the average prices per barrel and cubic foot respectively for the State.

[2] Excludes value of bromine (1973).

[3] Excludes value of natural gas (1973).

[4] Includes values for gem stones, some sand and gravel and stone (1973) that cannot be assigned to specific counties, and values indicated by symbol W.

[5] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Michigan business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	3,801	NA	NA
Unemployment	do	221	NA	NA
Employment:				
Manufacturing	do	1,167.7	1,106.4	−5.2
Contract construction	do	130.0	125.1	−3.8
Mining	do	12.9	13.4	+3.9
Transportation and public utilities	do	154.1	154.2	+.1
Wholesale and retail trade	do	658.8	665.3	+1.0
Finance, insurance, and real estate	do	127.0	130.1	+2.4
Services	do	499.7	520.6	+4.2
Government	do	533.7	556.4	+4.3
Personal income:				
Total	millions	$50,201	$53,930	+7.4
Per capita		$5,540	$5,928	+7.0
Construction activity:				
Valuation of nonresidential construction	millions	$685.8	$711.8	+3.8
Number of private and public residential units authorized		71,258	43,694	−38.7
State highway department: Contracts awarded	millions	$225.7	$190.0	−15.8
Portland cement shipments to and within Michigan	thousand short tons	3,198	3,027	−5.3
Farm marketing receipts	millions	$1,500.2	NA	NA
Mineral production value	do	$789.0	$1,040.1	+31.8

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and the U.S. Bureau of Mines.

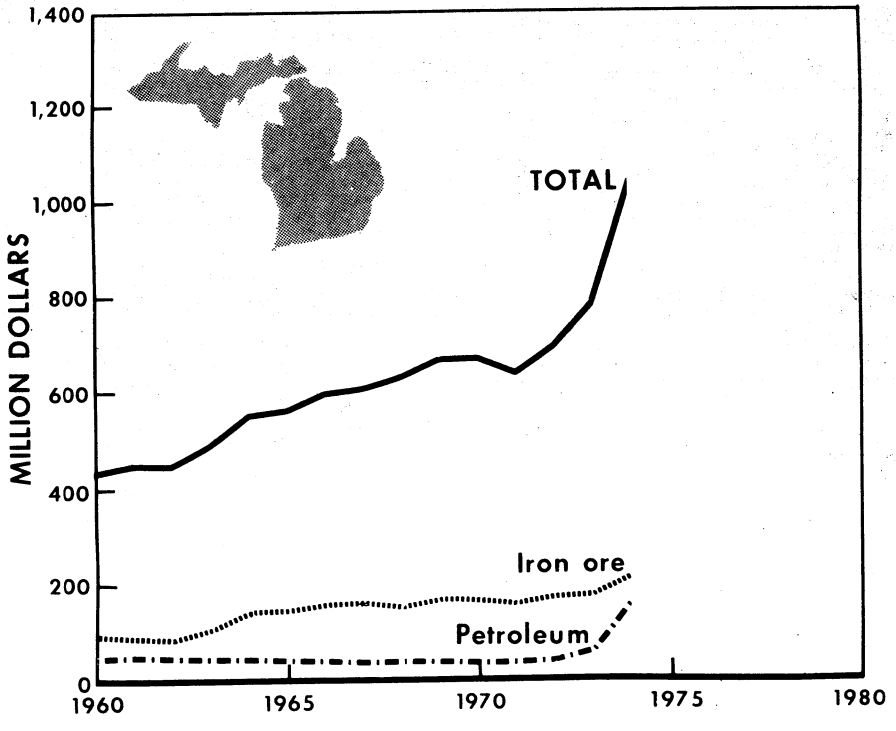

Figure 1.—Value of iron ore, and petroleum, and total value of mineral production in Michigan.

Exploration for nonferrous minerals in Michigan by Bethlehem Steel Corp. and the Cleveland-Cliffs Iron Co., through the efforts of their Beth-Cliffs joint venture, continued in 1974. One of the main efforts of the program has been the exploration of greenstone belts of the Upper Peninsula. However, a number of other geological environments also have been under study. In addition to airborne and ground geophysical exploration, the joint venture has done considerable geological mapping and geochemical exploration work. By yearend, a number of areas of interest had been tested by diamond drilling. Exploration is expected to continue through 1975.

The Department of Natural Resources, Geological Survey Division, in cooperation with the Institute of Mineral Research at Michigan Technological University, began a diamond core drilling program in the northeastern part of the Upper Peninsula. Their efforts are to develop information on the regional distribution, quality, and quantity of the Fiborn Limestone, a high-calcium stone, highly desirable as flux stone in the making of steel and the manufacture of cement and chemicals. Exploration will be continued into 1975.

Geophysical exploration for oil and gas continued at a high level. About 3,000 miles of seismograph lines were run in 1974.

In November 1974, Consumers Power Co. announced the signing of a nuclear fuel leasing agreement between themselves and Wolverine Energy Co. Under the fuel lease, Wolverine will take title to certain of Consumers Power's interests in nuclear fuel and will serve as a vehicle for financing the acquisition of fuel. In turn, Consumers Power will lease the nuclear fuel from Wolverine Energy for use in its nuclear plants in Michigan. Consumers Power presently has two nuclear plants, Big Rock Point and Palisades, and is constructing a twin-unit plant at Midland for service in 1980 and 1981.

Consumers Power Co. notified the U.S. Atomic Energy Commission in August 1974 that it was withdrawing its application to build a 2.3-million-kilowatt nuclear plant near Quanicassee. The company said it was withdrawing the application because of current market conditions for utility securities. The actual impact of the cancellation will not be felt until the mid-1980's when the plant was to have been completed.

Indiana & Michigan Power Co. announced that construction of the second 1.1-million-kilowatt generating unit at its Donald C. Cook nuclear plant near Bridgman has been halted indefinitely. The plant's Unit No. 1, scheduled to be in commercial operation in 1975, is not involved in the cutback. The company blamed the cutback on current economic and financial conditions.

The shipping season on the Great Lakes is gradually being extended toward year-round duration. Vessels of United States Steel Corp.'s Great Lakes fleet, which formerly hauled 10.3 million tons of iron ore in a regular season, hauled an additional 1.4 million tons during the extended season in 1973–74. Traditionally, the lakes have been considered fair-weather shipping lanes with a season lasting only 7½ to 8 months. Because iron ore was the largest tonnage commodity on the lakes and natural ore could not be shipped in extreme cold since its high moisture content caused freezing in freight cars and loading docks, all lake shipping generally stopped when cold weather came. The development of taconite beneficiation in the 1960's, however, set the stage for the new look in lake shipping. Moisture-free pellets did not freeze, permitting shipments all year round.

Supported by government funds specifically authorized to study the feasibility of extending the navigation season on the Great Lakes and St. Lawrence Seaway, many new techniques are being successfully applied. The Great Lakes-Seaway iron ore tonnage for the 1974–75 season totaled slightly over 90 million gross tons. This is about 4.5% below the 1973–74 season total but is the only other time ore tonnage exceeded 90 million since 1953. About 4.1 million tons of the 1974–75 traffic was loaded in the January–March 1975 period. A survey by the Great Lakes Commission indicates that pelletized ore accounted for 66.3 million tons, or nearly 74% of the total 1974–75 season shipments.

Legislation and Government Programs.—The Michigan Legislature was active in 1974, introducing numerous bills designed to protect the environment and to regulate the mining industry. Public Act 366 of 1974 enlisted the combined forces of State

and local governmental units and private industry to recover resources and clean up the State's land, air, and water. The bill established a Michigan Solid Waste Authority within the environmental protection branch of the Department of Natural Resources.

Under Executive Order 1974–4, Governor Milliken established the Michigan Environmental Review Board. The Board provides advice on environmental issues, makes recommendations regarding environmental policy, conducts public hearings and conferences, and assists in reviewing Federal and State environmental impact statements.

A land use bill introduced in 1973 was revised and a substitute bill (H.R. 6097) was introduced in 1974 to incorporate the changes. At present, the State has no statewide plan for the use and development of land resources.

A bill to create a State energy authority within the Department of Commerce (H.B. 6047) was introduced in May 1974. The bill was still in the Committee on Economic Development at the close of the 1974 legislative session.

Several other bills were introduced to control air and water pollution and solid waste disposal. Public Act 86 of 1974 provided eligibility requirements for grants for sewage treatment facilities. Public Act 271 of 1974 defined and provided regulation for a waste water disposal program.

House Bill 6060 was introduced early in 1974. The bill provided for regulation of construction and use of oil and gas pipeline facilities, gas processing plants, and gas storage facilities. It was referred to the Committee on Economic Development and was not reported out of committee at the end of 1974.

Effective January 1, 1975, oil and gas operators in Michigan must include soil erosion and sedimentation controls as part of the Department of Natural Resources' approved well installation construction. The controls are in accordance with Public Act 437 of 1972, a law in effect since January 1, 1973.

Because of the increase in sand mining along Lake Michigan's eastern shores from the Indiana border to Mackinaw City, and projections of huge quantities of dune sand being removed for foundry purposes, a special Michigan House Committee studying the problem recommended legislation to protect Michigan's sand dunes from destruction. The legislation would establish a permit system for sand mining operations under strict State supervision, and require the excavating firms to restore the area once mining is complete. It would also require the mining company to protect the neighboring property and the shoreline from damage.

Employment.—An office of the Mining Enforcement and Safety Administration (MESA), U.S. Department of the Interior, opened in Lansing, followed by a second office at Ishpeming. The two offices are responsible for MESA's standards for health and safety covering metal and nonmetal mining operations in Michigan. During 1974, MESA personnel conducted a total of 874 inspections.[3] Inspection of mining operations in Michigan by the State Department of Labor was discontinued on July 1, 1973, when the State Legislature failed to approve further funds for that purpose.

Data for 1973 and 1974 compiled by the MESA Health and Safety Analysis Center on employment and injuries in the mineral industry, excluding the petroleum industry, are shown in table 4.

[3] Includes spot and special investigations, as well as regular inspections.

Table 4.—Employment and injury statistics in the mineral industry

	Men	Man-hours worked	Number of injuries		Frequency injury rates per million man-hours	
			Fatal	Nonfatal disabling	Fatal injuries	Nonfatal disabling injuries
1973:						
Metal:						
Iron	3,141	6,489,748	--	243	--	37.29
Copper	2,493	5,555,510	4	336	.72	60.48
Total metal	5,634	12,045,258	4	579	.72	48.07
Nonmetal	794	1,498,617	--	41	--	27.36
Sand and gravel	1,102	1,911,709	1	30	.52	15.69
Stone	1,715	3,230,664	1	21	.33	12.55
Total, 1973	9,245	18,686,248	6	671	.32	35.91
1974:						
Metal:						
Iron	3,537	6,339,916	1	233	.16	36.75
Copper	2,576	5,302,283	3	196	.57	36.97
Total metal	6,113	11,642,199	4	429	.34	36.85
Nonmetal	970	1,615,432	--	47	.34	29.09
Sand and gravel	1,585	1,857,953	--	31	--	15.07
Stone	1,483	2,525,140	--	27	--	10.69
Total, 1974	10,151	17,640,724	4	534	.23	29.42

Source: Mining Enforcement and Safety Administration, Health and Safety Analysis Center, Denver, Colo.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasives, Manufactured.—Three companies produced metallic abrasives in Michigan during 1974. They were Abrasive Materials, Inc., at its Hillsdale plant; Cleveland Metal Abrasives, Inc., at its Howell plant; and Ervin Industries, Inc., at its plant in Adrian.

Abrasive Materials, Inc., is the sole producer of aluminum shot and stainless steel cut wire shot used by the aircraft industry.

Cleveland Metal Abrasives, Inc., has been in operation at the same location since 1940. In February 1974, the company changed hands and is now a privately owned corporation with headquarters in Cleveland, Ohio. In response to recommendations by the Michigan Air Pollution Control Board, Cleveland Metal Abrasives is currently working on the installation of air pollution control equipment. The company produces chilled iron shot and grit.

Ervin Industries, Inc., is Michigan's largest producer of metallic abrasives, mainly steel shot and grit used in blast cleaning equipment for the metalworking industry.

Bromine.—Output of elemental bromine decreased 9% in quantity and increased 33% in value in 1974. Bromine was produced in Midland, Mason, Manistee, and Gratiot Counties during the year. Three companies sold or used elemental bromine in 1974: The Dow Chemical Co. at its Ludington and Midland plants, Morton-Norwich Products, Inc. at Manistee, and Michigan Chemical Corp. at its St. Louis facility. Michigan ranks second in production and value of bromine in the United States. Bromine compounds sold or used by producers in Michigan included ethylene dibromide, hydrobromic acid, ethyl bromide, methyl bromide, tetrabromobisphenol, and other compounds.

Production of ethylene dibromide, a key ingredient in ethyl gasoline, has dropped sharply. Federal emission standards for gasoline which require the use of lead-free gasoline have almost eliminated the need for ethyl gasoline.

Calcium-Magnesium Chloride.—Output of calcium-magnesium chloride recovered from brine in 1974 increased 44% in quantity and 67% in value. Three companies continued to recover calcium-magnesium compounds: The Dow Chemical

Co. in Mason and Midland Counties, Michigan Chemical Corp. in Gratiot County, and Wilkinson Chemical Corp. in Lapeer County. Michigan is the leading producer of calcium-magnesium chloride in the Nation. New marketing techniques and sales promotion are primarily responsible for the increased demand for calcium-magnesium chloride.

Cement.—In 1974 Dundee Cement Co. completed a $3.7 million installation of electrostatic precipitators on kilns and a $2.4 million gravel bed filter for the clinker coolers at its Dundee, Mich., plant.

Martin Marietta Cement announced that it has consolidated the Great Lakes Division in Michigan and its Midwest Division in Iowa. The new unit will be known as the Northern Division and will have headquarters in Davenport, Iowa. To maintain its market position, Martin Marietta's cement plant at Bay City, Mich., has introduced imports of clinker from Canadian and Spanish sources. In April 1975, a new 3-year contract with Lake Ontario Cement will supply the plant with $20 million worth of clinker.[4] The installation of two new wet-process kilns has been proposed by Martin Marietta at its Bay City plant. Plans for the kilns and related facilities have been prepared by Kaiser Engineers.[5]

Medusa Cement Co., at its plant located in Charlevoix, produced a record amount of cement in 1974, following completion of major repairs. Dust collection on the clinker coolers was completed at the plant in 1974.

Detroit Edison, one of Michigan's leading suppliers of electricity, plans to turn the fly ash from its coal-burning generators into a construction filler material. The firm announced a joint venture with Kuhlman Corp., a Toledo, Ohio, concrete firm, to use the ash to make a new product—K-Krete (consisting of the ash, cement, and granular materials like sand and stone). The product can be used as fill material. Edison burns 12 million tons of coal per year and produces 1 million tons of ash.

Table 5.—Michigan: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	r 8	8
Production	6,006,643	5,844,211
Shipments from mills:		
Quantity	r 6,242,415	5,902,599
Value	$123,442,328	$140,513,188
Stocks at mills, Dec. 31	570,366	685,264

r Revised.

Table 6.—Michigan: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	4	4
Production	249,002	199,594
Shipments from mills:		
Quantity	246,656	217,400
Value	$6,185,134	$6,309,322
Stocks at mills, Dec. 31	67,490	50,688

Late in 1973, a major modernization and expansion program was announced for Huron Cement's Alpena plant. The program is scheduled for completion in mid-1975 and includes two new 17- by 19.5-by 500-foot Fuller rotary dry-process kilns with clinker coolers and related equipment to replace 12 old small kilns. Two Wheelabrator-Frye glass baghouses for these kilns are now in place. Scheduled completion date is sometime in the fourth quarter of 1975.

The Federal Trade Commission gave final approval to the Government's order to St. Lawrence Cement. The order directed divesture of the Wyandotte, Mich., Cement Division, acquired 3 years before from BASF Wyandotte, A.G. The operation is now privately owned under the name of Wyandotte Cement, Inc.

Clays.—Miscellaneous clays and shale were mined in 10 counties at 11 pits during 1974. Output of clay and shale increased less than 1% in quantity and 23% in value over 1973 figures. Eighty-nine percent of the clay and shale was used in cement manufacture in 1974, as compared with 86% in 1973. The remaining clay and shale was used in the manufacture of drain tile, sewer pipe, and pottery, and as lightweight aggregates. Principal producing counties were Alpena, Antrim, Emmet, Monroe, Ottawa, Saginaw, and Wayne.

Gem Stones.—Semiprecious gem stones are collected in Michigan by hundreds of amateur "rockhounds." Most specimens are gathered with hand picks and shovels and are hand-sorted. Virtually all gem stones in the State are used for decorative purposes in jewelry and other art objects and for exhibit in collections. Stones found in Michigan include agate, amethyst, garnets, Petoskey stone, datolite, thompsonite, rose quartz, and others. An undetermined number of Petoskey stones are collected, polished, and commercially sold to tourists. The Petoskey stone is Michigan's State

[4] Rock Products. V. 78, No. 5, May 1975.
[5] Pit and Quarry. V. 67, No. 7, January 1975.

stone, while chlorastrolite is the official State gem.

Gypsum.—National Gypsum Co., United States Gypsum Co., Michigan Gypsum Co., Georgia-Pacific Corp., and Grand Rapids Gypsum Co. mined gypsum in Iosco and Kent Counties during 1974. Output in these counties declined 21% to 1,482,000 tons in 1974. U.S. Gypsum, National Gypsum, Georgia-Pacific, and Grand Rapids Gypsum calcined gypsum in Iosco, Kent, and Wayne Counties. Output declined 26% to 442,800 tons in 1974. Among the States, Michigan ranked second in production and first in value of crude gypsum produced in 1974.

The decline in gypsum production can be partly attributed to general economic conditions and a slump in the construction industry because most of the gypsum produced is used in manufacturing plasterboard and for building purposes.

The failure of officials from management and the labor union to reach a new contract agreement resulted in a strike at Georgia-Pacific's Kentwood underground mine at Grand Rapids. The mine was shut down from July 1 through August 19, 1974, when a new contract was ratified.

Iodine.—The Dow Chemical Co., sole domestic producer of iodine, continued to recover crude iodine from natural well brines at Midland. Production remained almost constant in 1974, showing less than a 1% increase in quantity and value from the 1973 levels.

Lime.—Six companies produced 1,528,000 tons of quicklime at nine plants in seven counties. Leading counties were Wayne and Mason. Leading producers were BASF Wyandotte Corp., Marblehead Lime Co., Detroit Lime Co., and The Dow Chemical Co. The lime was used for alkalies, steel furnaces, and other uses. Output decreased 1% and was 14% below the record production of 1967. Among the States, Michigan ranked fifth in lime production and value. The lime was consumed in Michigan, Ohio, Indiana, and Pennsylvania. Consumption of lime in Michigan amounted to 1,787,000 tons.

Magnesium Compounds.—Michigan continued as the Nation's largest producer of magnesium compounds in 1974, accounting for over 55% of the U.S. total. Production increased 10% in quantity and 27.5% in value over 1973 figures. Output came from Gratiot, Manistee, Mason, and Midland Counties. Major producers of magnesium compounds in 1974 were The Dow Chemical Co.; Harbison-Walker Refractories Co.; Martin Marietta Chemicals, Refractories Division; Michigan Chemical Corp.; and Morton Chemical Co., Division of Morton-Norwich Products, Inc.

Martin Marietta Chemicals completed a project at its Manistee plant that doubled production capacity of high-quality periclase in 1974. Further addition of periclase capacity was commenced in 1974, even while the original project was in advanced stages. At Midland, Martin Marietta purchased an existing magnesite plant that will be modernized to increase production of both intermediate-grade refractory products and chemical magnesia. The plant was formerly owned by Kaiser Aluminum & Chemical Corp. and has been closed since 1970.

About 5,300 members of the United Steelworkers union walked off their jobs in March during a wage dispute with The Dow Chemical Co. in Midland. The strike ended in September 1974, nearly 6 months after it began. Production during the walkout was maintained through the use of supervisory and nonstriking personnel.

Perlite.—Crude perlite, mined in the Western States, was expanded by National Gypsum Co. at its National City plant, Iosco County; by Harborlite Corp. at its Vicksburg plant, Kalamazoo County; and by the U.S. Gypsum Co. at its Detroit plant, Wayne County. Output of expanded perlite remained the same in quantity and increased 18% in value in 1974. The expanded perlite was used for filter aid and plaster aggregate.

Salt.—Salt is produced in Michigan from artificial and natural brines and from rock salt. The only rock salt mine in the State is the International Salt Co.'s underground mine at Detroit, and the only salt produced from natural brines is at the Michigan Chemical Corp. facility at St. Louis. All other companies produce salt by the evaporation of artificial brines.

Michigan had been the Nation's leading salt producer for many years, and was second in rank only four times from 1905 through 1958. Increased salt production in other States, together with a decrease in Michigan's annual production, has reduced the State to fifth in the national ranking. The record production year for salt in the State was 1956, with a total

of 5,548,178 tons. Production in 1974 amounted to 4,445,000 tons valued at $62.1 million, a decrease of 8% in output and an increase of 15% in value over the 1973 figures.

Sand and Gravel.—Michigan maintained second place in the national ranking by value, but dropped to third place when ranked by production of sand and gravel in 1974, preceded by Alaska and California. Production of sand and gravel in Michigan decreased 3.8% and was valued at $82.6 million in 1974. A downturn in the construction industry was the major factor in the decrease of production. Nearly every county in the State reported sand and gravel production. In each of 12 counties, output exceeded 1 million tons. These counties provided approximately 60% of the total State production.

The first phase of American Aggregates Corp.'s construction of a sand and gravel processing plant in Milford (Oakland County) is nearing completion. The pit area, dredge, and desander are placed and ready to begin operation. The second phase, modified plant production equipment, is scheduled for completion in early fall of 1975, thus completing the construction program. The production from this plant will supply the market during the relocation of the Brighton plant, which is in the same general area.

Ten companies are involved in the production of industrial sand in Michigan. These companies supply more than 90% of the sand used by foundries associated with the American and Canadian automotive industries. Nationally, they supply nearly 50% of the total foundry sands used in the industry, as well as a considerable amount of sand for the glass industry. Michigan leads the Nation as a producer of industrial sand.

Table 7.—Michigan: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	57,272	62,820	16,351	19,231
Gravel			30,853	45,243
Unprocessed: Sand and gravel			7,656	3,803
Industrial:				
Sand	5,135	11,152	5,167	14,039
Gravel			--	--
Total	62,407	73,972	60,027	82,316

[1] Value data may not be directly comparable to those in tables 1, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 8.—Michigan: Construction aggregate [1] and industrial sand sold or used, by type of project and use

(Thousand short tons and thousand dollars)

Type of project and use	1973 [2]		1974	
	Quantity	Value	Quantity	Value [3]
Commercial projects:				
Construction aggregates: Nonresidential and residential construction	43,409	51,911	11,675	18,569
Highway and bridge construction			893	1,260
Other uses (dams, waterworks, airports, etc.)			731	988
Concrete products			3,243	5,457
Bituminous paving			3,328	4,681
Roadbase and subbase			8,322	12,489
Unprocessed aggregate			5,084	2,941
Fill	2,954	1,727	869	1,023
Other uses [4]	5,110	5,156	402	628
Industrial sand	5,135	11,152	5,167	14,039
Total	56,608	69,946	39,714	62,075
Publicly funded projects:				
Construction aggregates: Nonresidential and residential construction	3,978	2,964	116	102
Highway and bridge construction			2,926	3,503
Other uses (dams, waterworks, airports, etc.)			282	298
Concrete products			128	160
Bituminous paving			4,190	5,490
Roadbase and subbase			9,633	9,663
Unprocessed aggregate			2,572	861
Fill	1,475	801	379	362
Other uses	346	261	92	108
Total	5,799	4,026	20,313	20,542
Total construction aggregate and industrial sand	62,407	73,972	60,027	82,617

[1] Includes sand and gravel.
[2] "End use" categories expanded in 1974, breakdown not available for 1973 figures.
[3] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[4] Includes railroad ballast and miscellaneous (1973).

Table 9.—Michigan: Sand and gravel sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Alcona	3	149	139	3	149	134
Alger	2	W	W	1	75	88
Allegan	7	735	785	9	1,121	936
Alpena	4	226	313	4	185	213
Antrim	2	W	W	2	W	W
Arenac	3	W	W	2	W	W
Baraga	2	W	W	3	138	126
Barry	5	417	520	7	561	744
Bay	1	W	W	2	W	W
Benzie	1	13	20	1	16	23
Berrien	6	1,680	W	11	1,718	4,487
Branch	3	360	W	3	238	353
Calhoun	6	W	W	12	849	957
Cass	4	407	417	10	960	1,021
Charlevoix	4	66	46	4	176	265
Cheboygan	2	W	W	5	187	73
Chippewa	8	W	W	3	159	170
Clare	3	183	113	4	352	297
Clinton	14	1,067	1,019	11	919	1,098
Crawford	4	W	W	2	W	W
Delta	7	W	W	5	116	223
Dickinson	5	306	230	4	144	244
Eaton	5	W	448	9	674	701
Emmet	3	87	108	5	183	243
Genesee	6	785	916	3	268	375
Gogebic	3	W	W	3	188	162
Grand Traverse	4	206	W	5	254	551
Gratiot	3	447	349	7	572	569

See footnotes at end of tables.

Table 9.—Michigan: Sand and gravel sold or used by producers, by county—Continued
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Hillsdale	4	W	W	4	500	554
Houghton	3	277	299	3	255	267
Huron	8	363	266	6	422	394
Ingham	13	758	626	7	779	833
Ionia	4	W	W	5	415	397
Iosco	--	--	--	2	W	W
Iron	1	46	97	4	136	197
Isabella	4	W	W	6	908	824
Jackson	4	385	509	4	681	987
Kalamazoo	7	983	1,436	11	3,168	6,144
Kent	14	2,877	4,388	20	2,710	4,529
Keweenaw	1	81	134	1	62	23
Lake	1	23	27	1	W	21
Lapeer	7	536	440	8	1,056	999
Leelanau	2	W	W	4	260	371
Lenawee	4	385	367	7	747	963
Livingston	7	3,515	4,260	8	2,711	4,001
Luce	1	157	95	1	57	44
Mackinac	5	W	W	3	134	89
Macomb	10	2,808	2,765	8	2,101	2,785
Manistee	4	W	W	3	322	882
Marquette	9	1,079	1,286	5	602	805
Mason	1	W	W	2	W	W
Mecosta	2	W	376	3	633	595
Menominee	11	223	213	3	56	46
Missaukee	2	W	W	3	66	55
Monroe	2	W	W	2	W	W
Montcalm	9	424	263	8	547	326
Montmorency	1	59	59	2	W	W
Muskegon	5	W	W	3	606	1,783
Newaygo	4	W	W	2	W	W
Oakland	23	11,754	14,838	33	14,303	17,133
Oceana	4	259	294	6	282	320
Ogemaw	5	957	1,471	4	432	356
Ontonagon	4	W	W	3	201	128
Osceola	3	362	W	4	350	405
Oscoda	1	12	11	1	W	W
Otsego	2	W	W	5	230	269
Ottawa	13	3,236	4,089	15	2,971	5,736
Presque Isle	3	W	W	3	386	313
Roscommon	3	W	57	3	39	65
Saginaw	4	W	W	5	1,079	2,234
St. Clair	1	W	W	5	277	865
St. Joseph	1	213	284	5	537	485
Sanilac	7	650	527	5	369	355
Schoolcraft	1	43	39	1	43	27
Shiawassee	10	1,341	1,594	10	531	668
Tuscola	9	752	1,060	9	1,249	1,682
Van Buren	3	140	97	7	587	642
Washtenaw	8	1,777	2,099	9	2,122	2,237
Wayne	5	1,957	2,179	4	881	1,223
Wexford	3	80	81	4	470	971
Undistributed [1]	11	16,763	21,921	--	2,642	3,537
Total [2]	396	62,407	73,972	430	60,027	82,617

W Withheld to avoid disclosing individual company confidential data.
[1] Includes data withheld and some sand and gravel that cannot be assigned to specific counties.
[2] Data may not add to totals shown due to independent rounding.

In terms of economics, indications are that 1,334 foundries employing 144,000 people use sand from the Lake Michigan area.

Sand mining is concentrated along the Lake Michigan shoreline, with some mining taking place inland. Seven companies operating along the shoreline produce most of the total industrial sand used by foundries in Michigan and associated Great Lakes States.

Slag (Iron and Steel).—Michigan's slag, a nonmetallic material consisting mainly of silicates and alumnosilicates of lime, was once discarded as a waste material. Since 1921, however, the slag has been processed by the Edward C. Levy Co. of Detroit (Wayne County). Michigan remained one of the top five producers of slag during 1974. As in past years, nearly all of the slag produced in the manufacture of pig iron and steel was either recycled or used by the construction industry.

Stone.—Michigan, with production of

47.5 million tons of stone, ranked sixth in the Nation in 1974. Nine producers in the State accounted for 87.6% of the total output. Over 1 million tons of stone was produced in each of the following counties: Alpena, Chippewa, Mackinac, Monroe, Presque Isle, and Wayne. Tables 10 and 11 provide detailed information on the type of stone quarried and its use.

The real growth of Michigan's limestone industry followed the rapid growth of the cement industry that occurred between 1899 and 1903. The limestone industry lagged behind because in early days marl rather than limestone was used in the manufacture of cement. Gradually, limestone was substituted for marl, until about 1952 when Consolidated Cement Corp. at Cement City abandoned the use of marl completely. Today, large amounts of limestone are used for concrete aggregate and for the manufacture of cement. In Michigan, the limestone industry received another push with the discovery near cheap water transportation of large deposits of high-quality limestone especially adapted for blast furnaces. A third major development came from the initiation of a statewide program of road building requiring large quantities of both cement and crushed stone. A steady growth in the chemical industries using large quantities of limestone products has also helped to increase the growth of the limestone industry.

The world's largest limestone quarry, owned by United States Steel Corp., is located at Rogers City. Self-unloading vessels carry the stone from the site to industrial ports around the Great Lakes.

The only sandstone area in Michigan utilized for industrial sand, the Sylvania Sandstone, is located in southeastern Wayne County. This white sandstone, processed by Ottawa Silica Co., Michigan Division, consists of small grains of silica with very few impurities. The sandstone is used in making a variety of glass products, and also for molding sand and metallurgical and scouring abrasives.

The remaining three producers of sandstone in the State are located in Jackson County. Sandstone mined in this area is used as building stone and decorative stone.

Michigan remained the leading producer of marl in 1974 with production reported from seven counties. The bulk of the material came from Allegan, Barry, Cass, Calhoun, and Kalamazoo Counties. Marl is sold for agricultural purposes in Michigan.

Table 10.—Michigan: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total [1]	11	165	6	117
Crushed and broken:				
Limestone	36,573	42,515	37,223	50,897
Dolomite	8,448	14,393	9,228	17,232
Marl	73	79	151	258
Traprock	21	34	W	W
Other [2]	760	3,308	872	4,243
Total [3]	45,875	60,329	47,474	72,631
Grand total [3]	45,886	60,494	47,479	72,748

W Withheld to avoid disclosing individual company confidential data; included with "Other."
[1] Includes limestone, dolomite, and sandstone.
[2] Includes granite, sandstone, and other stone (1973).
[3] Data may not add to totals shown because of independent rounding.

Table 11.—Michigan: Crushed and broken stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	1,225	$1,636	984	$1,397
Concrete aggregate	4,546	5,547	5,287	7,292
Dense graded roadbase stone	1,434	2,095	1,332	2,273
Macadam aggregate	W	W	1,933	3,368
Surface treatment aggregate	353	596	194	377
Unspecified consrtuction aggregate and roadstone	1,198	1,706	1,482	2,635
Agricultural purposes [1]	733	1,080	642	1,107
Cement manufacture	8,178	6,633	8,730	9,322
Flux stone	13,241	19,021	13,681	22,435
Lime manufacture	10,555	13,257	10,412	15,450
Railroad ballast	246	385	223	335
Riprap and jetty stone	411	612	400	589
Other uses [2]	3,755	7,761	2,173	6,051
Total	45,875	60,329	[3] 47,474	72,631

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes data for agricultural limestone, agricultural marl and other soil conditioners, and poultry grit and mineral food.
[2] Includes data for manufactured fine aggregate, terrazzo, refractory stone (1974), fill (1973), chemical stone, bedding material (1974), glass, paper manufacture, and sugar refining (1974).
[3] Data do not add to total shown because of independent rounding.

Sulfur (recovered).—Byproduct sulfur was recovered from crude petroleum by TOTAL Leonard, Inc., at Alma and by Marathon Oil Corp. at Detroit. Production decreased 11% in quantity, but sales increased 29.4% in value.

New construction at Marathon Oil Company's Detroit petroleum refinery included two 40-ton-per-day sulfur plants with a gas purification unit. This equipment is scheduled to go onstream early in 1975, enabling the refinery to continue to process high-sulfur crude oil within the limits of strict environmental air quality standards. The new facilities at Detroit recover 99.5% of sulfur from waste gases.

Vermiculite.—Crude vermiculite, mined outside the State, was exfoliated at W.R. Grace & Co.'s plant in the Detroit area. It was sold for use in loose fill insulation, block insulation, fireproofing, concrete aggregate, soil conditioning, horticulture, and plaster aggregate. Production of exfoliated vermiculite remained the same in quantity and increased 3% in value from 1973 figures.

METALS

Aluminum.—Martin Marietta Aluminum Inc. closed its fabricating facility at Adrian due to the current shortage of aluminum. After an orderly phasedown in production, the plant was sold to General Motors Corp. of Detroit. No immediate plans for the future of the plant have been announced.

Copper.—Some 2,600 miners walked off their jobs at the White Pine Copper Co. in Michigan's Upper Peninsula on August 1, 1974, after negotiators had failed to reach a contract settlement. The miners, members of the United Steelworkers (USW) of America, joined other USW members in a strike against mining interests in Michigan. Resumption of work on August 21, 1974, signaled the end of the walkout. The new contract, which runs through July 31, 1977, was approved by the Nonferrous Council of Unions.

According to the 1974 Annual Report of the Copper Range Co., White Pine Copper Co.'s mill (concentrator) processed a total of 8,300,931 tons of ore in 1974, for an average of 24,634 tons per day (excluding the effect of the 19-day strike period). The mill recovered 85.71% of the copper in the ore, a decrease from the 1973 recovery rate of 86.22%. The recovery rate in 1975 is expected to be about 84.81%. Expected decreases are due to changes in the metallurgical characteristics of the ore as the mine plan is followed.[6]

White Pine's smelter operated both the No. 1 and No. 2 reverberatory furnaces until late August 1974, when the No. 1 furnace was shut down for a scheduled major overhaul. The overhaul was completed in December as planned, and the furnace was placed on standby status. Un-

[6] Copper Range Co. Annual Report 1974.

der these circumstances and reflecting production losses resulting from the strike, the smelter produced 134,024,000 pounds of copper.

During 1974, contracts were awarded by White Pine to outside firms to renovate the southwest shaft, which was sunk in the early 1960's for exploration purposes. Refurbishing of the shaft and construction of new surface buildings are currently underway and are expected to be completed early in 1976. The shaft will be used for development and services over the next decade.

At Calumet, in Houghton County, Homestake Copper Co., a wholly owned subsidiary of Homestake Mining Co., is continuing with a project at the Centennial mine to determine feasibility of resuming commercial mining operations at that location. A pilot concentrator, with an estimated cost of $4.5 million, is being erected at the Centennial No. 3 shaft for startup in the first quarter of 1975. It will process 750 tons of ore per day. The exploration of the extensive Calumet & Hecla properties on the Keweenaw Peninsula is being conducted in a joint venture owned 60% by Homestake Copper and 40% by American Copper & Nickel Co., a wholly owned subsidiary of The International Nickel Co., Inc.

Quincy Mining Co. has contracted for some exploration work as a prelude to possible resumption of copper mining at the Quincy Mining properties near Hancock. Company officials announced early in 1974 efforts to determine commercial potential of Quincy's mining properties. Sample-taking is one of the first stages of the project, which will be conducted on several levels of the old Quincy Shaft No. 8, located north of Hancock. The 7,850-foot shaft was sunk in 1898. If tests show there are commercial quantities of copper in the rock samples, additional exploration and testing will be conducted to determine the mine's commercial possibilities.

Table 12.—Michigan: Mine production (recoverable) of silver and copper

	1972	1973	1974
Mines producing: Lode	2	1	1
Material sold or treated:			
Copper ore, thousand short tons	8,250	8,884	8,801
Copper tailings, do	40	--	--
Production (recoverable):			
Quantity:			
Silver, troy ounces	785,100	850,273	642,944
Copper, short tons	67,260	72,221	67,012
Value:			
Silver, thousands	$1,323	$2,175	$3,028
Copper, do	68,874	85,943	103,601
Total, do	70,197	88,118	106,629

Iron Ore.—Operations at Michigan's iron mines halted for about 2 weeks during August 1974 when a strike by the United Steelworkers of America idled some 3,500 workers. The strike was settled after intensive negotiations between union representatives and the iron mining companies. When the new contract expires on August 1, 1977, negotiators will meet under an experimental negotiating agreement to insure there will be no work stoppage.

Shipments of iron ore products by Cleveland-Cliffs Iron Co. from its operations on the Marquette iron range aggregated 9,108,363 gross tons, including 41,801 tons of pellets from the new Tilden mine near Ishpeming. Startup and initial shipment of iron ore pellets occurred late in December 1974. When in full operation, this $200 million beneficiating and pelletizing complex will produce 4 million tons of pellets annually.[7]

In another major project on the Marquette range, the production capacity of the Empire mine, near Negaunee, is being expanded from 3,400,000 tons to 5,200,000 tons for completion early in 1975, at an expenditure of $75 million. The participants in the Empire mine are Inland Steel Co. (40%), McLough Steel (25%), International Harvester (15%), and Cleveland-Cliffs Iron Co. (20%).[8]

In anticipation of increased electric en-

[7] Skillings' Mining Review. V. 64, No. 5, Feb. 1, 1975.
[8] Work cited in footnote 7.

ergy requirements for future iron ore development, the Cleveland-Cliffs Iron Co. has authorized the preparation of environmental and engineering studies as a preliminary step leading to the construction of additional electric power capacity. A large portion of Cleveland-Cliffs' current electrical needs are being met by the Upper Peninsula Generating Co. from its Presque Isle generating station near Marquette. Two new electric power units are under construction at this facility to meet the power requirements of the Tilden mine and the expansion of the Empire mine.

Effective January 1, 1974, Jones and Laughlin Steel Corp.'s share in the production of the Republic mine, owned by the Marquette Iron Mining Co. and operated by Cleveland-Cliffs, increased from 25% to 46.5%.[9]

At Iron River, on the Menominee iron range, 478,235 gross tons of natural ore were shipped by Inland Steel from the Sherwood underground mine in 1974, an increase of 73,958 gross tons over the 1973 figure.[10] The tonnage was shipped by rail to the port of Escanaba for transfer to vessels.

Table 13.—Michigan: Usable iron ore [1] produced (direct-shipping and all forms of concentrates), by range
(Thousand long tons)

Year	Marquette range	Menominee range (Michigan part)	Gogebic range (Michigan part)	Total		
				Gross weight		Iron content (%)
				Ore [2]	Iron content	
1854–1969	379,734	290,532	249,625	919,892	NA	NA
1970	10,363	2,394	--	12,757	7,950	62.32
1971	9,495	2,424	--	11,919	7,384	61.95
1972	9,131	2,533	--	11,664	7,332	62.86
1973	9,036	2,404	--	11,440	7,210	63.02
1974	8,920	2,419	--	11,339	7,153	63.08
Total	426,679	[3] 302,706	[3] 249,625	979,011	NA	NA

NA Not available.
[1] Exclusive after 1905 of iron ore containing 5% or more manganese.
[2] Data may not add to totals shown because of independent rounding.
[3] Distribution by range partly estimated before 1906.

Table 14.—Michigan: Iron ore shipped from mines
(Thousand long tons)

Year	Direct-shipping ore [1]	Concentrates and agglomerates, total	Total usable ore [2]	Proportion of beneficiated ore to total usable ore (percent)
1970	1,512	11,588	13,100	88.5
1971	1,439	10,393	11,833	87.8
1972	727	11,965	12,692	94.3
1973	463	11,927	12,389	96.3
1974	548	11,054	11,602	95.3

[1] Includes crushed, screened, and sized ore not further treated.
[2] Data may not add to totals shown because of independent rounding.

Iron Oxide Pigments.—Shipments of crude iron oxide pigments in Michigan increased slightly in output and value over 1973 figures. Crude iron oxide pigments are produced in Marquette County by the Cleveland-Cliffs Iron Co., the State's sole producer and the largest in the United States. The primary use of these pigments is the manufacture of paint, particularly red barn paint.

Construction of a new finished iron oxide pigment operation began in 1974 at Wyandotte. The plant will be owned and controlled by the Colors & Chemicals Division of BASF Wyandotte, located in New Jersey. Current plans call for completion of the facility in late 1975.

Pig Iron and Steel.—The world's widest

[9] Jones & Laughlin Steel Corp. Annual Report 1973.
[10] Skillings' Mining Review. V. 64, No. 4, Jan. 25, 1975.

continuous slab caster is planned for National Steel Corp.'s Great Lakes Steel Division plant in Detroit. A major component of National's current 1-million-ton expansion program, the caster is expected to be in operation late in 1976, with a rated annual capacity of 1.2 million tons of carbon and low-alloy slabs. It will be the first slab-casting installation in this hemisphere to use lengthwise flame slitting of its product.

Ford Motor Co., in mid-June 1974, unveiled a $100 million steel mill that will enable the company to increase its raw steelmaking capacity by 750,000 tons per year. The expansion program, which includes an electric melting furnace to be completed in 1975, will increase Ford's production capacity to 3.75 million tons per year. The new mill is part of Ford's River Rouge production center in Dearborn and is the first to be built in the United States since 1970. It replaces the oldest continually running mill of its kind in this country (built in 1935).[11]

North Star Steel Co. of St. Paul, Minn., announced plans to build a $45 to $50 million plant in Michigan that will produce 300,000 tons of steel annually at the start, with production levels possibly reaching 1 million tons per year. North Star Steel is jointly owned by Cargill Inc. of Minneapolis and Co-Steel International of Canada.

Hillsdale Foundry announced that it has suspended operations and is going into voluntary bankruptcy. The firm closed in 1974 because of lagging orders from the automotive industry and the lack of required capital for the installation of air pollution control equipment. The firm had been in operation since 1941 at Hillsdale, Mich.

Silver.—Silver was recovered from copper ore mined at the White Pine mine in Ontonagon County during 1974. Output of silver in 1974 was 24% less than in 1973, while value rose 39% above 1973 levels.

MINERAL FUELS

Coal.—The recorded production of coal in Michigan from 1860, when records of the production of coal were first maintained, through December 31, 1951, when active coal mining ceased, was 42,248,404 tons. In the early days of coal mining, only the beds exposed or at shallow depths in the vicinity of Grand Ledge, Jackson, and Corunna were mined, and the rate of production was low. After the mines in Bay and Saginaw Counties were opened in 1897, however, coal mining became an important industry in the State. The greatest tonnage mined was in 1907, when a total of 2 million tons was produced by 37 mines. Except for a few minor temporary increases between 1918 and 1935, production declined steadily after 1907. From 1923 through 1952, annual production figures of coal did not exceed 1 million tons. In 1949, with only one mine operating, production declined to approximately 12,000 tons, the lowest in 85 years. The last commercially operated coal mine in Michigan, the Swan Creek mine at St. Charles, closed in 1952.

Michigan's first coal mine operation since 1952 opened near Williamston, in Ingham County, in late 1974. The strip mine was expected to produce about 10,000 tons of coal annually in 1975 and 1976. The mining is being done by Michigan Aggregates Corp., a sand and gravel firm. The coal is medium grade and is sold locally to an electric generating facility.

In the summer of 1973, Detroit Edison announced the signing of a contract with Decker Coal Co. for about 500,000 tons of coal in 1974, 1 million tons in 1975, 5 million tons in 1976, and 10 million tons annually beginning in 1978. The coal will be burned at the existing St. Clair station and in two new units to be on line in1976 and 1978. This coal will move by Burlington Northern Railway from the mine in southeastern Montana to a new terminal being constructed in Superior, Wis. It will then be loaded on self-unloading coal ships for transport to the Detroit area utility.[12]

Coke.—Operating problems in the first half of the year and coal supply problems in the second half kept the Detroit coke plant of Allied Chemical from realizing the full potential of the COALTEK pipeline charging facilities installed late in

[11] Michigan Manufacturer & Financial Record. V. 134, No. 2, August 1974.
[12] Mining Congress Journal. V. 60, No. 6, June 1974.

1973.[13] The COALTEK system, developed by the Semet-Solvay Division of Allied Chemical, preheats coal and feeds it into byproduct coke ovens through a closed pipeline. The system reduces pollution from coke ovens by as much as 70%, and increases the capacity of the ovens because preheated coal does not have to remain in the ovens as long.

Ford Motor Co.'s Steel Division continued to produce coke from coal in three blast furnaces. The coking process wastes are recycled into numerous byproducts such as fertilizer and tar.

Natural Gas.—Gas production increased in 1974 as a direct result of Niagaran reef development in the northern Lower Peninsula. Gas production figures for 1974 amounted to 69,133 million cubic feet.[14] This compares with 44,579 million cubic feet in 1973 and 34,221 million cubic feet in 1972. The gas figure is the highest volume ever recorded and a new record for a single year of Michigan gas production.

Gas imports to Michigan markets and gas storage fields via pipelines from Texas, Louisiana, Oklahoma, and Kansas remain at a high level.

New figures for natural gas reserves, provided by the American Gas Association, credit Michigan with 1,458 billion cubic feet. This represents a decline of 90.2 billion cubic feet from 1973, after allowing for the record production figures of 1974.[15]

In June 1974, a public hearing was held at Williamsburg to discuss the possible reopening and eventual completion of the Amoco State-Whitewater "E" 1–22 well which was linked to the Williamsburg gas eruptions in the spring of 1973. Permission to reopen and complete the well will not be given until an environmental impact statement has been prepared and approved by the various State agencies. The well remains temporarily plugged.

The second unit of Consumers Power Co.'s Marysville gas reforming plant was brought to full capacity of 105 million cubic feet in April 1974. The first unit went into operation in September 1973 and has been producing approximately 100 million cubic feet of synthetic natural gas daily since December 1973. The plant converts Canadian natural gas liquids into synthetic gas by a catalytic process, originally developed by the British Gas Council. The installation is the first large gas reforming plant to be built and operated in the United States. Under a 15-year contract with Canadian suppliers, the company receives up to 40,000 barrels of liquid feedstock for processing daily.

Amoco Production Co. assumed operating responsibility in November 1974 for the Kalkaska natural gas processing plant built by Consumers Power Co. The facility is one of the two plants now onstream in Kalkaska, located at the center of the present northern Michigan Niagaran oil and gas development trend. The other plant is owned and operated by Shell Oil Co. Consumers will continue to market the processed gas from the Kalkaska facility. At present, natural gas throughput at the Kalkaska plant amounts to 57 million cubic feet of wet gas per day.

A new gas processing plant owned and operated by Michigan Hydrocarbons, Inc., went onstream in mid-February 1974. The plant now strips light liquids from some 8 million cubic feet of gas produced each day from the Welch-Shell State N–1 well. Construction of the plant began in August 1973 and cost $1 million. Present capacity is over 10 million cubic feet of wet gas daily, with potential for processing some 30 million cubic feet per day. The dry gas goes into Michigan Consolidated Gas Co.'s pipeline system, while other products are distributed throughout the State. All products moving from the plant are utilized within the State.

A $12 million, 60-mile-long major pipeline system to gather natural gas from new developed wells in the northwest section of Michigan's Lower Peninsula has been completed by Michigan Consolidated Gas Co. When in full operation, the new lines will be able to deliver more than 100 million cubic feet of gas daily to processing plants in Kalkaska, where heavy hydrocarbons such as methane and butane will be removed. The lines will eventually gather gas in the area from about 100 wells owned principally by Shell Oil Co. and Amoco. The remainder of the wells are owned by smaller independent operators.

Natural Gas Liquids.—Production of natural gas liquids and ethane increased 24% over that of 1973, to 1,315,000 barrels in 1974. Of the total production, 466,000

[13] Allied Chemical Corp. Annual Reports, 1973 and 1974.

[14] Michigan Department of Natural Resources, Geological Survey Division, Petroleum Geology Unit.

[15] Oil & Gas News, V. 81, No. 16. April 18, 1975, p. 26.

barrels was natural gasoline and 849,000 barrels was liquified petroleum gases (LPG). LPG averaged $6.34 per barrel in 1974, compared with $3.66 in 1973; natural gasoline averaged $6.63 per barrel, compared with $3.20 in 1973.

According to the American Gas Association, proved reserves of natural gas liquids totaled 20,264,000 barrels at year-end 1974, down 4,782,000 barrels from 1973.[16]

Oil Shale.—Michigan's Lower Peninsula rests on the Antrim Shale Formation part of the Mississippian-Devonian series. It is one of the many saucers of geological formations that make up the Lower Peninsula. Antrim Shale is different from the western shale, which is actually a marl stone. The Michigan shale is expected to hold its structure when oil and gas are extracted, whereas the western variety loses some volume. Studies have shown the formation averages between 8 and 10 gallons of oil, or its equivalent, per ton, whereas western shale contains an average of 25 gallons per ton of rock. The Antrim Shale has been the source of some gas production in Otsego County, but the commercial attraction has been only marginal so far.

The Dow Chemical Co. of Midland, Michigan Technological University, Michigan State and Wayne State Universities, and the Environmental Research Institute of Michigan (formerly the University of Michigan Willow Run Laboratories) are drafting the Antrim Shale research proposal seeking Federal aid to determine the feasibility of extracting oil from the Michigan shale. These organizations, as well as five State agencies and the Michigan Consolidated Gas Co., are members of MERRA, the Michigan Energy Resource and Research Association, established by Governor Milliken near the end of 1974.

Peat.—The greatest continuous area of peat in Michigan lies along an extensive tract of flat country in the eastern part of the Upper Peninsula. There are no active peat producers in this area because of the obstacles presented in transportation and marketing. In the Lower Peninsula, there are no peat areas comparable in size; relatively few cover more than a few hundred acres. The deposits range in depth from a few feet to 60 to 70 feet; the average depth is 25 to 30 feet. In 1974, Michigan was the largest peat producer, accounting for 37% of the national total. Production came from 11 counties, with the major portion originating in Lapeer and Sanilac Counties. Other producing counties were Allegan, Eaton, Ingham, Kent, Mecosta, Monroe, Oakland, St. Joseph, and Shiawassee. Over 88 percent of the total output was used for general soil improvement; the remainder was used as an ingredient for potting soils, for mushroom beds, and for packing flowers.

Michigan Peat, Inc., a division of Bay Houston Towing, expanded operations with the purchase of J.M. Huber Inc., a peat producer in Sanilac County. The firm now owns three operations in Michigan.

A new peat producer, Oxford Peat Co., began operations in Oakland County during 1974. The company produces reed-sedge peat used for general soil improvement.

Petroleum.—The impact of recent Salina-Niagaran reef development on current production figures is one of the most important aspects of the petroleum industry in 1974. The northern Lower Peninsula—primarily Otsego, Crawford, Antrim, Kalkaska, Grand Traverse, and Mason Counties—accounted for almost 50% of the oil and almost 75% of the State's natural gas production in 1974. Michigan's 36-year-old standard for oil production was subject to dramatic increases in production at the new string of northern wells. In just two years, the State's daily average oil output was raised from 36,000 to almost 60,000 barrels per day. In 1974, oil production amounted to about 18 million barrels, up from 14.6 million in 1973. Production in 1974 almost matched that of 1960, when the Albion-Scipio field, the State's most prolific, was at its peak. Now the northern band of wells outproduces the vast Albion-Scipio field, which pumped about 27% of Michigan's oil and 23% of its natural gas in 1973.

A modest gain in crude oil reserves was registered in 1974, according to the American Petroleum Institute. Reserve estimates, as of December 31, 1974, were 82,299,000 barrels. This represents a net gain of 9,855,000 barrels after accounting for the year's actual production.[17]

Total imports of crude oil via pipeline from Western and Midwestern States and

[16] Oil & Gas News. V. 81, No. 16, Apr. 18, 1975, p. 26.
[17] Work cited in footnote 16.

from western Canadian oilfields amounted to 42,099,556 barrels in 1974, according to the Michigan Department of Natural Resources, Geological Survey Division, Petroleum Geology Unit. Of the total 1974 imports, Canadian crude amounted to 27,317,964 barrels, about 64% of the total.

Although the bulk of Michigan produced crude goes to local refineries, some is exported. The export mechanism is largely a "paper work-credit" type transaction involving pipeline transportation. Exports for 1974 amounted to 2,766,486 barrels, compared with 2,661,533 barrels exported in 1973.[18]

Petroleum and Natural Gas Exploration and Development.—An indication of confidence in future development of Michigan's oil and gas potential was evidenced by interest in the last State oil and gas lease sale held in June 1974. About 348,405 acres of State mineral lands were offered for lease. A total of 54 bidders leased 217,506 acres, the total bid amounting to $7,131,540. The average bid per acre was about $32.79, and the highest was $16,250.

In 1974, about 67% of all exploratory wells drilled resulted in dry holes. The drilling of development wells in 1974 resulted in about 42% dry holes. These figures show an improvement over the 1973 figure of 56% for development wells.

The Pigeon River Forest area has been a center of controversy regarding oil and gas exploration and development. Opposition to drilling in this region began several years ago. The issues are essentially environmental and involve wildlife habitats, the elk herd, and the many scenic values found in the area. The bulk of the area, about 140 to 150 square miles, is State land and minerals, although some tracts and minerals are privately owned.

[18] Michigan Department of Natural Resources, Geological Survey Division, Petroleum Geology Unit.

Table 16.—Michigan: Oil and gas well drilling completions in 1974, by county

	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Allegan	--	--	--	--	--	2	2	5,705
Alpena	--	--	--	--	--	1	1	5,971
Antrim	--	--	--	2	1	2	5	31,879
Benzie	--	--	--	--	--	1	1	4,639
Branch	--	--	--	--	--	3	3	15,014
Calhoun	4	4	7	2	1	5	23	82,561
Cass	--	--	--	--	--	3	3	3,494
Clare	--	--	--	--	--	2	2	8,046
Crawford	1	--	3	1	--	1	6	43,426
Eaton	1	2	2	3	1	6	15	56,078
Grand Traverse	6	3	9	10	11	31	70	409,014
Gratiot	--	--	--	--	--	4	4	9,708
Hillsdale	7	--	1	--	--	2	10	40,772
Huron	--	--	--	--	--	1	1	5,500
Ingham	9	1	8	2	--	8	28	113,923
Isabella	--	--	--	1	--	4	5	18,970
Jackson	--	--	--	--	--	2	2	8,086
Kalamazoo	--	--	--	--	--	1	1	3,091
Kalkaska	9	4	8	5	3	17	46	315,447
Lapeer	--	--	--	--	--	1	1	4,800
Livingston	--	--	--	--	--	2	2	8,890
Macomb	--	--	3	--	1	12	16	57,882
Manistee	9	1	2	13	13	12	50	248,198
Mason	2	2	2	--	2	1	9	41,059
Missaukee	2	--	1	--	--	--	3	13,695
Montcalm	--	--	1	--	--	2	3	10,209
Montmorency	--	--	--	--	--	3	3	14,675
Muskegon	--	--	1	--	--	--	1	285
Oceana	--	--	--	--	--	9	9	22,748
Ogemaw	2	--	--	--	--	2	4	11,226
Osceola	2	--	1	--	--	1	4	11,497
Otsego	12	--	11	9	1	25	58	334,750
Ottawa	--	--	--	--	--	1	1	3,970
Saginaw	--	--	--	--	--	1	1	3,852
St. Clair	--	--	--	--	--	3	3	8,292
Tuscola	--	1	--	--	--	--	1	7,420
Wexford	--	--	--	2	--	3	5	32,162
Total	66	18	60	50	34	174	402	2,016,934

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Petroleum Refineries.—Although Michigan is not one of the largest petroleum refining states in the United States, there is modest refinery activity. According to statistics supplied by the operators, the total capacity of the State's refineries is 145,000 barrels of crude oil per day, with an actual throughput reaching about 132,000 barrels daily.[19] Primary sources of crude oil for these operations are Canada and Michigan, with some oil coming from as far away as Wyoming and Louisiana.

The refineries are scattered throughout Michigan's Lower Peninsula, and all produce gasoline motor fuel, home heating oils, and residual industrial fuel. Several also manufacture asphalt, jet fuels, solvents, and petrochemical feedstocks.

The largest refinery is Marathon Oil Co.'s 65,000-barrel-per-day operation in Detroit, followed by TOTAL Leonard's installation in Alma, rated at 43,300 barrels per day. Bay Refining, a Dow Chemical-owned facility, is rated and runs at 17,000 barrels daily. Its principal supply source for crude oil is Canada, with some product from Michigan. The smaller operations include Crystal Refining Co. in Carson City, with a capacity of 6,200 barrels per day, but running at 3,000 barrels. In Kalamazoo, Lakeside Refining Co., a 4,000-barrel operation, is refining about 2,150 barrels per day.

Osceola Refining Co. operates a 9,500-barrel-per-day refinery at West Branch. The capacity will jump when installation of new equipment is complete, bringing the total to about 19,000 barrels daily. Necessary accounting and legal requirements for the purchase of all the capital stock of Osceola Refining Co. have been met. The company has been purchased by the United Refining Co. of Warren, Pa.

Pipeline Construction.—TOTAL Leonard, Inc., announced plans to build a $3.5 million, 44-mile oil pipeline between Bay City and its refinery in Alma. An additional 100,000-barrel storage tank will be built at the Bay City crude oil terminal. The project is scheduled for completion in late 1975. The new pipeline will allow the firm to discontinue 110 miles of older, smaller pipeline.

[19] Oil & Gas News. V. 80, No. 5, Feb. 1, 1974.

Table 17.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasives:			
Abrasive Materials, Inc	P.O. Box 291 Hillsdale, Mich. 49242	Plant	Hillsdale.
Cleveland Metal Abrasives Inc.	887 East 67th St. Cleveland, Ohio 44103	do	Livingston.
Ervin Industries, Inc	P.O. Box 1168 Ann Arbor, Mich. 48106	do	Lenawee.
Cement:			
Dundee Cement Co.[1]	P.O. Box 317 Dundee, Mich. 48131	do	Monroe.
Edward C. Levy Co.[2]	8941 West Jefferson Ave. Detroit, Mich. 48209	do	Wayne.
Medusa Cement Co.[1]	P.O. Box 5668 Cleveland, Ohio 44101	do	Charlevoix.
Amcord, Inc.[1]	610 Newport Center Dr. Newport Beach, Calif. 92660	do	Wayne.
Clays:[3]			
Coke: Allied Chemical Corp	P.O. Box 70 Morristown, N.J. 07960	do	Do.
Copper: White Pine Copper Co.[4]	P.O. Box 427 White Pine, Mich. 49971	Mine and plant	Ontonagon.
Gypsum:			
Georgia-Pacific Corp	900 SW Fifth Ave. Portland, Oreg. 97204	do	Kent.
Grand Rapids Gypsum Co	Grand Rapids, Mich. 49501	do	Do.
Michigan Gypsum Co	2840 Bay Rd. Saginaw, Mich. 48601	Surface mine	Iosco.
National Gypsum Co.[5]	325 Delaware Ave. Buffalo, N.Y. 14202	Surface mine and plant.	Do.
United States Gypsum Co.[6]	101 South Wacker Dr. Chicago, Ill. 60606	do	Wayne.

See footnotes at end of table.

Table 17.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Iron ore:			
Cleveland-Cliffs Iron Co.[7]	1460 Union Commerce Bldg. Cleveland, Ohio 44115	Surface and underground mines, plants.	Marquette.
Hanna Mining Co	100 Erieview Plaza Cleveland, Ohio 44114	Surface mine and plant.	Dickinson.
Inland Steel Co.[8]	30 West Monroe St. Chicago, Ill. 60603	Mine	Iron.
Iron and steel:			
Ford Motor Co.[9]	The American Rd. Dearborn, Mich. 48121	Plant	Wayne.
McLouth Steel Corp	300 South Livernois Ave. Detroit, Mich. 48217	---- do	Do.
National Steel Corp.[9]	2800 Grant Bldg. Pittsburgh, Pa. 15219	---- do	Do.
Lime:			
BASF Wyandotte Corp.[10]	100 Cherry Hill Rd. Parsippany, N.J. 07054	---- do	Do.
The Dow Chemical Co.[11]	2020 Dow Center Midland, Mich. 48640	---- do	Mason.
Marblehead Lime Co	300 West Washington St. Chicago, Ill. 60606	---- do	Wayne.
Magnesium compounds: Martin Marietta Corp.	Executive Plaza II Hunt Valley, Md. 21030	Brine wells	Manistee.
Natural gas processors:			
Consumers Power Co	212 West Michigan Jackson, Mich. 49201	Plant	St. Clair.
Michigan Wisconsin Pipe Line Co.	1 Woodward Ave. Detroit, Mich. 48226	---- do	Osceola.
Mobil Oil Corp	P.O. Box 258 Mason, Mich. 48854	---- do	Ingham.
Peat:			
Anderson Peat Co	332 Graham Rd. Imlay City, Mich. 48444	Bog and plant	Lapeer.
Fletcher and Rickard	54001 Grand River Rd. New Hudson, Mich. 48165	---- do	Oakland.
Huber Peat Co	P.O. Box 312 Sandusky, Mich. 48471	---- do	Sanilac.
Michigan Peat Inc	P.O. Box 3006 Houston, Tex. 77001	---- do	Do.
Scenic Lakes, Inc	P.O. Box 926 East Lansing, Mich. 48823	---- do	Shiawassee.
Expanded perlite: Harborlite Corp.	P.O. Box 458 Escondido, Calif. 92025	Plant	Kalamazoo.
Petroleum refineries:			
Crystal Refining Co	901 North Williams Carson City, Mich. 48811	---- do	Montcalm.
Lakeside Refining Co	2705 East Cork Kalamazoo, Mich. 49001	---- do	Kalamazoo.
Marathon Oil Co.[12]	1300 South Fort St. Detroit, Mich. 48217	---- do	Wayne.
Osceola Refining Co	P.O. Box 178 Reed City, Mich. 49677	---- do	Ogemaw.
TOTAL Leonard, Inc.[13]	East Superior St. Alma, Mich. 48801	---- do	Gratiot.
Salt:			
Diamond Crystal Salt Co	916 South Riverside St. Clair, Mich. 48079	Brine wells and plant.	St. Clair.
Hardy Salt Co	P.O. Drawer 449 St. Louis, Mo. 61366	Plant	Manistee.
Hooker Chemical Corp	P.O. Box 295 Montague, Mich. 49437	Brine wells and plant.	Muskegon.
International Salt Co., Inc	Clarks Summit, Pa. 18411	Mine	Wayne.
Michigan Chemical Corp.[14]	351 East Ohio St. Chicago, Ill. 60611	Brine wells and plant.	Gratiot.
Morton-Norwich Products, Inc.[15]	110 North Wacker Dr. Chicago, Ill. 60606	---- do	Manistee.
Pennwalt Corp	3 Penn Center Philadelphia, Pa. 19102	---- do	Wayne.
Sand and gravel:			
American Aggregates Corp	P.O. Drawer 160 Greenville, Ohio 45331	Pits and plants	Kalamazoo, Livingston, Macomb, Oakland.

See footnotes at end of table.

Table 17.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
Construction Aggregates Corp.	120 South LaSalle St. Chicago, Ill. 60603	Pits and plants	Ottawa.
J.P. Burroughs & Son	P.O. Box 1468 Saginaw, Mich. 48605	---- do	Oakland.
Sargent Sand Co	2840 Bay Rd. Saginaw, Mich. 48604	---- do	Bay, Mason, Saginaw, Tuscola.
Stone:			
Bethlehem Steel Corp	701 East Third St. Bethlehem, Pa. 18016	Quarry	Chippewa.
The France Stone Co	1800 Toledo Trust Bldg. Toledo, Ohio 43603	---- do	Monroe.
Ottawa Silica Co	33620 Streicher Rd. Rockwood, Mich. 48173	Quarry and plant	Wayne.
Presque Isle Corp	P.O. Box 426 Alpena, Mich. 49707	Quarry	Presque Isle.
Vermiculite (exfoliated):			
W.R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	Plant	Wayne.

[1] Also clays.
[2] Also lime.
[3] Principal producers of clay are shown under various other nonmetallic materials.
[4] Also silver, and smelting facilities.
[5] Also clays, stone, and expanded perlite.
[6] Also expanded perlite.
[7] Also iron oxide pigments.
[8] Also stone.
[9] Also coke.
[10] Also salt.
[11] Also bromine, calcium compounds, magnesium compounds, and natural gas and petroleum refining.
[12] Also natural gas and recovered elemental sulfur.
[13] Also recovered elemental sulfur.
[14] Also bromine, calcium, and magnesium compounds.
[15] Also bromine and magnesium compounds.

The Mineral Industry of Minnesota

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Minnesota Geological Survey for collecting information on all minerals except fuels.

By Cynthia T. Collins [1]

The value of mineral production in Minnesota in 1974 was $1.03 billion, an increase of 20% over that of 1973. Iron ore, the State's principal mineral commodity, accounted for 93% of total output value in 1974. Sand and gravel represented 4% of the total value, and stone represented 2%.

Production of iron ore in Minnesota in 1974 accounted for 70% of total U.S. iron ore production. Output consisted of 40.9 million tons of taconite pellets and 17.5 tons of natural ore and concentrates. All iron ore was produced in St. Louis and Itasca Counties.

Employment in the mineral industry at yearend 1974 totaled 14,200, about the same as that in 1973. Ninety percent were employed in metal mining industries, according to statistics published by the Minnesota Department of Employment Services.

According to a special survey conducted by the Bureau of Mines, more than 22 trillion kilowatt-hours of energy were consumed in the minerals industries of Minnesota in 1973. The State ranked 16th in the United States in energy consumption in the mineral industries. Consumption of natural gas in iron ore pelletizing plants accounted for over half of the total. Further information obtained from the survey is available in Mineral Industry Surveys: 1973 Fuel and Electrical Energy Requirements of Selected Mineral Industries Activities.

Legislation and Government Programs.—A bill creating the Minnesota Energy Agency was enacted in 1974. It provides for a nine-member policy commission with authority to: Issue certificates of need for new power generating plants; control certificates of need to locate new coal and petroleum depots; institute energy-conservation programs; formulate emergency allocation plans for fuel shortages; limit advertising practices of energy suppliers; and centralize gathering of energy data.

Also enacted was a bill authorizing assessors to do exploratory drilling in order to ascertain the existence of unmined iron ore.

An amendment to Minnesota Statutes 1971, Section 273.02, was also enacted by the legislature in 1974. It provides that newly discovered iron ore shall be entered on the assessment books for the 6 years immediately preceding the year of discovery and taxed as omitted property. This amendment does not apply to iron ore discovered in the course of mining operations.

[1] Mineral Specialist, Division of Ferrous Metals.

Table 1.—Mineral production in Minnesota [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons --	[2] 156	[2] $233	W	W
Gem stones	NA	14	NA	$14
Iron ore (usable) thousand long tons, gross weight --	62,614	782,197	59,422	949,678
Manganiferous ore ---- short tons --	170,971	W	225,560	W
Peat ---- thousand short tons --	W	W	20	471
Sand and gravel ---- do ----	37,935	39,438	36,720	42,370
Stone ---- do ----	7,581	20,411	8,301	22,041
Value of items that cannot be disclosed: Abrasive stone, cement, clays (kaolin), lime, and values indicatde by symbol W ----	XX	10,492	XX	11,792
Total ----	XX	852,785	XX	1,026,366
Total 1967 constant dollars ----	XX	625,177	XX	p 490,808

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes kaolin; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Minnesota, by county [1]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Aitkin	W	$7	Sand and gravel.
Anoka	W	W	Do.
Becker	W	218	Do.
Beltrami	$210	300	Do.
Benton	39	50	Do.
Big Stone	488	1,074	Stone, sand and gravel.
Blue Earth	W	W	Do.
Brown	W	W	Sand and gravel, clays.
Carlton	W	W	Sand and gravel, peat.
Carver	W	430	Sand and gravel.
Cass	177	387	Do.
Chippewa	295	226	Do.
Chisago	263	231	Do.
Clay	W	W	Sand and gravel, lime.
Clearwater	123	153	Sand and gravel.
Cook	W	W	Do.
Cottonwood	W	W	Do.
Crow Wing	W	W	Manganiferous ore, sand and gravel.
Dakota	W	W	Sand and gravel, stone.
Dodge	W	W	Stone, sand and gravel.
Douglas	59	W	Sand and gravel.
Faribault	W	--	
Fillmore	678	1,254	Stone, sand and gravel.
Freeborn	W	414	Sand and gravel.
Goodhue	700	568	Stone, sand and gravel.
Grant	W	W	Sand and gravel.
Hennepin	W	W	Sand and gravel, clays, stone.
Houston	355	621	Stone, sand and gravel.
Hubbard	W	206	Sand and gravel.
Isanti	--	47	Do.
Itasca	90,092	W	Iron ore, sand and gravel, peat.
Jackson	W	300	Sand and gravel.
Kanabec	W	55	Do.
Kandiyohi	W	572	Do.
Kittson	W	102	Do.
Koochiching	62	23	Do.
Lac qui Parle	W	W	Stone, sand and gravel.
Lake	67	W	Sand and gravel.
Lake of the Woods	62	W	Do.
Le Sueur	W	W	Sand and gravel, stone.
Lincoln	W	W	Sand and gravel.
Lyon	W	W	Do.
McLeod	24	190	Do.
Mahnomen	--	54	Do.
Marshall	343	264	Do.

See footnotes at end of table.

Table 2.—Value of mineral production in Minnesota, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Martin	$53	$245	Sand and gravel.
Meeker	W	191	Do.
Mille Lacs	W	W	Sand and gravel, stone.
Morrison	W	1,310	Sand and gravel.
Mower	745	W	Stone, sand and gravel.
Murray	17	W	Sand and gravel.
Nicollet	W	W	Stone, sand and gravel.
Nobles	W	W	Sand and gravel.
Norman	W	27	Do.
Olmsted	W	W	Stone, sand and gravel.
Otter Tail	146	70	Sand and gravel.
Pennington	W	W	Do.
Pine	340	W	Sand and gravel, peat.
Pipestone	W	W	Sand and gravel.
Polk	W	W	Lime, sand and gravel.
Pope	37	81	Sand and gravel.
Ramsey	W	W	Sand and gravel, stone.
Red Lake	7	--	
Redwood	216	W	Sand and gravel, clays, stone.
Renville	W	W	Sand and gravel, stone.
Rice	W	372	Do.
Rock	797	W	Sand and gravel, abrasives, stone.
Roseau	87	100	Sand and gravel.
St. Louis	703,100	846,718	Iron ore, cement, sand and gravel, peat, stone.
Scott	2,374	2,515	Stone, sand and gravel.
Sherburne	1,506	1,747	Sand and gravel.
Stearns	W	W	Stone, sand and gravel.
Steele	W	772	Sand and gravel, stone.
Stevens	W	W	Sand and gravel.
Swift	W	W	Sand and gravel.
Todd	266	422	Do.
Traverse	140	--	
Wabasha	298	W	Stone, sand and gravel.
Wadena	W	7	Sand and gravel.
Waseca	34	11	Do.
Washington	W	W	Sand and gravel, stone.
Watonwan	W	40	Sand and gravel.
Wilkin	W	365	Do.
Winona	1,501	W	Stone, sand and gravel.
Wright	W	W	Sand and gravel, stone.
Yellow Medicine	W	W	Stone, sand and gravel.
Undistributed [2]	47,092	163,632	
Total [3]	852,785	1,026,366	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Sibley County is not listed because no production was reported.

[2] Includes some sand and gravel that cannot be assigned to specific counties, value of gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

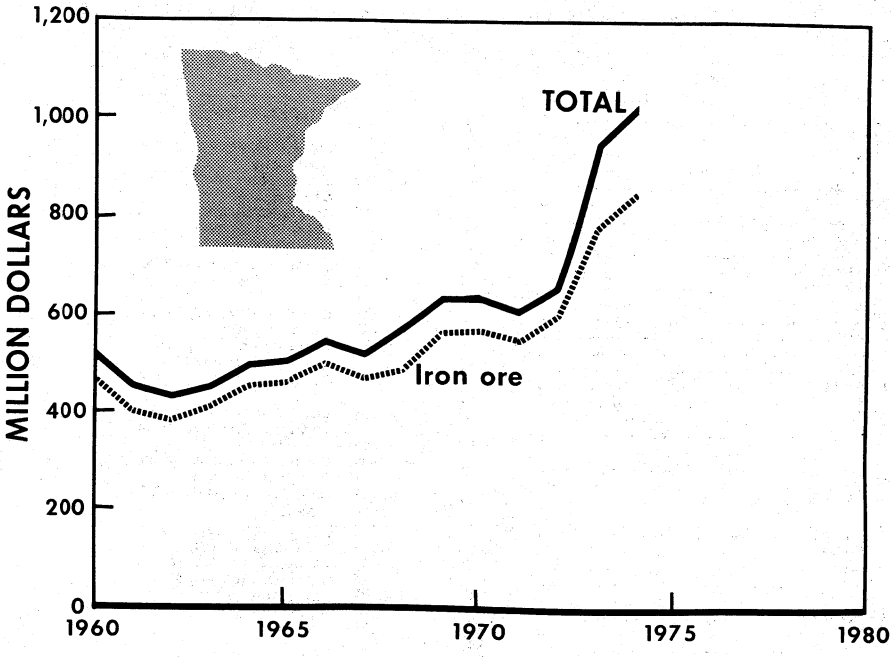

Figure 1.—Value of iron ore shipments and total value of mineral production in Minnesota.

Table 3.—Indicators of Minnesota business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---------- thousands --	1,776.0	NA	NA
Unemployment ---------- do ----	79.0	NA	NA
Employment:			
Manufacturing ---------- do ----	331.8	343.0	+3.4
Construction ---------- do ----	66.7	65.9	−1.2
Mining ---------- do ----	14.0	14.1	+0.7
Transportation and public utilities ---------- do ----	90.8	92.8	+2.2
Wholesale and retail trade ---------- do ----	351.7	363.0	+3.2
Finance, insurance, and real estate ---------- do ----	71.4	72.7	+1.8
Services ---------- do ----	254.5	268.7	+5.6
Government ---------- do ----	256.6	265.5	+3.5
Personal income:			
Total ---------- millions --	$20,010	$21,346	+6.7
Per capita ----------	$5,144	$5,450	+5.9
Construction activity:			
Value of authorized nonresidential construction -- millions --	$419.9	$495.9	+18.1
Number of private and public residential units authorized --	23,325	19,058	−18.3
State highway commission contracts available --- millions --	$127.7	$95.5	−25.2
Portland cement shipments to and within Minnesota thousand short tons --	1,762	1,721	−2.3
Farm marketing receipts ---------- millions --	$4,113.2	NA	NA
Mineral production value ---------- do ----	$852.8	$1,026.4	+20.4

e Estimate. p Preliminary. NA Not available.

Source: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

METALS

Copper-Nickel.—Early in the year International Nickel Co. of Canada, Ltd. (INCO), received permission from the U.S. Forest Service to remove a 10,000-ton sample of copper-nickel ore from the Superior National Forest near Ely. The ore was shipped to INCO facilities in Canada for testing. Later in the year AMAX Exploration, Inc., sought approval from the Minnesota Pollution Control Agency (PCA) to sink a 1,700-foot exploration shaft near Babbitt.

Public concern with potential environmental effects of mining and smelting in the Duluth gabbro area led to the formation of an interagency task force by the Minnesota Environmental Quality Council (EQC). The task force will study the potential environmental, social, and economic impacts of mining and processing copper-nickel ore. The EQC voted to require an environmental impact statement before any mining or smelting can take place. Later in the year, the EQC decided that the test shaft proposed by AMAX did not constitute "a major private action of more than local significance," and thus did not require preparation of an environmental impact statement. This action was later challenged in Hennepin County District Court by four environmental groups that contended the EQC's action violated State law.

The Bureau of Mines Twin Cities Metallurgy Research Center processed on a laboratory scale a sample of copper-nickel-bearing material from the INCO test pit. The objective was to conclude ongoing petrographic studies of ore from the gabbro formation. Research was also continued on development of an extraction process for recovering nickel and copper.

Iron Ore.—Minnesota iron ore production in 1974 totaled 58.5 million long tons, about 70% of total U.S. production. The average iron content of usable ore produced was 60% in 1974, compared with 60.5% in 1973. Shipments of taconite pellets in 1974 decreased to 41.1 million tons from the record 43.6 million tons in 1973. Shipments of natural ores were 18.3 million tons, down 4% from 19 million tons in 1973.

The decline in 1974 output was due largely to a series of strikes by local chapters of the United Steelworkers of America (USW) against Reserve Mining Co., Erie Mining Co., Eveleth Taconite Co., The Hanna Mining Co., and Cleveland-Cliffs Iron Co. The strikes involved more than 10,000 employees and lasted from 9 to 15 days. Final settlement was made on August 15. Three-year agreements were negotiated retroactive to May 1, 1974.

Construction of mine and plant facilities for the Hibbing Taconite Co. project continued in 1974. Production was expected to begin by late 1976. The pelletizing plant was being built by Dravo Corp. of Pittsburgh, Pa., and will use the traveling grate process to produce 5.4 million tons of pellets per year. Hibbing Taconite Co. is owned by Bethlehem Steel Corp. (75%), Pickands Mather & Co. (15%), and The Steel Co. of Canada, Ltd. (10%). Cost of the project was originally estimated at $150 million.

Inland Steel Co. broke ground in October for its Minorca taconite operation near Virginia, Minn. When completed, the pelletizing plant will have a production capacity of 2.6 million tons per year. The kiln burners will be equipped to burn natural gas, fuel oil, or coal. Cost of the project was estimated at $70 million, and production was scheduled to begin in the spring of 1977.

Expansion plans for three existing taconite facilities were announced during the year. United States Steel Corp. will increase the productive capacity of its Minntac plant by 50% to 18 million tons of pellets annually. Eveleth Taconite Co. will increase the capacity of its operation to 6 million tons of pellets annually. Hanna Mining Co. and National Steel Corp.'s expansion of their pelletizing plant at Keewatin will increase capacity to about 5.8 million tons per year. The three expansions will add 12.6 million tons of additional production capacity, will cost more than $500 million, and will be completed by early 1978.

Production began in mid-1974 at two natural ore mines which had been under development since 1972. Ore from the Whitney mine, operated by The Hanna Mining Co., was being concentrated at the Pierce plant. The first shipments of washed concentrate from the Rana mine,

owned by Rhude & Fryberger, Inc., were made in August. Also, production was resumed in 1974 at United States Steel's Stephens natural ore mine. The mine had been idle in 1973.

Four price increases in 1974 for Lake Superior iron ores resulted in an average increase in value of 17% for natural ores and 20% for pellets compared with 1973 prices. Ore prices in late 1974 were 32% higher than those on January 1. The increases closely reflected increases in operating costs and rapidly accelerating capital costs for modernization and expansion of productive capacities. At yearend the published price of Mesabi non-Bessemer ore, basis 51.5% Fe natural, delivered rail-of-vessel at lower lake ports, was $15.75 per long ton and that for iron ore pellets was 40.619 cents per long ton unit of iron for all companies except Hanna Mining. Hanna increased prices on Dec. 24, 1974, to $17.28 per long ton for Mesabi non-Bessemer ore and 44.559 cents per long ton unit of iron for pellets.

According to published rates in mid-1974, the cost of transportation of iron ore from the Mesabi range to lower lake ports (rail-of-vessel) in 1974 ranged from $5.49 to $6.05 per long ton. These rates represented a 24% to 30% increase over those in mid-1973. The rates include a dock-handling charge of $0.34.

Minnesota's 1974 ore shipping season began at Duluth on April 8 and was underway at all ports by April 17. The season ended for four upper lakes ports by January 27, 1975. However, ore shipments from the DM&IR docks at Two Harbors continued through March 1975, and, for the first time, vessel loading continued without interruption into the 1975 season. This historic event was due largely to favorable weather conditions and to the extension of the Winter Navigation Program authorized by Congress.

After an 8-month trial of the suit brought against Reserve Mining Co. by the U.S. Department of Justice, alleging pollution of water and air by the company's taconite processing plant at Silver Bay, the U.S. District Court in Minneapolis ordered the plant closed on April 20. Two days later it was allowed to reopen, following suspension of the order by the U.S. Court of Appeals. In October, the U.S. Supreme Court refused to intervene in the case, and the District Court later ruled that the plant's discharges violated Federal and State laws. The latter decision was under review by the Court of Appeals in December. In November, the company submitted to the State of Minnesota a preliminary plan for onland disposal of the plant's wastes, increased air pollution controls, and changes in the production process at an estimated cost of $243 million.

The University of Minnesota's Mineral Resources Research Center continued to conduct research programs although the 1974 State legislature discontinued its funding. The Center accepted a $150,000 contract from Arthur G. McKee & Co. for laboratory and pilot plant work on iron ore deposits in Angola and Chile.

A cooperative research effort was initiated by the Bureau of Mines and Eveleth Taconite Co. to produce iron ore concentrates containing less than 1.5% SiO_2 from plant concentrates containing about 4.5% SiO_2. The project is being undertaken because of current high interest in the use of prereduced pellets for electric-furnace steelmaking. The Bureau also continued research on beneficiation of nonmagnetic taconite from the Mesabi range.

Table 4.—Minnesota: Iron ore [1] data, in 1974, by county and range
(Thousand long tons)

County and range	Crude ore production [2]	Usable ore				
		Stocks Jan. 1	Production	Iron content of production	Shipments	Stocks Dec. 31
County:						
Itasca	25,029	295	8,462	4,979	8,442	315
St. Louis [3]	128,765	2,715	50,023	30,126	50,980	1,758
Total [4]	153,794	3,010	58,484	35,105	59,422	2,072
Mesabi Range	153,794	3,010	58,484	35,105	59,422	2,072

[1] Exclusive of ore containing 5% or more manganese.
[2] Entire production from open pit mines.
[3] Includes Lake County.
[4] Data may not add to totals shown because of independent rounding.

Table 5.—Minnesota: Usable iron ore [1] produced (direct-shipping and all forms of concentrate), by range
(Thousand long tons)

Year	Cuyuna	Mesabi	Vermillion	Spring Valley District	Total
1884–1969	70,336	2,720,452	103,527	8,150	[2] 2,902,464
1970	--	56,073	--	--	56,073
1971	--	51,283	--	--	51,283
1972	--	48,998	--	--	48,998
1973	--	60,021	--	--	60,021
1974	--	58,484	--	--	58,484
Total	70,336	2,995,311	103,527	8,150	3,177,323

[1] Exclusive, after 1905, of iron ore containing 5% or more manganese.
[2] Data do not add to total shown because of independent rounding.

Table 6.—Minnesota: Production of usable iron ore
(Thousand long tons)

	Natural ore			Taconite pellets	Total usable ore [1]	Iron content (percent)
	Direct shipping ore	Concentrates	Total			
1970	3,892	16,836	20,728	35,345	56,073	58.76
1971	3,335	14,178	17,513	33,771	51,283	59.89
1972	W	W	14,452	34,546	48,998	60.20
1973	W	W	18,420	41,601	60,021	60.53
1974	W	W	17,541	40,944	58,484	60.02

W Withheld to avoid disclosing individual company confidential data, included in "Total."
[1] Data may not add to totals shown because of independent rounding.

Table 7.—Minnesota: Shipments of iron ore [1] from mines
(Thousand long tons)

Year	Natural ore			Taconite pellets	Total usable ore	Proportion of taconite pellets to total usable ore (percent)
	Direct shipping ore [2]	Concentrates	Total			
1970	3,892	16,965	20,857	33,935	[3] 54,791	61.93
1971	3,335	13,100	16,435	32,619	49,054	66.50
1972	W	W	15,229	35,366	50,595	69.90
1973	W	W	19,013	43,601	62,614	69.63
1974	W	W	18,282	41,140	59,422	69.23

W Withheld to avoid disclosing individual company confidential data, included in "Total."
[1] Exclusive of ore containing 5% or more manganese.
[2] Includes crushed, screened, and sized ore not further treated.
[3] Data do not add to total shown because of independent rounding.

Table 8.—Dates of first and final cargoes of iron ore at Minnesota and Wisconsin upper Great Lakes

Port and dock	1973		1974	
	First	Final	First	Final
Duluth, Minn.: DM&IR	Mar. 29	Dec. 31	Apr. 8	Jan. 10 [2]
Silver Bay, Minn.: Reserve	Apr. 1	Jan. 13 [1]	Apr. 13	Jan. 21 [2]
Superior, Wisc.: Burlington Northern	Apr. 1	Jan. 9 [1]	Apr. 17	Jan. 27 [2]
Taconite Harbor, Minn.: Erie	Apr. 6	Jan. 4 [1]	Apr. 16	Jan. 23 [2]
Two Harbors, Minn.: DM&IR	Apr. 1	Feb. 5 [1]	Apr. 9	([3])

[1] 1974.
[2] 1975.
[3] Because of favorable navigation conditions permitting vessel loading to continue without interruption, the ore docks operated by the DM&IR at Two Harbors were not closed for the 1974 season.

Source: Skillings' Mining Review.

Table 9.—Minnesota: Shipments of ferruginous manganese ore[1] from the Cuyuna Range

	Quantity (long tons)	Contents (natural)	
		Fe (percent)	Mn (percent)
1970	286,996	29.96	13.97
1971	151,547	28.16	13.56
1972	106,539	27.09	12.64
1973	152,653	27.69	12.59
1974	201,393	29.64	12.74

[1] Containing 10% to 35% manganese, natural. There have been no shipments of manganiferous iron ore containing 5% to 10% manganese since 1969.

Iron and Steel.—The State's only steel mill, operated by North Star Steel Co., continued to produce steel from ferrous scrap in two electric furnaces at St. Paul. In 1974, Cargill, Inc., of Minneapolis purchased a majority interest in North Star, whose production included merchant bars, carbon and alloy special bars, reinforcing bars, angles, and channels. The company planned to build a plant in Duluth to produce grinding balls for the taconite industry. Planned production capacity was 40,000 tons of balls per year. Completion of the plant was scheduled for early 1977.

Manganiferous Ore.—All manganiferous ores shipped from the Cuyuna Range in 1974 were classed as ferruginous manganese ore containing 10% to 35% manganese. Shipments increased 32% over those of 1973. There have been no shipments of manganiferous iron ore containing 5% to 10% manganese since 1969.

NONMETALS

Abrasive Stone.—Production of grinding pebbles and tube-mill liners decreased in 1974 by 9% and value of sales decreased 1.6%. Abrasive stone products are produced from quartzite quarried by the Jasper Stone Co. in Rock County.

Cement.—Universal Atlas Cement Division of United States Steel Corp. continued to be the only cement producer in the State. It produced portland and masonry cement at Duluth for consumption in Minnesota.

Clays.—Production and value of common clay and shale increased over those of 1973. North Central Lightweight Aggregate Co., Inc., and Ochs Brick & Tile Co. produced the clays for use in lightweight aggregate and face brick production.

Gem Stones.—Agates and similar semiprecious gem stones gathered by amateur collectors accounted for all State gem stone production.

Lime.—American Crystal Sugar Co. produced lime at three plants in Clay and Polk Counties for their own use in sugar refining. Output increased 26% but was 59% below the 1968 record. Consumption of lime was 139,800 short tons.

Perlite.—W. R. Grace & Co. continued to produce expanded perlite in 1974 at its Zonolite Division in Minneapolis. The material is mined outside the State and used for horticultural purposes, plaster, and concrete aggregate.

Sand and Gravel.—Compared with 1973, production of sand and gravel decreased 3% but total value increased 7.4%. Sand and gravel accounted for 4% of the value of all mineral commodities produced in the State and ranked second only to iron ore. Average value was $1.15 per ton compared with $1.04 per ton in 1973.

Stone.—Value of all stone produced in Minnesota in 1974 was $22 million, up 8% from that of 1973. Stone ranked third in value of State mineral production, accounting for about 2% of total value.

Table 10.—Minnesota: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	37,935	39,438	9,427	12,087
Gravel			21,620	27,410
Unprocessed:				
Sand and gravel			5,673	2,535
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	37,935	39,438	36,720	42,032

W Withheld to avoid disclosing individual company confidential data; included with "Construction."

[1] Value data may not be directly comparable to that in tables 1, 11, 12, and 13 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 11.—Minnesota: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	29,060	31,489	6,112	9,631
Highway and bridge construction			1,396	2,095
Other uses (dams, waterworks, airports, etc.)			355	569
Concrete products (cement blocks, bricks, pipe, etc.)			2,835	4,453
Bituminous paving (asphalt and tar paving)			3,787	3,706
Roadbase and subbase			3,200	3,615
Unprocessed aggregate			3,978	2,008
Fill	2,478	1,452	1,211	1,438
Other uses	1,925	3,376	740	2,404
Industrial sand and gravel	W	W	W	W
Total	33,463	36,317	23,614	29,919

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 12.—Minnesota: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	3,763	2,544	347	629
Highway and bridge construction			959	1,405
Other uses (dams, waterworks, airports, etc.)			21	39
Concrete products (cement blocks, bricks, pipe, etc.)			W	W
Bituminous paving (asphalt and tar paving)			3,772	3,995
Roadbase and subbase			5,891	5,372
Unprocessed aggregate			1,695	527
Fill	509	363	108	141
Other	200	214	313	343
Total	4,472	3,121	13,106	12,451

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 13.—Minnesota: Sand and gravel sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973 r			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Aitkin	3	W	W	2	19	7
Anoka	1	W	W	2	W	W
Becker	4	W	W	3	203	218
Beltrami	3	249	210	4	286	300
Benton	2	57	39	2	63	50
Big Stone	3	W	W	2	W	W
Blue Earth	6	564	555	4	290	393
Brown	4	226	103	4	437	292
Carlton	8	275	221	10	728	533
Carver	2	W	W	3	396	430
Cass	6	155	177	6	238	387
Chippewa	10	322	295	6	342	226
Chisago	6	355	263	7	202	231
Clay	11	870	1,112	8	1,162	1,914
Clearwater	4	145	123	4	154	153
Cook	2	15	W	2	W	W
Cottonwood	3	W	W	3	W	W
Crow Wing	11	406	460	9	246	187
Dakota	15	3,479	3,569	17	2,820	3,477
Dodge	1	17	13	2	17	14
Douglas	2	148	59	2	W	W
Faribault	2	W	W	--	--	--
Fillmore	2	55	53	4	177	330
Freeborn	5	W	W	5	402	414
Goodhue	6	190	203	6	156	215
Grant	3	W	W	3	W	W
Hennepin	24	5,035	5,021	24	4,206	4,183
Houston	2	W	25	2	W	13
Hubbard	3	180	W	3	112	206
Isanti	--	--	--	1	62	47
Itasca	6	535	593	5	633	1,278
Jackson	2	W	W	4	211	300
Kanabec	2	W	W	3	67	55
Kandiyohi	3	W	W	6	552	572
Kittson	2	W	W	3	124	102
Koochiching	1	82	62	1	56	23
Lac qui Parle	5	W	W	4	40	63
Lake	3	79	67	2	W	W
Lake of the Woods	2	86	62	1	W	W
Le Sueur	5	929	2,442	6	1,016	2,693
Lincoln	2	W	W	2	W	W
Lyon	3	W	W	1	W	W
McLeod	2	32	24	4	251	190
Mahnomen	--	--	--	1	91	54
Marshall	5	396	343	4	347	264
Martin	2	87	53	4	244	245
Meeker	2	W	W	3	358	191
Mille Lacs	3	166	141	5	255	283
Morrison	1	W	W	4	491	1,310
Mower	3	W	W	5	276	239
Murray	1	23	17	5	W	W
Nicollet	3	W	W	3	307	433
Nobles	2	W	W	6	W	W
Norman	2	W	W	3	96	27
Olmsted	4	400	416	4	614	872
Otter Tail	7	168	146	5	119	70
Pennington	3	W	W	2	W	W
Pine	3	339	340	4	759	516
Pipestone	2	W	W	1	W	W
Polk	7	626	588	4	580	646
Pope	1	24	37	3	81	81
Ramsey	3	W	W	2	W	W
Red Lake	1	7	7	--	--	--
Redwood	3	W	W	6	143	139
Renville	10	570	480	7	782	668
Rice	2	W	W	2	W	W
Rock	3	W	W	3	220	357
Roseau	3	128	87	4	168	100
St. Louis	34	3,610	3,493	34	3,554	2,940
Scott	4	610	607	5	519	537
Sherburne	6	1,261	1,504	7	1,238	1,747
Stearns	7	441	262	9	782	975
Steele	3	W	W	5	286	515
Stevens	1	W	W	2	W	W
Swift	1	W	W	2	W	W
Todd	3	356	266	4	564	422
Traverse	1	140	140	--	--	--

See footnotes at end of table.

Table 13.—Minnesota: Sand or gravel sold or used by producers, by county—Continued

(Thousand short tons and thousand dollars)

County	1973 r			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Wabasha	8	W	W	3	146	205
Wadena	1	W	W	1	21	7
Waseca	1	69	34	1	19	11
Washington	16	2,928	3,600	21	2,852	3,330
Watonwan	2	W	W	1	42	40
Wilkin	2	W	W	5	400	365
Winona	2	W	W	3	421	603
Wright	12	1,351	1,354	10	728	928
Yellow Medicine	4	56	85	5	134	136
Other counties	5	9,692	9,688	2	3,415	3,618
Total [1]	376	37,935	39,438	402	36,720	42,370

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Other counties."

[1] Data may not add to totals shown because of independent rounding.

Table 14.—Minnesota: Limestone and dolomite sold or used by producers, by use

(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Rough architectural [1] thousand cubic feet	12	50	25	107
Cut stone do	59	775	64	1,147
House stone veneer [2] do	107	403	84	481
Total (thousand short tons)	15	1,228	14	1,735
Crushed and broken:				
Bituminous aggregate	404	559	207	293
Concrete aggregate	731	1,197	740	1,304
Dense graded roadbase stone	2,982	4,252	2,717	4,158
Surface treatment aggregate	608	905	919	1,550
Unspecified construction aggregate and roadstone	663	1,071	958	1,546
Agricultural limestone	223	416	334	762
Riprap and jetty stone	44	62	55	88
Other [3]	663	1,123	542	1,021
Total	6,318	9,585	6,472	[4] 10,721
Grand total	6,333	10,813	6,486	12,456

[1] Data include irregular shaped stone, rubble, and rough flagging.

[2] Data include sawed stone, dressed flagging, and monumental (1974).

[3] Data include stone used for macadam aggregate, railroad ballast, filter stone, asphalt filler, bedding material, and uses not specified.

[4] Data do not add to total shown because of independent rounding.

Table 15.—Minnesota: Granite sold or used by producers, by use

(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Rough architectural ____ thousand cubic feet	W	W	W	W
Rough monumental ____ do	258	472	7	59
Flagging ____ do	8	46	7	46
Dressed architectural ____ do	W	W	W	W
Dressed monumental ____ do	W	W	W	W
Total (thousand short tons)	W	W	W	W
Crushed and broken:				
Aggregate and roadstone [1]	363	W	346	619
Railroad ballast	W	W	1,022	1,713
Riprap and jetty stone	--	--	--	--
Filter stone	4	6	--	--
Other [2]	553	1,665	71	208
Total	920	1,671	1,439	[3]2,539
Grand total	W	W	W	W

W Withheld to avoid disclosing individual company confidential data.
[1] Include stone used for bituminous aggregate, concrete aggregate, dense graded roadbase stone, unspecified construction aggregate and roadstone, poultry grit, riprap, and jetty stone.
[2] Includes items indicated by symbol W in crushed and broken.
[3] Data do not add to total shown because of independent rounding.

Table 16.—Minnesota: Stone sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974			Kind of stone produced in 1974 [1]
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Big Stone	2	W	W	2	W	W	Granite.
Blue Earth	4	W	W	5	W	W	Limestone.
Carver	1	61	91	--	--	--	--
Dakota	1	W	W	2	W	W	Limestone.
Dodge	3	W	W	3	W	W	Do.
Fillmore	10	345	625	16	463	924	Do.
Goodhue	15	374	496	12	238	353	Do.
Hennepin	2	1	2	3	5	16	Do.
Houston	14	253	330	22	399	608	Do.
Kandiyohi	2	3	5	--	--	--	--
Lac qui Parle	3	2	289	2	W	W	Granite.
Le Sueur	2	W	W	2	W	W	Limestone.
Mille Lacs	1	W	W	1	W	W	Granite.
Mower	5	W	W	3	W	W	Limestone.
Nicollet	1	W	W	1	W	W	Quartzite.
Olmsted	11	W	W	11	W	W	Limestone.
Ramsey	--	--	--	1	(2)	1	Do.
Redwood	2	W	W	1	1	48	Granite.
Renville	1	W	W	1	W	W	Do.
Rice	2	W	W	2	W	W	Limestone.
Rock	1	W	W	1	W	W	Quartzite.
St. Louis	6	153	358	3	90	179	Traprock.
Scott	5	1,019	1,767	18	1,122	1,978	Limestone.
Sherburne	1	1	2	--	--	--	--
Stearns	10	W	W	8	W	W	Granite.
Steele	1	125	181	1	154	257	Limestone.
Wabasha	2	W	W	2	W	W	Do.
Washington	3	W	W	2	W	W	Do.
Winona	9	366	907	13	W	W	Do.
Wright	1	W	W	1	W	W	Other stone.
Yellow Medicine	2	W	W	2	W	W	Granite.
Undistributed	--	4,878	15,359	--	5,829	17,678	
Total [3]	123	7,581	20,411	141	8,301	22,041	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] "Limestone" used generally to include dolomite.
[2] Less than ½ unit.
[3] Data may not add to totals shown because of independent rounding.

Sulfur.—Koch Refining Co. and Northwestern Refining Co. continued to recover sulfur as a byproduct from their petroleum refining operations near Pine Bend, Dakota County, and St. Paul Park, Washington County.

Vermiculite.—Production of exfoliated vermiculite by three Minnesota companies decreased slightly in 1974. W. R. Grace & Co., MacArthur Co., and Diversified Insulation Co., Inc. (formerly Certain-teed Products, Inc.) produced the expanded material from vermiculite shipped from outside the State. It was sold for use as concrete and plaster aggregate, insulation, packing material, fireproofing, and for horticultural purposes.

MINERAL FUELS

Peat.—Minnesota peat production and sales in 1974 totaled 20,000 tons, valued at $471,000. The peat was sold in bulk and in packaged form for use in general soil improvement. The State's five producers of peat were Red Wing Peat Corp., Carlton County; Power-O-Peat Co., St. Louis County; Arrowhead Peat Co., Itasca County; Northern Peat Co., Itasca County; and Pine City Peat Co., Pine County. Minnesota has 50% of the Nation's known peat supply but, to date, a complete inventory of the State's peat resources has not been completed. Of the 7.5 million acres of peat in the State, only 53 areas comprising approximately 155,000 acres have been completely surveyed.

Table 17.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasive stone: Jasper Stone Co.	Box 206 Sioux City, Iowa 51102	Quarry and plant.	Rock.
Clays:			
North Central Lightweight Aggregate Co., Inc.	4901 W. Medicine Lake Dr. Minneapolis, Minn. 55427	Pit and plant	Hennepin.
Ochs Brick & Tile Co	Springfield, Minn. 56087	do	Brown and Redwood.
Coke: Koppers Co., Inc	1000 Hamlin Ave., North St. Paul, Minn. 55104	Coke ovens	Ramsey.
Iron ore:			
Cleveland-Cliffs Iron Co	1460 Union Commerce Bldg. Cleveland, Ohio 44115	Mines and plants.	Itasca.
The Hanna Mining Co.[1]	100 Erieview Plaza Cleveland, Ohio 44114	do	Itasca and St. Louis.
Jones & Laughlin Steel Corp.	Virginia, Minn. 55792	do	Do.
Oglebay Norton Co	Hanna Bldg. Cleveland, Ohio 44115	do	St. Louis.
Pickands Mather & Co	1100 Superior Ave. Cleveland, Ohio 44114	do	Do.
Pittsburgh Pacific Co.[2]	2521 First Ave. Hibbing, Minn. 55746	do	Do.
Reserve Mining Co	Silver Bay, Minn. 55614	do	St. Louis and Lake.
Rhude & Fryberger, Inc	Box 66 Hibbing, Minn. 55746	do	St. Louis.
United States Steel Corp.[3]	Box 417 Mountain Iron, Minn. 55768	do	St. Louis, Itasca.
Iron and steel: North Star Steel Co.	1400 Red Rock Rd. St. Paul, Minn. 55119	Plant	Ramsey.
Secondary lead smelters:			
Gopher Smelting & Refining Co.	33855 S. Highway 49 St. Paul, Minn. 55111	do	Dakota.
NL Industries, Inc	111 Broadway New York, N.Y. 10006	do	Hennepin.
Lime: American Crystal Sugar Co.	Boston Bldg. Denver, Colo. 80201	Shaft kilns	Clay and Polk.
Peat:			
Power-O-Peat Co	Gilbert, Minn. 55741	Bog	St. Louis.
Red Wing Peat Corp	Box 3006 Houston, Texas 77001	Bog	Carlton.
Perlite, expanded: W. R. Grace & Co.	62 Whittemore Ave. Cambridge, Mass. 01109	Plant	Hennepin.

See footnotes at end of table.

Table 17.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel:			
Barton Contracting Co	10300 89th Ave. North Osseo, Minn. 55369	Pits and plants	Carlton, Chisago, Dakota, Hennepin, Sherburne, Washington.
Duininck Bros. & Gilchrist	Olivia, Minn. 56277	do	Various.
Fisher Sand and Aggregates.	Rosemount, Minn. 55068	Plant	Dakota.
J. L. Shiely Co.[3]	1101 North Snelling Ave. St. Paul, Minn. 55108	Pit and plant	Washington.
Ulland Brothers, Inc	Box 98 Austin, Minn. 55912	Pits and plants	Carlton, Cook, Freeborn, Lake, Mower, Olmsted, St. Louis, Steele.
Stone:			
Cold Spring Granite Co	Cold Spring, Minn. 56320	Quarries	Big Stone, Mille Lacs, Renville, Stearns.
Mankato Ag. Lime & Rock Co.	Route 3 Mankato, Minn. 56001	Quarry and plant.	Blue Earth.
Quarve & Anderson Co	Route 3, Box 27 Rochester, Minn. 55901	Quarries and plants.	Dodge, Goodhue, Olmsted, Wabasha, Winona.
New Ulm Quartzite Quarries, Inc.	New Ulm, Minn. 56073	Quarry and plant.	Nicollet.
Sulfur, recovered:			
Koch Refining Co	Box 3596 St. Paul, Minn. 55101	Plant	Dakota.
Northwestern Refining Co	P.O. Drawer 9 St. Paul, Minn. 55071	do	Washington.

[1] Also manganiferous ore.
[2] Also coke.
[3] Also stone.

The Mineral Industry of Mississippi

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Mississippi Geological, Economic, and Topographical Survey for collecting information on all minerals except fuels.

By John L. Reuss [1] and Charles L. Readling [2]

The value of mineral production in Mississippi established a record high of $391.2 million during 1974, a significant 39% increase over the previous record high of $281.7 million attained during 1973. The combined value of crude oil and natural gas production accounted for 85% of the State's total mineral production value. Although production of both petroleum and natural gas were lower than that of 1973, the average unit value of petroleum increased by a monumental 60%, and natural gas recorded a significant 29% increase. The value of all other mineral production, excluding petroleum and natural gas, increased by approximately $13 million, 28.8% greater than that of 1973.

[1] State Liaison Officer, Bureau of Mines, Jackson, Miss.
[2] Mineral Specialist, Division of Interfuels Studies.

Table 1.—Mineral production in Mississippi [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---------- thousand short tons --	2,075	$9,082	2,013	$10,468
Lime ---------- do ----	W	W	70	1,393
Natural gas ---------- million cubic feet --	99,706	22,846	78,787	23,242
Petroleum (crude) -- thousand 42-gallon barrels --	56,102	213,747	50,779	309,753
Sand and gravel ---------- thousand short tons --	14,251	17,383	14,439	19,487
Stone ---------- do ----	[2]760	[2]809	1,719	2,572
Value of items that cannot be disclosed: Cement, magnesium compounds, natural gas liquids, and values indicated by symbol W --	XX	17,871	XX	24,240
Total ----------	XX	281,738	XX	391,155
Total 1967 constant dollars ----------	XX	206,542	XX	[p]187,050

[p] Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes limestone; included with "Value of items that cannot be disclosed."

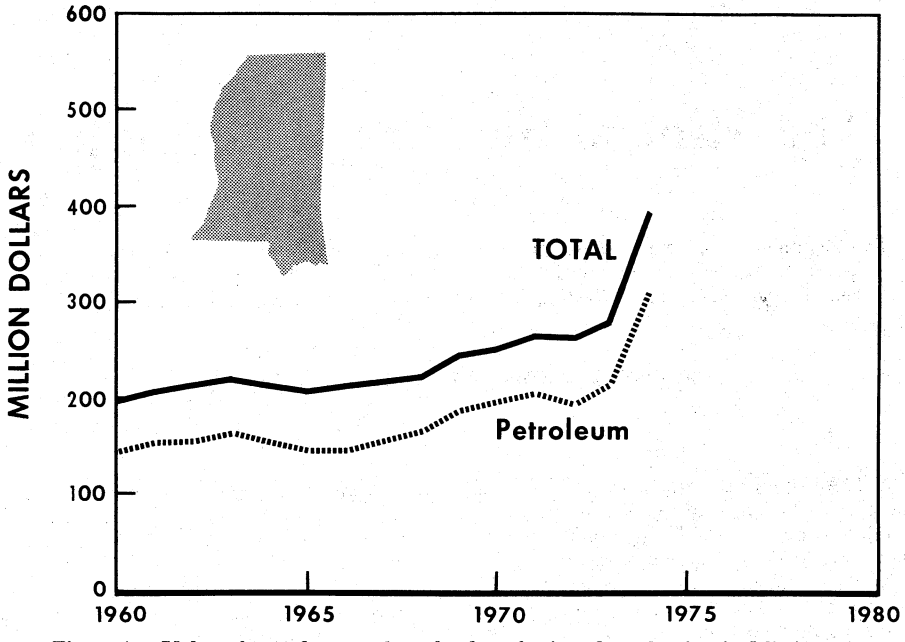

Figure 1.—Value of petroleum and total value of mineral production in Mississippi

Table 2.—Value of mineral production in Mississippi, by county [1 2]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	$18,616	$28,730	Petroleum, sand and gravel, natural gas, natural gas liquids.
Alcorn	W	W	Clays.
Amite	W	5,509	Petroleum, natural gas.
Bolivar	--	W	Sand and gravel.
Calhoun	W	W	Natural gas.
Carroll	W	W	Sand and gravel, clays.
Chickasaw	W	W	Natural gas.
Clarke	48,426	64,921	Petroleum, natural gas, natural gas liquids.
Clay	484	837	Sand and gravel, stone, natural gas.
Copiah	W	3,089	Sand and gravel, natural gas, petroleum.
Covington	W	650	Petroleum, natural gas, sand and gravel.
DeSoto	950	W	Sand and gravel.
Forrest	2,434	2,845	Sand and gravel, natural gas, petroleum, clays.
Franklin	7,024	9,937	Petroleum, natural gas.
George	--	W	Sand and gravel.
Greene	556	986	Petroleum, natural gas.
Grenada	418	W	Sand and gravel.
Hancock	227	289	Natural gas, petroleum.
Harrison	--	22	Sand and gravel.
Hinds	2,115	2,194	Petroleum, clays, natural gas.
Holmes	W	1,483	Sand and gravel, petroleum, natural gas.
Humphreys	12	87	Petroleum, natural gas.
Itawamba	752	893	Clays, natural gas, sand and gravel.
Jackson	W	W	Magnesium compounds, lime.
Jasper	42,669	62,077	Petroleum, natural gas, natural gas liquids.
Jefferson	W	1,103	Petroleum, natural gas.

See footnotes at end of table.

Table 2.—Value of mineral production in Mississippi, by county [1 2]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Jefferson Davis	$3,373	$3,264	Natural gas, petroleum, sand and gravel.
Jones	9,696	13,764	Petroleum, natural gas, clays.
Kemper	W	W	Clays.
Lamar	30,310	46,804	Petroleum, natural gas.
Lauderdale	W	--	
Lawrence	W	--	
Lee	W	W	Clays.
Leflore	W	W	Sand and gravel, petroleum, natural gas.
Lincoln	4,855	7,607	Petroleum, clays, natural gas, sand and gravel.
Lowndes	W	W	Cement, sand and gravel, stone, clays.
Madison	W	2,091	Petroleum, natural gas.
Marion	5,533	4,741	Natural gas, petroleum, sand and gravel.
Marshall	343	413	Clays.
Monroe	3,863	4,782	Clays, sand and gravel, natural gas, petroleum.
Noxubee	W	W	Clays, stone.
Oktibbeha	W	W	Natural gas.
Panola	W	W	Clays.
Pearl River	W	340	Natural gas, petroleum.
Perry	W	413	Petroleum, sand and gravel, natural gas.
Pike	1,792	2,958	Petroleum, sand and gravel, natural gas, natural gas liquids.
Prentiss	W	W	Clays.
Quitman	W	W	Do.
Rankin	9,130	11,457	Cement, natural gas, petroleum, stone.
Scott	W	581	Petroleum, natural gas.
Simpson	W	2,332	Do.
Smith	10,100	11,303	Petroleum, natural gas, natural gas liquids, clays.
Stone	W	W	Sand and gravel.
Sunflower	22	34	Clays.
Tate	--	75	Sand and gravel.
Tippah	W	W	Clays.
Tishomingo	W	W	Stone, sand and gravel.
Walthall	W	8,900	Petroleum, natural gas, sand and gravel.
Warren	5,759	W	Cement, sand and gravel, stone.
Washington	300	W	Sand and gravel.
Wayne	15,969	27,542	Petroleum, natural gas, stone.
Wilkinson	W	7,986	Petroleum, natural gas.
Winston	W	W	Clays.
Yalobusha	465	W	Sand and gravel.
Yazoo	13,383	16,663	Petroleum, sand and gravel, natural gas.
Undistributed [3]	42,160	31,452	
Total [4]	281,738	391,155	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties were not listed because no production was reported: Attala, Benton, Choctaw, Claiborne, Coahoma, Issaquena, Lafayette, Leake, Montgomery, Neshoba, Newton, Pontotoc, Sharkey, Tallahatchie, Tunica, Union, and Webester.

[2] The value of petroleum and natural gas (1974) are based on an average price per barrel and cubic foot respectively for the State.

[3] Includes value of mineral production that cannot be assigned to specific counties and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

The effects of the energy crisis, which developed in 1973 and accelerated during 1974, continued to impede the progress of the electric utility industry in Mississippi. Because of significant natural gas curtailments by all major suppliers and the high cost of substitute fuel oil, the average cost of fuel used for electric power generation by both the Mississippi Power and Light Co. (M.P.&L.) and the Mississippi Power Co. increased by approximately 100% over that of the previous year.

The curtailment of natural gas coupled with the uncertainty of reliable supplies of fuel oil, is forcing the Mississippi electric utility industry to accept alternate forms

of fuel for the generation of electric power. The Mississippi Power Co., which completed construction of a 500,000-kilowatt, coal-fired generating facility during 1973, is currently constructing two additional 500,000-kilowatt, fossil-fired units located in Jackson County. Each of these units, originally designed to use low-sulfur residual oil as a primary fuel source, were modified to operate as fossil-fired units during 1974. The first of these units is scheduled for completion in 1977, and the second is scheduled for service in 1979.

MP&L completed construction of the 750,000-kilowatt Gerald Andrus steam-electricity-generating unit during December. Costing $107 million this plant is the fifth in the MP&L system, and the first constructed to burn fuel oil on a permanent basis. On September 4, the Atomic Energy Commission granted a construction permit to build the 2,500,000-kilowatt Grand Gulf Nuclear Station near Port Gibson. This $1.2 billion nuclear-fueled facility will consist of 2 companion 1,250,000-kilowatt units, the first of which is scheduled to commence operations during 1980.

The Governors of Mississippi and Alabama have signed letters of intent with SPLITT, Ltd. for the development of a $189 million monoport off the coast of Mississippi-Alabama. The monoport system will allow giant tankers to unload crude oil in 120 feet of water, about 28 miles off the coast, and pump the products to onshore tank farms. If a federal permit can be obtained during 1975, it is anticipated that this port facility could be operational by 1978.

Because of increased demand for mineral fuels, exploratory drilling for oil and gas deposits increased by a dramatic 47% over that of 1973, and were accelerating at yearend. At least 15 new oil and gas discoveries were confirmed during 1974. Approximately half of the exploratory wells were drilled to the shallow Wilcox formation of southeastern Mississippi, but all five of the geologic intervals used to classify the productive trends in Mississippi were tested. Significant discoveries were reported from sediments of Eocene, Upper Cretaceous, Lower Cretaceous, and Jurassic trends. Paleozoic drilling activity yielded four new discoveries; however, none were considered to be significant.

Offshore exploratory drilling in the Federal leases off Mississippi, Alabama, and Florida (Mafla) have been disappointing. Of the 15 tests drilled in the Mafla area, which was leased to industry for $1.49 billion during 1973, only 1 has proved to be successful. The offshore exploration conducted during 1974 tested only the Eocene and Cretaceous trends. The deeper Jurassic sections had not been penetrated as of yearend 1974.

The Mississippi Geological, Economic, and Topographical Survey published another bulletin[3] in its series of comprehensive investigations of the mineral resources of individual counties. A commemorative bulletin[4] on the Tinsley oilfied was also published.

Employment.—Employment in the mining industry rose by 5.0% during 1974, after remaining relatively stable for several years. Much of this rise was in response to the energy crisis which stimulated interest in oil and gas exploration. Conversely, the energy crisis was considered responsible for a sharp 9.5% decline in gasoline service station employment, which contributed significantly to a 2.0% decrease in the total number of wage-and-salary workers engaged in petroleum production, refining, and related industries.

[3] May, J. H., and others. Wayne County Geology and Mineral Resources. Mississippi Geol., Econ., and Topographical Survey Bull. 117, 1974, 292 pp.

[4] Moore, W. H. Tinsley Field 1939–1974, A Commemorative Bulletin. Mississippi Geol., Econ., and Topographical Survey Bull. 119, 1974, 56 pp.

Table 3.—Indicators of Mississippi business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total work force	thousands	903.5	908.5	+0.6
Unemployment	do	29.2	47.9	+64.0
Employment (nonagricultural):				
Construction	do	42.3	44.2	+4.5
Mining	do	6.0	6.3	+5.0
All manufacturing	do	219.9	220.0	+0.1
Other industries [1]	do	410.3	425.0	+3.6
Personal income:				
Total	millions	$7,864	$8,657	+10.1
Per capita		$3,448	$3,764	+9.2
Construction activity:				
Building permits, total private nonresidential	millions	91.7	NA	NA
Cement shipments to and within Mississippi	thousand short tons	1,034	1,045	+1.1
Mineral production value	millions	$281.7	$391.2	+38.9

p Preliminary.
[1] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; services; and government.

Sources: Survey of Current Business; Construction Review; Employment and Earnings; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

Table 4.—Wage-and-salary workers in petroleum production, refining, and related industries

Year	Crude petroleum and natural gas production	Petroleum refining [1]	Pipeline transportation (except natural gas)	Gas utilities	Retail filling stations	Chemicals manufactured as byproducts of petroleum or used in refining of petroleum [2]
1970	5,900	864	175	2,153	5,238	424
1971	5,738	1,000	181	2,187	5,115	411
1972	5,764	1,038	182	2,225	5,429	397
1973	5,131	1,006	177	2,236	5,766	459
1974	5,295	1,119	170	2,192	5,216	482

[1] Employment in petroleum refineries and petrochemicals manufactured in petroleum refineries.
[2] Employment in petrochemical manufacturing facilities located outside petroleum refineries.

Source: Mississippi Employment Security Commission.

Legislation and Government Programs.—Following passage of Public Law 93-627 (the Superport Act), by the 93rd U.S. Congress, the Governors of Mississippi and Alabama signed a Letter of Intent with SPLITT, Ltd. of New Orleans, for a $189 million superport facility. This facility will allow giant tankers to unload crude oil in 120 feet of water, about 29 miles off the Mississippi-Alabama coast. The crude oil would be pumped into onshore tank farms located in both Mississippi and Alabama.

The Mississippi Air and Water Pollution Control Commission, under authority granted by the Environmental Protection Agency, has granted a permit to E. I. du-Pont de Nemours and Co., Inc., to discharge effluents from a proposed titanium dioxide manufacturing plant into the Gulf of Mexico at Bay St. Louis, Miss. The Mississippi Air and Water Polution Control Commission also conducted statewide public hearings for the purpose of establishing wastewater permit regulations for the State of Mississippi in compliance with the Federal Water Pollution Control Act of 1972 (PL 92-500).

Following the enactment of Public Law 92-363, the Mississippi Board of Water Commissioners was contracted by the U.S. Corps of Engineers to identify and inventory all artificial water reservoirs having a downstream flood hazard potential. Through this program, a total of 2,732 dams were identified.

Three bills affecting or related to the mineral industry were considered by the Mississippi legislature, but none were enacted into law. The bills considered were HB 221—Erosion and Sedimentation Control, SB 2049—the Ground Water Management Bill, and SB 2415—the Ground Water Bill.

The State of Mississippi participated in foreign trade missions to Europe and South America. The European mission was fol-

lowed by the establishment of a foreign trade office in Brussels. A South American mission has led to active negotiations for an exchange of Mississippi agricultural technology for Venezuelan controlled petroleum products.

In conjunction with the Nature Conservancy, a private conservation agency, the State of Mississippi is conducting an inventory of wildlife and natural heritage areas which are unique to Mississippi and have thus far been untouched by commercial development.

Transportation.—Following several years of significant natural gas transmission pipeline construction activity, there were no new transmission pipelines installed in Mississippi during 1974.

According to the American Gas Association, there were 16,990 miles of utility gas mains in Mississippi at the end of 1974. During the year 155 miles of utility gas mains were installed, of which 151 miles were distribution lines and 3 miles were gathering lines. Only 1 mile was added to the State's transmission pipeline system.

There were 3,389 miles of crude-oil and refined-products pipelines in the State as of January 1, 1974, according to the latest Bureau of Mines crude-oil and product pipelines triennial report.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

The combined value of crude petroleum and natural gas production was $333 million, a significant 40.7% increase from the comparable 1973 period. The value of the combined crude oil and natural gas production was responsible for 85% of the State's total mineral production compared with 84% during the previous year.

Mississippi retained its ninth-place rank in order of total U.S. crude oil production. The State ranked 14th in the production of natural gas, a 2-point drop from the 12th place rank established during 1973. Leading counties, in order of mineral fuels value, were Clark, Jasper, Lamar, Adams, Wayne, and Yazoo.

The Mississippi State Oil and Gas Board reported 15 oil and gas discoveries recorded during 1974. Drilling activity increased over that of 1973, and was accelerating as the year came to a close. Discoveries were made throughout the State, from the shallow Wilcox sands of southwestern Mississippi to the deep Jurassic sediments of south-central and southeastern Mississippi. Eleven of the new discoveries were recorded as oilfield finds, and four were gas.

Significant discoveries were reported from four of the five geologic intervals used to classify the productive trends in Mississippi. Seven of the new oilfield discoveries occurred in Tertiary (Eocene) age sediments of the Wilcox Formation, at depths ranging from 4,000 to 7,000 feet, in Adams, Franklin, and Wilkinson Counties. The Lower Tuscaloosa Formation of the Upper Cretaceous trend provided one new oilfield discovery in Lincoln County. Lower Cretaceous drilling activity yielded two important new gasfield discoveries from the Hosston Formation in Jefferson Davis County and the Paluxy Formation in Walthall County. Drilling in the Jurassic trend, principally the Smackover Formation, yielded a new oilfield discovery in Clarke County, and two new gasfield discoveries in Jones and Rankin Counties. Paleozoic drilling activity increased by 50% over that of 1973. Four new field discoveries were reported; however, none were considered to be significant. Much of the Paleozic exploration occurred in the Mississippian Carter sandstone in Monroe County. However, at yearend, the R.L. Burns Corp. was preparing to test the Paleozic trend in eastern Clay County.

According to the Mississippi State Oil and Gas Board, there were 446 oil pools and 82 gas pools producing in 444 fields in the State. There were 3,042 producible wells, a decline of 1.6% from the 3,090 producible wells reported as of yearend 1973.

Table 5.—Mississippi: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Adams	10	1	21	2	--	54	88	572,863
Amite	1	--	4	2	--	8	15	165,820
Calhoun	--	--	--	--	--	1	1	3,215
Chickasaw	--	--	1	--	--	4	5	16,855
Claiborne	--	--	--	--	--	1	1	18,375
Clarke	4	--	6	2	--	10	22	274,562
Coahoma	--	--	--	--	--	1	1	17,599
Copiah	--	--	--	--	--	3	3	36,417
Covington	--	--	--	1	--	--	1	18,756
Forrest	--	--	--	--	--	3	3	28,550
Franklin	7	--	5	5	--	39	56	377,162
Hancock	--	--	--	--	--	1	1	11,000
Hinds	--	--	1	1	--	2	4	37,411
Humphreys	--	--	--	--	--	2	2	22,315
Issaquena	--	--	--	--	--	1	1	8,201
Itawamba	--	--	2	--	--	3	5	7,513
Jasper	10	1	4	1	--	11	27	324,246
Jefferson	--	--	4	--	--	7	11	66,620
Jefferson Davis	--	--	--	--	1	--	1	17,020
Jones	1	--	1	1	--	5	8	91,810
Lafayette	--	--	--	--	--	1	1	11,185
Lamar	1	--	--	--	--	1	2	27,022
Lawrence	--	--	--	--	--	1	1	20,588
Lincoln	2	--	3	3	--	4	12	129,881
Lowndes	--	--	--	--	--	1	1	5,002
Madison	--	--	--	--	--	4	4	25,861
Marion	--	--	1	--	--	1	2	18,928
Monroe	1	17	13	1	4	21	57	179,424
Newton	--	--	--	--	--	1	1	12,744
Perry	--	--	--	--	--	1	1	16,385
Pike	--	--	--	--	--	8	8	95,295
Pontotoc	--	--	--	--	--	1	1	3,000
Rankin	--	--	--	--	--	2	2	21,781
Scott	--	--	--	--	--	3	3	18,661
Sharkey	--	--	--	--	--	2	2	21,908
Simpson	--	1	--	--	--	--	1	13,825
Smith	--	--	--	--	--	2	2	31,431
Tunica	--	--	--	--	--	1	1	12,902
Walthall	1	--	3	--	1	7	12	133,798
Warren	--	--	--	--	--	1	1	6,800
Wayne	2	--	6	1	--	6	15	157,401
Wilkinson	4	--	11	3	--	36	54	411,049
Yazoo	--	--	--	--	--	2	2	25,534
Total	44	20	86	23	6	263	442	3,516,715

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 6.—Mississippi: Estimated proved recoverable reserves of crude oil, natural gas liquids, and natural gas

Commodity	Proved reserves Dec. 31, 1973	Changes in proved reserves due to extensions and discoveries in 1974	Proved reserves Dec. 31, 1974 (Production deducted)	Changes from 1973 (percent)
Crude oil thousand barrels	291,049	27,252	261,408	−10.2
Natural gas liquids thousand barrels	14,090	1,172	12,593	−10.6
Natural gas million cubic feet	1,178,218	68,042	1,079,420	−8.4

Source: American Petroleum Institute and American Gas Association.

Natural gas.—Marketed natural gas production was 78.8 billion cubic feet, a decline of 21% from the 99.7 billion cubic feet marketed in 1973. This is the 10th consecutive year that marketed natural gas volume has declined. Total value of marketed natural gas averaged 29.5 cents per thousand cubic feet (Mcf) in 1974, an increase of 29% from the 22.9 cents per Mcf established in 1973. Mississippi ranked

14th in the Nation in the marketed production of natural gas during 1974.

Eight of the 38 gas-producing counties supplied 82% of the natural gas produced in the State. In descending order of production, they were Walthall, Marion, Rankin, Jefferson Davis, Smith, Jasper, Clarke, and Lamar. During 1974, the numbers of gas-producing counties were increased by two with the addition of Holmes and Humphreys.

Natural gas reserves in Mississippi declined 8.4% from 1973, resuming the downward trend that continued from 1961 to 1972. According to the American Gas Association, estimated gas reserves were 1,079.4 billion cubic feet as of December 31, 1974. Because of the 21% decline in natural gas production, the reserve-to-production ratio increased to 13.7:1 from the 11.8:1 reported in 1973.

The Mississippi Oil and Gas Board reported the discovery of four new gasfields during 1974. Of major significance was the Shell Oil Co. Southwest Piney Woods sour gas discovery in Rankin County. This discovery was completed at a depth of 22,066 feet from the Smackover Formation (Jurassic), and flowed 33,500,000 cubic feet per day at a remarkable reservoir pressure of 22,000 psi, which is believed to be the highest pressure ever recorded. Drilling in the Jurassic trend yielded another successful discovery from the Haynesville Formation in Jones County. This well was drilled by the Getty Oil Co. and was completed at a depth of 21,533 feet.

Lower Cretaceous drilling activity yielded two important gasfield discoveries. The Florida Gas Exploration Co. discovered both the Bassfield field from the Hosston Formation, at a depth of 16,009 feet in Jefferson Davis County and the Tylertown field from the Paluxy Formation, at a depth of 12,866 feet in Walthall County.

According to the American Gas Association, the 69 storage wells and 4 pools contained 76,084 million cubic feet of gas on December 31, 1974. Ultimate storage capacity at 4 separate locations in Covington, Hinds, Monroe, and Rankin Counties was 109,645 million cubic feet.

Natural Gas Liquids.—Reserves of natural gas liquids as of December 31, 1974, decreased 1,497,000 barrels, or 10.6% from yearend 1973, according to the American Petroleum Institute (API). Mississippi contained 0.2% of the Nation's natural gas liquid reserves.

According to the Oil and Gas Journal annual survey of natural gas plants,[5] 8 plants operating in Mississippi during 1974, had a total capacity of 221.7 million cubic feet per day (MMcfd), a decrease of 8.3% from the 241.9 MMcfd reported at yearend 1973. This capacity was approximately 0.3% of the U.S. total. This survey indicated that Mississippi plants operated at an average of 56.9% capacity during 1974, a significant increase from the average operating capacities of 48.3% in 1973, and 30% in 1972.

Four companies conducted underground natural gas liquids storage operations in the Petal salt dome in Forrest County. According to the Natural Gas Processors Association, 1973 LPG storage survey, storage capacity in the dome was 6.75 million barrels of propane and 177,000 barrels of butane-propane mix.

Petroleum.—Mississippi ranked ninth in crude petroleum production and accounted for 1.6% of the U.S. output. State production of 50.8 million barrels of crude petroleum was valued at $309.8 million, an average unit value of $6.10 per barrel, which represents an increase of 60% over the average $3.81 per barrel established in 1973. Seven counties produced more than 2 million barrels of crude petroleum, and they accounted for 81.1% of the total production. These counties, in descending order of production were Clarke, Jasper, Lamar, Adams, Wayne, Yazoo, and Jones. Salt water produced in association with crude petroleum production was 220.4 million barrels, an average of 4.3 barrels of water for each barrel of petroleum.

According to API drilling statistics, 442 wells were drilled for oil and gas in Mississippi during 1974. This is a 26% increase in drilling activity from the 350 wells drilled during the previous year. There were 64 successes—44 oil and 20 gas producers—from 150 proved field wells drilled. There were 23 successful oil- and 6 successful gas ventures from a total of 292 exploratory wells drilled, a success ratio of 9.93%. Exploratory drilling accounted for 66.1% of all drilling activity in the State.

Exploratory and development oil and gas well drilling totaled 3,516,715 feet. Average depth of wells drilled in Mississippi was 7,956 feet, considerably deeper than the national average of approximately 4,950 feet. Mississippi's deepest oil produc-

[5] Oil and Gas Journal. 1975 Survey of Gas Processing Plants. V. 73, No. 28, July 14, 1975, p. 77.

ing well was recorded during 1974, when a wildcat drilled by the Getty Oil Co. in the South Summerfield area established a producing zone in the Haynesville Formation at a depth of 18,640 feet.

Mississippi Oil and Gas Board monthly bulletin data indicated that approximately 51% of the exploratory wells were drilled to the Wilcox Formation (Tertiary age), 21% to Cretaceous age formations, and 16% to formations of the Jurassic age. Of the proved field well completions, 38% were drilled to the Wilcox Formation, 31% to Cretaceous age formations, and 17% to Jurassic age formations, principally the Smackover. As of December 31, 1974, approximately 2,915 oil wells were producing an average of 45.4 barrels of crude oil per day, a decrease of 5 barrels per day from that of 1973.

According to API estimates, proved crude oil reserves as of December 31, 1974, were 261 million barrels, 30 million barrels less than at yearend 1973. The crude oil reserve to production ratio was 5.1:1, about the same as reported during 1973.

According to the Oil and Gas Journal annual refining survey,[6] crude-oil-refining capacity of the 5 State refineries was 289,500 barrels per day, unchanged from the previous year.

[6] Oil and Gas Journal. 1975 Annual Refining Survey. V. 73, No. 14, Apr. 7, 1975, p. 98.

Table 7.—Mississippi: Crude oil production, indicated demand, and stocks in 1974, by month
(Thousand 42-gallon barrels)

Month	Production	Indicated demand [1]	End of month stocks originating in Mississippi
January	4,608	5,022	2,917
February	3,916	3,943	2,890
March	4,411	4,362	2,939
April	4,253	4,413	2,779
May	4,361	3,809	3,331
June	4,198	4,283	3,246
July	4,313	4,425	3,114
August	4,248	3,890	3,472
September	4,065	4,506	3,031
October	4,233	4,341	2,923
November	4,068	4,226	2,765
December	4,105	4,279	2,591
Total:			
1974	50,779	51,499	XX
1973	56,102	56,594	XX

XX Not applicable.
[1] Calculated from monthly production and changes in stocks.

Table 8.—Mississippi: Crude petroleum production, by field
(Thousand 42-gallon barrels)

Field	1973	1974	Cumulative through Dec. 31,1974
Baxterville	7,768	7,536	167,043
Bay Springs	1,772	1,537	26,152
Brookhaven	794	709	68,453
Bryan	753	660	22,864
Davis	1,582	1,534	6,748
East Eucutta	1,199	1,403	39,155
East Heidelberg	3,761	3,576	77,584
West Heidelberg	1,563	1,453	36,601
Lake Como	1,196	774	2,638
West Nancy	1,541	1,173	7,601
Pachuta Creek	4,581	3,651	24,238
Quitman Field	918	765	13,967
Quitman Bayou	1,340	1,376	14,159
Soso	1,002	891	53,098
Tinsley	3,054	2,549	195,962
Other Fields	23,278	21,192	743,573
Total	56,102	50,779	1,499,836

Source: Mississippi State Oil and Gas Board.

Petrochemicals.—The Mississippi Chemical Corp. announced plans for the construction of a 1,150-ton-per-day Kellogg ammonia plant and a 1,200-ton-per-day urea plant. Also, the Federal Power Commission ruled favorably on Mississippi Chemical Corp.'s request for a daily increase of 4.4 million cubic feet of natural gas to its Pascagoula facility, which will allow the firm to produce an additional 120 tons of ammonia per day.

NONMETALS

The combined value of nonmetals and natural gas liquids production was $58.2 million and represents 15% of the value of the State's mineral production. This value of nonmetals, including natural gas liquids production, represents a 29% increase over the comparable 1973 value.

Cement.—Portland and masonry cements were produced at three plants using the wet process. Raw materials used in making cement were limestone, marl, oyster shells, and gypsum. Production of portland cement in 1974 was 55% greater than that of 1973 because of the completion of a new cement production facility during March. The average unit value of portland cement increased 20% to $27.49 per ton in 1974 from the $22.97 reported during 1973. Production of masonry cement decreased by 2.8% from 1973, but the average unit value increased by approximately 5% during the same period.

United Cement Co., a subsidiary of Texas Industries Inc., completed construction of a $15 million wet process cement operation near Columbus, and commenced operations during March. Initial design capacity is rated at 376,000 tons annually, with provisions to expand to 1.1 million tons. This is the first cement producer in Mississippi to employ coal as its primary energy source.

Clays.—Total clays produced in Mississippi amounted to 2,012,888 tons, a 3% decrease from 1973, but the average unit value increased by 18.7%. Common clay production decreased by 8% but accounted for 74% of the total clay output. The production of ball clay and fuller's earth increased by 13% from the previous year, and bentonite output increased by 17%.

Clays were mined from 34 pits in 20 counties. The leading producing counties, in descending order of output, were Hinds, Noxubee, Marshall, and Monroe. Production from these four counties accounted for 62% of the State total. Common clay, used primarily for brick, lightweight aggregates, flue lining, drain tile, and sewer pipe, was mined in 14 counties. Bentonite was mined in three counties. Fuller's earth was produced in Tippah County, and ball clay was produced in Panola and Quitman Counties.

Table 9.—Mississippi: Clays sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Year	Bentonite		Ball clay, fire clay, and fuller's earth		Common clay		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1970	262	3,124	318	3,930	974	1,008	[1]1,553	8,062
1971	281	3,396	[2]137	[2]2,966	1,860	2,139	2,278	8,501
1972	278	3,388	[2]144	[2]2,943	1,497	1,506	1,919	7,837
1973	286	3,607	[2]166	[2]3,390	1,623	2,085	2,075	9,082
1974	334	4,599	[2]187	[2]3,822	1,492	2,047	2,013	10,468

[1] Data do not add to total shown because of independent rounding.
[2] Ball clay and fuller's earth.

Lime.—Corchem, Inc. produced quicklime at Pascagoula in Jackson County from dolomite quarried in Alabama. Production from this operation decreased from the 1973 record. Total consumption of lime in Mississippi was 147,100 tons, a reduction of 13.2% from 1973.

Magnesium Compounds.—Production of magnesium compounds for use in the manufacture of refractory bricks decreased 4% from that of 1973. The average unit value decreased by less than 1% from the previous year.

Perlite.—Johns Manville Perlite Corp. continued to produce expanded perlite in Adams County near Natchez. Production in 1974 increased 4.7% from the previous year, and average unit value increased by 26%. All of this perlite was used to manufacture roofing insulation products.

Sand and Gravel.—Production was reported from 59 individual operations lo-

cated in 29 counties. Output was 14.44 million tons, only 1.3% greater than in 1973. However, the average unit value for sand and gravel was $1.35 per ton compared with $1.22 per ton in 1973, a 10.7% increase.

The leading producing counties, in descending order of output, were Copiah, Forrest, Lowndes, De Soto, and Leflore. These five counties accounted for 46.96% of the total production and 46.53% of the value.

The output of processed sand totaled 3,721,000 tons and processed gravel totaled 8,113,000 tons. The production of unprocessed sand and gravel amounted to 2,605,000 tons. The principal uses for sand and gravel were in paving, building, and bridge construction. The amount of sand and gravel used for publicly funded projects soared to 3,902,000 tons in 1974 from 182,000 tons during 1973.

Table 10.—Mississippi: Sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Year	Commercial		Government-and-contractor		Total [1]	
	Quantity	Value	Quantity	Value	Quantity	Value
1970	10,599	11,738	260	211	10,859	11,950
1971	11,234	13,413	55	114	11,289	13,526
1972	13,295	15,867	124	266	13,419	16,133
1973	14,069	17,058	182	325	14,251	17,383
1974	10,537	14,324	3,902	5,163	14,439	19,487

[1] Data may not add to totals shown because of independent rounding.

Table 11.—Mississippi: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	14,251	17,383	3,721	4,832
Gravel			8,113	13,376
Unprocessed:				
Sand and gravel			2,605	1,251
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	14,251	17,383	14,439	19,459

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data may not be directly comparable to that in tables 1, 10, 12, and 13 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 12.—Mississippi: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	13,189	16,409	2,376	3,554
Highway and bridge construction			684	1,092
Other uses (dams, waterworks, airports, etc.)			80	132
Concrete products (cement blocks, bricks, pipe, etc.)			1,504	2,433
Bituminous paving (asphalt and tar paving)			845	1,405
Roadbase and subbase			2,926	4,299
Unprocessed aggregate			1,847	985
Fill	601	339	12	24
Other uses [2]	281	309	263	400
Industrial sand and gravel	W	W	W	W
Total [3]	14,069	17,058	10,537	14,324

W Withheld to avoid disclosing individual company confidential data; included with Other uses."
[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).
[3] Data may not add to totals shown because of independent rounding.

Table 13.—Mississippi: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	182	325	34	87
Highway and bridge construction			710	1,213
Other uses (dams, waterworks, airports, etc.)			126	195
Concrete products (cement blocks, bricks, pipe, etc.)			79	153
Bituminous paving (asphalt and tar paving)			1,376	1,954
Roadbase and subbase			819	1,294
Unprocessed aggregate	--	--	758	267
Fill	--	--	W	W
Other	--	--	--	--
Total	182	325	3,902	5,163

W Withheld to avoid disclosing individual company confidential data; included with "Other uses such as dams, waterworks, airports, etc."
[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

Stone.—Crushed and broken limestone was produced in Lowndes, Rankin, Tishomingo, and Warren Counties. Marl was produced in Clay, Noxubee, and Warren Counties. Total stone output from 9 quarries totaled 1,719,763 tons. This was an increase over the previous year. Average unit value for all stone increased 40.2% to $1.50 per ton. Principal uses of stone produced in Mississippi were for cement manufacture and agricultural purposes.

Sulfur.—Recovery of sulfur from refinery and natural gases was reported in Clarke, Jackson, Lamar, and Rankin Counties. Because of a reduction in the volume of sour natural gas treated, the total production of recovered sulfur decreased by 17.6% from the previous year. However, the average unit value increased by 20.7%.

Table 14.—Principal producers

Commodity and company	Address	Type of activity or producing fields	County
Cement:			
Marquette Cement Mfg. Co.[1]	20 North Wacker Dr. Chicago, Ill. 60606	Plant	Rankin.
United Cement Co	P.O. Box 185 Artesia, Miss. 39736	---- do	Lowndes.
Valley Cement Ind., Inc.[1]	Box 22491 Jackson, Miss. 39205	---- do	Warren.
Clays:			
International Minerals & Chemical Corp.	P.O. Box 346A Aberdeen, Miss. 39730	Mine	Monroe.
Filtrol Corp	3250 E. Washington Blvd. Los Angeles, Calif. 90023	---- do	Itawamba and Smith.
Lime:			
Corchem, Inc	Box 1707 Pascagoula, Miss. 39567	Plant	Jackson.
Magnesium compounds: Corhart Refractories Co.	1600 West Lee St. Louisville, Ky. 40210	---- do	Do.
Petroleum refineries:			
Amerada Hess Corp., Hess Oil & Chemical Div.	One Hess Plaza Woodbridge, N.J. 07095	Purvis refinery	Calhoun.
Southland Oil Co	P.O. Box 328 Yazoo City, Miss. 39194	Sandersville refinery.	Jones.
		Lumberton refinery.	Lamar.
		Crupp refinery	Yazoo.
Standard Oil Co. of Kentucky	P.O. Box 1300 Pascagoula, Miss. 39567	Pascagoula refinery.	Jackson.

See footnote at end of table.

Table 14.—Principal producers—Continued

Commodity and company	Address	Type of activity or producing fields	County
Petroleum (crude) and natural gas:			
Atlantic Richfield Co	Box 2819 Dallas, Tex. 75221	East Heidelberg	Jasper.
Amoco Production Co	Box 591 Tulsa, Okla. 74102	Clear Springs	Franklin.
		Collins	Covington.
		Dollar Lake	Leflore.
		Dry Bayou	Franklin.
		North Freewoods	Do.
		Knoxville	Do.
		North Knoxville	Do.
		Quitman Bayou	Adams.
		Stringer	Jasper.
		Zeigler Creek	Franklin.
		Brookhaven	Lincoln.
		South Center Ridge.	Smith.
		Cranfield	Adams and Franklin.
		Hub	Marion.
		Hub East	Do.
		Knoxo	Walthall.
		East Mallalieu	Lincoln.
		West Mallalieu	Do.
		Mize	Smith.
		Pisgah	Rankin.
Chevron Oil Co., Western Div	Box 599 Denver, Colo. 80201	Puckett	Rankin and Smith.
		Raleigh	Simpson.
Cities Service Oil Co	Box 12026 Jackson, Miss. 39211	Reedy Creek	Jones.
		Hazlit Creek	Wilkinson.
Continental Oil Co	Box 2197 Houston, Tex. 77001	North Mud Creek	Do.
		Davis	Clarke.
Getty Oil Co	Box 1404 Houston, Tex. 77001	East Nancy	Do.
		West Nancy	Do.
Gulf Oil Corp	Box 1166 Pittsburgh, Pa. 15230	Baxterville	Lamar and Marion.
		Bolton	Hinds.
		Gwinville	Jefferson Davis.
		Heidelberg	Jasper.
		East Heidelberg	Do.
		West Heidelberg	Do.
		Pistol Ridge	Forrest and Pearl River.
		Soso	Jasper, Jones, Smith.
		East Yellow Creek.	Wayne.
Exxon Co., U.S.A	Box 2180 Houston, Tex. 77001	Baxterville	Marion and Lamar.
		Bryan	Jones and Jasper.
		East Fairview	Adams.
		Gillsburg	Amite.
		Gwinville	Jefferson Davis.
		Hub	Marion.
		Hub East	Do.
		Knoxo	Walthall.
		Pistol Ridge	Pearl River.
		Sandy Hook	Marion.
		East Yellow Creek.	Wayne.
		North Carthage Point.	Adams.
		Clear Springs	Franklin.
		Courtland	Adams.
		Dexter	Walthall.
Pennzoil Producing Co	900 Southwest Tower Houston, Tex. 77002	Tinsley	Yazoo.
Placid Oil Co	1401 Elm St. Dallas, Tex. 75202	Nancy	Clarke.
Shell Oil Co	Shell Building 921 Common New Orleans, La. 70112	Pachuta Creek	Do.
		Goodwater	Do.
		Bay Springs	Jasper.
		Tallahala Creek	Smith.
		East Tallahala Creek.	Do.

See footnote at end of table.

Table 14.—Principal producers—Continued

Commodity and company	Address	Type of activity or producing fields	County
Petroleum (crude) and natural gas—Continued:			
Skelly Oil Co	Box 1650 Tulsa, Okla. 74101	Bay Springs	Jasper.
		Goodwater	Clarke.
Sun Oil Co	1608 Walnut Philadelphia, Pa. 19103	Baxterville	Lamar.
		Diamond	Wayne.
		West Eucutta	Do.
		East Franklin	Franklin.
		East Heidelberg	Jasper.
		Kokomo	Walthall.
		Mantua	Adams.
		McComb	Pike.
		Mercer	Adams.
		Pistol Ridge	Forrest and Pearl River.
		Sandy Hook	Marion.
		Smithdale	Amite.
		Tom Branch	Franklin.
		West Yellow Creek.	Wayne.
Texaco, Inc	Box 60252 New Orleans, La. 70150	Baxterville	Lamar.
		Pachuta Creek	Clarke.
Sand and gravel:			
American Sand & Gravel Co	Box 272 Hattiesburg, Miss. 39401	Stationary	Forrest.
Blaine Gravel Co	Box 268 Crystal Springs, Miss. 39059	do	Copiah.
J. J. Ferguson Sand & Gravel	Box 318 Greenwood, Miss. 38930	do	Carroll.
Green Bros. Gravel Co., Inc	Route 4, Box 17 Franklinton, La. 70438	do	Copiah.
Memphis Stone & Gravel Co	Box 6246 Memphis, Tenn. 38111	do	De Soto.
W. J. Runyon & Son, Inc	3312 Oak St. Vicksburg, Miss. 39180	do	Warren.

[1] Also stone.

The Mineral Industry of Missouri

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Missouri Geological Survey for collecting information on all minerals.

By Joseph C. Arundale,[1] J. Patrick Ryan,[2] and James A.Martin [3]

In 1974, the value of Missouri's mineral output, with a 35% gain over that of 1973, reached an alltime high for the 13th consecutive year. Total value of the State's mineral and metal products increased to nearly $700 million. This huge gain was achieved by increases in production and prices of most of the mineral commodities produced in Missouri.

Principal minerals produced in order of value were lead, cement, stone, zinc, iron ore, lime, coal, copper, sand and gravel, and clays.

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[2] Supervisory physical scientist, Division of Nonferrous Metals.
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Table 1.—Mineral production in Missouri [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Barite ---- thousand short tons --	196	$3,395	177	$3,386
Cement:				
Masonry ---- do ----	84	2,400	75	2,434
Portland ---- do ----	4,582	99,858	4,229	106,985
Clays ---- do ----	2,551	11,626	[2] 2,565	[2] 13,151
Coal (bituminous) ---- do ----	4,658	24,999	4,623	29,383
Copper (recoverable content of ores, etc.) short tons --	10,273	12,224	12,665	19,580
Iron ore (usable)-thousand long tons, gross weight --	2,630	W	1,866	W
Lead (recoverable content of ores, etc.) short tons --	487,143	158,711	562,097	252,944
Lime ---- thousand short tons --	1,626	23,534	1,901	36,369
Natural gas ---- million cubic feet --	33	8	33	10
Petroleum (crude) -- thousand 42-gallon barrels --	60	W	56	W
Phosphate rock ---- thousand 42-gallon barrels --	42	W	35	W
Sand and gravel ---- do ----	10,879	16,950	10,933	19,462
Silver (recoverable content of ores, etc.) thousand troy ounces --	2,058	5,264	2,387	11,244
Stone ---- thousand short tons --	49,304	79,921	50,626	90,204
Zinc (recoverable content of ores, etc.) short tons --	82,350	34,027	91,987	66,047
Value of items that cannot be disclosed: Asphalt (native), clays (bentonite, kaolin value, and fuller's earth, 1974), and values indicated by symbol W ----	XX	39,717	XX	39,850
Total ----	XX	512,634	XX	691,049
Total 1967 constant dollars ----	XX	375,812	XX	[p] 330,460

[p] Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes bentonite, fuller's earth, and value of kaolin; included with "Value of items that cannot be disclosed."

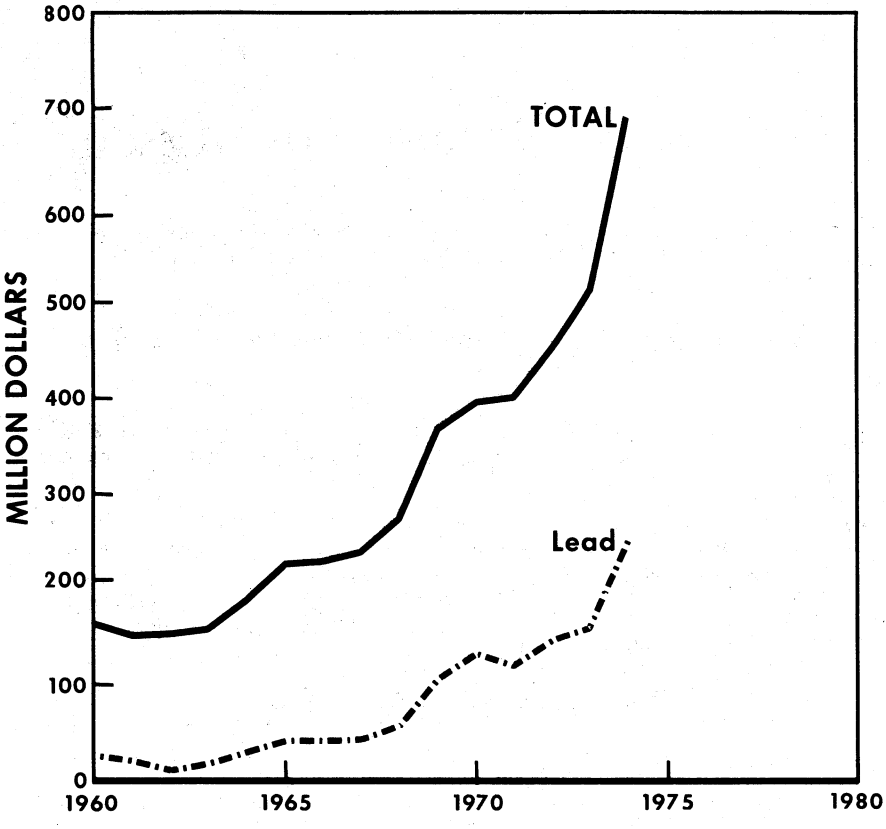

Figure 1.—Value of lead and total value of mineral production in Missouri.

Table 2.—Value of mineral production in Missouri, by county [1 2]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adair	W	W	Stone.
Andrew	W	W	Do.
Atchison	$29	W	Petroleum.
Audrain	1,682	$2,376	Clays.
Barry	W	--	
Barton	W	3,206	Coal, stone.
Bates	W	W	Do.
Benton	W	W	Stone.
Boone	2,087	2,426	Stone, sand and gravel, clays.
Buchanan	W	W	Stone.
Butler	W	W	Sand and gravel, stone, clays.
Caldwell	514	W	Stone, natural gas.
Callaway	W	3,421	Clays, stone, sand and gravel.
Camden	W	W	Stone, sand and gravel.
Cape Girardeau	W	W	Cement, stone, sand and gravel, clays.
Cass	W	1,369	Stone, petroleum.
Cedar	W	W	Stone.
Chariton	W	W	Stone, sand and gravel.
Christian	993	W	Stone.
Clark	W	W	Do.
Clay	W	W	Stone, sand and gravel.
Clinton	604	634	Stone, natural gas.

See footnotes at end of table.

Table 2.—Value of mineral production in Missouri, by county [1 2]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Cole	W	W	Sand and gravel, stone.
Cooper	W	W	Do.
Crawford	$4,620	$6,576	Lead, zinc, copper, silver, stone.
Dade	122	370	Stone.
Dallas	W	283	Stone, sand and gravel.
Daviess	W	W	Do.
De Kalb	130	233	Stone.
Douglas	W	415	Sand and gravel.
Franklin	W	787	Stone, sand and gravel, clays.
Gasconade	W	4,041	Clays, stone, sand and gravel.
Gentry	W	W	Stone, sand and gravel.
Greene	W	7,128	Stone, clays.
Grundy	W	W	Stone, sand and gravel.
Harrison	W	1,700	Do.
Henry	W	W	Stone, coal.
Hickory	W	93	Stone.
Holt	W	W	Do.
Howard	702	W	Stone, sand and gravel, coal.
Howell	W	W	Stone, sand and gravel.
Iron	135,480	207,692	Lead, zinc, iron ore, copper, silver, stone.
Jackson	20,949	20,824	Cement, stone, sand and gravel, clays, petroleum.
Jasper	W	3,266	Stone, sand and gravel.
Jefferson	W	30,572	Cement, stone, sand and gravel, clays.
Johnson	302	W	Stone.
Knox	W	W	Do.
Laclede	W	W	Stone, sand and gravel.
Lafayette	W	W	Do.
Lawrence	W	W	Stone.
Lewis	W	W	Sand and gravel, stone.
Lincoln	W	W	Stone, sand and gravel.
Livingston	W	W	Stone, clays, sand and gravel.
Macon	4,918	W	Coal.
Madison	--	W	Stone.
Maries	W	W	Clays, sand and gravel.
Marion	W	W	Stone.
Mercer	W	723	Do.
Miller	W	W	Stone, sand and gravel.
Moniteau	128	114	Stone.
Monroe	W	444	Stone, clays.
Montgomery	W	2,316	Clays, stone, sand and gravel.
Newton	226	W	Stone.
Nodaway	W	966	Stone, sand and gravel.
Oregon	W	W	Sand and gravel, stone.
Osage	W	W	Clays, sand and gravel.
Ozark	15	--	
Pemiscot	200	108	Sand and gravel.
Perry	W	W	Stone, sand and gravel.
Pettis	W	W	Stone.
Phelps	W	W	Do.
Pike	28,479	30,840	Cement, stone, clays, sand and gravel.
Platte	800	W	Stone, clays, sand and gravel.
Polk	256	275	Stone.
Pulaski	W	476	Sand and gravel, stone.
Putnam	W	697	Coal.
Ralls	W	19,762	Cement, stone, clays.
Randolph	3,549	W	Coal, stone.
Ray	1,793	1,596	Stone.
Reynolds	62,176	118,067	Lead, zinc, copper, silver, sand and gravel.
St. Charles	W	2,814	Stone, sand and gravel, clays.
St. Clair	W	W	Stone.
St. Francois	W	W	Lime, stone.
Ste. Genevieve	24,194	38,892	Lime, stone, sand and gravel.
St. Louis	39,128	35,151	Cement, stone, sand and gravel, clays, petroleum.
Saline	1,223	1,609	Stone.
Scotland	W	W	Do.
Scott	W	W	Clays, stone.
Shannon	W	W	Stone.
Shelby	W	W	Do.
Stoddard	703	765	Sand and gravel.
Stone	W	W	Stone.
Sullivan	W	--	
Taney	W	W	Stone, sand and gravel.
Texas	225	144	Stone.
Vernon	W	2,232	Coal, stone, native asphalt, petroleum.
Warren	W	W	Clays, stone.
Washington	51,704	59,157	Lead, iron ore, zinc, barite, copper, silver, asphalt, sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Missouri, by county [1] [2]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Wayne	$373	$749	Stone.
Webster	W	176	Do.
Worth	W	W	Do.
Wright	W	W	Do.
Undistributed [3]	124,329	75,573	
Total [4]	512,634	691,049	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Bollinger, Carroll, Carter, Dent, Dunklin, Linn, McDonald, Mississippi, Morgan, New Madrid, Ripley, and Schuyler.

[2] Value of petroleum is based on an average price per barrel for the State.

[3] Includes values of sand and gravel (1973) and stone that cannot be assigned to specific counties, natural gas (1973), and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Missouri business activity

	1973	1974 [p]	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands	1,999.9	NA	NA
Unemployment ---- do	73.0	NA	NA
Employment (nonagricultural):			
Construction ---- do	75.8	72.6	—4.2
Mining ---- do	8.1	8.6	+6.2
Manufacturing ---- do	457.0	449.8	—1.6
Personal income:			
Total ---- millions	$23,032	$24,152	+4.9
Per capita	$4,831	$5,056	+4.7
Construction activity:			
Building permits, total private nonresidential -- millions	405.6	396.7	—2.2
Cement shipments to and within Missouri thousand short tons	1,921	1,758	—8.5
Mineral production value ---- millions	$512.6	$691.0	+34.8

[p] Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

Labor, Employment, and Safety.—According to the Division of Employment Security, Missouri Department of Labor and Industrial Relations, the mining industry employed 8,545 workers in 1974, an increase over that of 7,977 in 1973. Employment in the coal industry increased to 1,298 from 1,078 in the previous year. Employment in the metal mining industry increased to 3,182 compared with 3,072 in the previous year, and the nonmetal industry employed 3,885 in 1974 compared with 3,648 in 1973.

At its annual meeting in Jefferson City in March, the Mining Industry Council of Missouri formally declared their opposition to Senate bill 2117, deeming it "desirable that the administration of the Metallic and Nonmetallic Mine Safety Act and Coal Mine Health and Safety Act continue to be under the Department of the Interior for the reasons that (a) both of these acts and the standards promulgated thereunder are being efficiently and rigorously enforced; that (b) the proposed changes would not add to the safety of mining; and that (c) the Department of Labor has little or no background or experience concerning the special problems of the mining industry, while the Department of the Interior is very knowledgeable in this matter."

In its annual report for 1974, St. Joe Minerals Corp. reported that a contract was signed with the United Steel Workers of America extending their agreement with the Southeast Mining and Milling Div. until April 1, 1978. A similar contract was negotiated with the International Brotherhood of Teamsters for the lead smelter at Herculaneum.

In an impressive demonstration of industry and government dedication and cooperation in safety matters, Wayne Kanack,

subdistrict manager, Mining Enforcement and Safety Administration (MESA), accepted on behalf of his agency a formal Safety Policy Resolution issued by the Missouri Limestone Producers Association (MLPA). The resolution expressed "a deep sense of responsibility in the promotion of safe practices" and a pledge of "full and whole-hearted cooperation in promoting compliance with the regulations of the Federal Metallic and Nonmetallic Mine Safety Law" enforced by MESA, with a resolve to "work with employees of the Department of the Interior . . . for the betterment of the crushed stone industry in Missouri."

A State plan for inspection of metal and nonmetal mines in Missouri, as provided by the Metallic and Nonmetallic Mine Safety Act, was being studied by Federal and State officials, the Missouri Legislature, officials of the minerals industry and trade unions in the State, but a decision was not reached by the end of 1974.

Legislation and Government Programs.—The 1974 session of the Missouri General Assembly approved an extensive reorganization of the executive branch of the State government. A major aspect of that reorganization was the establishment of a new Department of Natural Resources. Governor Bond and the director of the new department, James L. Wilson, began incorporating into that department various mineral-related and mineral-fuels-related responsibilities and activities and consolidating them under two support divisions and three functional divisions. The two support divisions are for planning and policy development and for administrative services. The three functional divisions are environmental quality, parks and recreation, and research and technical information. The following agencies, boards, and commissions were brought into the new department: Air Conservation Commission; Clean Water Commission; Environmental Health Section of the Division of Health; Office of the State Geologist and the Division of Geological Survey and Water Resources; Land Reclamation Commission; Land Survey Authority; Oil and Gas Council; Interagency Council for Outdoor Recreation; Soil and Water Districts Commission; Park Board and the Water Resources Board. The aim of this organizational plan is a department unified in concept and function to insure capable planning, management, and utilization of Missouri's natural resources.

Environment.—Environmental matters remained a major concern of the minerals industry, Federal and State agencies, and other groups in Missouri. Laws and regulations as well as new equipment, methods, and facilities continued to improve mineral-related environmental situations in the State.

The Missouri Air Conservation Commission (MACC) issued its 1973 annual report listing some of the air quality highlights of that year:

State and local air pollution control officials in Missouri scored a "major victory" in 1973 when the Federal Environmental Protection Agency (EPA) announced it was lifting its requirement for nitrogen oxide control in St. Louis and 44 other cities. EPA administrator, William D. Ruckelshaus, said the decision was based on measurements obtained with a new testing technique that showed nitrogen oxide levels to be considerably lower than originally estimated.

The MACC had argued repeatedly that the original testing method was extremely inaccurate and had refused to adopt a nitrogen oxide regulation until a better method was available. The MACC said such a regulation would be unenforceable without a reliable sampling technique.

The original tests, under the old sampling method, had shown nitrogen oxide levels in St. Louis to be about 75% higher than Federal standards allowed. With the improved sampling technique, levels were found to be within the air quality standards.

In early 1973, the EPA announced that a system of traffic restrictions would be needed in order for the Kansas City metropolitan area to meet Federal standards for carbon monoxide by May 31, 1975—the deadline specified in the Clean Air Act. To assist Missouri and Kansas in the development of a plan, EPA hired PEDCo-Environmental Specialists Inc. (PEDCo), a Cincinnati, Ohio, consulting firm. Traffic-control proposals developed by PEDCo were presented at a public hearing in Kansas City on April 25. But a short time later, EPA announced that traffic restrictions would not be needed after all. They said a "re-evaluation of air sampling data" indicated the necessary reduction in carbon monoxide would be achieved by the pol-

lution controls coming on newer cars. Instead, EPA said traffic restrictions would be needed in St. Louis to control both carbon monoxide and photochemical oxidants. By the end of 1973, PEDCo was working on proposals to reduce traffic in that city.

The attorney general of Missouri issued the opinion that Missouri authorities do not have the power, under State law, to regulate complex sources of air pollution. Complex sources include shopping centers, convention centers, sports complexes and other developments that may cause air quality standards to be violated by attracting large volumes of automobile traffic. The opinion was requested by the MACC after a Federal court in Washington, D.C., ruled that complex sources must be controlled in order to prevent degradation of existing air quality. The attorney general's opinion recommended that the legislature explicitly spell out the extent of powers that the MACC should exercise in such matters.

Toward the end of 1973, the Nation's worsening energy crisis made it apparent that some Missouri industries were going to have difficulty obtaining enough clean fuels, such as natural gas, to continue meeting air quality standards for sulfur oxides and particulates. Rather than relax the standards or amend the regulations, however, the MACC decided to handle fuel-related problems through the variance system. A total of 14 Missouri firms were given variances allowing them to temporarily exceed clean air standards by burning dirtier fuels while adequate clean fuels were not available. Of the 14, only 9 actually used their variances, and none of those that did had to use their variance for the entire winter.

A significant fact is that most of the variances used were for particular emissions rather than for sulfur dioxide. Particulates are generally less hazardous and easier to control. Although there are many good particulate-removal devices available, burning low-sulfur fuel is still the only reliable and economical way to reduce sulfur dioxide emissions for most firms. One firm had to use its sulfur dioxide variance while three did not. The other 10 fuel-related variances involved only particulates.

Missouri's largest electric powerplants were already operating on sulfur dioxide variance granted by the MACC previously and were not among the 14 firms that needed the special fuel-related variances.

The executive secretary of MACC reported that 25% of all Federal actions against air polluters in the first 7 months of 1973 were against Missouri firms. The Federal agency has threatened also to dock the Federal grant support for air pollution control in order to pay for the Federal action. The Missouri agency received $254,056—or more than 40% of its total budget—from EPA. The attorney general's office said that the State might have grounds for legal action in one of two ways. It could contest an attempt by EPA to withhold funds, or it could enter a case on the side of an industry subject to Federal action.

The 5-year, $22 million air-pollution-monitoring program announced for St. Louis in 1972 went into operation at the Missouri Botanical Garden. The program was designed and is being operated for EPA by Rockwell International Science Center. Known as RAPS (Regional Air Pollution Study), the program will enable the development of effective plans to combat urban air pollution. It has been described by EPA as "the most extensive study of the dynamics of air pollution in an urban situation that has ever been made . . . and of enormous importance to the entire national and international air pollution control effort."

EPA ordered Union Electric Co. of St. Louis (UE) to submit a schedule for compliance with Federal air pollution regulations for its plants in the St. Louis area by August 20. UE promptly filed suit questioning some of the clean air laws, arguing that sulfur controls are impractical, uneconomical, unreliable, and perhaps even unnecessary. UE told a Federal appeals court that the emissions control equipment demanded by EPA would force power rates up by 30%, contending that what it called imperfect equipment would cost more than $500 million to install and $120 million a year to operate. UE serves about 848,000 customers in eastern Missouri, western Illinois, and southeastern Iowa. EPA proposed that UE be given until February 1975 to make a preliminary study of steps that could be taken to meet Federal standards, plus a 36-month compliance period. The MACC declined to go along with the

EPA's request for the State's cooperation in the proposal, and questioned the wisdom of pressuring UE. An MACC member said they "needed more information" and felt that they could not "set dates at this point or expect Union Electric to do so." The electric industry attached major significance to the UE case.

"The topic of air pollution is less often in the news in Kansas City these days, and for the best of reasons. Not that the problem has been solved or the desired levels of air quality achieved. But the process of getting there is moving ahead as a by-now established operation, run by people who know what they are doing and with the necessary funding." That excerpt from an editorial in the Kansas City Times newspaper acknowledged the following improvements: In 1973, particulate pollution had declined from a rating of 98 to 80, still short of the primary standard of 75 and the ultimate goal of 60. Nitrous oxides and carbon monoxide measurements also dropped, and both were better than the standards. Sulfur dioxide levels were well within the allowable range. Federal, State, and local agencies and industry were working steadily toward the kind of air Kansas City wants.

The 76th (1971) General Assembly of Missouri passed two acts creating the Land Reclamation Commission and directing this commission to regulate those companies which mine coal, barite, limestone, sand and gravel, and clay by surface methods in Missouri. The commission issued its first biennial report for the years 1971–72. The report showed revenues accruing to the fund (from permit fees and acreage fees paid by surface mining industries) totaled $55,562 in 1972 and $59,247 in 1973.

The commission reported that there were no bond forfeitures to 1974 and that only one bond release had been authorized. This comprised a permit of about 135 acres at the Tebo mine of Peabody Coal Co. upon completion of the planned approved reclamation.

In response to a number of questions relating to interpretation of the new statutes, the commission established the following policies during the first 2 years (1972–73) of its operations:

House Bill 519.—(1) Sand and gravel operators should estimate their acreage and pay fees accordingly.

(2) Sandstone operators are not included in House bill 519.

(3) "In Channel" operations would be the only operations eligible for bond reductions.

(4) A scale of 1 inch to 100 feet was approved as the largest scale required for limestone, clay, and sand and gravel operations.

Senate Bill 1.—(1) The barite producers can base their estimated annual affected acreage either on the anticipated tons of barite concentrate produced or on the anticipated cubic yards of ore to be mined.

(2) The commission will accept any insurance company licensed to do business in the State of Missouri for the bonds for coal and barite operations.

(3) Applicants for permits to surface mine coal will be asked to provide an inventory of all wells in the proposed tract, giving such information on type of well, plugging procedure (if plugged), and amount of casing in the hole.

For House Bill 519 and Senate Bill 1.—(1) Substitution does not fulfill the bond obligation.

(2) Operators would have the privilege of establishing credit by reclaiming acreage in excess of that which is intended to be mined during the current year if the substitution plan is approved.

Official Opinions.—A number of questions about the statutes required official opinions of the office of the attorney general of Missouri. The following official opinions were handed down during the first 2 years of the commission's operation:

(Opinion 64—June 7, 1972) The trust agreement between the State treasurer and the commission covering moneys received by the commission that are required as bond by Secs. 444.772 and 444.778 RSMo., Supp. 1971, is not in violation of Secs. 13 or 15 of Art. VI, Constitution of Missouri.

(Opinion 213—August 16, 1972) The county courts of third and fourth class counties that are conducting surface mining operations are not required to obtain permits under the provisions of Secs. 44.760 through 444.786 RSMo., Supp. 1971, because they are not "operators" as defined by Sec. 444.765 (5).

(Opinion 29—April 9, 1973) 1. If a person removed what would be considered overburden for the purpose of then removing natural deposits of clay, limestone, sand or gravel, that person must obtain a

permit before the removal of the overburden, for such person would be engaged in surface mining, even if actual removal of the sought-after materials did not occur for several years after the operation began.

2. If all earth and other materials have been removed above natural deposits of clay, limestone, sand or gravel prior to January 1, 1972, and only pure deposits of clay, limestone, sand or gravel are thereafter being removed, with no further removal or disturbance of earth and other materials, then a permit is not required. However, if the reverse is true, then a permit is required and this is so even though there is only vertical extension of the pit. If there is lateral extension to new, undisturbed ground, a permit is required.

3. It is our opinion that any time a permit is required, a bond is also required for any acreage covered by the permit and that bond must remain in effect and cannot be released until such time as all reclaiming has been completed, inspected, and finally released by the commission. We do note that in appropriate situations the bond can be reduced, Sec. 444.772 (1), but this does not mean it could be reduced to zero since this would, in effect, amount to releasing the bond prior to completion of reclamation, which cannot be done. The bond must at all times be of sufficient amount which will, in the judgment of the commission, insure complete compliance with the Land Reclamation Act and the rules and regulations of the commission.

4. The only acreage fee required to be paid is $17.50 per acre when a permit is originally applied for.

The commission and the attorney general's office proposed that changes be made in the State's reclamation law to include the surface mining of so-called tar sands and heavy oil deposits of western Missouri. A bill was being considered that would amend Senate bill 1, which regulates the reclamation of coal and barite land.

Table 4.—Missouri: Summary of mining acreages permitted in 1972 and 1973 by commodity

Commodity	Acreage	
	1972	1973
Barite	164	209
Clay	199	165
Coal	1,187	1,996
Limestone	768	389
Sand and gravel	196	56
Total	2,514	2,815

Exploration, Geologic Studies, and Mapping.—Getty Oil Co. and Azcon Corp. (formerly American Zinc Co.) concluded their joint drilling project on a deep copper iron prospect near Boss. Drilling has been conducted for several years in that mineralized area but results or conclusions have not been announced.

The Missouri Geological Survey continued to release data compiled in its "Operation Basement" project to provide information on the geologic nature and mineral potential of the Precambrian. Two publications were made available late in 1974. The first,[4] one on a series of Late Cambrian sedimentary rocks in Missouri and surrounding areas, contains results of 13 drillholes from southeast Missouri on a line to northeast Oklahoma and southeast Kansas. The section defines some structural and stratigraphic aspects of the regional structural high trending southwest from the St. Francois Mountains across the Ozark uplift.

The second report by Missouri Geological Survey contains data from 545 holes drilled to the Precambrian basement as of January 1973.[5] A map showing the configuration of the Precambrian surface is also included—a useful tool if the Precambrian target is intended as an exploration target.

The Bibliography of the Geology of Missouri, 1974, was issued by Missouri Geological Survey. This booklet lists published and unpublished papers indexed by subject, county, and author about Missouri's geology that were issued during 1974. The Missouri Geological Survey also prepared a revised list of its publications updated to the end of 1974.

Special environmental problems led the Missouri Geological Survey into the remote sensing field, which was found to have great potential in several aspects of their efforts. A remote sensing data file that included photographic and remotely sensed data was opened to outside researchers. Two maps prepared from imagery were published, one with vegetation enhancement and the other with water enhancement.

The popular monthly series published

[4] Kurtz, V. E., J. L. Thacker, K. H. Anderson, and P. E. Gerdemann. Traverse in Late Cambrian Strata From the St. Francois Mountains, Missouri to Delaware County, Oklahoma. Mo. Geol. Survey RI 55, 1975, 112 pp.

[5] Kisvarsanyi, Eva B. Data on Precambrian in Drillholes of Missouri Including Rock Type and Surface Configuration. Mo. Geol. Survey RI 56, 1975, 20 pp.

for many years by Missouri Geological Survey entitled Missouri Mineral News was discontinued at the end of 1974. Much of the news formerly in that publication will be contained in a new publication of the Missouri Department of Natural Resources entitled Missouri's Environment.

Energy.—The energy crisis of 1974 whelmed Missouri and affected its minerals industry broadly and deeply. Governor Bond called a special session of the general assembly and got emergency powers to deal with the energy problems of the State.

The Missouri Fuel Allocation Board, set up under the Public Service Commission (PSC) as an emergency measure a year ago, was expanded, reorganized, and assigned to the Department of Natural Resources, the director of which, James L. Wilson, was named chairman of the Missouri Energy Council. The allocation board was created by executive order and financed by the legislature earlier this year. The board operated with employees borrowed from other State agencies at the height of the fuel shortage in the winter of 1973–74. The State was recently informed that it would receive up to $212,000 in Federal funds from the Federal Energy Administration (FEA) to operate its emergency fuel program in the winter of 1974–75.

Electric utilities in Missouri were ordered to submit reports to the PSC on their energy production and the quantity of petroleum products their plants consume. The purpose of the survey was to determine the extent of the State's energy-producing capacity, help in forecasting the fuel needs, and provide the allocation board with greater knowledge of petroleum-based fuel use in the State.

The Missouri Chamber of Commerce established an energy data exchange to assist State businessmen on energy problems. The exchange was to supply information on regulations, whom to contact on energy matters, and what firms were doing to conserve energy. An energy newsletter was being published on an as-needed basis.

Natural gas and electric utility costs and rates were soaring throughout Missouri. Rate increase applications and consumers objections were literally clogging the PSC and the courts.

Later in the year, the energy crisis eased to an energy problem as a result of new allocation regulations and procedures, improved coordination between Federal and State allocation efforts, increased experience of officials, new legislative actions, fuel and energy conservation, ameliorating weather conditions, and better understanding by the public.

Fuel and energy supplies in Missouri became more plentiful. In March, the State had 5 million gallons of gasoline left over from an allocation of 12.4 million gallons for the last week of February, according to fuel board officials. However, prices of electricity and most fuels were accelerating rapidly as 60-cent gasoline was seen often in the State. But Missourians were in the midst of an all-out effort to devise more efficient ways to live, work, manufacture, and transport, with the realization that disruption and change were inevitable and that the transition was going to be difficult.

Energy and fuel problems continued to trouble the minerals industry in the State throughout 1974. Some of the principal problems involved the need to conserve scarce fuels such as natural gas and petroleum products while achieving flexibility in fuel utilization and converting to more plentiful alternate fuels.

The problem of expanding the development of Missouri's ample coal resources was being actively investigated both by industry and State and Federal agencies. Missouri joined other major coal-producing states in forming a Council on Coal and Energy at the National Governors' Conference. The council was formed to "share information on the problems and potential of development of coal reserves."

UE, along with the City of St. Louis, was operating a prototype plant that converted 200 tons of residential refuse daily into power by burning with coal to generate electricity. In addition, the plant reclaimed steel in the form of small nuggets. The $3 million experiment was financed by a $2.2 million grant from the EPA and local funds. The project, started in May 1972, "has been proven technically sound and economically feasible." Officers of the company announced an expansion of the demonstration program, the first of its kind in the country. UE was expected to spend $70 million to construct a plant that will burn almost all the solid waste produced in St. Louis and six adjacent counties. The plant was expected to be operational by 1977.

REVIEW BY MINERAL COMMODITIES

In 1974, metals accounted for about 56% of the total value of the State's mineral output compared with 49% in 1973. Nonmetal production provided about 40% of the State's total mineral production value, and mineral fuels comprised about 4%.

METALS

All metals produced in Missouri registered increases in 1974 over that of 1973 except iron ore.

Aluminum.—Noranda Aluminum, Inc., produced primary aluminum metal near New Madrid in the "bootheel" area of southeast Missouri. This 70,000-ton-per-year plant was completed in late 1971 at a cost of $106 million, considerably over that of the original budget. During 1974, the company began expanding the plant to double the previous capacity. About 250 employees will be added to the present staff of 550 when the project is finished and on-stream in 1976.

Associated Electric Co-operative, Springfield, Mo., completed a 600,000-kilowatt, electric-generating unit near Noranda's reduction plant in 1972 at a cost of $158 million and was building an additional 600,000-kilowatt generating plant at an estimated cost of $150 million to supply the increased power requirements for the new aluminum capacity.

Amax Aluminum Co. announced a decision to expand its aluminum foil mill in St. Louis. The firm, 50% owned by Mitsui & Co. of Japan, rolls sheet aluminum into foil products down to 0.00025 inch. Once the $10 million plant is completed, the company will take its raw material in 2,000-pound ingots from Amax's reduction plant at Bellingham, Wash. Finished foil will be used in basic household products, frozen food packaging, and chewing gum wrappers. At present, the plant produces tin foil and lead foil. The latter is rolled from ingots shipped from Amax's mining and smelting operations near Buick.

Copper.—Increased ore production in the New Lead Belt resulted in more copper concentrates in 1974 because the copper is a coproduct of lead (and zinc) at these operations.

Iron Ore.—Output of iron ore decreased substantially during 1974 because of a substantial reduction at the Pea Ridge mine of Meramec Mining Co.

St. Joe Minerals Corp. reported in its annual report that 1974 was a year of transition for Meramec. Iron ore pellet production was reported down 502,678 tons from the previous year because of expansion of underground development work. St. Joe also reported that "costs per ton of pellets were higher than the selling price," but predicted that 1975 should "see an increase in production."

Lead.—Missouri mines accounted for about 85% of the Nation's total mine output of lead and in 1974 achieved an alltime high of 562,097 short tons of lead metal contained in ore and concentrates.

In its annual report, St. Joe Minerals Corp. reported 1974 production of 247,494 tons of lead in concentrate, up substantially from the 204,058 tons produced in 1973. Metal production at the Herculaneum smelter was reported at capacity rate in 1974 with 230,873 tons, up 7% over the smelter's output in 1973.

The first several months of 1974 were featured by heavy buying of lead because of the feeling that raw material shortages would continue. A downturn for lead came during the fourth quarter when deliveries fell off owing to slackening in the new-car battery market. In addition to foreign purchases, tonnages of U.S. Government stockpile metal had been drawn down and inventories were growing rapidly. Stocks of finished lead at smelters were at relatively low levels at the end of the year.

During the first 3 months of 1975, plants operated at close to capacity, building up adequate inventories for future requirements. Beginning with the second quarter, with demand still slack, the operating level of the zinc smelter was reduced by 40% and the lead smelter by 25%.

Table 5.—Missouri: Tenor of lead ore milled and concentrates produced in 1974

Total material	short tons	9,110,057
Metal content of ore:[1]		
Copper	percent	0.14
Lead	do	6.17
Zinc	do	1.01
Concentrates produced and average content:		
Copper	short tons	14,534
Recovery ratio	percent	0.16
Average copper content	do	25.35
Copper-lead	short tons	8,942
Recovery ratio	percent	0.10
Average copper content	do	28.75
Average lead content	do	9.79
Lead	short tons	784,922
Recovery ratio	percent	8.62
Average lead content	do	73.87
Zinc	short tons	182,938
Recovery ratio	percent	2.01
Average zinc content	do	55.81

[1] Figures represent metal content of crude ore only as recovered in the concentrate.

Table 6.—Missouri: Mine production (recoverable) of silver, copper, lead, and zinc

		1972	1973	1974
Mines producing: Lode		10	11	10
Material sold or treated:				
Lead ore	thousand short tons	8,486	7,586	9,110
Production (recoverable):				
Quantity:				
Silver	troy ounces	1,971,530	2,057,732	2,387,250
Copper	short tons	11,509	10,273	12,665
Lead	do	489,397	487,143	562,097
Zinc	do	61,923	82,350	91,987
Value:				
Silver	thousands	$3,322	$5,264	$11,244
Copper	do	11,785	12,224	19,580
Lead	do	147,113	158,711	252,944
Zinc	do	21,983	34,027	66,047
Total[1]	do	184,203	210,226	349,814

[1] Data may not add to totals shown because of independent rounding.

Table 7.—Total value of mineral production in Missouri and production and value of lead in Missouri and the United States

Year	Total value of Missouri mineral production (thousands)	Lead production					
		Missouri				United States	
		Quantity (short tons)	Value (thousands)	Percent of U.S. production	Percent of world production	Quantity (short tons)	Value (thousands)
1970	$392,996	421,764	$131,751	73.8	11.3	571,767	$178,609
1971	400,089	429,634	118,579	74.3	11.4	578,550	159,679
1972	451,817	489,397	147,113	79.1	12.9	618,915	186,046
1973	512,634	487,143	158,711	80.8	12.7	603,024	196,465
1974	691,049	562,097	252,944	84.7	14.7	663,870	298,742

Amax, Inc., reported in its annual report that improved prices and ore grade offset higher production costs at the Missouri mine-mill-smelter complex jointly owned by Amax and Homestake Mining Co. Mine output was reported at 1,560 million tons of ore, about the same as 1973 production. Lead concentrate reached 250,600 tons, an increase of 11.5%. The smelter at this complex produced 134,300 tons of refined lead, approximately half of which is tolled for others, with the remainder divided evenly between Amax and Homestake.

Silver.—Recovery of silver as a byproduct of lead-zinc operations, in a rising trend for several years, increased again in

1974 to reach another alltime high. Higher prices more than doubled the total value of production. Missouri was the Nation's sixth largest producer of silver with about 7% of the total.

Zinc.—After becoming the Nation's largest producer of zinc in 1973, Missouri slipped to second place in 1974 when New York (the Balmat and Edwards mine complex) surged ahead. However, zinc production in Missouri was the highest in any year since World War I when the Old Tri-State district was in full production.

St. Joe Minerals Corp. reported that zinc in concentrates from its southeast Missouri operations doubled over that of 1973 to 26,581 tons.

Amax Lead Co. of Missouri reported that zinc concentrate production from its Buick mine was 110,400 tons, down slightly from the 1973 rate.

U.S. zinc smelter capacity—or lack of it—was seriously handicapping the Missouri zinc concentrate producers. At the end of 1974, zinc concentrates were piling up in huge stockpiles for lack of a place to send them.

NONMETALS

In 1974, nonmetals accounted for 40% of the total value of mineral output, compared with 46% in 1973.

Output of barite, cement and phosphate rock, was down in the State from the previous year, but the value of each of these minerals, except barite, increased. Both quantity and value of lime and sand and gravel increased.

Barite.—Output of barite was down slightly, but Missouri remained the second largest barite producer in the Nation. Active operations produced barite largely for grinding as an ingredient in drilling fluids.

Cement.—Seven cement plants operated by six companies produced 4.3 million tons of cement in 1974 valued at a record $109 million, making Missouri the sixth largest producer of cement in the Nation.

Table 8.—Missouri: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	7	7
Production	4,358,852	4,297,528
Shipments from mills:		
Quantity	4,581,685	4,229,241
Value	$99,858,393	$106,984,842
Stocks at mills, Dec. 31	267,335	395,695

Table 9.—Missouri: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	4	4
Production	77,485	80,225
Shipments from mills:		
Quantity	84,158	74,940
Value	$2,400,095	$2,434,252
Stocks at mills, Dec. 31	6,516	11,801

Clay.—Output of clay was steady, but prices brought total value of all clays up considerably over that of 1973.

Table 10.—Missouri: Clays sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Year	Fire clay		Common clay		Other clays		Total	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1970	927	4,854	1,201	1,626	W	W	2,128	6,480
1971	872	4,896	1,440	2,558	[1] 42	W	2,354	7,454
1972	894	5,512	1,677	3,583	W	W	2,571	[2] 9,096
1973	829	7,563	1,565	2,371	[1 3] 157	[1 3] 1,692	2,551	11,626
1974	924	10,761	1,542	2,391	[3] 99	W	2,565	[2] 13,151

W Withheld to avoid disclosing individual company confidential data.
[1] Bentonite.
[2] Data do not add to total shown because of independent rounding.
[3] Kaolin.

Lime.—Lime production in Missouri set a new record high in 1974. The State was the third largest producer in the Nation. Three firms produced lime in 1794.

Sand and Gravel.—Increased production of sand and gravel at higher prices set a new record in tonnage and value. Much of this increase was attributed to increased road maintenance as road construction was reduced.

Table 11.—Missouri: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	9,852	12,510	6,354	8,681
Gravel			2,832	4,555
Unprocessed: Sand and gravel			357	224
Industrial:				
Sand	1,027	4,440	1,390	5,991
Gravel			--	--
Total	10,879	16,950	10,933	19,451

[1] Value data may not be directly comparable to that in tables 1, 12, and 13 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 12.—Missouri: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction	8,247	10,476	3,468	4,820
Highway and bridge construction			467	741
Other uses (dams, waterworks, airports, etc.)			52	78
Concrete products (cement blocks, bricks, pipe, etc.)			642	924
Bituminous paving (asphalt and tar paving)			994	1,629
Roadbase and subbase			1,426	1,739
Unprocessed aggregate			326	190
Fill	878	702	202	321
Other uses [2]	673	1,287	239	387
Industrial sand and gravel	1,027	4,440	1,390	5,991
Total	10,825	16,905	9,206	16,820

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 13.—Missouri: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	18	12	98	209
Highway and bridge construction			501	725
Other uses (dams, waterworks, airports, etc.)			84	136
Concrete products (cement blocks, bricks, pipe, etc.)			5	5
Bituminous paving (asphalt and tar paving)			372	547
Roadbase and subbase			527	800
Unprocessed aggregate			31	34
Fill	28	21	109	187
Other uses	8	12	--	--
Total	54	45	1,727	2,643

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Output of stone was slightly above that of 1973, but the total value of stone increased 13%. Missouri held its rank as sixth among the States in stone output.

Table 14.—Missouri: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone	6	1,285	8	1,686
Crushed and broken:				
Bituminous aggregate	3,126	5,718	2,882	5,707
Concrete aggregate	7,737	13,410	7,339	13,198
Dense graded roadbase stone	5,666	9,543	6,176	11,949
Macadam aggregate	3,266	4,910	2,668	3,902
Surface treatment aggregate	3,636	7,185	3,854	8,232
Unspecified construction aggregate and roadstone	r 5,081	r 8,968	5,671	10,605
Agricultural purposes [1]	r 3,502	r 6,444	4,619	9,700
Cement and lime manufacture	10,729	11,332	10,305	13,486
Manufactured fine aggregate (stone sand)	166	435	140	397
Mineral fillers, extenders, and whiting	158	976	551	2,314
Railroad ballast	62	113	34	55
Riprap and jetty stone	3,772	3,870	4,512	4,908
Sulfur dioxide removal	--	--	283	702
Other [2]	2,398	5,733	1,584	3,363
Total [3]	49,298	78,636	50,618	88,518
Grand total [3]	49,304	79,921	50,626	90,204

r Revised.
[1] Data include agricultural limestone, other soil conditioners (1973), and poultry grit and mineral food.
[2] Includes stone used for filter stone, terrazzo and exposed aggregate, flux stone, mine dusting, chemicals, glass, dead-burned dolomite (1974), abrasives (1973), ferrosilicon (1973), bedding material (1974), roofing aggregate chips and granules, and uses not specified.
[3] Data may not add to totals shown because of independent rounding.

Table 15.—Missouri: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension total [1]	6	1,285	8	1,686
Crushed and broken:				
Limestone [2]	48,750	76,613	50,024	87,389
Other stone [3]	548	2,024	594	1,129
Total	49,298	[4] 78,636	50,618	88,518
Grand total	49,304	79,921	50,626	90,204

[1] Data include limestone, granite, marble, and sandstone.
[2] Limestone used generally to include dolomite.
[3] Data include granite, marble, sandstone, and traprock in 1973.
[4] Data do not add to total shown because of independent rounding.

Sulfur.—Two lead smelters in the State contributed significantly to the value of mineral production in the State in the form of sulfur as sulfuric acid. St. Joe Minerals Corp. recovered sulfur as acid at its Herculaneum lead smelter. Amax Lead Co. of Missouri recovered sulfuric acid at its lead smelter near Boss. Although this acid was used for many purposes, the bulk of it was sent to plants manufacturing fertilizer from phosphate rock. A significant tonnage of sulfur was removed from oil refining operations at Sugar Creek by Amoco Oil Co.

MINERAL FUELS

Mineral fuels continued to comprise less than 5% of the value of the State's mineral output.

Mineral fuel resources in Missouri include bituminous coal, oil, gas, and the energy potential of huge deposits of tar sands or "heavy oil" in the western part of the State. Coal was the only mineral fuel being produced in significant quantities in the State in 1974.

Coal.—Output of bituminous coal from Missouri's 10 strip mines remained constant

at about 4.6 million tons for the year, although total value due to higher prices set an alltime high record.

Increased demand for coal within the State was satisfied by increasing shipments from western coalfields and from Illinois. But several companies were investigating the advisability of expanding or initiating coal production in Missouri.

The Supreme Court left standing a Federal Trade Commission (FTC) order requiring Kennecott Copper Corp. to divest itself of Peabody Coal Co. of St. Louis. The action appeared to terminate Kennecott's $621 million purchase of the Nation's largest coal mining firm in 1968. The FTC had ruled that Kennecott, prior to acquisition of Peabody, planned to become a national producer of coal in competition with the St. Louis-based firm and other large national coal companies.

One firm began utilizing the augering technique for mining hillside coal in northern Missouri.

American Commercial Barge Line (ACBL) and Burlington Northern announced plans for a $20 million riverport coal terminal in north St. Louis County that would be the largest on the Missouri-Mississippi-Ohio river system. More than 20 million tons of slow-sulfur coal annually from mines in Wyoming and Montana would be transferred from Burlington Northern unit trains to ACBL barges for transport in several directions to steam-generating plants along the system. A target date of 1976 was set for the operation.

Table 16.—Missouri: Bituminous coal production, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				Production (thousand short tons)				Value (thousands)
	Underground	Strip	Strip-auger	Total	Underground	Strip	Strip-auger	Total	
Barton	--	1	--	1	--	501	--	501	W
Bates	--	1	--	1	--	974	--	974	W
Henry	--	2	--	2	--	W	--	W	W
Howard	--	1	--	1	--	3	--	3	$39
Macon	--	1	--	1	--	W	--	W	W
Putnam	--	1	--	1	--	179	--	179	697
Randolph	--	1	--	1	--	W	--	W	W
Vernon	--	2	--	2	--	108	--	108	W
Undistributed	--	--	--	--	--	2,858	--	2,858	28,647
Total	--	10	--	10	--	4,623	--	4,623	29,383

W Withheld to avoid disclosing individual company confidential data and included with "Undistributed."

Petroleum and Natural Gas.—Small quantities of oil and gas have been produced in Missouri for nearly a century but output has never been significant when compared with the major producing states.

Missouri had 157 producing oil wells and 12 producing gas wells in 1974, with an output of 56,000 barrels of oil and about 33 million cubic feet of natural gas.

Drilling activity in Missouri during 1974 increased significantly following the stepped-up leasing activity during 1972 and 1973 in the Forest City basin. The Missouri Oil and Gas Council issued 101 drilling permits in 1974 as compared with 20 permits for 1973. Classification of these wells shows 91 dry holes, 7 oil development wells, and 1 noncommercial gas well. Two of the permitted wells were not completed by the end of 1974.

Shallow core drilling in Barton and Vernon Counties evaluating heavy oil deposits was responsible for a majority of the wells permitted, accounting for 81 of the total drilling permits.

Sixteen wells permitted in the Forest City basin resulted in several significant tests. The Anschutz Corp. drilled the No. 1 Quinn in Gentry County, which reached Precambrian rocks at a total depth of 3,420 feet. Seven additional permitted Arbuckle tests by Anschutz in Gentry, De Kalb, and Harrison Counties were expected to provide significant subsurface data for this area. Several tests by Sands-American in Nodaway, Holt, and Atchison Counties tested strata ranging from Mississippian to Upper Middle Ordovician.

There were no new fields discovered; however, at the end of 1974, two old abandoned pools in the heavy oil area of

Vernon County were in the process of being revived by secondary recovery methods. Seven new development wells were completed in one pool (Eastburn), and approximately 38 wells were worked over by another operator in the other unnamed pool.

Production of oil in Missouri is classified as being 100% in the stripper category. Although the Missouri Geological Survey has been collecting production data for many years, these data were not required by law to be furnished until 1966 when legislation patterned after that suggested by the Interstate Oil Compact Commission (IOCC) was enacted.

Table 17.—Principal producers

Commodity and company	Address	Type of activity	County
Asphalt, native:			
Bar-Co-Roc Asphalt Co	P.O. Box 11 Lantha, Mo. 64753	Mine	Barton.
Silica Rock Asphalt Corp	Sheldon, Mo. 64784	do	Vernon.
Barite:			
Milchem, Inc	P.O. Box 22111 Houston, Tex. 77027	Mine and mill	Washington.
NL Industries, Inc	P.O. Box 1675 Houston, Tex. 77001	do	St. Louis and Washington.
Pfizer & Co	Box 47 Mineral Point, Mo. 63660	do	Washington.
Cement:			
Alpha Portland Cement Co	15 South Third St. Easton, Pa. 18043	Plant and quarry	St. Louis.
Dundee Cement Co.[1 2]	P.O. Box 317 Dundee, Mich. 48131	do	Pike.
Marquette Cement Manufacturing Co.[1 2]	20 North Wacker Dr. Chicago, Ill. 60606	do	Cape Girardeau.
Missouri Portland Cement Co.[1 2]	7751 Carondelet Ave. St. Louis, Mo. 63105	do	Jackson and St. Louis.
River Cement Co	Festus, Mo. 63028	do	Jefferson.
U.S. Steel Corp.[1 2]	600 Grant St. Pittsburgh, Pa. 15230	do	Ralls.
Clays:			
Dresser Industries Inc	2 Gateway Center Pittsburgh, Pa. 15222	Mine and plant	Callaway, Gasconade, Montgomery, Warren.
Kaiser Aluminum & Chemical Corp.	P.O. Box 499 Mexico, Mo. 65265	do	Audrain, Callaway, Gasconade, Montgomery, Warren.
U.S. Gypsum Co	Mexico, Mo. 65265	do	Franklin and Gasconade.
Coal:			
Peabody Coal Co	301 North Memorial Dr. St. Louis, Mo. 63102	do	Henry, Macon, Randolph.
Pittsburgh & Midway Coal Mining Co.	Tenmain Center Kansas City, Mo. 64105	do	Barton and Bates.
Iodine:			
Hoffman-Taff, Inc	West Bennett Rd. Springfield, Mo. 65800	Plant	Greene.
Mallinckrodt Chemical Works.	3600 North Second St. St. Louis, Mo. 63147	do	St. Louis.
West Agro-Chemical, Inc	42-16 West St. Long Island City, N.Y. 11101	do	Jackson.
Iron Ore:			
Meramec Mining Co	Route 4 Sullivan, Mo. 63080	Underground mine.	Washington.
Pilot Knob Pellet Co	Box 26 Ironton, Mo. 63650	do	Iron.
Lead:			
Amax Lead Co. of Mo.[3]	Boss, Mo. 65440	do	Do.
Cominco American, Inc.[3]	Box 430 Salem, Mo. 65560	do	Do.
Ozark Lead Co.[3]	Sweetwater, Mo. 63680	do	Reynolds.
St. Joe Minerals Corp.[3]	Boone Terre, Mo. 63628	do	Crawford, Iron, Reynolds, Washington.

See footnotes at end of table.

Table 17.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Lime:			
Ash Grove Cement Co	1000 Ten Main Center Kansas City, Mo. 64105	Plant	Greene.
Mississippi Lime Co.[2]	7 Alby St. Alton, Ill. 62002	do	Ste. Genevieve.
Valley Mineral Products Corp.	915 Olive St. St. Louis, Mo. 63101	do	St. Francois.
Perlite, expanded: J. J. Brouk & Co.	1367 South Kings Highway Blvd. St. Louis, Mo. 63110	do	St. Louis.
Roofing granules: GAF Corp	P.O. Box 278 Annapolis, Mo. 63620	do	Iron.
Sand and gravel:			
Holliday Sand & Gravel Co	6811 West 63d St. Overland Park, Kans. 66202	Dredge	Various.
Missouri Gravel Co	313 16th St. Moline, Ill. 61265	Pit and plant	Lewis.
Riverside Sand & Dredging	5000 Bussen Rd. St. Louis, Mo. 63129	Dredge	St. Louis.
St. Charles Sand Co	Rt. 1 Box 253 Bridgeton, Mo. 63042	Plant	Do.
Winter Bros. Material Co	13098 Gravios Rd. St. Louis, Mo. 63127	do	Do.
Stone:			
Ash Grove Cement Co	P.O. Box 70 Butler, Mo. 64730	Quarries	Bates, Greene, Jackson, Vernon.
Fred Weber Inc	7929 Alabama Ave. St. Louis, Mo. 63111	do	Jefferson, St. Charles, St. Louis.
Medusa Corp	Box 5668 Cleveland, Ohio 44101	do	Boone, Daviess, Gentry, Harrison.
West Lake Quarry & Material Co.	Rt. 1, Box 206 Taussig Rd. Bridgeton, Mo. 63042	do	Cape Girardeau, St. Louis, Scott.
Vermiculite, exfoliated: W. R. Grace & Co.	62 Whittemore Ave. Cambridge, Mass. 01109	Plant	St. Louis.

[1] Also clays.
[2] Also stone.
[3] Also silver, copper, and zinc.

The Mineral Industry of Montana

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Montana Bureau of Mines and Geology for collecting information on all minerals.

By George T. Krempasky [1] and Don C. Lawson [2]

In 1974, Montana's mineral production was valued at $575 million, an increase of 49% over the 1973 value. The 1974 value of copper rose 29% compared with that of the previous year. Other metals showing significant increases in value of production were gold, 66%, and silver, 49%.

The value of petroleum production in 1974 increased 99% over that of 1973. Natural gas production increased 5% in value over 1973 production. Coal continued its upward trend with an increase in production value of 82%.

The value of output of nonmetallic minerals was about the same or slightly lower; the value of sand and gravel decreased 56%. Nonmetallics showing increases in value were clays, 69%; talc, 27%; phosphate rock, 57%; lime, 11%; and gem stones, 167%.

Montana's 1974 legislative session passed numerous mineral-industry-related bills: (1) A 3-year moratorium was placed on water appropriation from the Yellowstone River Basin; (2) a resource indemnity trust was established in the State, to be funded by moneys obtained from a levy on nonrenewable resources such as coal, oil, gas, copper, etc.; (3) laws relating to hard rock mining were revised and the Montana Strip-Mining and Reclamation Act was amended; (4) the Board of Land Commission was empowered to lease geothermal resources on State land; (5) "The Strip-Mine Siting Act" was passed; (6) the "coal mining code" as it relates to safety was revised; (7) the reclamation of areas disturbed by drilling or exploration for oil and gas was required; (8) a severance tax on coal was levied for the support of government. Other legislation indirectly related to the mineral industry has also been enacted.

In early November, The Anaconda Company announced the closing of its underground mining facilities in the Butte area. Company officials stated reasons for the decision as escalated expenses, a decline in copper prices, and the fact that continuation of vein mining in this area would impair the mineral potential of large zones of lower grade underground copper. Diamond drilling into the underground zones, expected to last 2 years, is designed to further prove reserves.

The Montana Energy and Magnetohydrodynamics (MHD) Research and Development Institute, Inc., was established in November 1974 to encourage and support MHD and energy research and development in the State. The Institute, headquartered at Butte, was created in response to a $5 million Federal appropriation for MHD research at Montana College of Mineral Science and Technology at Butte and other units of the State's university system.

Based on dollar value, Montana ranked third in the value of silver produced, fourth in the value of copper produced, and sixth in the value of gold produced compared with production in other States.

Nonmetallic minerals, particularly barite, talc, phosphate rock, bentonite, fluorspar, silica, and vermiculite, are receiving increased attention.

[1] State Liaison Officer, Bureau of Mines, Helena, Mont.
[2] Field Agent, Montana Bureau of Mines and Geology.

Table 1.—Mineral production in Montana [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays [2] thousand short tons	219	$1,298	298	$2,189
Coal (bituminous) do	10,725	30,238	14,106	54,961
Copper (recoverable content of ores, etc.) short tons	132,466	157,634	131,131	202,728
Gem stones	NA	150	NA	400
Gold (recoverable content of ores, etc.) troy ounces	27,806	2,720	28,268	4,516
Iron ore (usable) thousand long tons, gross weight	13	W	30	W
Lead (recoverable content of ore, etc.) short tons	176	57	154	69
Lime thousand short tons	210	3,028	226	3,364
Manganese ore and concentrate (35% or more Mn) short tons, gross weight	239	W		
Natural gas million cubic feet	56,175	13,240	54,873	13,883
Peat thousand short tons	1	W	W	W
Petroleum (crude) thousand 42-gallon barrels	34,620	115,423	34,554	229,802
Sand and gravel thousand short tons	11,694	13,819	4,242	6,126
Silver (recoverable content of ores, etc.) thousand troy ounces	4,350	11,127	3,512	16,542
Stone thousand short tons	5,054	9,559	[3] 3,115	[3] 6,242
Zinc (recoverable content of ores, etc.) short tons	73	80	136	98
Value of items that cannot be disclosed: Antimony, cement, fire clay, fluorspar, gypsum, natural gas liquids, phosphate rock, stone (dimension, 1974), talc, tungsten, vermiculite, and values indicated by symbol W	XX	26,962	XX	33,881
Total	XX	385,285	XX	574,801
Total 1967 constant dollars	XX	282,452	XX	p 274,870

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes fire clay; included with "Value of items that cannot be disclosed."

[3] Excludes dimension stone; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Montana, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Beaverhead	W	$414	Stone, silver, sand and gravel, copper lead, zinc, gold.
Big Horn	W	38,364	Coal, petroleum, sand and gravel, stone.
Blaine	$290	W	Petroleum.
Broadwater	W	W	Iron ore, zinc, lead, silver, gold, copper.
Carbon	W	W	Petroleum, clays, stone, sand and gravel.
Carter	W	1,361	Clays, petroleum, sand and gravel.
Cascade	W	W	Sand and gravel, clays, stone.
Chouteau	535	70	Sand and gravel.
Custer	W	15	Do.
Daniels	58	W	Petroleum.
Dawson	2,366	W	Petroleum, sand and gravel.
Deer Lodge	3,603	3,774	Lime, stone, sand and gravel, tungsten, silver, clays, gold, copper, zinc, lead.
Fallon	22,876	34,628	Petroleum, natural gas liquids.
Fergus	W	W	Gypsum, sand and gravel, clays.
Flathead	1,142	1,202	Sand and gravel, silver, stone, lead, peat, gold, copper.
Gallatin	8,537	W	Cement, stone, sand and gravel, clays.
Glacier	2,324	3,735	Petroleum, natural gas liquids.
Golden Valley	30	10	Sand and gravel.
Granite	W	1,097	Silver, stone, gold, copper, zinc, tungsten, sand and gravel, lead.
Hill	207	W	Sand and gravel.
Jefferson	W	8,810	Cement, stone, silver, gold, sand and gravel, zinc, lead, copper.

See footnotes at end of table.

Table 2.—Value of mineral production in Montana, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Judith Basin	$24	--	
Lake	W	W	Sand and gravel, peat.
Lewis and Clark	223	$286	Sand and gravel, gold, silver, stone, lead, zinc, copper.
Liberty	1,152	W	Petroleum.
Lincoln	W	W	Vermiculite, stone, sand and gravel.
McCone	1,420	W	Petroleum.
Madison	W	2,328	Talc, gold, silver, zinc, copper, lead, sand and gravel.
Meagher	168	W	Gypsum, stone, lead, silver, zinc, gold.
Mineral	855	139	Stone, sand and gravel.
Missoula	W	W	Sand and gravel, stone, copper, silver, gold, lead, zinc.
Musselshell	W	W	Petroleum, sand and gravel, clays.
Park	W	191	Sand and gravel, stone, silver, copper, gold.
Petroleum	6	6	Sand and gravel, stone.
Phillips	15	228	Stone, clays.
Pondera	47	W	Petroleum, stone, sand and gravel.
Powder River	$0,011	W	Petroleum, sand and gravel, clays.
Powell	W	W	Phosphate rock, stone, sand and gravel, gold, silver, lead, copper, zinc.
Prairie	--	41	Stone.
Ravalli	W	W	Fluorspar, sand and gravel, stone, silver, lead, zinc, gold.
Richland	8,297	14,932	Petroleum, coal, natural gas liquids, lime, sand and gravel.
Roosevelt	W	W	Petroleum, natural gas liquids, sand and gravel, stone.
Rosebud	17,013	26,843	Coal, petroleum, sand and gravel, clays, stone.
Sanders	824	602	Antimony, sand and gravel, silver, copper, stone, zinc, gold, lead.
Sheridan	6,565	W	Petroleum, stone, sand and gravel.
Silver Bow	171,062	221,977	Copper, silver, gold, sand and gravel, stone.
Stillwater	1	--	
Sweet Grass	65	2	Stone.
Teton	39	W	Sand and gravel, petroleum, stone.
Toole	W	W	Petroleum, stone, sand and gravel.
Treasure	W	760	Clays.
Valley	W	W	Sand and gravel, clays, stone.
Wheatland	50	--	
Wibaux	8	25	Sand and gravel.
Yellowstone	1,874	3,049	Stone, sand and gravel, lime, petroleum, clays.
Yellowstone National Park	1,196	--	
Undistributed [2]	103,902	209,906	
Total [3]	385,285	574,801	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Garfield County is not listed because no production was reported.

[2] Includes petroleum and natural gas production and stone that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Montana business activity

		1973	1974 p	Change, percent
Annual average labor force and employment:				
Total labor force	thousands	309.8	NA	NA
Unemployment	do	19.6	NA	NA
Employment:				
Manufacturing	do	24.9	24.5	−1.6
Wholesale and retail trade	do	56.9	59.5	+4.6
Mining	do	6.7	7.4	+10.4
Construction	do	14.0	12.8	−8.6
Transportation and public utilities	do	18.7	19.5	+4.3
Finance, insurance, real estate	do	9.6	10.4	+8.3
Services	do	42.1	43.7	+3.8
Government	do	55.4	57.9	+4.5

See footnotes at end of table.

Table 3.—Indicators of Montana business activity—Continued

	1973	1974 p	Change, percent
Personal income:			
Total ---------- millions --	$3,375	$3,511	+4.0
Per capita ----------	$4,626	$4,776	+3.2
Construction activity:			
Value of authorized nonresidential construction millions --	$31.9	$39.9	+25.1
Highway construction contracts awarded -------- do ----	$33.6	$40.0	+19.0
Cement shipments to and within Montana thousand short tons --	285	272	−4.6
Farm marketing receipts ---------- millions --	$1,074.1	NA	NA
Mineral production value ---------- do ----	$385.3	$574.8	+49.2

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; U.S. Bureau of Mines.

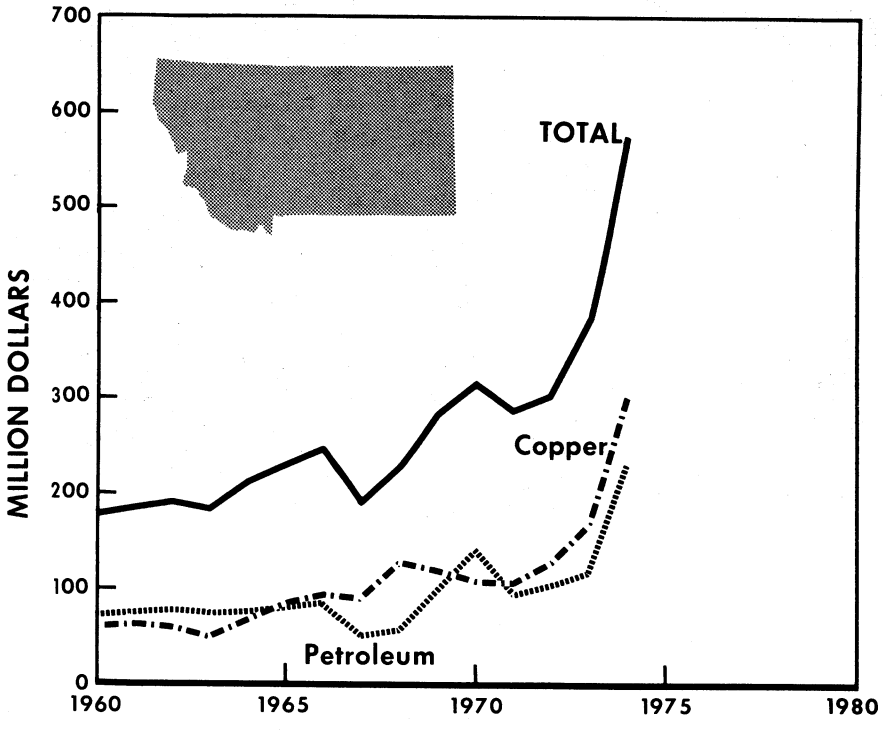

Figure 1.—Value of copper, petroleum, and total value of mineral production in Montana.

REVIEW BY MINERAL COMMODITIES

METALS

Aluminum.—The Environmental Science Division of the Montana Department of Health and Environmental Sciences has agreed to support a variance by the Anaconda Aluminum Company for its Columbia Falls refinery. Under the variance, the company will be allowed 5 years to meet State pollution standards.

During the first 2 months of 1974, the Anaconda reduction plant operated at less than 100% capacity. Production was cur-

tailed during the period for lack of hydroelectric power.

Antimony.—The second-largest antimony producer in the nation, U.S. Antimony Corp., announced that it is now a fully integrated operation for the production of antimony metal. The Sanders County-based operation installed a reduction furnace and is producing a battery-grade antimony metal of 93% purity. Further upgrading by additional processes yields a product of +99% purity. The integrated operation has the capability of producing 350 tons per day of antimony metal.

Copper.—Copper is mined in 13 counties in Montana. However, 99% of the copper produced in Montana came from the Butte area.

The first commercial copper produced by The Anaconda Company's Arbiter Process, "a smokeless smelter," was pulled from the electrolytic tanks the first week of October 1974. The sheets of copper refined by chemical and electrolytic methods represents the first successful commercial application of the hydrometallurgical process in the industry according to Anaconda officials.

Ore to the plant at Anaconda is shipped in a slurry from the concentrator in Butte. The slurry is leached with ammonia and oxygen in a series of closed vessels. It is then put through an electrical process in which the copper adheres to plates in ar electrolytic tank. The washed residue i then given a flotation treatment to recove residual copper and noble metals.

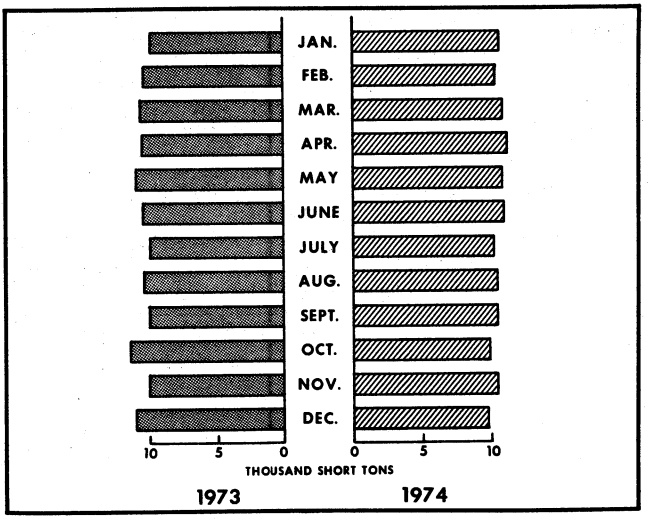

Figure 2.—Mine production of copper in Montana, by month, in terms of recoverable metal.

Gold.—Gold was produced principally as a byproduct of copper refining. During the year, gold output increased to 28,268 ounces valued at $4,515,529, an increase of 66% in value compared with the value of gold produced in 1973.

Exploration and reevaluation of former gold-producing areas is widespread. The Jardine District (Park County) and the Flint Creek Range (Granite and Deer Lodge Counties) are being investigated for gold potentials. In Madison County, the Tidal Wave, Sheridan, Melrose, Pony, Nevada City, and Virginia City mines are under scrutiny. Activity in Phillips County at Landusky and Zortman is centered around the former producing properties, Ruby and Little Ben. In the Judith Mountains (Fergus County), activity is centered at the Giltedge mine. The Kendall-Barnes area in the North Moccasin Mountains is undergoing extensive investigation, including geological mapping, geochemical study, rock sampling, and metallurgical testing.

One major company continued evaluating a potential open-pit mining operation in Jefferson County.

Table 4.—Montana: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by class of ore or other source material

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Dry gold	15	4,467	1,006	6,849	2	5	12
Dry gold-silver	19	21,388	2,420	91,474	17	64	72
Dry silver	33	29,457	121	131,508	108	39	12
Total [2]	67	55,312	3,547	229,831	126	109	95
Copper	10	23,141,975	24,308	3,249,733	112,308	1	3
Copper-lead-zinc	1	12	2	328	(3)	1	1
Lead	7	289	23	2,587	1	34	6
Lead-zinc	4	200	12	1,923	(3)	5	6
Zinc	6	792	44	2,323	1	4	26
Total [2]	28	23,143,268	24,389	3,256,894	112,310	45	41
Other lode material:							
Silver tailings	1	5,816	89	18,603	16	--	--
Copper precipitates	2	23,695	--	--	18,674	--	--
Copper tailings	1	3,204	100	6,812	4	--	--
Total	4	32,715	189	25,415	18,694	--	--
Total lode material [2]	96	23,231,295	28,125	3,512,140	131,131	154	136
Placer	2	--	143	21	--	--	--
Grand total	98	23,231,295	28,268	3,512,161	131,131	154	136

[1] Detail may not add to total because some mines produce more than one class of material.
[2] Data may not add to totals shown because of independent rounding.
[3] Less than ½ unit.

Table 5.—Montana: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county

County	Mine producing		Material sold or treated [1] (short tons)	Gold		Silver	
	Lode	Placer		Troy ounces	Value	Troy ounces	Value
1972 total	37	2	17,232,749	23,725	$1,390,288	3,325,052	$5,602,713
1973 total	57	1	19,114,099	27,806	2,719,707	4,349,869	11,126,968
1974							
Beaverhead	7	--	441	9	1,439	4,071	19,174
Broadwater	4	--	163	9	1,437	160	754
Deer Lodge	3	--	562	13	2,077	1,238	5,807
Granite	17	--	15,898	1,057	168,845	124,265	585,287
Jefferson	20	1	12,193	969	154,788	59,154	278,617
Lewis and Clark	11	1	1,379	341	54,469	4,881	22,989
Madison	10	--	6,185	1,141	182,264	26,759	126,034
Powell	8	--	422	52	8,307	1,006	4,738
Silver Bow	8	--	23,188,390	24,609	3,931,041	3,259,012	15,349,948
Undistributed [2]	8	--	5,662	68	10,862	31,620	148,930
Total	96	2	23,231,295	28,268	4,515,529	3,512,161	16,542,278

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1972 total	123,110	$126,064,454	287	$86,392	12	$4,303	$133,148,150
1973 total	132,466	157,634,461	176	57,200	73	30,127	171,568,463
1974							
Beaverhead	2	2,659	4	1,751	2	1,233	26,256
Broadwater	(3)	191	(3)	203	2	1,632	4,217
Deer Lodge	1	1,266	(3)	19	(3)	66	9,235
Granite	23	35,691	2	1,010	15	10,550	801,383
Jefferson	12	18,787	69	31,007	50	35,868	519,067
Lewis and Clark	1	2,100	28	12,583	16	11,747	103,888
Madison	6	9,178	11	5,059	46	32,703	355,238
Powell	1	1,017	2	904	1	719	15,685
Silver Bow	131,062	202,621,365	--	--			221,902,354
Undistributed [2]	23	35,633	37	16,592	5	3,424	215,441
Total [4]	131,131	202,727,887	154	69,128	136	97,942	223,952,764

[1] Does not include gravel washed.
[2] Flathead, Meagher, Missoula, Park, Ravalli, and Sanders Counties combined to avoid disclosing individual company confidential data.
[3] Less than ½ unit.
[4] Data may not add to totals shown because of independent rounding.

Table 6.—Montana: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by type of material processed and method of recovery

Type of material processed and method of recovery	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Smelting of concentrates from ore	24,405	3,245,603	112,292	1	1
Direct smelting of—					
Ore	3,531	241,122	144	153	136
Precipitates	--	--	18,674	--	--
Tailings	189	25,415	21	--	--
Total[1]	3,720	266,537	18,838	153	136
Total lode material[1]	28,125	3,512,140	131,131	154	136
Placer	143	21	--	--	--
Grand total	28,268	3,512,161	131,131	154	136

[1] Data may not add to totals shown because of independent rounding.

Table 7.—Montana: Mine production (recoverable) of gold, silver, copper, lead, and zinc, in Silver Bow County

Year	Mines producing	Material sold or treated (thousand short tons)	Gold (troy ounces)	Silver (thousand troy ounces)
	Lode			
1970	4	18,745	19,454	3,590
1971	4	13,531	13,789	2,415
1972	5	17,208	22,535	3,159
1973	12	19,055	24,341	4,070
1974	8	23,188	24,609	3,259
1882–1974	--	[1]465,565	2,562,104	665,558

	Copper (short tons)	Lead (short tons)	Zinc (short tons)	Total value (thousands)
1970	120,292	--	--	$145,881
1971	88,503	--	--	96,344
1972	123,058	2	--	132,656
1973	132,282	--	--	170,208
1974	131,062	--	--	221,902
1882–1974	8,998,158	415,427	2,406,818	4,957,000

[1] Complete data not available: 1882–1904.

Iron.—The R&S Iron Company produced ore from two open-pit mines. The direct shipping ore was all used in cement manufacturing.

Lead.—Production of lead was reported from mines in 13 counties during 1974 compared with production from mines in 8 counties in 1973. However, the output based on quantity declined 12% during 1974. Silver values in the ore from which lead was recovered were higher than the recovered values of lead.

Silver.—The principal source of silver, approximately 93% of the State total, was as a byproduct from copper operations in the Butte area. The quantity of silver produced declined 19% compared with production in 1973; however, the value of the silver produced increased 49%.

Interest in silver remained high in many counties throughout the State. In 1974, silver was obtained from mines in 15 counties compared with 9 counties in 1973. In Lincoln County, a deposit reported to have reserves of 50 million tons of copper-silver ore grading 0.7% copper and 1.5 ounces per ton silver is being evaluated. In Granite County, exploration and development work is continuing at three different sites. Extensive exploration and development continued in Madison County. Several major companies were involved in exploration and development work in Beaverhead County. A new mill was constructed for

the purpose of milling tailings from mine dumps and ore from the Bryant District west of Melrose. At Basin, Jefferson County, construction started on a flotation mill to mill both company and custom ores. Exploration, development, and production is currently being done by major mining companies and independents in many areas of the State.

Tungsten.—Only a few hundred tons of tungsten concentrates were produced in 1974. Areas of known tungsten occurrences under investigation were Jardine (Park County), Flint Creek Range (Granite and Deer Lodge Counties), Pony District (Madison County), Pioneer Range (Beaverhead County), and Brown's Lake area (Beaverhead County).

Zinc.—The output of zinc from mines increased 86% in quantity over the production of 1973. Production of zinc was reported from mines in 12 counties in 1974 compared with 7 counties in 1973. In most cases, the value of silver in the ore was higher than the value of other commodities recovered.

NONMETALS

Clays.—Output of all types of clays and shales for use in building products, iron ore pelletizing, and oilwell drilling muds (bentonite) came from 15 mines in 12 counties. Miscellaneous clays and shale for making clay products, mainly face brick, were mined by Lewiston Clay, Inc., in Fergus County and by Lovell Clay Products Co. in Yellowstone County. Super-Lite Products mined expanded shale in Cascade County, and Kanta Products, Inc., mined expanded shale in Gallatin County. Foundry sand was produced by American Colloid Co.; Hallett Minerals Co., and International Minerals and Chemical Corp. Bentonite for drilling mud was produced by American Colloid Co., International Minerals and Chemical Corp., and NL Industries, Hallett Minerals Co. mined bentonite for use in iron ore pelletizing.

Gypsum.—United States Gypsum Co. and Hilde & Maronick Joint Venture mined gypsum in Fergus and Meagher Counties. Output decreased 8%. United States Gypsum calcined gypsum in Fergus County. Output declined 29%.

Lime.—The Anaconda Company, Great Western Sugar Co., and Holly Sugar Corp. produced 226,000 tons of quicklime in Deer Lodge, Richland, and Yellowstone Counties for copper ore concentration, sugar refining, and sewage treatment. Output increased 8% but was 11% below the 1969 record production. The lime was used in Montana. Consumption of lime in Montana was 228,000 tons.

Phosphate Rock.—A phosphate rock deposit is being developed in the Pikes Peak District, Granite County. In Powell County, a vertical 3.5-foot phosphate bed containing 37% P_2O_5 is being developed by three underground adits.

Sand and Gravel.—Sand and gravel output declined 63.7% to 4.2 million tons valued at 6.1 million. This was due mainly to decreased demand for highway construction.

A total of 64 plants were operated in the State: 53 plants produced less than 100,000 tons during the year; 11 plants produced in excess of 100,000 tons per year, but less than 600,000 tons per year. Commercial firms utilized 63.8% of the material, and government entities used 36.2% of the production.

Sand and gravel was produced in 40 of the State's 56 counties. Production in the counties varied from a low of 4,861 tons per year to a high of 818,268 tons per year.

Table 8.—Montana: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	11,687	13,809	910	1,710
Gravel			1,860	3,173
Unprocessed: Sand and gravel			1,472	1,168
Industrial:				
Sand	7	10	--	--
Gravel			--	--
Total	11,694	13,819	4,242	6,051

[1] Value data may not be directly comparable to that in tables 1, 9, and 10 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 9.—Montana: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction			563	1,387
Highway and bridge construction			70	153
Other uses (dams, waterworks, airports, etc.)			58	126
Concrete products (cement blocks, brick, pipe, etc.)	2,119	2,766	208	371
Bituminous paving (asphalt and tar paving)			169	292
Roadbase and subbase			392	725
Unprocessed aggregate			1,097	924
Fill	285	205	54	77
Other uses	266	384	98	141
Industrial sand and gravel	7	10	--	--
Total[2]	2,678	3,366	2,709	4,196

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Data may not add to totals shown because of independent rounding.

Table 10.—Montana: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction			58	182
Highway and bridge construction			219	269
Other uses (dams, waterworks, airports, etc.)			21	45
Concrete products (cement blocks, brick, pipe, etc.)	8,558	10,123	13	27
Bituminous paving (asphalt and tar paving)			294	386
Roadbase and subbase			463	682
Unprocessed aggregate			375	244
Fill	357	270	85	90
Other	101	60	5	5
Total	9,016	10,453	1,533	1,930

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

MINERAL FUELS

Coal.—Output of bituminous coal increased 32% over the 1973 production level. Production came from eight active surface mines, and the increase was due to further expansion at existing mines and first production from the Sarpy Creek area.

The Montana Bureau of Mines and Geology published the results of an 8-year study of southeastern Montana coal deposits.[3] Thirty-two subbituminous and lignite coal deposits described in the report contain low-sulfur coal reserves of 32 billion tons. Estimated totals of all surface-minable coal in eastern Montana exceed 50 billion tons.

Burlington Northern (BN) announced that plans have been formulated for construction of a complex that would synthesize ammonia fertilizer, methanol-methyl fuel, and synthetic diesel fuel at Circle, Mont. The complex would utilize water from the Fort Peck Reservoir and coal mined in the area. The project was labeled an "integrated agricultural-mineral-industrial development."

[3] Mont. BuMines and Geol., Bull. 91.

Table 11.—Montana: Bituminous coal and lignite production in 1974, by type of mine and county

(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines			Production (thousand short tons)			Value (thousands)
	Underground	Strip	Total	Underground	Strip	Total	
Bituminous coal:							
Big Horn	--	2	2	--	8,315	8,315	W
Musselshell	--	2	2	--	20	20	$238
Rosebud	--	2	2	--	5,440	5,440	W
Total	--	6	6	--	13,775	13,775	53,834
Lignite coal:							
Powder River	--	1	1	--	W	W	W
Richland	--	1	1	--	W	W	W
Total	--	2	2	--	331	331	1,126
Total Montana	--	8	8	--	14,106	14,106	[1]54,961

W Withheld to avoid disclosing company confidential data.
[1] Data do not add to total shown because of independent rounding.

Petroleum and Natural Gas.—Crude petroleum recovery declined less than 1% compared with the 1973 figure of 34.62 million barrels. Petroleum production amounted to 34.55 million barrels in 1974 and accounted for about 40% of the State's 1974 mineral production value. About 56% of the crude oil produced came from six fields: The Bell Creek Field (9.35 million barrels), Powder River County; the Cut Bank Field (3.39 million barrels), Toole, Glacier, and Pondera Counties; the Cabin Creek Field (2.27 million barrels), Fallon County; the Pine Field (2.90 million barrels), Fallon County; and the Sumatra Field (1.44 million barrels), Rosebud County.

The Bell Creek Field continued as the largest source of petroleum in the State, accounting for nearly 27% of the total production in 1974. The Cut Bank Field, which ranked second in 1974, remained the leading alltime producing field in Montana. Its cumulative output was 134.95 million barrels, about 16% of the total cumulative State production of 860.51 million barrels.

In the secondary recovery programs at Bell Creek Field and Fred and George Creek Fields, 1974 production increased about 1.3 million barrels over that of 1973.

The discovery of additional reserves at Little Wall Creek, Sioux Pass, and Sumatra Fields resulted in a production increase of 0.593 million barrels over that produced in 1973.

Production from the Sioux Pass, Rosebud, Northeast, Raymond, Lone Butte, and Howard Coulee Fields, discovered in 1974, added to 1974 production.

Discoveries in central Montana at the Gumbo Ridge and Sheepherder Fields are highly significant according to the Montana Oil and Gas Conservation Division.[4] The finding of commercial Tyler sand accumulations at Gumbo Ridge Field is important because of the distance (approximately 12 miles) from producing areas. The finding of Tyler A sand production at Sheepherder Field, located on the downthrown side of a long, east-west trending fault that characterizes the north flank of Ragged Point Field, points to the need for intensive exploration of Tyler sands along the downthrown side of this fault in the Stensvad and Sumatra Fields.

In 1973, production in the Sioux Pass Field from the Red River formation and from the Siluro-Ordovician formation and in the Winnett Junction Field was recorded. During 1974, a total of 421,909 barrels was obtained from the 1973 discoveries, an increase of over 166,000 barrels over 1973 production.

Natural gas production in Montana during 1974 totaled 54,873 million cubic feet. This was a 2% decrease from that of 1973 owing to a greatly reduced production from the Tiger Ridge gasfield in Blaine and Hill Counties. The 1974 production from the Tiger Ridge gasfield was 19.4 bil-

[4] Oil and Gas Conservation Division, Department of Natural Resources and Conservation of the State of Montana. Annual Review for the Year 1974. Helena, Mont., 1975.

lion cubic feet compared with production of 29.1 billion cubic feet during 1973.

Of the 30 producing gasfields listed by the Oil and Gas Conservation Division, 10 had an increase of production over that of 1973 and 16 had a decrease. Four gasfields from which no production was obtained in 1973—North Canadian Coulee (Hill and Liberty Counties), Kicking Horse (Toole County), Rapelje (Stillwater County), and Sherard (Blaine and Chouteau Counties)—produced approximately 3.82 billion cubic feet.

Table 12.—Montana: Oil and gas well drilling completions in 1974, by county

County	Proved field wells			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Big Horn	--	--	--	--	--	6	6	23,686
Blaine	3	27	38	--	6	31	105	208,694
Carbon	2	1	1	--	--	9	13	57,895
Carter	--	--	--	--	1	6	7	10,420
Cascade	--	--	--	--	--	2	2	4,697
Chouteau	--	18	17	--	--	12	47	94,163
Custer	--	1	--	--	--	2	3	7,765
Daniels	--	--	--	--	--	1	1	9,211
Dawson	--	--	--	--	--	3	3	21,443
Fallon	2	--	2	--	--	--	4	38,054
Fergus	--	--	2	--	1	11	14	30,483
Garfield	--	--	--	--	--	10	10	59,783
Glacier	10	2	9	--	--	2	23	69,697
Golden Valley	--	--	--	--	--	4	4	11,694
Hill	--	27	48	--	1	16	87	154,550
Lewis and Clark	--	--	--	--	--	2	2	14,302
Liberty	1	9	14	--	2	7	33	99,154
McCone	--	--	--	--	--	9	9	72,913
Musselshell	13	--	26	2	--	20	61	234,339
Petroleum	1	--	2	--	--	3	6	17,586
Phillips	--	69	16	--	4	25	114	185,362
Pondera	1	--	3	--	2	3	9	22,532
Powder River	--	1	--	--	--	1	2	8,940
Richland	2	--	--	1	--	4	7	88,054
Roosevelt	1	--	--	1	--	9	11	106,685
Rosebud	10	--	8	2	--	20	40	194,409
Sheridan	2	--	1	1	--	1	5	38,900
Stillwater	--	12	4	--	--	5	21	47,992
Sweet Grass	--	--	--	--	--	1	1	5,686
Teton	4	--	2	--	--	11	17	44,677
Toole	4	9	19	--	4	12	48	95,792
Treasure	--	--	--	--	--	1	1	2,395
Valley	--	3	4	--	--	10	17	49,667
Wheatland	--	--	--	--	--	1	1	1,750
Wibaux	2	--	--	--	--	1	3	29,580
Yellowstone	--	--	1	--	--	4	5	10,069
Total	58	179	212	7	21	265	742	2,178,519

Source: Annual Review for the Year 1974, Montana Oil and Gas Conservation Division.

Table 13.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Ideal Cement Co	821 17th St. Denver, Colo. 80202	Plant	Gallatin.
Kaiser Cement & Gypsum Corp.[1]	300 Lakeside Dr. Oakland, Calif. 94604	do	Jefferson.
Clays:			
Hallett Minerals Co	P.O. Box 491 Forsyth, Mont. 59327	do	Rosebud, Phillips, Treasure, Valley.
International Minerals and Chemicals Corp.	Old Orchard Rd. Skokie, Ill. 60076	Pit	Carter.
NL Industries, Inc	P.O. Box 1675 Houston, Tex. 77001	Pit	Do.

See footnotes at end of table.

Table 13.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Coal:			
Decker Coal Co	Box 12 Decker, Mont. 59025	Strip mines	Big Horn.
Western Energy Co	40 East Broadway Butte, Mont. 59701	do	Rosebud.
Copper: The Anaconda Co.[2]	Anaconda, Mont. 59711	Smelter, mine, plant.	Silver Bow.
Fluorspar: Roberts Mining Co	P.O. Box 365 Darby, Mont. 59829	Mine and plant	Ravalli.
Gypsum: United States Gypsum Co.	101 South Wacker Dr. Chicago, Ill. 60606	Underground mine and plant.	Fergus.
Iron Ore: R&S Iron Co	Radersburg, Mont. 59644	Mine	Broadwater.
Phosphate rock:			
Cominco American, Inc	Garrison, Mont. 59731	Mine and plant	Powell.
Stauffer Chemical Co	299 Park Ave. New York, N.Y. 10017	Plant	Silver Bow.
Sand and gravel:			
Gallatin Sand and Gravel Co	Box 248 Bozeman, Mont. 59715	Pit	Gallatin.
McElroy & Wilkin Inc	P.O. Box 35 Kalispell, Mont. 59901	Pit	Flathead.
Midland Materials Co	Box 2521 Billings, Mont. 59103	Pit	Yellowstone.
Barry O'Leary Co	Box 1102 Billings, Mont. 59103	Pit	Do.
M.S. Ready Mix	Box 1501 Missoula, Mont. 59801	Pit	Missoula.
Stone: Big Horn Calcium Co	Box 118 Frannie, Wyo. 82423	Quarry	Carbon and Granite.
Vermiculite, crude: W. R. Grace & Co.	62 Whittemore Ave. Cambridge, Mass. 02140	Plant	Lincoln.

[1] Also clays and stone.
[2] Also aluminum, gold, lime, silver, and stone.

The Mineral Industry of Nebraska

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Conservation and Survey Division of the University of Nebraska, Nebraska Geological Survey, for collecting information on all minerals except fuels.

By Roland W. Merwin [1] and Raymond R. Burchett [2]

In 1974 Nebraska's mineral production was valued at $98.6 million, an increase of $17.8 million, or 22%, above that of 1973. The increase was almost entirely accounted for by a $17.1 million increase in the production value of petroleum.

Petroleum and natural gas accounted for 47% of the State's mineral production value in 1974, compared with 36% in 1973. Together, sand and gravel and stone contributed 28% of the total mineral production value, compared with 36% in 1973. The remaining 25% of the State's 1974 mineral production value was accounted for by a substantial production of cement and a relatively minor production of clays, gem stones, lime, and natural gas liquids.

Legislation and Government Programs.—The Nebraska Geological Survey was engaged in geologic and other investigations concerning Nebraska's mineral potential, mineral-related industrial development, and the relationships between mineral development and other land uses. One publication [3] inventoried the State's mining operations within the past half century. Included in this report are tabulations listing past and present mining operations by name, location, ownership, present status, geologic formations mined, use of materials mined, acres disturbed and reclaimed, and type of land treatment following mining. During this period approximately 2,750 quarries, pits, and mines were operated. These operations affected about 29,500 acres of land, more than one-fourth of which have been reclaimed or converted to some useful purpose.

The mining industries in Nebraska continued to be actively engaged in reclaiming land disturbed by mining activities. In 1974 mining activities affected 1,253 acres of which 433 acres were restored. In addition, 911 acres were reclaimed at inactive and abandoned mines.

The Nebraska Geological Survey continued with its long-range program of field mapping with subsequent publication of quadrangle maps showing geology and bedrock outcrops on a scale of 1:250,000. Maps covering the Lincoln-Nebraska City and Grand Island quadrangles were published, and the map of the Fremont-Omaha quadrangle was being printed. Field mapping was in progress for the Sioux City, McCook, North Platte, and Scotts Bluff quadrangles. The survey also continued evaluating the State's mineral resources utilizing remote sensing by aircraft and satellite imagery as the primary sources of information and initiated a study on the coal resources of Nebraska.

[1] Supervisory physical scientist, Division of Nonmetallic Minerals.
[2] Research geologist, Nebraska Geological Survey.
[3] Burchett, R.R., and D.A. Eversoll. Inventory of Mining Operations in Nebraska. Nebr. Geol. Survey Res. Rept. 7, 1974, 272 pp.

Table 1.—Mineral production in Nebraska [1]

Mineral	1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- thousand short tons --	158	$286	182	$414
Gem stones ----------	NA	11	NA	W
Lime ---------- thousand short tons --	31	651	36	591
Natural gas ---------- million cubic feet --	3,836	698	2,538	863
Petroleum (crude) ----- thousand 42-gallon barrels --	7,240	28,035	6,611	45,167
Sand and gravel ---------- thousand short tons --	15,906	18,366	13,231	17,727
Stone ---------- do ----	5,368	10,958	4,630	10,364
Value of items that cannot be disclosed:				
Cement, natural gas liquids and values indicated by symbol W ----------	XX	21,816	XX	23,508
Total ----------	XX	80,821	XX	98,634
Total 1967 constant dollars ----------	XX	59,250	XX	p 47,167

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

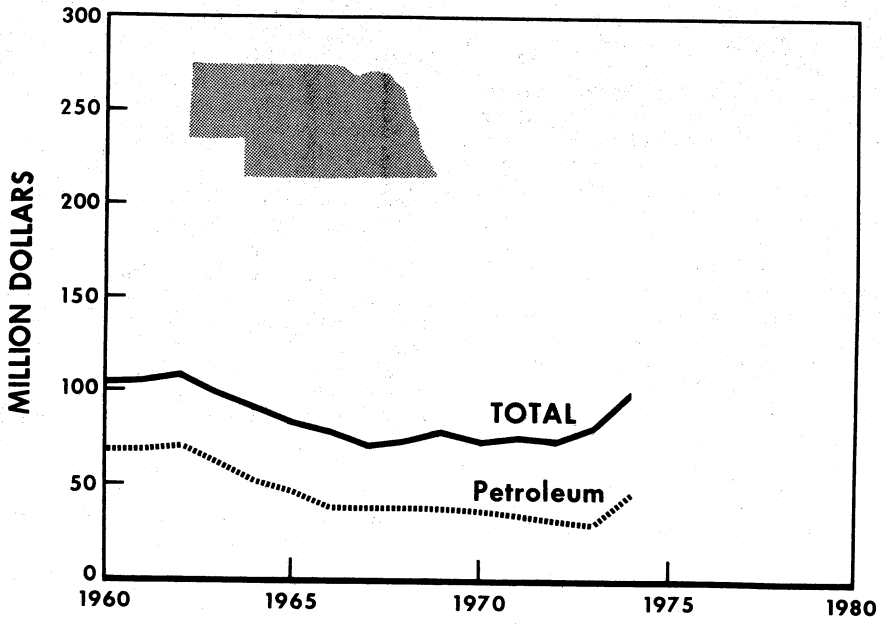

Figure 1.—Value of petroleum and total value of mineral production in Nebraska.

Table 2.—Value of mineral production in Nebraska, by county [1 2]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	W	W	Sand and gravel.
Antelope	$108	$111	Do.
Banner	W	W	Petroleum, sand and gravel, natural gas.
Boyd	--	61	Sand and gravel.
Brown	W	W	Do.
Buffalo	586	431	Do.
Burt	--	6	Do.
Butler	W	346	Do.
Cass	21,540	22,045	Cement, stone, sand and gravel, clays.
Cedar	238	232	Sand and gravel.
Chase	W	W	Do.
Cherry	W	W	Do.
Cheyenne	7,988	12,777	Petroleum, natural gas liquids, natural gas, sand and gravel.
Clay	W	W	Sand and gravel.
Colfax	128	152	Do.
Cuming	W	749	Do.
Custer	128	263	Do.
Dawes	--	W	Do.
Dawson	467	644	Do.
Deuel	W	W	Natural gas, sand and gravel.
Dixon	W	W	Sand and gravel, stone.
Dodge	987	714	Sand and gravel.
Douglas	W	W	Sand and gravel, clays.
Dundy	11	W	Petroleum, sand and gravel.
Fillmore	152	177	Sand and gravel.
Franklin	124	149	Do.
Frontier	W	339	Petroleum, sand and gravel, natural gas.
Furnas	59	W	Sand and gravel, petroleum.
Gage	W	W	Sand and gravel, stone.
Garden	W	W	Petroleum, sand and gravel.
Garfield	W	W	Sand and gravel.
Grant	--	6	Do.
Greeley	--	W	Do.
Hall	614	574	Do.
Hamilton	23	W	Do.
Harlan	W	W	Petroleum, sand and gravel.
Hayes	W	W	Sand and gravel.
Hitchcock	678	W	Petroleum, sand and gravel.
Holt	190	218	Sand and gravel, stone.
Hooker	--	9	Sand and gravel.
Howard	W	W	Do.
Jefferson	--	W	Sand and gravel, clays.
Kearney	38	124	Sand and gravel.
Keith	W	178	Do.
Keya Paha	3	7	Do.
Kimball	5,897	9,252	Petroleum, natural gas liquids, natural gas, sand and gravel.
Knox	203	155	Sand and gravel.
Lancaster	W	276	Stone, clays, sand and gravel.
Lincoln	132	W	Sand and gravel, petroleum.
Loup	W	W	Sand and gravel.
McPherson	W	--	
Madison	291	W	Sand and gravel.
Merrick	W	W	Do.
Morrill	W	2,834	Petroleum, sand and gravel, lime, natural gas.
Nance	W	W	Sand and gravel.
Nemaha	W	W	Stone.
Nuckolls	W	W	Cement, sand and gravel, stone.
Otoe	W	W	Clays, stone.
Pawnee	W	W	Stone.
Perkins	W	W	Sand and gravel.
Phelps	W	W	Do.
Pierce	159	107	Do.
Platte	1,049	992	Do.
Polk	W	122	Do.
Red Willow	8,887	W	Petroleum, sand and gravel.
Richardson	W	534	Petroleum, stone, sand and gravel.
Rock	2	W	Sand and gravel.
Saline	W	W	Do.
Sarpy	1,519	W	Stone, sand and gravel, clays.
Saunders	W	W	Sand and gravel, stone.

See footnotes at end of table.

Table 2.—Value of mineral production in Nebraska, by county [1] [2]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Scotts Bluff	W	$2,567	Petroleum, lime, sand and gravel, natural gas.
Seward	W	W	Stone.
Sheridan	$16	W	Sand and gravel.
Stanton	W	W	Do.
Thayer	371	345	Do.
Thomas	52	W	Do.
Valley	W	W	Do.
Washington	W	W	Stone.
Webster	W	165	Sand and gravel.
Wheeler	W	W	Do.
York	33	111	Do.
Undistributed [3]	28,147	40,864	
Total [4]	80,821	98,634	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Arthur, Blaine, Boone, Box Butte, Dakota, Gosper, Johnson, Logan, Sherman, Sioux, Thurston, and Wayne.

[2] Values of petroleum and natural gas (1974) are based on the average prices per barrel and cubic foot, respectively, for the State.

[3] Includes some sand and gravel (1973) which cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Nebraska business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands --	688.9	NA	NA
Unemployment ---- do ----	22.7	NA	NA
Employment (nonagricultural) ---- do ----	536.8	553.1	+3.0
Mining ---- do ----	1.6	1.7	+6.3
Construction ---- do ----	29.3	30.1	+2.7
Manufacturing ---- do ----	91.1	92.3	+1.3
Government ---- do ----	111.2	114.8	+3.2
Other nonagricultural employment -- do ----	303.7	314.1	+3.4
Personal income:			
Total ---- millions --	$8,121	$7,526	−7.3
Per capita ----	$5,299	$4,877	−8.0
Construction activity:			
Value of nonresidential construction - millions --	$102.2	$148.9	+45.7
Number of new housing units ----	10,207	7,004	−31.4
Cement shipments to and within Nebraska thousand short tons --	1,206	1,130	−6.3
Farm marketing cash receipts ---- millions --	$4,020.3	NA	NA
Mineral production value ---- do ----	$80.8	$98.6	+22.0

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Cement manufacturing contributed significantly to Nebraska's mineral production in 1974. The output decreased moderately in quantity and increased slightly in value compared with that of 1973. Cement was produced by Ash Grove Cement Co. in Cass County, and by Ideal Basic Industries, Inc. in Nuckolls County. The chief raw materials used were limestone, common clay and shale, and gypsum. Disposition of output was to ready-mix companies 61%, highway contractors 20%, concrete product manufacturers 10%, building dealers 5%, and other contractors 4%. Distribution of shipments was 57% by truck and 43% by railroad. The apparent consumption of portland cement in Nebraska was 1,115,000 tons, 6% below that of 1973. The apparent consumption of masonry cement was 15,000 tons, 5% above that of 1973.

Clays.—Common clay and shale was produced at six operations by Ash Grove Cement Co. in Cass County, Endicott Clay Products in Jefferson County, Omaha Brick Works in Douglas and Sarpy Counties, Western Brick & Aggregate Co. in Otoe County, and Yankee Hill Brick Manufacturing Co. in Lancaster County. Output increased by 15% in quantity and 45% in value over that of 1973 and was used for face brick 51%, lightweight aggregate 27%, cement manufacturing 21%, and common brick 1%.

Fertilizer Materials.—Three of the four ammonia producers in Nebraska also had urea and ammonium nitrate production facilities. These were Allied Chemical Co. in Sarpy County, CF Industries Inc. in Dodge County, and Phillips Chemical Co. in Gage County. Farmland Industries Inc. produced ammonia at a plant in Adams County. In addition, Cominco-American Inc. produced ammonium nitrate at a plant in Gage County.

Lime.—Great Western Sugar Co. produced lime at four plants in Morrill and Scotts Bluff Counties. The output, used solely for sugar refining, increased 16% over that of 1973, but declined 9% in value. Total consumption of lime in Nebraska, including that received from outside the State, was 67,014 tons, an increase of 17% over that of 1973.

Perlite.—W.R. Grace & Co. received crude perlite from outside the State and expanded it at a plant in Douglas County. The output increased moderately in quantity and substantially in value over that of 1973. The major use of the finished product was as insulation material.

Sand and Gravel.—Sand and gravel accounted for 18% of the State's mineral production value in 1974. Output decreased 17% in quantity and 3% in value below that of 1973.

Sand and gravel was produced in 75 counties, by 134 companies at 208 commercial operations and by 26 government organizations at 31 operations. Twenty eight large operations with individual outputs of more than 100,000 tons accounted for 50% of the State's total sand and gravel production by quantity. The leading producers were Central Sand & Gravel Corp., Hartford Sand & Gravel Co., Lyman-Richey Sand & Gravel Corp., and Western Sand & Gravel Co. Together, their 28 operations accounted for 39% of the State's output by quantity and 43% by value.

Commercial uses of sand and gravel accounted for 53% of the output by quantity and 55% by value. The remainder of the production was used in publicly funded projects. The combined major uses by quantity were for highway and bridge construction 28%, road and roadbase material 21%, and residential and nonresidential construction 14%. A more detailed breakdown of uses by both quantity and value is shown in tables 6 and 7. Transportation of sand and gravel output was 84% by truck and 15% by railroad; 1% was moved by other methods or was used at pit site.

Table 4.—Nebraska: Sand and gravel sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Antelope	3	107	108	3	86	111
Banner	2	57	W	2	47	W
Boyd	--	--	--	1	42	61
Buffalo	9	633	586	8	556	431
Burt	--	--	--	1	11	6
Butler	3	261	W	4	234	346
Cass	3	500	662	4	496	667
Cedar	5	225	238	5	164	232
Chase	3	46	W	2	W	W
Cherry	1	W	W	2	30	W
Cheyenne	2	W	136	3	192	273
Clay	2	W	W	3	W	W
Colfax	5	114	128	4	95	152
Cuming	3	645	W	4	530	749
Custer	4	121	128	4	134	263
Dawson	5	527	467	7	549	644
Dodge	8	625	987	4	505	714
Douglas	10	2,909	3,439	7	2,118	3,224
Dundy	1	2	2	1	W	W
Fillmore	1	98	152	1	W	177
Franklin	3	126	124	3	113	149
Furnas	4	44	49	4	82	123
Gage	4	45	47	8	179	402
Grant	--	--	--	1	1	6
Hall	6	702	614	9	585	574
Hamilton	1	46	23	3	W	W
Hitchcock	4	59	48	4	41	42
Holt	7	284	190	11	204	203
Hooker	--	--	--	1	2	9
Jefferson	4	W	W	4	W	W
Kearney	1	51	38	1	W	124
Keith	3	W	W	5	249	178
Keya Paha	1	3	3	1	W	7
Kimball	6	61	57	5	W	W
Knox	5	187	203	7	132	155
Lincoln	7	176	132	9	309	246
Madison	5	242	291	4	W	W
Morrill	3	W	W	4	209	259
Phelps	1	234	W	2	W	W
Pierce	4	146	159	3	61	107
Platte	8	652	1,049	8	609	992
Polk	2	W	W	4	108	122
Red Willow	5	135	W	7	143	236
Rock	1	2	2	1	W	W
Saline	3	80	W	3	101	W
Sarpy	4	655	W	4	219	245
Saunders	3	1,271	W	3	1,323	1,806
Scotts Bluff	4	338	295	6	338	327
Sheridan	1	14	16	2	W	W
Thayer	4	336	370	5	224	345
Thomas	1	47	52	1	W	W
Webster	3	W	W	3	144	165
York	1	15	33	1	44	111
Undistributed [1]	35	3,087	7,539	32	2,026	2,749
Total [2]	214	15,906	18,336	239	13,231	17,727

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes Adams, Brown, Dawes (1974), Deuel, Dixon, Frontier (1974), Garden, Garfield, Greeley (1974), Harlan, Hayes, Howard, Lancaster, Loup, McPherson (1973), Merrick, Nance, Nuckolls (1974), Perkins, Richardson, Stanton, Valley and Wheeler Counties, and some sand and gravel that cannot be assigned to specific counties.

[2] Data may not add to totals shown because of independent rounding.

Table 5.—Nebraska: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	15,906	18,366	4,979	5,769
Gravel			7,677	11,136
Unprocessed: Sand and gravel			525	521
Industrial:				
Sand	W	W	50	266
Gravel			--	--
Total	15,906	18,366	13,231	17,692

W Withheld to avoid disclosing individual company confidential data; included with "Construction" (1973).

[1] Value data may not be directly comparable to those in tables 1, 6, and 7 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 6.—Nebraska: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction	12,512	14,805	1,735	2,034
Highway and bridge construction			894	1,356
Other uses (dams, waterworks, airports, etc.)			242	276
Concrete products (cement blocks, bricks, pipe, etc.)			1,358	1,750
Bituminous paving (asphalt and tar paving)			717	1,109
Roadbase and subbase			1,141	1,925
Unprocessed aggregate			247	380
Fill	759	556	548	556
Other uses [2]	1,127	1,133	134	178
Industrial sand and gravel	W	W	50	266
Total [3]	14,397	16,493	7,061	9,880

W Withheld to avoid disclosing individual company confidential data; included with "Other uses" (1973).

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes railroad ballast and miscellaneous (1973).

[3] Data may not add to totals shown because of independent rounding.

Table 7.—Nebraska: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	942	884	100	142
Highway and bridge construction			2,795	3,682
Other uses (dams, waterworks, airports, etc.)			53	52
Concrete products (cement blocks, bricks, pipe, etc.)			W	W
Bituminous paving (asphalt and tar paving)			1,149	1,481
Roadbase and subbase			1,693	2,367
Unprocessed aggregate			278	141
Fill	187	363	96	71
Other	380	626	6	11
Total	1,509	1,873	6,170	7,897

W Withheld to avoid disclosing individual company confidential data; included with "Bituminous paving."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Stone accounted for 11% of the State's mineral production by value. Output decreased 14% in quantity and 5% in value below that of 1973.

Production was entirely in the form of crushed and broken limestone. It was produced in 14 counties by 16 commercial producers with 28 quarries and by the Lancaster County Highway Department quarry. Four large quarries with individual outputs of more than 400,000 tons accounted for 63% of the State's total stone production by quantity. In Cass County, six companies with eight quarries produced 65% of the stone by quantity and 61% by value. The leading stone producers by quantity were Ash Grove Cement Co., Fort Calhoun Stone Co., Hopper Bros. Quarries, and Kerford Limestone Co. Together, their 14 operations accounted for 82% of the stone production by quantity and 65% by value.

The major uses for crushed and broken stone were for cement manufacture, bituminous and concrete aggregate, and surface treatment aggregate. Together, these uses accounted for 73% of that sold or used. Transportation was by truck 80%, railroads 16%, and waterway 4%.

Table 8.—Nebraska: Limestone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone, total	(1)	5	--	--
Crushed and broken stone:				
Dense-graded roadbase stone	632	1,277	353	737
Surface treatment aggregate	992	2,227	W	W
Agricultural purposes [2]	186	W	311	1,799
Unspecified construction aggregate and roadstone	W	W	126	289
Riprap and jetty stone	747	1,674	283	831
Other uses [3]	2,810	5,775	3,558	6,708
Total [4]	5,368	10,953	4,630	10,364
Grand total [4]	5,368	10,958	4,630	10,364

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Less than ½ unit.
[2] Includes agricultural limestone, poultry grit and mineral food.
[3] Includes stone used in bituminous aggregate, concrete aggregate, cement manufacture, asphalt and other filler (1973), railroad ballast (1974), and a minor amount of whiting (1974).
[4] Data may not add to totals shown because of independent rounding.

Talc.—Cyprus Mines Corp. produced ground talc at a plant in Hall County using crude talc obtained from outside the State. The output increased moderately in quantity and substantially in value over that of 1973. The product was used in the manufacture of ceramics, insecticides, paint, paper, rubber, textiles, and toilet preparations.

Vermiculite.—W. R. Grace & Co. produced exfoliated vermiculite at a plant in Douglas County, using crude vermiculite obtained from outside the State. Output decreased moderately below that of 1973 in both quantity and value. Principal uses of the finished material were as block insulation, concrete aggregate, fireproofing, and loose-fill insulation.

MINERAL FUELS

Reflecting an upsurge in mineral fuels activities, the Nebraska Oil and Gas Conservation Commission issued 325 permits to drill for oil and gas in 1974, compared with 228 permits in 1973. Of these, 129 were for development wells, 195 were for exploratory wells, and one was for a stratigraphic test. Permits were issued in 21 counties with 186 permits being issued in Banner, Cheyenne, and Kimball Counties.

There were 230 oil and gas well drilling completions in Nebraska in 1974 with a total footage drilled of 1,189,152 feet, compared with 163 completions in 1973 with a footage drilled of 829,315 feet. Of the total wells completed in 1974, 45 were productive and 185 were dry. Completions were reported in 22 counties with Banner, Cheyenne, and Kimball Counties accounting for 139 of the total completions.

At yearend 1974, there were 1,152 active oil and gas wells in Nebraska and 472 capped wells. Of the total active wells, 992 were in Banner, Cheyenne, Kimball, and Red Willow Counties.

Table 9.—Nebraska: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Antelope	--	--	--	--	--	1	1	4,663
Banner	4	--	13	2	--	29	48	303,409
Box Butte	--	--	--	--	--	1	1	4,340
Cherry	--	--	--	--	--	1	1	4,040
Cheyenne	9	2	14	3	1	26	55	271,295
Dawes	--	--	--	--	--	1	1	2,146
Deuel	--	--	--	--	1	7	8	30,112
Douglas	--	--	--	--	--	1	1	1,257
Dundy	1	--	--	1	--	1	3	13,538
Frontier	--	--	--	--	--	1	1	4,200
Furnas	--	--	--	--	--	3	3	10,530
Garden	--	--	--	--	--	3	3	10,996
Hayes	--	--	--	--	--	2	2	8,768
Hitchcock	5	--	4	1	--	5	15	63,946
Keith	--	--	--	--	--	2	2	7,130
Kimball	4	--	9	3	1	19	36	234,645
Lincoln	--	--	--	--	--	1	1	4,753
Morrill	--	--	3	2	--	19	24	107,404
Red Willow	2	--	--	1	--	5	8	27,583
Richardson	2	--	--	--	--	1	3	7,240
Scotts Bluff	--	--	3	--	--	8	11	57,977
Sioux	--	--	--	--	--	2	2	9,185
Total	27	2	46	13	3	139	230	1,189,152

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 10.—Nebraska: Number of active and capped oil and dry gas wells at yearend, by county

County	Oil wells		Dry gas wells	
	Active	Capped	Active	Capped
Banner	165	72	--	--
Cheyenne	235	50	17	2
Deuel	--	--	7	3
Dundy	3	--	--	--
Frontier	8	3	--	--
Furnas	--	3	--	--
Garden	1	1	--	--
Harlan	8	--	--	--
Hitchcock	35	22	--	--
Kimball	277	150	1	--
Lincoln	1	--	--	--
Morrill	53	20	--	--
Red Willow	297	120	--	--
Richardson	14	21	--	--
Scotts Bluff	30	5	--	--
Total	1,127	467	25	5

Source: Nebraska Oil and Gas Conservation Commission.

Natural Gas.—The marketed production of natural gas in 1974 decreased by 34% in quantity below that of 1973, but the value of the output increased by 24%. The average unit sales price for marketed natural gas increased from 18 cents per thousand cubic feet in 1973 to 34 cents per thousand cubic feet in 1974. Production of dry and casing-head gas was reported in seven counties; Cheyenne County was the major producer.

Natural Gas Liquids.—Natural gasoline and cycle products and liquid petroleum gases were produced in Cheyenne and Kimball Counties. The outputs of these products declined slightly in quantity but increased substantially in total value as compared to those in 1973.

Petroleum.—Crude petroleum was again the principal mineral commodity produced in the State, accounting for 46% of total mineral production value in 1974. The

output decreased by 9% in quantity compared with that in 1973, but the total value increased by 61%. The reported unit sales value of crude petroleum increased 76% from $3.87 per barrel in 1973 to $6.83 per barrel in 1974.

Production was reported in 14 counties, with Banner, Cheyenne, Kimball, and Red Willow Counties accounting for 85% of the total output. The State's largest producing field, the Sleepy Hollow field in Red Willow County, produced 20% of the total. Twenty-four smaller fields accounted for an additional 34% of the output.

Table 11.—Nebraska: Crude petroleum production, by county
(Thousand 42-gallon barrels)

County	1973	1974	Principal fields
Banner	909	854	Singleton, Stage Hill,[1] Johnson.
Cheyenne	1,696	1,547	Jormar, Margate, Southwest Sidney, West Engelland, Filon.
Dundy	2	12	East Indian Creek, Rock Canyon.
Frontier	55	45	Bed Canyon.[2]
Furnas	3	2	Southwest Wilsonville.
Garden	9	7	Richards and McCord.
Harlan	23	22	South Alma.
Hitchcock	163	218	Reiher.
Kimball	1,356	1,258	Sloss, Enders, Axial, Bertramson.
Lincoln	--	2	Red Willow Creek.
Morrill	428	362	Bridgeport.
Red Willow	2,250	1,985	Sleepy Hollow, Ackman, Danbury, Bed Canyon.[2]
Richardson	43	42	Dawson, Falls City, Barada.
Scotts Bluff	303	254	Cedar Valley, Stage Hill,[1] Minatare.
Total	7,240	[3]6,611	

[1] Partly in Banner and Scotts Bluff Counties.
[2] Partly in Frontier and Red Willow Counties.
[3] Data may not add to totals shown because of independent rounding.

Source: Nebraska Oil and Gas Conservation Commission.

Table 12.—Nebraska: Crude oil production in the 25 largest fields in 1974
(42-gallon barrels)

Field	County	Annual output	Average daily output
Sleepy Hollow	Red Willow	1,313,104	3,598
Ackman	---- do	180,091	493
Silver Creek	---- do	179,892	493
Jormar	Cheyenne	161,704	443
Bush Creek	Hitchcock	124,930	342
Pecos	Cheyenne	124,897	342
Southwest Sidney	---- do	113,363	311
Cedar Valley	Scotts Bluff	112,412	308
Singleton	Banner	107,355	294
Margate	Cheyenne	101,513	278
Stage Hill	Banner and Scotts Bluff	99,655	273
Danbury	Red Willow	92,150	252
Bridgeport	Morrill	91,794	251
Middle Creek	Cheyenne and Morrill	83,541	229
Midway	Red Willow	79,690	218
Sloss	Kimball	75,724	207
Joyce	Banner	74,577	204
S. E. Johnson	Cheyenne	68,536	188
Johnson	Banner	64,083	176
Reiher	Hitchcock	61,680	169
West Engelland	Cheyenne	55,390	152
Doran	---- do	55,037	151
Bed Canyon	Frontier and Red Willow	54,421	149
Enders	Kimball	52,960	145
Filon	Cheyenne	52,922	145

Source: Nebraska Oil and Gas Conservation Commission.

METALS

The Omaha refinery of American Smelting and Refining Co. (ASARCO) recovered antimony, bismuth, gold, lead, and silver from out-of-State smelter products.

Table 13.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Ash Grove Cement Co.[1 2]	1000 Tenmain Center Kansas City, Mo. 64105	Plants	Cass.
Ideal Basic Industries, Inc.[1]	420 Ideal Cement Bldg. Denver, Co. 80202	do	Nuckolls.
Clays:			
Endicott Clay Products Co	Endicott, Nebr. 68350	Open pit mine and plant.	Jefferson.
Western Brick & Aggregate Co	Box 1141 Nebraska City, Nebr. 68410	do	Otoe.
Yankee Hill Brick Manufacturing Co.	Route 1 Lincoln, Nebr. 68502	do	Lancaster.
Natural gas and petroleum: [3]			
Sand and gravel:			
Behrens Construction Co	Box 118 Beatrice, Nebr. 68310	Pits and plants	Gage and Saline.
Central Sand & Gravel Corp	Box 626 Columbus, Nebr. 68601	Dredging	Butler, Hall, Madison, Pierce, Platte.
Hartford Sand & Gravel Co	Box 571 Valley, Nebr. 68064	Dredging and pits.	Dodge and Douglas.
Lyman-Richey Sand & Gravel Corp.	4315 Cuming St. Omaha, Nebr. 68131	Pits and plants	Cass, Dodge, Douglas, Morrill, Platte, Sarpy, Saunders.
Western Sand & Gravel Co	Lincoln, Nebr. 68501	Dredging	Saunders.
Stone:			
City Wide Rock & Excavation Co.	38th and Mason Sts. Omaha, Nebr. 68105	Quarries and plants.	Sarpy.
Fort Calhoun Stone Co	1255 South St. Blair, Nebr. 68008	do	Washington.
Hopper Bros. Quarries	Weeping Water, Nebr. 68463	do	Cass, Nemaha, Pawnee, Saunders.
Kerford Limestone Co	Box 434 Weeping Water, Nebr. 68463	Quarry and plant.	Cass.
United Rock Construction, Inc	1117 Woodman of the World Bldg. Omaha, Nebr. 68102	do	Do.

[1] Also stone.
[2] Also clay.
[3] Most of the major oil and gas companies and many smaller companies operate in Nebraska, and several commercial directories contain lists of them.

The Mineral Industry of Nevada

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, United States Department of the Interior, and the Nevada Bureau of Mines for collecting information on all minerals.

By Paul V. Fillo [1]

The value of Nevada's mineral output reached $257.9 million compared with $201.8 million in 1973. Production value of metals as a group increased 33%, nonmetals increased 15%, and mineral fuels (petroleum) increased 33%. Gold production increased significantly and lead and zinc were added to the State's metal output. With copper production down 10%, its portion of the State's total mineral production value slipped from 55% in 1973 to 50% in 1974.

Of the 16 nonmetallic materials, 8 showed an increase in production, 7 showed a decrease, and 1 was essentially unchanged. Substantial percentage gains were made by lithium minerals and barite, while gypsum and sand and gravel showed large declines.

Trends and Developments.—Exploration in Nevada for precious and base metals continued in 13 of the 17 counties. The Anaconda Co. started to develop its open pit copper mine, the Victoria mine, located 97 miles north of Ely, in the first part of 1974. The ratio of waste to ore is estimated at five to one, and an underground operation is considered in Anaconda's long-range program. Simultaneously, a concentrator is under construction and will be capable of processing 1,000 tons of ore per day. Concentrates will be trucked to Wendover, Utah, then shipped by rail to Anaconda, Mont. The mill is scheduled for operation by February of 1975.

Copper Range Exploration Co., in a joint venture with Felmont Oil Corp., will reactivate the former Nevada Porphyry gold mining property near Round Mountain. Construction is to get underway in late 1974 and a target date of 1976 has been set for start of production from the property. Silver King Mines, Inc., continued work in the Tybo and Taylor silver districts. Other companies were active in gold and silver exploration and development at Silver Peak, the Gooseberry mine in Storey County, the Divide mining district in Esmeralda County, and in Churchill, Clark, Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Nye, Pershing, and White Pine Counties.

Placer Amex, Inc., San Francisco, Calif., and Mineral Exploration Co., Ltd., Tucson, Ariz., have announced that they plan to place into production the McDermitt mercury property in northern Humboldt County, Nev.

The Apco Co. renovated their 100-ton cyanide plant southwest of the Duval Copper operation near Battle Mountain for their silver mine. The company purchased one-half interest in the Gooseberry mine in Storey County. Cortez Gold Mine reactivated their own Cortez open pit while their mining continues at the Gold Acres mine. A consortium of Canadian companies is conducting an intensive sampling and drilling program on gold placer deposits in the Manhattan area.

Cordex Exploration Co. is working toward developing a large tonnage of low-grade gold and silver ore suitable for large-scale open pit operations at the Tonopah Hasbrouck mine in the Divide mining district of Esmeralda County. Sampling

[1] State Liaison Officer, Bureau of Mines, Carson City, Nev.

started in January on underground workings and surface areas and has progressed to a drilling operation.

Kennecott Copper Corp. put the 750-foot stack and air monitoring system into operation at its McGill smelter. Kennecott was granted a 1-year postponement in the applicability of the primary air quality standard to allow the company time to complete an acid plant to process the sulfur dioxide emissions.

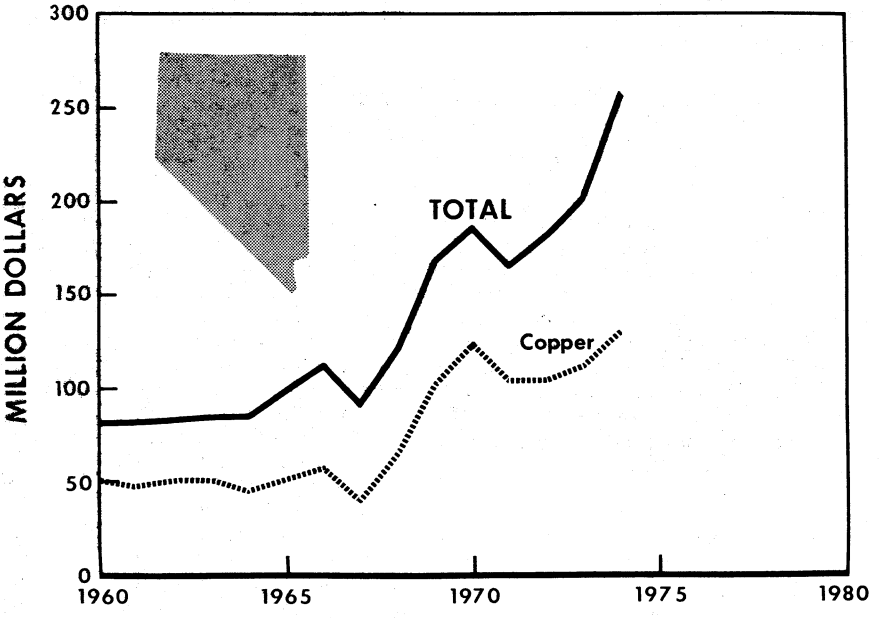

Figure 1.—Value of copper and total value of production in Nevada.

Table 1.—Mineral production in Nevada [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Barite ---- thousand short tons	549	$4,691	761	$8,115
Clays ---- do	36	176	39	218
Copper (recoverable content of ores, etc.) ---- short tons	93,702	111,505	84,101	130,021
Gem stones	NA	142	NA	400
Gold (recoverable content of ores, etc.) ---- troy ounces	260,437	25,473	298,754	47,723
Gypsum ---- thousand short tons	1,154	3,662	843	2,959
Iron ore (usable) ---- thousand long tons, gross weight	119	W	139	W
Lead (recoverable content of ores, etc.) ---- short tons	--	--	1,785	803
Mercury ---- 76-pound flasks	698	200	W	W
Petroleum (crude) ---- thousand 42-gallon barrels	96	W	129	W
Sand and gravel ---- thousand short tons	12,448	14,614	8,736	14,515
Silver (recoverable content of ores, etc.) thousand troy ounces	624	1,595	872	4,108
Stone ---- thousand short tons	3,595	5,429	2,186	4,203
Tungsten (W content) ---- thousand pounds	150	377	132	537
Zinc (recoverable content of ores, etc.) ---- short tons	--	--	3,405	2,445
Value of items that cannot be disclosed: Antimony, cement, diatomite, fluorspar, lime, lithium minerals, magnesite, molybdenum, perlite, pumice, salt, talc, and values indicated by symbol W	XX	33,949	XX	41,829
Total	XX	201,813	XX	257,876
Total 1967 constant dollars	XX	147,949	XX	p 123,316

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of minerals produced in Nevada, by county
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Carson City [1]	W	W	Stone, pumice, sand and gravel.
Churchill	$467	$1,014	Diatomite, sand and gravel, tungsten, salt, stone, silver, gold, zinc.
Clark	19,818	22,778	Lime, sand and gravel, gypsum, stone, tungsten, silver, clays, lead, zinc.
Douglas	W	W	Sand and gravel, stone.
Elko	1,244	4,415	Gold, barite, copper, sand and gravel, stone, tungsten, antimony, silver.
Esmeralda	5,841	W	Lithium, diatomite, clays, talc, sand and gravel, silver, zinc, lead.
Eureka	16,729	24,681	Gold, iron ore, stone, mercury, silver.
Humboldt	W	741	Sand and gravel, stone, copper, lead, silver, clays, zinc, gold.
Lander	27,857	46,595	Copper, gold, barite, silver, lead, zinc.
Lincoln	W	W	Zinc, silver, lead, sand and gravel, perlite, stone, gold, clays.
Lyon	51,643	65,084	Copper, cement, stone, sand and gravel, gypsum, silver, gold.
Mineral	W	W	Tungsten, sand and gravel, gold, silver, stone, copper, lead.
Nye	3,511	4,592	Magnesite, barite, petroleum, fluorspar, pumice, sand and gravel, gold, tungsten, clays, silver.
Pershing	8,019	8,817	Diatomite, copper, gypsum, iron ore, antimony, mercury, sand and gravel, clays, silver, gold, perlite, tungsten, lead, zinc.
Storey	W	W	Diatomite, stone, sand and gravel.
Washoe	W	4,343	Sand and gravel, stone, pumice, clays.
White Pine	58,849	W	Copper, gold, silver, lime, molybdenum, stone, sand and gravel, clays, tungsten.
Undistributed [2]	7,829	74,810	
Total [3]	201,813	257,876	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Independent city, formerly Ormsby County.
[2] Includes some mercury, sand and gravel that cannot be assigned to specific counties (1973), gem stones, barite, and values indicated by symbol W.
[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Nevada business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	258.4	NA	NA
Unemployed	do	16.0	NA	NA
Employment:				
Mining	do	3.7	4.1	+32.3
Contract construction	do	18.6	16.9	−9.1
Manufacturing	do	11.5	12.3	+7.0
Government	do	41.4	43.0	+3.9
Other	do	169.4	182.1	+7.5
Personal income:				
Total	millions	$3,148	$3,480	+10.5
Per capita		$5,712	$6,073	+6.3
Construction activity:				
Valuation of private authorized nonresidential construction	millions	$159.1	$111.1	−30.2
Total authorized residential units		13,428	5,781	−56.9
Cement shipments to and within Nevada	thousand short tons	467	369	−21
Farm marketing receipts	millions	$147	NA	NA
Mineral production value	do	$202	$258	+27.8

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; and the U.S. Bureau of Mines.

Legislation and Government Programs.—The Army Corps of Engineers released $100,000 to start advance planning on the Humboldt Project in northeastern Nevada. The funds will be used to plan a three-dam project on tributaries of the Humboldt River.

The Federal Register of February 26, 1974, contained an announcement of a proposed withdrawal from mineral entry of approximately 1,583,000 acres in the Desert National Wildlife Range, Clark and Lincoln Counties. An additional 70,000 acres was also requested for withdrawal from the aforementioned two counties to enlarge the Desert National Wildlife Range.

The Bureau of Land Management (BLM) announced that approximately 3,800 acres of privately owned land in Nevada was reconveyed to the Federal Government and that these lands will be subject to most public land laws including mining and mineral leasing laws. BLM also reported that applications for oil and gas leases tripled in 1974.

Nevada received $432,772 in bonuses, royalties, and rentals covering mineral leases and permits.

The Supreme Court of the State of Nevada upheld an amended provision of the Nevada State mining law that became effective July 1, 1971, which required claim maps of all new mining claims and those already existing be filed with the county recorder. The constitutionality of the provision was successfully challenged in trial court on the grounds that the mapping requirements were in violation of and inconsistent with the discovery requirements of the federal law. The Supreme Court, however, ruled the mapping provision does not violate federal laws, but merely places an additional burden on the claimant that is within the State's prerogative.

Under the Office of Minerals Exploration (OME) program, the U.S. Geological Survey had two active contracts in Nevada during 1974, the New Pass mine and the Mardon mine. The contract for the New Pass mine was completed during the year. The original contract for the Mardon mine was completed and, with an amendment, additional funding was granted to complete their exploration work. No new applications for Nevada were approved during the year owing to lack of funds.

With increases in the prices of silver and gold, an interest has developed in research being conducted on precious metals. Projects conducted at the Bureau of Mines Reno Metallurgy Research Center oriented to the recovery of silver and gold from low-grade ores or mill wastes had a particularly strong appeal. Research continued on electrooxidation techniques for gold and molybdenum and hydrometallurgical processes for treating lead-zinc concentrates without causing environmental degradation.

Other projects included aqueous chlorination to extract lead, zinc, and silver values, followed by electro-winning and the nitric acid leaching of uranium from refractory carbonaceous flotation concentrate produced from acid leach tailings. Studies also continued on flux smelting of ilmenite as a means for controlling pollution problems when manufacturing pigments by the sulfate process.

The Reno Metallurgy Research Center furnished service assistance to the miniplant at the Boulder City Metallurgy Research Laboratory in producing alumina from clay. The main project at the Boulder City station was the mini pilot plant for nitric acid leaching of alumina from clay. Eight commercial metal producers have joined the Bureau of Mines as cosponsors in research on extracting aluminum from domestic materials to ease dependence on imports. Tests were continued on the use of sulfur in paving material, land pollution abatement, and construction materials.

REVIEW BY MINERAL COMMODITIES

METALS

Copper.—Copper output decreased 10% from that of 1973, making the State the Nation's fifth largest copper producer. Most of the output came from operations of The Anaconda Co., Lyon County; Kennecott Copper Corp., White Pine County; and Duval Corp., Lander County. Ranchers Development and Exploration Co. continued to produce cement copper from its Big Mike open pit mine, located 30 miles south of Winnemucca. The walls of the pit were blasted into the center of the pit for an in situ leaching operation that increased production over that of 1973.

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

County	Mines producing		Materials sold or treated [1] (short tons)	Gold		Silver	
	Lode	Placer		Troy ounces	Value	Troy ounces	Value
1972, total	10	3	21,351,069	419,748	$24,597,233	595,351	$1,003,166
1973, total	13	5	24,596,246	260,437	25,473,344	623,660	1,595,324
1974:							
Elko	3	--	139,014	10,830	1,729,984	313	1,474
Esmeralda	1	--	10	--	--	63	297
Lander	5	--	3,495,673	117,173	18,717,215	297,089	1,399,290
Lincoln	1	--	301,688	42	6,709	409,982	1,931,016
Lyon	1	--	10,702,455	251	40,095	10,939	51,523
Mineral	4	--	490	129	20,607	1,451	6,834
Pershing	4	--	201,206	101	16,134	12,987	61,169
White Pine	2	--	7,500,661	20,255	3,235,534	134,764	634,738
Undistributed [2]	9	--	769,098	149,973	23,956,686	4,655	21,925
Total [3]	30	--	23,110,295	298,754	47,722,964	872,243	4,108,266

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1972, total	101,119	$103,545,425	(4)	$31	--	--	$129,145,855
1973, total	93,702	111,504,886	--	--	--	--	138,573,554
1974:							
Elko	W	W	--	--	--	--	W
Esmeralda	--	--	1	273	(4)	$83	653
Lander	W	W	W	W	W	W	W
Lincoln	--	--	1,725	776,314	3,393	2,435,972	5,150,011
Lyon	35,378	54,693,686	--	--	--	--	54,785,304
Mineral	(4)	359	(4)	29	--	--	27,829
Pershing	496	766,121	1	647	1	433	844,504
White Pine	34,198	52,870,529	--	--	--	--	56,740,801
Undistributed [2]	14,030	21,689,956	57	25,828	12	8,546	67,550,904
Total [3]	84,101	130,020,651	1,785	803,091	3,405	2,445,034	185,100,006

W Withheld to avoid disclosing individual company confidential data; included in "Undistributed."
[1] Does not include gravel washed.
[2] Includes Churchill, Clark, Eureka, Humboldt, and Nye Counties combined to avoid disclosing individual company confidential data, and items indicated by symbol W.
[3] Data may not add to totals shown because of independent rounding.
[4] Less than ½ unit.

Gold.—Nevada was the Nation's second largest gold producer in 1974. Carlin Gold Mining Co. in Eureka County and Cortez Gold Mines in Lander County provided most of the production. Value of gold output increased 87% above that of 1973. The quantity produced, however, rose only about 15% mainly because of greater activity at the Carlin gold mine where the company started to mine from two additional properties, the Bootstrap and the Blue Star mines. The balance was produced primarily as a byproduct from copper ores and from 15 small lode mines.

Iron Ore.—Three mines were active in 1974, and usable iron ore production and shipments increased 17% above those of 1973. Direct shipping grade ores were produced by Nevada-Barth Corp., Eureka County, and by Cooney Brothers and Nevada Iron Ore Co., Inc., both in Pershing County.

Lead.—Lead producers in Nevada resumed operations in 1974. Pan American lead-zinc mine in Lincoln County dominated the lead industry in Nevada with 97% of the total output.

Mercury.—Production of mercury decreased from that of 1973. Crofoot Tungsten Co. was the largest producer in the State with its Red Bird mine in Pershing County. The Carlin Gold Mining Co. continued to produce mercury as a byproduct from its gold mine in Eureka County. The McDermitt mine, a joint venture between Mineral Exploration and Placer Amex, is presently under construction near McDermitt, Humboldt County. The new mine will be an open pit and will produce about 20,000 flasks of mercury per year, which is about 50% of domestic primary demand. The mine is scheduled to go on-stream in the spring of 1975.

Molybdenum.—Molybdenum was recovered by Kennecott Copper Corp. as a coproduct of treating copper ores from the Ruth mine in their McGill concentrator, White Pine County. Both production and shipments were substantially lower than in 1973.

Silver.—The production of silver increased 40% and the value increased 158% above those of 1973. Byproduct recovery from gold, copper, and lead ores also was higher, but most of the increase in total output was credited to the Pan American mine. Lead-zinc ores yielded 47% of the total lode silver; copper ores, 46%; silver ores and all other ores, 7%.

Tungsten.—Although the number of producing tungsten properties increased from 7 to 11, the 1974 tungsten production decreased 14%. Shipments decreased by 12%. The difference was in the stocks on hand. Most of the State's output was shipped to the tungsten carbide plant of Kennametal in Churchill County. A small amount was shipped to Union Carbide Corp.'s ammonium paratungstate plant at Pine Creek near Bishop, Calif. Union Carbide Corp. announced its intention to produce about 1,000 tons of tungsten ore per day from the Tempiute mine in Lincoln County to be operational in 1976.

Zinc.—The Pan American lead-zinc mine, Lincoln County, dominated Nevada's zinc industry, yielding almost all of the total zinc recovered during 1974.

NONMETALS

Barite.—Barite production in Nevada, centered in northern Nye County, increased 39% during 1974. With 16 active mines, Nevada was the leading barite-mining State for the year, producing 69% of the total national quantity of the mineral but only 48% of the total value due to transportation costs and distance to markets. Sales of ground barite, including tonnages used by producers, increased 12%. Most of the ground and crushed barite was sold for use in well drilling.

Cement.—Portland cement was produced by Nevada Cement Co. in a dry-process plant at Fernley in Lyon County. Shipments decreased about 1%, but the value increased 6% from those of 1973. Most of the cement was used by ready-mix concrete and concrete products manufacturers, building materials dealers, and highway contractors.

Clays.—Clays were produced from eight operations, one each in Clark, Esmeralda, Humboldt, Lincoln, Nye, Pershing, Washoe, and White Pine Counties. Bentonite was mined by Western Talc Co. from the Francis pit near Apex, Clark County; the Blanco pit near Mina, Esmeralda County; the Hi Hopes mine 15 miles west of Winnemucca, Humboldt County; and the New Discovery pit near Beatty in Nye County. Soil conditioner was produced by Good Earth Corp. near Panaca in Lincoln County. Fire clay was mined from the McDonough clay bed near Ely, White Pine County. Common clay was obtained from a deposit near Flanigan, Washoe County, by

Nevada Cement Co. for use at the company's cement plant in Lyon County. Kelly Moore Paint Co., Inc., mined kaolin near Lovelock in Pershing County. Clays sold or used increased 8.3% in quantity above the 1973 figure.

Diatomite.—Sales of prepared diatomite rose 15% in value above those of 1973. No sales of crude material were reported in 1974. Four deposits were mined, one each in Churchill, Esmeralda, Pershing, and Storey Counties. Major processing plants were operated in Pershing and Storey Counties by Eagle-Picher Industries, Inc., and in Esmeralda County by Grefco, Inc. The Churchill County deposit of Cyprus Diatomite Corp. supplied the company plant in Lyon County. Sales of prepared diatomite, in order of greatest demand, were for filtration, anti-caking agent, fillers, lightweight aggregate, insulation, and abrasives. Eagle-Picher Industries, Inc., reported plans to increase production capacity of diatomaceous earth by 50% at its Lovelock plant.

Fluorspar.—Production and shipments of metallurgical-grade fluorspar were about the same as in 1973, coming from two Nye County mines. J. Irving Crowell, Jr., shipped from the Crowell (Daisy) mine and the Spor Bros. from the Mary mine, formerly owned by Monolith Portland Cement Co. All shipments were made to out-of-State customers.

Gypsum.—Crude gypsum production was 27% lower in quantity than that in 1973. Output was 842,900 tons for use at Nevada and California plants making plaster and board products, and as a retarder in portland cement.

Gypsum was mined by The Flintkote Co., Johns-Manville Products Corp., United States Gypsum Co., and Art Wilson in Clark, Lyon, and Pershing Counties. Flintkote, Johns-Manville, and United States Gypsum calcined gypsum in Clark and Washoe Counties. Output declined 29% to 382,700 tons.

Lime.—Output of lime increased 5% above the 1973 record. Most of the shipments were made to the steel and paper industries; some went into the manufacture of glass. Shipments were made throughout the Western States, but most went to consumers in California.

U.S. Lime Div. of The Flintkote Co. and Weatherly & Morrison Lime Co. produced lime at three plants in Clark and White Pine Counties. Total consumption of lime in Nevada was 52,243 tons.

Lithium Compounds.—The output of lithium carbonate from the Silver Peak facility of Foote Mineral Co. in Esmeralda County increased 22% compared with that of 1973. The company reported that production and sales reached new highs. The use of lithium carbonate as a cell additive in aluminum potlines has clearly become the major market.

Magnesite.—Basic, Inc., produced magnesite from open pit operations near Gabbs in Nye County, and upgraded the ore in nearby processing facilities. Mine production and combined consumption and shipments of all materials were higher than in 1973. Most of the ore was used in the manufacture of refractories and special products.

Perlite.—Crude perlite sales increased slightly in 1974, and no sales of expanded material were reported. Only two mines were active in 1974, Delamar Perlite (Mackie claims) in Lincoln County, and United States Gypsum Co. (Perlite Hill quarry) in Pershing County. The crude perlite was shipped to out-of-State customers. United States Gypsum shipped a small amount of expanded perlite and used it in the company's wallboard plant in Washoe County.

Pumice (Volcanic Cinder).—Output of pumice and volcanic cinder decreased 8% in 1974 compared with that of 1973. Use in concrete admixtures, aggregate, landscaping, and roofing, and use in road construction was down from the 1973 level. Cind-R-Lite mined volcanic cinder from the Cinder Cove deposit southeast of Beatty, Nye County, for landscaping and concrete aggregate use. Volcanic cinder from the Cinderlite Aggregates property of Savage Construction Co., Inc., Carson City, was prepared for use in concrete admixture, road construction, landscaping, and roofing. Pumice from the Rilite Aggregate Co., Washoe County, was prepared for use in concrete aggregate.

Salt.—Solar-evaporated salt was harvested from the surface of a dry lake bed near Sand Springs, Churchill County. The sole salt producer in the State was Huck Salt Co., which leased and operated the Leslie Salt Co. deposit. All of the production was used in Nevada. Most of the output was sold for use in ice control on roads by State, county, and local agencies. Lesser

quantities were used by meat packers, tanners, and dairies.

Sand and Gravel.—Output of sand and gravel was down 29.8% from that of 1973, primarily because of the economic climate of business in general; the number of sand and gravel operations decreased from 103 to 84. Most of the decreased output came from Clark and Washoe Counties.

Table 5.—Nevada: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	12,122	13,001	1,626	2,942
Gravel			6,046	9,692
Unprocessed: Sand and gravel			767	452
Industrial:				
Sand	326	1,613	297	1,381
Gravel			--	--
Total	12,448	14,614	8,736	14,467

[1] Value data may not be directly comparable to that in tables 1, 6, and 7 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 6.—Nevada: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction	6,902	9,730	1,959	3,678
Highway and bridge construction			65	103
Other uses (dams, waterworks, airports, etc.)			30	60
Concrete products (cement blocks, bricks, pipes, etc.)			88	147
Bituminous paving (asphalt and tar paving)			829	1,186
Roadbase and subbase			835	1,204
Unprocessed aggregate			454	352
Fill	940	676	286	307
Other uses [2]	301	376	40	60
Industrial sand and gravel	326	1,613	297	1,381
Total	[3] 8,470	12,395	4,883	8,478

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).
[3] Data do not add to total shown because of independent rounding.

Table 7.—Nevada: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			56	145
Highway and bridge construction			1,160	2,028
Other uses (dams, waterworks, airports, etc.)			W	W
Concrete products (cement blocks, bricks, pipe, etc.)	3,228	1,842	--	--
Bituminous paving (asphalt and tar paving)			778	1,511
Roadbase and subbase			1,441	1,941
Unprocessed aggregate			313	100
Fill	98	51	105	312
Other	651	326	--	--
Total	[2] 3,978	2,219	3,853	6,037

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Data do not add to total shown because of independent rounding.

Stone.—About 2.2 million tons of stone was quarried from 12 established locations, and 81 smaller sales were transacted by the Bureau of Land Management in the State during the year, compared with 3.6 million tons quarried from 20 locations in 1973. The decrease was due mostly to declining demand by the building industry and for material used in road construction. The unit value of material produced this year increased over the unit value of last year, even though production was down.

Most of the limestone was converted to lime or used in cement. Some was also used as a metallurgical flux, primarily in the smelting of copper. Most of the dolomite was used in lime manufacture, and most of the granite and quartzite were used in road construction. Marble was quarried in Mineral County for terrazzo.

Public work crews and contractors produced limestone, granite, and quartzite in several counties for use as riprap, roadbase, and concrete aggregate.

MINERAL FUELS

Petroleum.—The Eagle Springs oilfield continued to be the only producing area in the State. The production was 129,413 barrels compared with 96,472 barrels in 1973, an increase of 34%. The field has yielded a total of 2,853,355 barrels of oil through December 1974. The Nevada Oil and Gas Conservation Commission issued 10 well drilling permits in 1974, 6 more than in 1973. Two of the 10 well permits were drilled and were plugged and abandoned as dry holes.[2]

[2] Source, American Petroleum Institute.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Barite:			
NL Industries, Inc	P.O. Box 1675 Houston, Tex. 77001	Surface mine	Elko.
Dresser Minerals	P.O. Box 375 Battle Mountain, Nev. 89820	do	Lander.
Milchem, Inc	P.O. Box 22111 Houston, Tex. 77027	do	Do.
Cement: Nevada Cement Co.[1]	Fernley, Nev. 89408	Plant	Lyon.
Clays: Kelly-Moore Paint Co	1015 Commercial St. San Carlos, Calif. 94070	Pit	Pershing.
Copper:			
The Anaconda Co.[2]	P.O. Box 1000 Weed Heights, Nev. 89443	Surface mine	Lyon.
Duval Corp.[3]	P.O. Box 451 Battle Mountain, Nev. 89820	do	Lander.
Kennecott Copper Corp.[4]	McGill, Nev. 89318	do	White Pine.
Diatomite:			
Eagle-Picher Industries, Inc	P.O. Box 1869 Reno, Nev. 89505	do	Pershing and Storey.
Cyprus Diatomite Corp	P.O. Box 1201 Trenton, N.J. 08606	do	Churchill.
Fluorspar: J. Irving Crowell, Jr	P.O. Box 96 Beatty, Nev. 89003	Underground mine.	Nye.
Gold:			
Carlin Gold Mining Co.[5]	P.O. Box 979 Carlin, Nev. 89822	Surface mine	Elko and Eureka.
Cortez Gold Mines	Cortez, Nev. 89821	do	Lander.
Gypsum:			
The Flintkote Co.[6]	P.O. Box 127 Henderson, Nev. 89015	do	Clark.
Johns-Manville Products Corp	P.O. Box 14186 Las Vegas, Nev. 89114	do	Do.
United States Gypsum Co.[7]	101 S. Wacker Dr. Chicago, Ill. 60606	do	Pershing.
Iron Ore: Nevada-Barth Corp	P.O. Box 1057 Winnemucca, Nev. 89445	do	Eureka.
Lime:			
Weatherly & Morrison Lime Co.[8]	East Ely, Nev. 89315	Rotary kilns	White Pine.
Lithium: Foote Mineral Co	Silverpeak, Nev. 89047	Dry lake brines	Esmeralda.
Magnesite: Basic, Inc.[9]	Box 4 Gabbs, Nev. 89409	Surface mine	Nye.
Mercury: Crofoot Tungsten Co	P.O. Box 797 Lovelock, Nev. 89419	Underground mine.	Pershing.
Petroleum: Western Oil Lands, Inc.	380 Linden St. Reno, Nev. 89502	Wells	Nye.
Pumice: Rilite Aggregate Co	P.O. Box 5665 Reno, Nev. 89503	Surface mine	Washoe.
Salt: Huck Salt Co	Rt. 2, Box 33 Fallon, Nev. 89406	Solar evaporation plant.	Churchill.
Sand and gravel:			
Robert L. Helms Construction & Development.	P.O. Drawer 608 Sparks, Nev. 89431	Pit	Washoe.
Nevada Aggregates and Asphalt.	P.O. Box 7424 Reno, Nev. 89502	Pit	Do.
Nevada Rock & Sand Co	P.O. Box 2775 Huntridge Station Las Vegas, Nev. 89101	Pit	Clark.
Stewart Brothers Co	do	Pit	Nye.
Wells-Cargo, Inc	P.O. Box 14037 Las Vegas, Nev. 89114	Pit	Do.
W.M.K. Transit Mix, Inc	1606 Industrial Rd. Las Vegas, Nev. 89102	Pit	Do.
Tungsten: Rawhide Mining Co	P.O. Box 378 Fallon, Nev. 89406	Underground mine.	Mineral.

[1] Also clay and stone.
[2] Also gold and silver.
[3] Also gold, silver, and lead.
[4] Also gold, silver, and molybdenum.
[5] Also mercury.
[6] Also lime and stone.
[7] Also perlite.
[8] Also stone.
[9] Sole magnesite producer in the United States.

The Mineral Industry of New Hampshire

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the New Hampshire Department of Resources and Economic Development for collecting information on all minerals except fuels.

By William R. Barton [1] and Glenn W. Stewart [2]

The value of mineral production in New Hampshire declined 3% to $13.7 million compared with $14.1 million in 1973. Sand and gravel and stone represented 99% of the total 1974 production value. The greatest output was concentrated in the most populous counties—Hillsborough, Rockingham, Carroll, and Merrimack. Common clay and gem stones were the only other minerals produced. The quantity of most minerals produced declined; the unit value increases were due to rapid price inflation during 1974.

The New Hampshire Air Pollution Control Commission voted to permit continued burning of higher sulfur fuel oils until May 31, 1975. The variance allowed the burning of 2.0% sulfur fuel oil beyond October 31, 1974, the date when all companies were to have switched to 1.5% sulfur oil.

New Hampshire House Bill 22, to establish a Critical Lands Commission to protect open space, drew about 200 interested persons to a legislative committee hearing. Developers and real estate interests were critical of the zoning powers the bill would put in State hands in place of local authorities. The House defeated the bill by a 212-to-117 vote. Several additional land-use planning bills were being prepared by interested groups for introduction before the legislature early in 1975.

Several key personnel changes were made in the State Government. Marshall Cobliegh, former speaker of the New Hampshire House, was appointed Executive Vice-Chairman of the Governor's Council on Energy replacing Robert Mitchell, who became Director of the Federal Energy Administration Regional Office in Boston. Frederick Goode, Administrative Assistant to Governor Meldrim Thomson, was assigned to coordinate all energy-related functions in the State Government. Daniel Hoik resigned as Director of the New Hampshire Division of Economic Development. He was replaced by Edward J. Bennett.

The Governor announced formation of a New Hampshire Economic Recovery Council. Its declared policies and goals were to (1) promote offshore exploration for oil and gas, (2) encourage the early location of an oil refinery on a New Hampshire site approved by home rule, (3) expedite the construction of the Seabrook Nuclear Plant, (4) encourage research and development through institutions of higher learning on solar, breeder reactor, and gasification sources of energy, and (5) support Federal efforts to develp new energy sources.

The Department of Resources and Economic Development, Office of the New Hampshire State Geologist, published one bulletin in 1974—"Surficial Geology of the Ossipee Lake Quadrangle" by Robert M. Newton. According to a Bureau of

[1] Liaison Officer, Bureau of Mines, Newmarket, N.H.
[2] State geologist, Department of Resources and Economic Development, Durham, N.H.

Mines report[3] only 0.09% of New Hampshire's land has been utilized for mining, and that 30% of the land so disturbed has already been reclaimed. The respective national averages are 0.16% and 40.0%. The less than average land disturbance in New Hampshire reflects its rank as 48th among the 50 States in mineral production.

[3] Information Circular 8642, "Land Utilization and Reclamation in the Mining Industry, 1930–71" by James Paone, John L. Morning, and Leo Giorgetti.

Table 1.—Mineral production in New Hampshire[1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons	43	$64	34	$55
Gem stones	NA	42	NA	42
Sand and gravel ---- thousand short tons	7,795	8,597	6,126	8,223
Stone ---- do	1,836	5,416	590	5,371
Total	XX	14,119	XX	13,691
Total 1967 constant dollars	XX	10,351	XX	p 6,547

p Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in New Hampshire, by county
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Belknap	W	$654	Sand and gravel, stone.
Carroll	$1,395	1,157	Do.
Cheshire	W	894	Do.
Coos	547	451	Do.
Grafton	815	655	Sand and gravel, stone, clays.
Hillsborough	3,558	W	Stone, sand and gravel.
Merrimack	2,057	W	Sand and gravel, stone.
Rockingham	W	W	Stone, sand and gravel, clays.
Strafford	553	W	Sand and gravel, clays.
Sullivan	W	373	Sand and gravel, stone.
Undistributed[1]	5,193	9,506	
Total[2]	14,119	13,691	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes gem stones, and values indicated by symbol W.
[2] Data may not add to total shown because of independent rounding.

Table 3.—Indicators of New Hampshire business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands	328.6	334.9	+1.9
Unemployment ---- do	12.7	16.3	+28.3
Employment:			
Manufacturing ---- do	95.8	95.0	−0.8
Mining ---- do	0.4	0.4	−0.0
Construction ---- do	16.6	17.9	+7.8
Services ---- do	52.7	53.3	+1.1
Government ---- do	43.0	45.1	+4.9
Other[1] ---- do	86.4	90.8	+5.1
Factory payrolls:			
Average weekly hours	39.7	39.1	−1.5
Average hourly earnings	$3.38	$3.64	+7.7
Personal income:			
Total ---- millions	$3,665	$4,156	+13.4
Per capita	$4,615	$5,143	+11.4
Construction activity: Portland cement shipments to New Hampshire ---- thousand short tons	279	242	−13.3
Mineral production value ---- thousands	$14,119	$13,691	−3.0

p Preliminary.
[1] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate.

Sources: Survey of Current Business; Employment and Earnings; Area Trends in Employment and Unemployment; New England Economic Indicators; and U.S. Bureau of Mines.

Table 4.—Employment and injury statistics in the New Hampshire mineral industries [1]

Year	Average men working daily	Man-hours	Number of injuries		Injury rates, frequency per million man-hours	
			Fatal	Nonfatal	Fatal	Nonfatal
1973	461	848,098	--	37	--	42.45
1974	521	918,105	--	39	--	38.12

[1] Preliminary data. Supplied by Mining Enforcement and Safety Administration.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—There are no cement plants in New Hampshire. In 1974, domestic producers reported they shipped 241,962 tons of finished portland cement and 10,945 tons of prepared masonry cement into the State. Respective figures in 1973 were 279,400 tons and 13,040 tons.

Clay.—W. S. Goodrich, Inc., Kane-Gonic Brick Corp., and Densmore Brick Co. mined 33,827 tons of common clay to manufacture common and face brick. Output declined 21% compared with that of 1973. The clay was mined and manufactured into brick in Grafton, Rockingham, and Strafford Counties.

Diatomaceous Earth.—Interest continued in the State-owned deposit of diatomaceous earth beneath Lake Umbagog. The last attempt to obtain a mining permit in 1970–72 was beaten back under pressure from environmentalist groups.

Gem Stones.—The value of gem stones and mineral specimens collected was estimated at $42,000. The old Ruggles mine, in a pegmatite near Grafton, was operated as a commercial tourist attraction. It was a center for mineral collectors as well as for those just wishing to tour the mine.

Gypsum.—National Gypsum Co. calcined gypsum from Canada at its Portsmouth plant in Rockingham County. Output increased 13% and was 4% above the 1972 record.

Lime.—There are no lime plants in New Hampshire. Consumption of lime, as measured by shipments of domestic lime into the State, was 9,672 tons in 1974. Much agricultural liming was done in the form of ground limestone and is not reflected in the lime consumption total.

Mica.—Mica was not produced in New Hampshire in 1974, and none of the mica mines in the State have been active for many years. One person, in Rumney, was trying to market fine-ground, bagged mica mined during an earlier active mining period.

Two firms, the Macallen Co., Inc. (division of Essex International, Inc.), at Newmarket, and Concord Mica Corp., Penacook, processed or fabricated mica purchased elsewhere.

Perlite.—National Gypsum Co. expanded perlite for plaster aggregate at Portsmouth, Rockingham County. Output decreased 3% in 1974 compared with that of 1973. The crude perlite was shipped into New Hampshire from Western States.

Salt.—The State of New Hampshire placed orders for 104,000 tons of road salt in 1974 at prices ranging from $14.95 to $19.30 per ton delivered at various depots. Imported salt was purchased from Granite State Minerals of Portsmouth, and domestic rock salt, from the Morton Salt Co., Seneca Lake, N.Y.

Sand and Gravel.—Production of sand and gravel decreased 21% in tonnage and 4% in value compared with that of 1973. A total of 53 pits were operated in the 10 counties. The three counties recording the highest production in 1974 were Merrimack, Hillsborough, and Carroll; they accounted for 49% of the total sand and gravel output. The leading commercial producers were Manchester Sand, Gravel & Cement Co., Tilton Sand & Gravel Inc., R. S. Audley, Inc., and J. J. Cronin Company. The New Hampshire Department of Public Works and Highways was another important producer.

Ossipee Aggregates, the New Hampshire subsidiary of Boston Sand and Gravel Co., planned to challenge a State law that says it cannot deposit Massachusetts trash in a worked-out portion of its 5,300-acre sand and gravel operation at Ossipee. The company said that a State law prohibiting the import of out-of-State rubbish into

New Hampshire is unconstitutional because it restrains interstate commerce. The State of New Hampshire contended that it was not trying to restrain commerce but that it feared interstate shipment of rubbish is unsanitary. The proposed shipments would be compacted bales back-hauled in empty sand and gravel hopper cars, 35 of which make a trip to Boston from Ossipee each day (about 115 miles).

The Nashua Sand and Gravel Corp. operations were described in an article in the November 4, 1974, issue of "New England Construction" magazine.

Table 5.—New Hampshire: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	7,795	8,597	1,734	1,968
Gravel			3,040	5,291
Unprocessed: Sand and gravel			1,352	839
Industrial:				
Sand	--	--	W	W
Gravel			--	--
Total	7,795	8,597	6,126	8,098

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data in this table may not be directly comparable to that in tables 1, 6, and 7 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 6.—New Hampshire: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction	4,234	6,288	1,100	2,166
Highway and bridge construction			291	480
Other uses such as dams, waterworks, airports, etc			88	165
Concrete products (cement blocks, bricks, pipe, etc.)			254	447
Bituminous paving (asphalt and tar paving)			770	1,219
Roadbase and subbase			392	652
Unprocessed aggregate			1,352	839
Fill	1,806	1,214	148	137
Other uses[2]	650	712	509	949
Industrial sand and gravel	--	--	W	W
Total	6,690	[3]8,215	4,904	7,054

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).
[3] Data do not add to total shown because of independent rounding.

Table 7.—New Hampshire: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction			58	96
Highway and bridge construction			115	193
Other uses such as dams, waterworks, airports, etc.			W	W
Concrete products (cement blocks, bricks, pipe, etc.)	1,101	381	2	W
Bituminous paving (asphalt and tar paving)			225	409
Roadbase and subbase			693	262
Unprocessed aggregate			--	--
Fill	4	1	14	27
Other	--	--	115	182
Total	1,105	382	1,222	1,169

W Withheld to avoid disclosing individual company confidential data; included with "Fill."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Stone production decreased 68% in tonnage and was essentially unchanged in value in 1974. Dimension granite was quarried in Hillsborough and Merrimack Counties for dressed architectural, construction, monumental stone, and curbing. Fabrication plants were also operated in both counties.

The John Swenson Granite Co., Inc., of Concord announced it had agreed to sell its building division to a new company, the Swenson Building Granite Corp. The new firm will operate John Swenson's former mill No. 4 and will have offices in Concord and New York City. John Swenson Granite Co. continued to quarry and produce curbing, blocks for the monument industry, and granite for sale to other fabricators.

About 100 employees of the John Swenson Granite Co., Inc., who lost their jobs due to increased granite imports were certified by the Labor Department as eligible to apply for trade adjustment assistance. They became eligible for a cash allowance of 65% of their average weekly wage for up to 78 weeks while completing approved retraining courses.

In Conway, a referendum on banning granite quarrying above an elevation of 1,000 feet was defeated by only 20 votes out of about 2,000 cast. The Redstone and Greenstone quarries, jointly owned by John Swenson Granite Co., Inc., and H. E. Fletcher Granite Co., would have been adversely affected if the vote had gone the other way.

Crushed traprock was produced by Lebanon Crushed Stone, Inc., in Grafton County and crushed metavolcanic rock (statistically classified as granite) by Iafolla Industries, Inc., in Rockingham County. North Country Aggregates, Inc., crushed quartz in Hillsborough County for exposed concrete aggregate. The New Hampshire Department of Public Works and Highways crushed stone in several counties for road aggregate. Production of crushed stone decreased 68% in tonnage and 1% in value in 1974.

Total stone production was 590,328 tons valued at $5.4 million in 1974 compared with the record production of 1,836,000 tons valued at $5.4 million in 1973.

MINERAL FUELS

Natural Gas.—Sea-3, Inc. (Division of Gaz-Ocean, S. A.) started construction of a 400,000-barrel liquefied petroleum gas (LPG) storage tank at Newington, N.H. The facility will be operational in early 1975 and will receive Algerian gas from 25,000- to 30,000- deadweight-ton cryogenic tankers. The facility will handle about 100 million gallons per year—about one-third of New England's current LPG needs. Manchester Gas Co. announced it will build a 300,000-barrel liquefied natural gas (LNG) cryogenic tank and liquefaction plant near the Tennessee Gas Transmission Co. pipeline in the southern Merrimack valley.

Petroleum.—C. H. Sprague and Son Co. began full-scale operation of an eco-separator plant in Newington. The plant separates mixed petroleum products (that is, "artificial crude" and pipeline interface

mixtures) and also reclaims used crankcase oil.

Several proposals to build oil refineries and a super-tanker terminal in New Hampshire created considerable debate and turmoil. A proposal by C. H. Sprague and Son Co. for a 50,000-barrel-per-day refinery was voted down 177 to 132 in Newington. An Olympic Refineries, Inc., proposal for a 400,000-barrel-per-day refinery was voted down 1,254 to 144 in Durham. An Isle of Shoals superport plan was opposed by the "Concerned Citizens of Rye" and "Save Our Shores" organizations. Some seacoast area industrial towns did respond favorably to the idea of a local petroleum refinery. Two referenda were conducted in Newmarket, and a refinery was favored both times 575 to 355 and 644 to 526. Rochester citizens voted in favor of a refinery by almost a 2-to-1 margin: 1,386 to 767. In addition to Sprague and Olympic, other interested firms mentioned included Shaheen Natural Resources, Inc., and two newly formed corporations, Granite State Refineries, Inc., and Yankee Refineries, Inc.

METALS

Copper.—Considerable prospecting occurred in old copper mining districts of New Hampshire. Activity by several firms appeared to be centered in the areas around Gardner Mountain, Milan, and north of Gorham.

Iron and Steel Scrap.—Madbury Metals, Inc., began processing ferrous scrap in a new plant located in an old gravel pit in Madbury. The plant crushes and compacts wornout automobiles. The product is shipped over a Boston and Maine Railroad spur that formerly served the worked-out gravel pit.

Exports of scrap steel to Europe for reprocessing began from Portsmouth. The shipper, Stalmet, Inc., planned to move two shiploads per week to France, Spain, Italy, and Turkey.

Zirconium.—Ionarc, Inc. (division of Ionarc Smelters, Ltd.), produced zirconium and zirconium dioxide in a plant at Bow. The zircon raw material was imported principally from Australia and converted by the Ionarc process.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Clays:			
Densmore Brick Co	Lebanon, N.H. 03766	Pit	Grafton.
W. S. Goodrich, Inc	Epping, N.H. 03042	Pit	Rockingham.
Kane-Gonic Brick Corp	Gonic, N.H. 03867	Pit	Strafford.
Gypsum (calcined): National Gypsum Co.[1]	325 Delaware Ave. Buffalo, N.Y. 14202	Plant	Rockingham.
Sand and gravel:			
Allvan J. Coleman & Son, Inc	Route 3A, Bow, N.H. 03302	Pit	Merrimack.
R. S. Audley, Inc	Route 16, Conway, N.H. 03818	Pit	Carroll.
J. J. Cronin Company	Box 176 North Reading, Mass. 01864	Pit	Hillsborough.
Iafolla Industries, Inc.[2]	Peverly Hill Rd. Portsmouth, N.H. 03801	Pit	Rockingham. and Strafford.
Keene Sand & Gravel, Inc	725 Main St. Keene, N.H. 03431	Pit	Cheshire.
Manchester Sand, Gravel & Cement Co.	Box 415, Hookset, N.H. 03106	Pit	Merrimack.
Tilton Sand & Gravel, Inc	Tilton, N.H. 03276	Pit	Belknap.
Stone:			
Granite, dimension:			
Kitledge Granite Corp	Armory Rd. Milford, N.H. 03055	Quarry	Hillsborough.
John Swenson Granite Co., Inc.	North State St. Concord, N.H. 03301	do	Merrimack.
Maine-New Hampshire Granite Co.	P.O. Box 1122 Lowell, Mass. 01852	do	Hillsborough.
Granite, crushed: North Country Aggregates, Inc.	Box 55 South Lyndeboro, N.H. 03082	do	Do.
Traprock, Crushed Stone, Inc	Plainfield Rd. West Lebanon, N.H. 03784	do	Grafton.

[1] Also expanded perlite.
[2] Also traprock.

The Mineral Industry of New Jersey

By Stanley K. Haines [1]

The value of New Jersey's mineral production totaled $140.7 million, a 23% increase over that of 1973. Crushed and broken stone production declined 1% in quantity but increased 15% in value. Sand and gravel, the second leading commodity in value, registered a drop in production of 6% and an increase of 10% in value. Zinc production dropped 1% but increased 73% in value. Sussex was the leading mineral producing county and was followed, in descending order of value, by Somerset, Burlington, Passaic, Hunterdon, Camden, Monmouth, and Atlantic. Mineral production was reported in all counties except Salem.

Among the States, New Jersey ranked 37th in value of mineral production.

[1] Physical scientist, Division of Nonmetallic Minerals.

Table 1.—Mineral production in New Jersey [1]

Mineral		1973		1974	
		Quantity	Value (thousands)	Quantity	Value (thousands)
Clays	thousand short tons	183	$666	104	$524
Gem stones		NA	16	NA	16
Peat	thousand short tons	44	514	31	603
Sand and gravel [2]	do	19,040	43,098	17,924	47,292
Stone [3]	do	15,902	45,585	15,749	52,456
Zinc (recoverable content of ores, etc.)	short tons	33,027	13,647	32,848	23,585
Value of items that cannot be disclosed: Lime (1973), magnesium compounds, manganiferous residuum, greensand marl, stone (dimension), and titanium concentrates (ilmenite)		XX	10,490	XX	16,272
Total		XX	114,016	XX	140,748
Total 1967 constant dollars		XX	83,585	XX	p 67,306

p Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Value reflects sand and gravel sold or used as construction aggregate. Also includes industrial sand and gravel.
[3] Excludes dimension stone; included with "Value of items that cannot be disclosed."

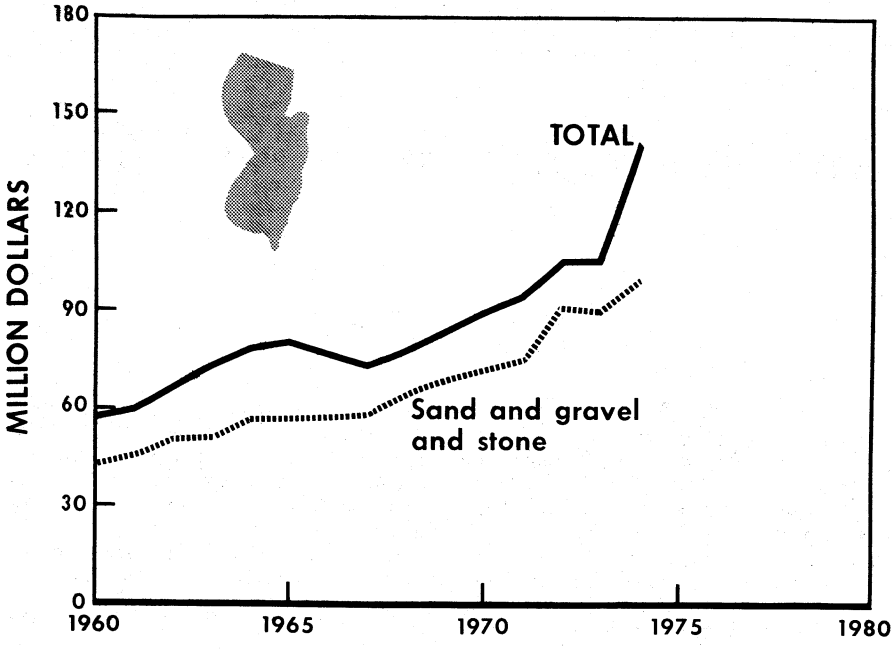

Figure 1.—Value of sand and gravel and stone, and total value of mineral production in New Jersey.

Table 2.—Value of mineral production in New Jersey, by county [1]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Atlantic	$436	$538	Sand and gravel.
Bergen	W	W	Do.
Burlington	W	9,889	Sand and gravel, clays.
Camden	1,729	1,889	Sand and gravel.
Cape May	W	W	Magnesium compounds, sand and gravel.
Cumberland	W	W	Sand and gravel, clays.
Essex	W	W	Stone.
Gloucester	876	W	Greensand marl, sand and gravel.
Hudson	W	W	Stone.
Hunterdon	3,851	5,168	Do.
Mercer	W	W	Do.
Middlesex	W	W	Sand and gravel, clays.
Monmouth	1,347	1,323	Sand and gravel.
Morris	7,304	W	Sand and gravel, stone.
Ocean	W	W	Ilmenite, sand and gravel.
Passaic	9,084	7,667	Stone, sand and gravel.
Somerset	20,642	25,289	Stone, clays.
Sussex	22,773	33,834	Zinc, stone, sand and gravel, peat, manganiferous residuum.
Union	W	W	Stone.
Warren	1,351	W	Sand and gravel, stone, peat.
Undistributed [2]	44,622	55,152	
Total [3]	114,016	140,748	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Salem County is not listed because no production was reported.
[2] Includes gem stones and values indicated by symbol W.
[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of New Jersey business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total work force ---- thousands	2,760.8	2,781.6	+.08
Unemployment ---- do	178.0	NA	NA
Employment:			
Manufacturing ---- do	840.8	822	−2.2
Construction ---- do	125.6	117.7	−6.3
Transportation and public utilities ---- do	186.3	184.4	−1.0
Finance, insurance, and real estate ---- do	131.8	137.1	+4.0
Service ---- do	459.6	474.9	+3.3
Government ---- do	417.1	437.6	+4.9
Mining ---- do	3.3	3.1	−6.1
Payroll, average weekly earnings: Manufacturing	$174.7	$186.5	+6.8
Personal income:			
Total ---- millions	$43,026	$46,798	+8.8
Per capita	$5,874	$6,384	+8.7
Construction activity:			
Number of housing units authorized	52,290	25,847	−50.6
Cement shipments to New Jersey thousand short tons	2,339	1,994	−14.7
Mineral production value ---- thousands	$114,016	$140,748	+23.4

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Shipments of portland cement into New Jersey totaled 1,928,000 short tons, a decrease of 14% from 1973. Masonry cement shipments into New Jersey were 66,000 short tons, 24% lower than 1973. Most of the portland and masonry cement was manufactured in eastern Pennsylvania and eastern New York.

Clays.—The quantity of clay produced decreased 43% compared with that of 1973. Total value was 21% lower than in 1973; however, the average unit value of clay increased significantly, from $3.64 in 1973 to $5.04 in 1974. Common clay and shale accounted for 64% of the total tonnage and 56% of the value. Fire clay accounted for the remaining 36% of tonnage and 44% of value. Common clay and shale were used for face brick, and fire clay was used for foundry sand, fire brick, refractory mortar and cement, and caulking putty. Common clay and shale were produced in Somerset and Burlington Counties. Fire clay was mined in Cumberland and Middlesex Counties. The leading clay producers were New Jersey Shale, Brick and Tile Corp. and J. S. Morie and Son, Inc.

Gem Stones.—Commercial and amateur rockhounds, collected from several localities, mine dumps, and quarries, located principally in the northern part of the State. The value of the material collected was estimated to be $16,000, the same as 1973.

Gypsum.—National Gypsum Co., The Flintkote Co., Kaiser Gypsum Co., Inc., and Celotex Corp. calcined gypsum in Bergen, Burlington, and Camden Counties. Output was used mainly in the manufacture of wallboard, lath, and sheathing. Production declined to 549,000 tons, 7% below the 1973 record.

Iodine.—Consumption in inorganic and organic iodine uses was 718,101 pounds and 294,890 pounds, respectively. The increase in total consumption from 756,032 pounds in 1973 to 1,012,991 pounds in 1974 was the result of a growing market and some hedging against future price increases. The iodine was used for medicines, sanitation products, and other chemicals.

Lime.—Consumption of lime in New Jersey declined 18% from 146,224 tons in 1973 to 119,212 tons in 1974. There was no production of lime in New Jersey in 1974.

Magnesium Compounds.—Production of magnesium compounds increased compared with that of 1973. An increase in average unit value was also reported. Refractory magnesia was produced in Cape May

County from dolomite and domestic seawater. J. T. Baker Chemical Co., Warren County, converted purchased materials to a variety of magnesium compounds.

Marl, Greensand.—Output of greensand marl increased significantly and was produced by Inversand Co., Clayton, N.J., a subsidiary of Hungerford and Terry Inc. The marl was recovered from a pit in Gloucester County and used for water treatment and agricultural purposes. Among the States, New Jersey ranked first in greensand marl production.

Perlite.—Crude perlite from domestic mines was expanded at two plants in Middlesex County. Expanded perlite was used in roof insulation, in plaster and concrete aggregate, in masonry and cavity filler, and as a soil conditioner.

Pigments.—Metal-base pigments used primarily in the manufacture of paint were produced at a number of plants. Iron oxide pigments were produced by the Pigments and Specialties Div., Cities Service Co. in Mercer and Middlesex Counties. Iron oxide and lead pigments were produced by E.I. du Pont de Nemours & Co., Inc., in Essex County. Titanium dioxide was produced by New Jersey Zinc Co, Gloucester City, and NL Industries, Inc., near Sayreville. Zinc oxide pigments were produced by Royce Chemical Co., Carlton Hill.

Sand and Gravel.—The total output of sand and gravel decreased 6% in quantity while increasing 10% in value over that of 1973. Production of sand and gravel for construction declined 1% in quantity but increased 21% in value as compared with that of 1973. Average value per ton was $1.95 in 1974. Of the 14.7 million tons of sand and gravel used for construction, 57% was processed sand, 28% was processed gravel, and 15% was unprocessed sand and gravel.

Output of industrial sand decreased 24% in quantity and 11% in value with an average unit value of $5.32 per ton. Industrial sand accounted for 18% of the tonnage and 38% of the value of all sand and gravel produced in the State. The primary uses of industrial sand were for glass, molding, and foundry purposes. Most of the industrial sand was produced in Cumberland County. Dredging operations were the principal method of recovering the sand.

The number of sand and gravel operations dropped by 5 to 89. Production came from 14 of the State's 21 counties. The leading producing counties, ranked by tonnage, were Burlington, Cumberland, Ocean, Morris, and Sussex. Cumberland County ranked first in value.

Table 4.—New Jersey: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	14,787	23,632	8,309	15,588
Gravel			4,122	11,226
Unprocessed: Sand and gravel			2,246	1,843
Industrial:				
Sand	4,253	19,466	3,247	17,272
Gravel			--	--
Total	19,040	43,098	17,924	45,929

[1] Value data in this table may not be directly comparable to that in tables 1, 5, and 6 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 5.—New Jersey: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction			3,772	7,564
Highway and bridge construction			908	2,026
Other uses (dams, waterworks, airports, etc.)			392	881
Concrete products (cement blocks, bricks, pipe, etc.)	12,342	20,651	4,137	10,881
Bituminous paving (asphalt and tar paving)			1,183	2,626
Road base and subbase			521	1,281
Unprocessed aggregate			2,246	1,843
Fill	1,700	1,311	217	328
Other uses [2]	741	1,664	45	101
Industrial sand and gravel	4,253	19,466	3,247	17,272
Total	19,036	43,092	16,668	44,803

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 6.—New Jersey: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction			W	W
Highway and bridge construction			394	835
Other uses (dams, waterworks, airports, etc.)			W	W
Concrete products (cement blocks, bricks, pipe, etc.)	4	6	51	127
Bituminous paving (asphalt and tar paving)			540	987
Road base and subbase			229	470
Unprocessed aggregate			--	--
Fill	--	--	--	--
Other	--	--	42	69
Total	4	6	1,256	2,488

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Only 3 companies produced more than 1 million tons, 4 produced from 500,000 to 1 million tons, and 34 produced from 100,000 to 500,000 tons. Shipments to consumers were primarily by truck (74%) and rail (23%).

Stone.—Crushed and broken stone production decreased 1% in quantity but increased 15% in value over that of 1973. Basalt, granite, and limestone, in decreasing order of tonnage, were the primary types of stone quarried in 1974. Basalt (traprock) continued as the leading type of stone produced and accounted for 73% and 74% of the State's total crushed and broken stone production and value, respectively. Average value per ton for traprock was $3.38, $0.05 more than the crushed and broken State average for all stone. Somerset and Passaic Counties were the leading basalt producers. Producers were also located in Mercer, Hunterdon, Union, Hudson, Essex, and Morris Counties. Most of the output was used as aggregate for highway and building construction. Total production of crushed and broken basalt was 11.4 million tons.

Crushed granite production increased from 2.72 million tons in 1973 to 3.33 million tons in 1974. The average unit value was $2.42 in 1974, up $0.33 from 1973. Granite was produced from eight quarries in Hunterdon, Sussex, Morris, and Passaic Counties in 1974. The principal uses of granite in 1974 were dense-graded roadbase, bituminous aggregate, and concrete aggregate.

Crushed limestone was produced at two quarries in Sussex County and one in Warren County. The limestone was used

principally for roadbase, agricultural limestone, filler, flux stone, and unspecified aggregate.

Somerset County with eight quarries had the largest reported production of stone, followed by Passaic with six quarries, Sussex with five quarries, and Hunterdon with six quarries. Other producing counties had a total of nine quarries. There were 4 quarries with production of over 900,000 tons, 7 quarries produced between 500,000 short tons and 900,00 short tons, 18 quarries produced between 100,000 short tons and 500,000 short tons, and 5 produced less than 100,000 short tons. Most of the stone (97%) was transported by truck; the remaining 3% moved by rail.

Sulfur.—Recovered sulfur in New Jersey dropped from 81,797 long tons in 1973 to 70,788 long tons in 1974. The total value was $2,255,000, resulting in a unit value of $31.85 per long ton. Elemental sulfur was recovered as a byproduct of petroleum refining at five plants, two each in Gloucester and Middlesex Counties and one in Union County.

Table 7.—New Jersey: Crushed and broken stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	2,721	6,888	2,459	10,015
Concrete aggregate (coarse)	342	809	944	2,155
Dense-graded road base stone	4,361	12,283	4,614	13,473
Macadam aggregate	284	703	W	W
Surface treatment aggregate	256	617	300	759
Unspecified construction aggregate and roadstone	6,058	17,350	5,679	18,889
Riprap and jetty stone	184	630	W	W
Other uses[1]	1,696	6,304	1,754	7,166
Total[2]	15,902	45,585	15,749	52,456

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes agricultural limestone, railroad ballast (1974), filter stone, manufactured fine aggregate (1973), flux stone, asphalt and other fillers, lime manufacture (1973), acid neutralization, roofing aggregates, and uses not specified.
[2] Data may not add to totals shown because of independent rounding.

Vermiculite.—Exfoliated vermiculite was produced by one plant each in Mercer and Middlesex Counties from crude vermiculite mined in other States. The exfoliated vermiculite was used mainly for agricultural purposes, loose-fill insulation, fireproofing, and lightweight concrete aggregate.

METALS

Ferroalloys.—Shieldalloy Corp., Newfield, Gloucester County, produced ferroalloys of vanadium, titanium, boron, columbium, and columbium-nickel.

Iron Ore.—Jersey Central Power and Light Co. and Halecrest Co. were planning a threefold project making use of the old Mt. Hope iron ore mine 5 miles north of Dover. The project will resume production of magnetite iron ore, produce high-quality construction aggregate, and provide a large underground void for use in a 1,000-megawatt pump-storage hydroelectric plant. Production of magnetite ore and construction aggregate is expected to begin about mid-1977, and the hydroelectric plant is to start up by 1985.

Selenium.—Selenium was produced as a byproduct from two copper refineries in 1974. AMAX Copper, Inc., Carteret, N.J., and the Anaconda Co., Perth Amboy, N.J., produced selenium for such end uses as electronic components, glass, and chemical pigments.

Tellurium.—Tellurium was produced by AMAX, Inc., Carteret, N.J., and The Anaconda Co., Perth Amboy, N.J. The major uses of tellurium were for mold dressing for cast iron products, for improvement of machinability of some low-carbon steels and high-strength alloy steels, and for use in various chemicals.

Titanium.—In 1974 the quantity and value of ilmenite concentrate produced were higher than in 1973. The average unit value also increased. Glidden-Durkee Div. of SCM Corp. recovered ilmenite

from a sand deposit about 3 miles northwest of Lakehurst, Ocean County. The material was concentrated and shipped to a company-owned plant at Baltimore, Md., for conversion to titanium dioxide pigment.

Zinc.—The production of zinc decreased 1% in quantity but increased 73% in value. The ore was mined by New Jersey Zinc Co. at Sterling Hill, Sussex County, crushed, and shipped directly to a company-owned smelter at Palmerton, Pa., where zinc and manganiferous residue were recovered.

MINERAL FUELS

Peat.—Production of peat decreased 30% in quantity, while increasing 17% in value. Peat was recovered from bogs near Newton and Stanhope, in Sussex County, and from Great Meadows in Warren County. Most of the output was used for general soil improvement.

Petroleum.—There were four operating refineries in New Jersey at yearend. Chevron Oil Co. in Perth Amboy operated a refinery with a capacity of 88,000 barrels per day, Exxon Co. in Linden operated with a capacity of 265,000 barrels per day, Mobil Oil Corp. in Paulsboro operated with a capacity of 98,000 barrels per day, and Texaco Inc. in Westville operated with a capacity of 88,000 barrels per day.[2]

[2] Oil and Gas Journal. Survey of Operating Refineries in the U.S. V. 73, No. 17, Apr. 17, 1975, pp. 98–101.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Clays:			
Fire clay: Daniel Goff Div., Jesse S. Morie & Son, Inc.	P.O. Box 35 Mauricetown, N.J. 08329	Pit	Cumberland.
Miscellaneous clay: New Jersey Shale Brick & Tile Corp.	P.O. Box 490 Somerville, N.J. 08876	Pit	Do.
Greensand marl: Inversand Co	226 Atlantic Ave. Clayton, N.J. 08312	Pit	Gloucester.
Gypsum, calcined:			
The Celotex Corp	North 1 River Rd. Edgewater, N.J. 07020	Plant	Bergen.
The Flintkote Co	480 Central Ave. East Rutherford, N.J. 07073	do	Camden.
Kaiser Gypsum Co., Inc	Delanco, N.J. 08075	do	Burlington.
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	do	Do.
Ilmenite: Glidden-Durkee Division of SCM Corp.	P.O. Box 5 Lakehurst, N.J. 08733	Pit	Ocean.
Iron oxide pigments (manufactured): Cities Service Co	380 Madison Ave. New York, N.Y. 10017	Plant	Mercer and Middlesex.
Magnesium compounds:			
Harbison-Walker Refractories, Div. of Dresser Industries.	2 Gateway Center Pittsburgh, Pa. 15222	do	Cape May.
Peat:			
Hyper-Humus Co	Lafayette Rd. Newton, N.J. 07860	Bog	Sussex.
Kelsey Humus Co., Partac Peat Co.	Kelsey Park Great Meadows, N.J. 07838	Bog	Warren.
Mt. Bethel Humus Co., Inc	315 West 57th St. New York, N.Y. 10019	Bog	Sussex.
Perlite (expanded): Grefco, Inc	3450 Wilshire Blvd. Los Angeles, Calif. 90010	Plant	Middlesex.
Petroleum refineries:			
Chevron Oil Co	1200 State St. Perth Amboy, N.J. 08861	do	Do.
Exxon Co. U.S.A	Box 22, Linden, N.J. 07036	do	Union[1] and Hudson.
Mobil Oil Corp.[1]	P.O. Box 900 Dallas, Tex. 75221	do	Gloucester.
Sand and gravel:			
Brick-Wall Corp	Route 70 Lakehurst, N.J. 08733	Pit	Ocean.
Fisher Bros. Sand & Gravel Co.	115 Hickory Lane Bayville, N.J. 08721	Pit	Do.
Houdaille Construction Materials, Inc.[2]	10 Park Pl. Morristown, N.J. 07960	Pit	Morris, Ocean, Warren.
Pennsylvania Glass Sand Corp.	Berkeley Springs, W.Va.	Pit	Do.

See footnotes at end of table.

Table 8.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
Saxon Falls Sand & Gravel Co. Inc.	R. D. 3 Stanhope, N.J. 07874	Pit	Morris.
Tuckahoe Sand & Gravel	P.O. Box 101 Tuckahoe, N.J. 08350	Pit	Cape May.
Smelters (copper):			
American Smelting & Refining Co.	120 Broadway New York, N.Y. 10005	Plant	Do.
The Anaconda Co	25 Broadway New York, N.Y. 10004	do	Do.
Stone:			
Limestone Products Corp. of America.	122 Main St. Newton, N.J. 07860	Quarry	Do.
Somerset Crushed Stone Division, Anthony Ferrante & Sons, Inc.	Route 202, Mine Brook Rd. Bernardsville, N.J. 07924	do	Somerset.
Tri County Asphalt Corp.	Route 15 Hopatcong, N.J.	do	Sussex.
Trap Rock Industries, Inc.	Laurel Ave. Kingston, N.J. 08528	do	Hunterdon, Mercer, Somerset.
The Union Building & Construction Corp.	1111 Clifton Ave. Clifton, N.J. 07013	do	Passaic.
Vermiculite (exfoliated):			
W. R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	Plant	Mercer.

[1] Also byproduct elemental sulfur.
[2] Also stone.

The Mineral Industry of New Mexico

James I. Craig [1]

Mineral production in New Mexico established a record high in 1974, reaching a total value of over $1.9 billion, an increase of almost $635 million over that of 1973. Again New Mexico remained a major supplier of minerals, mineral fuels, and related materials. The high increase in value of mineral production resulted mainly from increased prices rather than from corresponding higher output of mineral commodities. Fuels ranked first in value of minerals produced, $1,319.5 million; metals second, $451.1 million; and nonmetals third, $171.0 million. Principal minerals in 1974 and their share in the total value of mineral production in New Mexico follow: Crude oil, 36.7%; natural gas, 20.1%; copper, 15.7%; natural gas liquids, 9%; potassium salts, 6.6%; and uranium, 5.4%.

[1] State Liaison Officer, Bureau of Mines, Santa Fe, N. Mex.

Table 1.—Mineral production in New Mexico [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays [2] thousand short tons	88	$169	55	$317
Coal (bituminous) do	9,069	31,862	9,392	W
Copper (recoverable content of ores, etc.) short tons	204,742	243,643	196,585	303,920
Gem stones	NA	70	NA	200
Gold (recoverable content of ores, etc.) troy ounces	13,864	1,356	15,427	2,464
Gypsum thousand short tons	255	1,220	157	532
Iron ore (usable) thousand long tons, gross weight	5	114	6	135
Lead (recoverable content of ores, etc.) short tons	2,556	833	2,364	1,064
Lime thousand short tons	44	793	58	1,679
Manganiferous ore (5% to 35% Mn) short tons	32,084	W	47,348	W
Mica, scrap thousand short tons	10	82	12	60
Natural gas million cubic feet	1,218,749	287,889	1,244,779	390,861
Natural gas liquids:				
Natural gasoline and cycle products thousand 42-gallon barrels	9,848	32,449	9,713	53,545
LP gases do	29,652	74,427	30,271	120,781
Peat thousand short tons	3	50	4	111
Perlite do	478	5,024	480	6,306
Petroleum (crude) thousand 42-gallon barrels	100,986	414,041	98,695	712,578
Potassium salts thousand short tons	2,168	91,996	2,102	128,588
Pumice do	339	1,001	471	1,466
Salt do	W	W	167	W
Sand and gravel do	10,641	15,753	7,413	10,605
Silver (recoverable content of ores, etc.) thousand troy ounces	1,111	2,843	1,195	5,628
Stone thousand short tons	2,830	5,894	[3] 3,531	8,359
Uranium (recoverable content U_3O_8) thousand pounds	[r] 9,286	[r] 60,356	9,971	104,693
Zinc (recoverable content of ores, etc.) short tons	12,327	5,094	13,784	9,897
Value of items that cannot be disclosed: Carbon dioxide, cement, clay (fire), fluorspar (1974), molybdenum, stone (dimension, 1974), tin, vanadium, and values indicated by symbol W	XX	29,631	XX	77,755
Total	XX	[r] 1,306,590	XX	1,941,544
Total 1967 constant dollars	XX	957,861	XX	[p] 928,446

[p] Preliminary. [r] Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes fire clay; included with "Value of items that cannot be disclosed."

[3] Excludes dimension stone: included with "Value of items that cannot be disclosed."

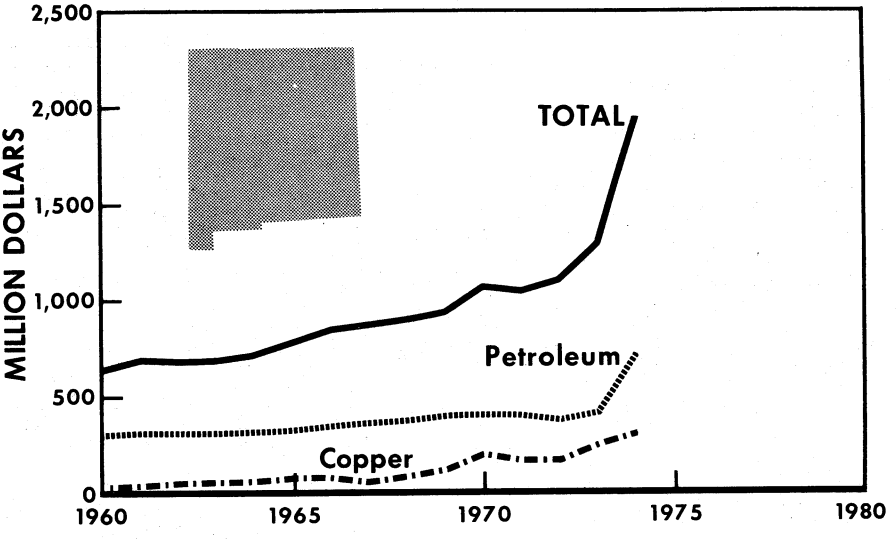

Figure 1.—Value of petroleum, copper, and total value of mineral production in New Mexico.

In 1974 mining was significantly affected by the energy crisis. Total physical output of crude petroleum and natural gas remained about the same, but oil and gas exploration took place not only in the traditional producing areas of the State—the San Juan Basin in the northwest and the Permian Basin in the southeast—but also in McKinley, Valencia, San Miguel, Grant, and other counties. As a result, employment in the oil and gas industry increased nearly 20% above its 1973 level.

The metals sector presented a somewhat mixed picture. Total employment increased nearly 17% from that of 1973. However, much of this growth was attributable to a return to work by miners after a lengthy uranium strike in 1973.

Total mining employment climbed approximately 16% above the prevailing level of 1973. This increase was the largest for this sector of the State's economy in the last 10 years. As indicated, oil and gas exploration was the main factor in this growth in employment. As a result of the energy crisis, the 1975 outlook for mining continues to be favorable. However, the indicated recession at yearend may hurt some industries within this sector, particularly the copper industry.

New Mexico again was the leading U.S. producer of perlite and potassium salts. Furthermore, the State was among the leaders in output of copper, molybdenum, natural gas, natural gas liquids, pumice, and crude petroleum. Although there were mining operations throughout the State, most of the petroleum and natural gas was produced in the southeastern and northwestern parts. Copper output came from the southwestern corner of the State, uranium was mined and processed

into yellow cake in the west-central part of the State, potash was mined in the southeast, and most of the perlite was produced in the north-central part of New Mexico.

Most of the mineral industry's products were consumed outside the State, making New Mexico a significant supplier of raw materials to other States.

During 1974 principal events in the mining industry of New Mexico included the following: Phelps Dodge Corp. continued construction of its new 100,000-ton-per-year copper smelter in southern Hidalgo County; Sohio Petroleum Co. broke ground for its new L-Bar uranium mine, which will include the first installation of solar heating for process water; Occidental Minerals Corp. continued a major drilling program to delineate a large low-grade copper ore body to be mined by in situ leaching; Mississippi Chemical Corp. purchased the Teledyne, Inc., potash reserves and all above and below ground facilities; Kennecott Copper Corp.'s Chino Division started operating its newly constructed 500-ton-per-day sulfuric acid plant as part of its smelting operation; Gulf Energy Minerals Co. announced the start of work on surface facilities for what could become America's deepest uranium mine, 3,500 feet; Ranchers Exploration and Development Corp. continued development of its Johnny M uranium mine in the Grants area; the Famariss Oil Co. brought its new 30,000-barrel-per-day refinery onstream at Lovington; preparation for the construction of coal gasification plants by El Paso Natural Gas Co. and Western Gasification Co. (WESCO) continued with little or no progress reported.

Table 2.—Value of mineral production in New Mexico, by county [1 2]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Bernalillo	$15,973	$16,400	Cement, sand and gravel, stone, clays.
Catron	W	W	Pumice, tin.
Chaves	10,746	16,573	Petroleum, natural gas, sand and gravel, stone.
Colfax	W	W	Coal, sand and gravel.
DeBaca	W	W	Sand and gravel, stone.
Doña Ana	W	1,017	Stone, pumice, sand and gravel, clay.
Eddy	224,195	368,127	Petroleum, potassium salts, natural gas, natural gas liquids, salt, stone, sand and gravel.
Grant	245,261	315,558	Copper, zinc, silver, gold, lime, lead, molybdenum, manganiferous ore, stone, fluorspar, sand and gravel.
Guadalupe	W	W	Sand and gravel.
Harding	W	W	Natural carbon dioxide.
Hidalgo	3,279	4,342	Copper, stone, sand and gravel, gold, silver, clays, zinc, lead.
Lea	460,197	716,791	Petroleum, natural gas, natural gas liquids, stone, sand and gravel, potassium salts.
Lincoln	231	458	Sand and gravel, stone.
Luna	W	W	Sand and gravel, stone, clays.
McKinley	r 76,303	119,873	Uranium, natural gas liquids, petroleum, coal, natural gas, stone, sand and gravel, vanadium, molybdenum.
Mora	281	20	Sand and gravel.
Otero	850	943	Stone, sand and gravel.
Quay	W	W	Sand and gravel.
Rio Arriba	52,992	72,236	Natural gas, petroleum, natural gas liquids, sand and gravel, stone.
Roosevelt	10,878	14,981	Petroleum, natural gas liquids, natural gas, pumice.
Sandoval	12,384	11,005	Copper, petroleum, stone, natural gas, gypsum, silver, clays, peat, sand and gravel, pumice, gold, zinc.
San Juan	130,860	186,988	Natural gas, petroleum, coal, natural gas liquids, sand and gravel, stone, pumice, clays.
San Miguel	W	122	Sand and gravel.
Santa Fe	1,852	1,238	Sand and gravel, gypsum, pumice, copper, gold, silver, zinc, clays.
Sierra	W	W	Sand and gravel, copper.
Socorro	77	542	Zinc, sand and gravel, lead, stone, silver, gold, copper.

See footnotes at end of table.

Table 2.—Value of mineral production in New Mexico, by county [1] [2]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Taos	$21,601	$28,663	Molybdenum, perlite, sand and gravel, stone, mica.
Torrance	175	178	Iron ore, sand and gravel.
Union	W	W	Pumice, sand and gravel.
Valencia	r 23,954	44,521	Uranium, stone, sand and gravel, pumice.
Undistributed [3]	14,506	20,968	
Total [4]	r 1,306,590	1,941,544	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Curry and Los Alamos Counties are not listed because no production was reported.
[2] The value of petroleum is based on an average price per barrel for the State. County data for uranium have been estimated for 1973.
[3] Includes some sand and gravel (1973), stone (1973), and natural gas (1974) which cannot be assigned to specific counties, gem stones, vanadium (1973), and values indicated by symbol W.
[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of New Mexico business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total work force ---- thousands	411.6	NA	NA
Unemployment ---- do	23.5	NA	NA
Employment (nonagricultural):			
Mining ---- do	16.4	19.0	+15.9
Construction ---- do	24.9	24.7	—.8
Manufacturing ---- do	27.9	29.1	+4.3
Transportation and public utilities ---- do	22.5	23.2	+3.1
Wholesale and retail trade ---- do	76.5	79.6	+4.1
Finance, insurance, and real estate ---- do	15.5	16.3	+5.2
Services ---- do	63.0	64.9	+3.0
Government ---- do	99.5	102.2	+2.7
Personal income:			
Total ---- millions	$4,262	$4,642	+8.9
Per capita	$3,877	$4,137	+6.7
Construction activity:			
Total residential units authorized	9,987	6,281	—37.1
Value of nonresidential construction ---- millions	$112.7	$98.4	—12.7
Cement shipments to and within New Mexico thousand short tons	612	601	—1.8
Mineral production value ---- millions	$1,306.6	$1,941.5	+48.6

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

Legislation and Government Programs.—Environment and energy were the main items considered by the legislature. The main accomplishment was the repeal of the 1970 law requiring environmental impact statements on State-funded projects. The New Mexico Environmental Improvement Board continued its program to lower pollution standards to levels below those set by Federal authorities. This is especially true in the case of heavy metals contained in surface effluent discharges and smelter stack discharges. A continuation of this policy will result in New Mexico having the most stringent pollution laws in the United States.

The Coal Surfacemining Commission operated effectively and efficiently during the year. Six permits were issued and four complete examinations and evaluations of completed reclamation work were made.

The New Mexico Bureau of Mines and Mineral Resources received a supplemental grant of $24,804 to continue studies of deep coal reserves in the Four Corners area. The State will supplement the funding with additional monies. The coal in this area continues to be of great interest as a source of energy due to its low sulfur content. It is now a proven source material for the manufacturing of synthetic gas and generation of electric power. The State also received an addition to another grant to continue exploration of the feasibility of thermophilic, biogenic extraction of metals from sulfide ores by column leaching.

The Energy Task Force appointed by

the Governor of New Mexico completed its assignment in 1974, but no reports were released.

Papers relating to the mineral industry of the State were published by the U.S. Geological Survey.[2] There were no 1974 publications concerning New Mexico by the Federal Bureau of Mines, but the New Mexico State Bureau of Mines and Mineral Resources (a division of New Mexico Institute of Mining and Technology) released five new publications.[3]

According to the Roswell office of the U.S. Geological Survey, the number of mining and oil and gas leases on Federal lands in New Mexico increased slightly to 15,081 leases comprising 11,634,413 acres, approximately one-third of the Federal lands in the State and about 13% of the total area of the State. Mining leases on Federal land decreased from 648 in 1973 to 629 in 1974. Acreage in mining leases increased approximately 3%, from 682,702 acres to 702,460 acres, during 1974. Oil and gas leases increased slightly from 14,116 comprising 9,733,474 acres in 1973 to 14,452 containing 10,931,954 acres in 1974.

Unlike the Federal public domain, where prospectors may seek mineral deposits, prospecting is not allowed on State land. All State Trust Lands must be leased upon proper application before being prospected.

Competitive bidding ordered by the Commissioner of Public Lands resulted in a renewed interest in hard rock mineral leasing. At yearend 1974 there were 2,161 general mining leases in effect covering 905,232 acres.

Coal leasing and coal royalties showed a marked increase in 1974. No coal has been mined on State lands to date; however, royalty payments are due and payable in the absence of production. Revenues from this source during 1974 were $636,188.

The State conducted a geothermal competitive bid sale on August 14, 1974, the first such sale ever held in the United States. Revenue received from the sale amounted to $187,398.

Employment and Safety.—The mineral industry of New Mexico employed about 19,000 people, or 5.3% of a total civilian work force of 359,000. The average unemployment rate for the same period was 6.3%. According to the 1974 Annual Report by the State Inspector of Mines, the breakdown of employment, by activity, was as follows:

	Coal	Metals	Non-metals	Sand and gravel	Other	Total
Surface	634	2,254	655	600	--	4,143
Underground	205	1,942	1,375	--	--	3,522
Mill or plant	(1)	1,282	723	510	687	3,202
Other	(1)	385	243	89	4	721
Total	839	5,863	2,996	1,199	691	11,588

[1] Included in surface.

The difference between the 19,000 figure used as employment in the industry as a whole and the total reported above is accounted for by the number of people employed in exploration, administration, and sales.

Employment in the petroleum and gas producing and refining industry was estimated to be about 16,500.

During 1974 the metal and nonmetal

[2] Green, M. W. The Iyanbito Member (a New Stratigraphic unit) of the Jurassic Entrada Sandstone, Gallup-Grants Area, N. Mex. U.S. Geol. Survey Bull. 1395-D, 1974, 12 pp.

Kelly, T. E. Reconnaissance Investigation of Ground Water in the Rio Grande Drainage Basin—With Special Emphasis on Saline Ground-Water Resources. U.S. Geol. Survey Map HA-510, 1974.

Myers, D. A., and E. J. McKay. Geologic map of the Southwest Quarter of the Torreon 15-minute Quadrangle, Torrance and Valencia Counties, N. Mex. U.S. Geol. Survey Map I-820, 1974.

Segerstrom, K., and G. E. Ryberg. Geology and Placer-Gold Deposits of the Jicarilla Mountains, Lincoln County, N. Mex. U.S. Geol. Survey Bull. 1308, 1974, 25 pp.

Snipes, R. J., and others. Floods of June 1965 in Arkansas River Basin, Colorado, Kansas, and New Mexico. U.S. Geol. Survey Water-Supply Paper 1850-D, 1974, 97 pp.

[3] Asquith, G. B. Petrography and Petrogenesis of Tertiary Camptonites and Diorites, Sacramento Mountains, New Mexico. N. Mex. BuMines and Miner. Res. Circ. 141, 1974, 6 pp.

Chapman, Wood and Griswold, Inc. Geologic Map of Grants Uranium Region. N. Mex. BuMines and Miner. Res. Geologic Map 31, 1974.

Kelly, V. C. Albuquerque—Its Mountains, Valley, Water, and Volcanoes. N. Mex. BuMines and Miner. Res. Scenic Trip 9, 1974, 106 pp.

Sanford, A. R., and T. R. Toppozada. Seismicity of Proposed Radioactive Waste Disposal Site in Southeastern New Mexico. N. Mex. BuMines and Miner. Res. Circ. 143, 1974, 15 pp.

Woodward, L. A., D. McLelland, and W. H. Kaufman. Geologic Map and Sections of Nacimiento Peak Quadrangle, New Mexico. N. Mex. BuMines and Miner. Res. Geologic Map 32, 1974.

mining industry experienced an accident frequency rate of 27.69 per million man hours worked, compared with 27.54 in 1973. The severity rate per million man-hours worked for the same periods was 2,879 and 3,934 respectively. During 1974 the industry experienced 566 lost-time accidents, of which 7 were fatal.

During 1974 active central mine rescue stations were maintained with regular training sessions held in Carlsbad, Eddy County; Grants, Valencia County; Lordsburg, Hidalgo County; and Silver City, Grant County. All funds necessary for equipping and maintaining these stations along with training personnel are provided by the mining companies in the area.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

New Mexico continued to be a major producer of mineral fuels and a signifcant supplier of energy to other States during 1974.

In 1974 the value of mineral fuels production increased $478.7 million, or 56.9% over that of 1973. The total value of mineral fuels, $1,319.5 million, comprised 68% of the State's mineral production value. In 1974 the petroleum and natural gas liquids share increased appreciably to $886.9 million, or 67.2% of the total value of fuels; natural gas (marketed) production increased in value over that of 1973 by $103 million, reaching $390.9 million for the year 1974, or 29.6% of the fuels total.

Coal.—Most of New Mexico's coal is in two major areas, the San Juan Basin in the northwest and the Raton area in the north-central part of the State. The San Juan Basin is the southeastern part of the Colorado Plateau region, whereas the Raton coalfield is on the western edge of the High Plains. Most of the other coalfields in the State are relatively small and are in the Southern Rockies and northern Basin and Range Provinces. Coalbeds underlie about 25,000 square miles of New Mexico. Some of the beds are at a depth of more than 5,000 feet.

The known coal reserves in New Mexico are 5,910 million tons for strip mining and 276,967 million tons for deep mining. These reserves include proven as well as potential reserves. Deep mining is classified as all coal that has more than 250 feet of cover and is not below 3,000 feet. There is probably as much coal below 3,000 feet as there is above that depth, but there is no economical method of recovering it at present.

New Mexico coal is desirable from an industrial standpoint as well as an environmental standpoint, because of its low sulfur content. Most of the coal in New Mexico contains less than 1% sulfur.

The highest recorded annual yield of bituminous coal in New Mexico was achieved in 1974 when 9,392,134 short tons were produced. The average price per ton increased 92 cents.

Six mines, one of which was an underground mine, were in operation employing a total of 839 people. The bulk of the coal produced in New Mexico is strip-mined in McKinley and San Juan Counties, with some being produced in Colfax County. Approximately 95% of the coal mined is consumed by electric - power - generating companies.

The largest producer in the State was Utah International, Inc., which operated the Navajo strip mine for supplying coal to the Four Corners generating plant and performed contract mining for the San Juan powerplant by operating its San Juan pit. Both mines produced from the Fruitland Formation, which contains a low-sulfur, high-ash coal. This grade of coal is required so that the coal-burning power generating plant can comply with the air quality regulations of the State Environmental Improvement Agency. The coal, high in ash content, contains an average of 20% ash and 13% moisture. In burning this coal, approximately 90% of the ash is recovered as fly ash with the remaining 10% being removed as bottom ash From this it can be seen that control of stack emissions is a critical problem.

All bottom and fly ash was returned to the mined-out area, where it was covered by spoil material produced while making the next cut. Serious study and consideration were being given to the development of an economical means of recovering the aluminum content of the ash. A typical analysis shows the material to contain approximately 27% Al_2O_3, or roughly 10%

aluminum. Disposal of this material under a loose, unconsolidated fill of many feet in thickness is a serious waste of a needed metal.

At the York Canyon mine, operated by Kaiser Steel Corp., longwall mining was continued in cooperation with the Denver Mining Research Center of the Federal Bureau of Mines. Many problems were encountered, but apparently were overcome. Expansion of the system may in turn create additional operating problems, however.

During the year Kaiser completed the test area for strip mining. The test work indicated that strip mining in York Canyon was feasible, and Kaiser was progressing with a new project estimated to cost more than $5 million. The new open pit or strip area would increase production by 350,000 tons per year of high-grade metallurgical coal.

The McKinley mine of The Pittsburgh & Midway Coal Mining Co., located northwest of Gallup, continued stripping operations during 1974, followed by reclamation. Plans were being formulated to enlarge this operation to two or three times its present size.

Table 4.—New Mexico: Bituminous coal production, in 1974, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines			Production (thousand short tons)		
	Underground	Strip	Total	Underground	Strip	Total
Colfax	1	1	2	529	363	892
McKinley	--	2	2	--	628	628
San Juan	--	2	2	--	7,873	7,873
Total	1	5	6	529	8,864	[1] 9,392

[1] Data may not add to totals shown because of independent rounding.

Coal Gasification.—Plans for two multimillion-dollar coal gasification plants in northwest New Mexico were running more than a year behind schedule owing to inflation, Federal regulations, and Navajo discontent. Whether the two complex units that will convert coal to synthetic pipeline quality gas are ever constructed on the arid reservation land, will be decided mostly by the Navajo Nation, and opposition within the tribe has been intense. The two interested corporations, El Paso Natural Gas Co. and Western Gasification Co. (WESCO), were still talking about a starting time of 1976, but both admitted that there are many problems to overcome.

El Paso has put off further onsite work on a gasification plant by withdrawing its permit requests to the Federal Power Commission for at least 2 years. In addition, El Paso does not have a source of water to meet the plant's 30,000-acre-foot demand. Another major problem facing both El Paso and WESCO was financing since plant cost first estimated at about $350 million have escalated to $1 billion or more.

Natural Gas.—A near banner year in gas production in New Mexico was achieved in 1974, despite uncertainty in the industry.

Inflation, drilling equipment and supply shortages, political uncertainty, distribution problems, price disparities between old and new gas, and other factors affected both majors and independents alike in 1974. Seemingly insurmountable obstacles were overcome to keep rigs turning in one of the major gas-producing States in the United States. Southern Union Gas Co. and El Paso Natural Gas Co. continued to be the leaders in exploration for and production of natural gas.

Southern Union Gas Co. completed and started filling its first major underground gas storage facility, located 40 miles northwest of Albuquerque at San Ysidro. The operation will have an ultimate capacity of 25 billion cubic feet of gas.

Natural gas continued to be the principal primary source of energy consumed in 1974. Marketed output as reported by the New Mexico Oil and Gas Conservation Commission increased 2.51% from 1,199,539 million cubic feet in 1973 to 1,229,673 million cubic feet in 1974. The Permian Basin Counties of Chaves, Eddy,

Lea, and Roosevelt produced 682,281 million cubic feet, which represents a 5.05% increase over 1973 production, while the San Juan basin counties of McKinley, Rio Arriba, San Juan, and Sandoval produced 547,392 million cubic feet, or a decrease of 0.49% from 1973 production.

As of December 31, 1974, estimates by the American Gas Association (AGA) indicated proved reserves of 11,944,902 million cubic feet of gas, or a 4.3% decrease for the year 1974. According to the New Mexico Oil and Gas Conservation Commission, at yearend there were 10,300 wells producing natural gas, compared with 10,133 in 1973.

Royalties and taxes received by the State of New Mexico from gas production amounted to $35.5 million, or 49% above that of 1973. A major contributing factor to the increases noted was the change in the severance tax rate from 2½% to 2¾% effective July 1, 1974, as well as the increase in the price paid for new gas.

Natural Gas Liquids.—Production of natural gas liquids increased 1.2% to 39,984 million barrels and about 63.1% in value. According to the New Mexico Oil Conservation Commission, a total of 1,052 billion cubic feet of gas was processed in 46 plants. After extraction of liquids, 918 billion cubic feet of gas was delivered to the transmission companies, and 3.2 billion cubic feet was reinjected. Plant use, venting, and shrinkage accounted for 157 billion cubic feet, and the remainder was delivered directly to the pipeline operators.

As of December 31, 1974, estimates made by the American Petroleum Institute (API) and the AGA indicated proved reserves of 397 million barrels of natural gas liquids,[4] a decline of 16 million barrels, or about 4%, from the 1973 estimate. A decline in natural gas liquids was recorded in both the San Juan and the Permian Basins. The reduction in reserves was not as great as consumption owing to increased drilling activity and the resulting discovery of new sources.

Petroleum.—Production of petroleum declined in the State for the fifth consecutive year. Despite the apparent continuing decline in production, petroleum remains the largest single source of wealth, tax revenue, and nongovernmental employment. The field production portion of the industry, which involves large areas, has a minimal effect on the surrounding environment or degradation of land. It also attracts large quantities of out-of-State capital.

Output of petroleum totaled 98,695 million barrels as reported by the New Mexico Oil and Gas Commission. This was 2,291 million barrels, or 2.3%, less than was produced in 1973. Despite the drop in production, the value of the oil produced amounted to $712,578,000, which represents a 72.1% increase over the previous year. Dollarwise, 1974 was the best year on record.

Tables 5 and 6 depict the continued decline in petroleum production. During the year 17,235 active oil wells produced from 764 pools, a decrease of 52 producing wells but an increase of 15 pools. The number of pools or reservoirs is a highly debatable statistic; over a period of years it has been shown that what was considered a pool or reservoir for years was, in the end, an extension of another. There were 3,070 injection wells being used for secondary recovery or pressure maintenance, an increase of 116 over that of 1973. This fact again demonstrates that New Mexico oil producers are going to become more and more dependent on secondary and tertiary procedures to maintain a reasonable or significant production.

[4] American Gas Association, Inc., American Petroleum Institute, and Canadian Petroleum Association. Reserves of Crude Oil, Natural Gas Liquids and Natural Gas in the United States and Canada as of Dec. 31, 1974. V. 29, May 1975.

Table 5.—New Mexico: Production of crude oil and condensate and natural gas, by county

County	Crude oil and condensate (thousand 42-gallon barrels)		Natural gas (million cubic feet)	
	1973	1974	1973	1974
Southeast New Mexico:				
Chaves	1,921	1,788	10,308	10,294
Eddy	18,040	21,505	211,256	229,214
Lea	71,835	66,028	420,153	436,930
Roosevelt	1,620	1,373	7,704	5,842
Total	93,416	90,694	649,421	[1] 682,281
Northwest New Mexico:				
McKinley	1,674	1,263	2,355	2,668
Rio Arriba	1,616	1,476	178,647	174,870
San Juan	4,080	4,998	368,077	368,566
Sandoval	200	264	1,039	1,289
Total	7,570	8,001	550,118	[1] 547,392
Total New Mexico	100,986	98,695	[2] 1,199,539	[2] 1,229,673

[1] Data do not add to total shown because of independent rounding.
[2] Totals for natural gas differ from same totals in table 1. U.S. Bureau of Mines and the State of New Mexico use different pressure basis for natural gas statistics.
Source: New Mexico Oil Conservation Commission. 1974 Oil and Gas Statistics.

Table 6.—New Mexico: Oil and gas field statistics

	Southeast area	Northwest area	Total
Wells completed:			
Oil	382	62	444
Gas	249	332	581
Dry	238	57	295
Total	869	451	1,320
Service	32	10	42
Depleted wells abandoned:			
Oil	166	68	234
Gas	14	15	29
Service	61	--	61
Total	241	83	324
Number of pools:			
Oil	687	77	764
Gas	230	64	294
Total	917	141	1,058
Number of active wells:			
Oil	15,631	1,604	17,235
Gas	1,700	8,600	10,300
Injection	2,796	274	3,070
Total	20,127	10,478	30,605
Production from natural gas processing plants:			
Natural gasoline barrels	14,258,863	3,644,378	17,903,241
Butane do	4,124,481	4,276,343	8,400,824
Propane do	4,814,472	4,695,956	9,510,428
Composite liquids do	2,439,329	9,775,167	12,214,496
Total liquids do	25,637,145	22,391,844	48,028,989
Sulfur long tons	22,097	--	22,097
Gas processed in plants, Mcf:			
Intake	588,436,807	463,983,261	1,052,410,068
Plant use	77,767,336	13,321,523	91,088,859
Shrinkage	44,445,840	18,692,380	63,138,220

Source: 1974 Report of New Mexico Oil Conservation Commission.

The Permian Basin in the southeast portion of the State remained the principal oil-producing area, accounting for about 92% of the total. Direct revenue to the State from petroleum production in 1974 totaled $84.4 million, an increase of 78% over that of 1973.[5] Here again, the energy shortage with its attending price increases was the main contributing factor to the large increase. Royalties amounted to $39.3 million, ad valorem tax $8.1 million, conservation tax $0.9 million, severance tax $19.9 million, and school tax $16.2 million.

The API reports that proven reserves of crude oil decreased 2.8% to 625 million barrels at yearend. To this amount one can add an estimated 312 million barrels of secondary and tertiary reserves. This figure is subject to challenge because it is based on what is considered engineering knowledge and on judgment of what would be recovered by the application of fluid injection and other recently developed recovery techniques.

Based on API data, overall drilling activity in the State totaled 1,128 wells and 6,367,602 feet, an increase of 78 wells and 908,679 feet compared with 1973 figures. The data presented in other sections of this report, which were obtained from the New Mexico Oil Conservation Commission, differ from the API data. In view of the methods used to collect data, the New Mexico Oil and Gas Accounting Commission data appear to be more exact and reliable.

The number of exploratory wells increased from 191 in 1973 to 209 in 1974. The success ratio for wildcat drilling was 27%, about 5% above results reported in 1973. For development drilling, the success ratio was 82.4%, a 5% decrease from the results obtained in 1973. Eddy County, with 33 new oil and gas discoveries, was the area of most successful exploratory drilling.

Seven petroleum refineries were in operation part of or all of the year 1974: Caribou Four Corners Oil Co. at Kirkland, San Juan County; Famariss Oil and Refining Co. at Monument and Lovington, both in Lea County; Navajo Refining Co. at Artesia, Eddy County; Plateau Inc. at Bloomfield, Lea County; Shell Oil Co. at Ciniza, McKinley County; and Thriftway Oil Co. at Bloomfield, San Juan County. Aggregate output capacity was approximately 105,000 barrels per day.

Famariss Oil and Refining Co. completed construction of its new 37,000-barrel-per-day refinery located 4 miles south of Lovington, and started production June 11, 1974. The Holly Corporation of Artesia completed an expansion of its refinery in June 1974. The increase in capacity amounted to 9,000 barrels per day.

[5] New Mexico Oil and Gas Accounting Commission.

Table 7.—New Mexico: Oil and gas well drilling completions, by county

	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Chaves	9	7	16	--	3	18	53	188,650
Colfax	--	--	--	--	--	2	2	4,565
Curry	--	--	--	--	--	1	1	7,067
De Baca	--	--	--	--	1	2	3	19,893
Doña Ana	--	--	--	--	--	1	1	21,759
Eddy	85	114	54	3	30	67	353	2,514,683
Guadalupe	--	--	--	--	--	1	1	526
Harding	--	--	--	--	5	1	6	15,730
Lea	195	44	61	3	4	16	323	1,903,069
Luna	11	--	7	--	--	8	26	57,704
McKinley	--	--	--	--	1	--	1	480
Mora	--	--	--	--	--	2	2	5,226
Quay	6	151	5	--	1	4	167	802,490
Rio Arriba	2	--	5	--	--	1	8	40,954
Roosevelt	1	1	--	2	1	5	10	43,695
Sandoval	33	98	14	--	--	15	160	704,415
San Juan	--	--	--	--	--	3	3	14,559
San Miguel	--	--	--	--	--	1	1	2,093
Torrance	--	--	--	--	2	2	4	9,980
Union	--	--	--	--	--	3	3	10,064
Total	342	415	162	8	48	153	1,128	6,367,602

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 8.—New Mexico: Principal oil and gas discoveries in 1974

County and field	Well	Operator	Location			Producing formation	Total depth (feet)	Initial production	
			Section	Township	Range			Barrels of oil per day	Thousand cubic feet of gas per day
Eddy:									
Unnamed	No. 1—Pan Canadian	Coquina Oil Corp	34	19 S	25 E	Morrow	9,639	--	28,463
Corral Draw	No. 1—Corral Draw Unit	Mobil Oil Corp	14	25 S	29 E	do	15,585	--	19,517
South Empire	No. 4—South Empire Deep Ut.	Midwest Oil Corp	32	17 S	29 E	Wolfcamp	10,950	303	--
Lea:									
Leaco-Seven Rivers	No. 4—Laney	Sam K. Viersen	30	18 S	39 E	Seven Rivers	3,784	360	--
Ojo Chiso-Morrow Gas	No. 1—Ojo Chiso Unit	Brunson & McKnight, Inc	23	22 S	34 E	Morrow	13,188	--	14,744
McKinley: Unnamed	No. 1—State	Sage Corp	16	19 N	6 W	Mesaverde	2,184	60	--
Rio Arriba: Unnamed	No. 2—Schalk 62	Coastline Petroleum Corp	33	32 N	5 W	Gallup	7,686	--	16,207
Sandoval:									
Unnamed	No. 1—Chacno Jicarilla Apache.	Keesee & Thomas	23	23 N	3 W	Dakota	7,345	95	--
Do	No. 1—Rusty Federal	Chace Oil Co	11	22 N	7 W	Mesaverde	3,511	48	--
San Juan:									
Unnamed	No. 1—Schalk 94	Coastline Petroleum Corp	26	32 N	8 W	Gallup	7,605	--	2,901
Do	No. 2—Lloyd A	El Paso Natural Gas Co	9	29 N	11 W	Chacra	3,022	--	3,345
Do	No. 7—Lively	Lively Exploration Co	35	30 N	8 W	do	3,700	--	4,545

METALS

The value of metal production increased to slightly over $451 million, 35.8% greater than the $332.1 million in 1973. Increased production of most base metals and an upward trend in unit prices accounted for the increase. Value of copper production accounted for 67.4% of the total metal value in the State. The uranium share was an additional 23.2%. New Mexico also recorded production of iron ore, lead, molybdenum, manganiferous iron ore, and vanadium.

The metals sector presented a somewhat mixed picture. Total employment increased approximately 13% from that of 1973; much of this growth was attributable to a return to work by miners after a lengthy uranium strike which occurred in 1973. By yearend, however, the recession was beginning to affect the industry, and production cutbacks occurred in some New Mexico copper mines. A strike during the summer of 1974 also reduced copper output. For the entire year copper production decreased 4% from its 1973 level. In the molybdenum industry demand was strong throughout the year, with foreign demand playing an important role in maintaining output.

Copper.—During 1974 mine production of copper peaked in the third quarter and started to drop off in the fourth quarter. Total copper recovered for the year was 8,157 tons less than in 1973. The total value of 1974 production was $60.3 million greater than the 1973 value owing to an increase in price. The State remained the third largest producer, following Arizona and Utah. Kennecott Copper Corp.'s Chino mine at Santa Rita and Phelps Dodge's Tyrone mine, both in Grant County, continued to be the largest copper producers in the State. Tables 9, 10, and 11 show the details of copper production.

Table 9.—New Mexico: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by class of ore or other source material

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Gold-silver and lead [2]	3	4,417	559	27,147	6	2	(3)
Copper	8	26,343,270	14,469	1,040,205	171,022	--	230
Lead-zinc and zinc [2]	4	178,370	399	127,448	553	2,362	13,554
Total	15	26,526,057	15,427	1,194,800	171,581	2,364	13,784
Other lode material:							
Copper precipitates	3	31,891	--	--	25,004	--	--
Grand total	16	26,557,948	15,427	1,194,800	196,585	2,364	13,784

[1] Detail may not add to total because some mines produce more than 1 class of material.
[2] Combined to avoid disclosing individual company confidential data.
[3] Less than ½ unit.

Table 10.—New Mexico: Mine production (recoverable) of gold, silver, copper, lead, and zinc, by county

County	Mines producing [1] (lode)	Material sold or treated (short tons)	Gold		Silver	
			Troy ounces	Value	Troy ounces	Value
1972, total	14	20,270,860	14,897	$872,965	1,016,880	$1,713,441
1973, total	13	26,577,749	13,864	1,356,038	1,111,269	2,842,627
1974:						
Grant	8	25,488,124	14,081	2,249,300	1,103,175	5,195,955
Hidalgo	2	58,042	1,062	169,644	29,398	138,464
Undistributed [2]	6	1,011,782	284	45,366	62,227	293,089
Total	16	26,557,948	15,427	2,464,310	1,194,800	5,627,508

	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1972, total	168,034	$172,067,407	3,582	$1,076,602	12,735	$4,521,084	$180,251,499
1973, total	204,742	243,642,811	2,556	832,884	12,327	5,093,603	253,767,963
1974:							
Grant	190,394	294,345,557	2,120	953,935	13,490	9,686,310	312,431,057
Hidalgo	1,798	2,779,044	5	2,527	4	2,834	3,092,513
Undistributed [2]	4,393	6,795,596	239	107,344	290	207,528	7,448,923
Total	196,585	303,920,197	2,364	1,063,806	13,784	9,896,672	322,972,493

[1] Operations at plants leaching runoff water not counted as producing mines.
[2] Includes Sandoval, Santa Fe, Sierra, and Socorro Counties, combined to avoid disclosing individual company confidential data.

Table 11.—New Mexico: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by type of material processed and method of recovery

Type of material processed and method of recovery	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Smelting of concentrates	14,868	1,167,446	171,535	2,357	13,780
Direct smelting of—					
Ore	559	27,354	47	7	4
Cleanup	--	--	--	--	--
Precipitates	--	--	25,003	--	--
Total	559	27,354	25,050	7	4
Grand total	15,427	1,194,800	196,585	2,364	13,784

Earth Resources Co. closed its Nacimiento open pit mine and mill on January 1, 1974. The operation, one of the few red bed copper mines in the country, remained closed all year. It was reported that the decline in metal prices and the softening of the copper metal market were the reasons for closing. A standby maintenance crew was being kept at the property to allow a quick return to production, should the copper market improve.

Federal Resources Corp. started to reduce its work force during the last quarter of 1974. A complete closure of the property was forecast for mid-1975.

Work continued on the new 100,000-ton-per-year copper smelter being constructed by the Phelps Dodge Corp. near Animas in Hidalgo County. Two environmental groups filed lawsuits in an effort to stop construction of the smelter. Both suits were denied by the courts. The smelting process will be the flash process developed in Finland and is designed to remove more than 90% of the sulfur dioxide content of the smelter emissions to the air. The total cost of the smelter is estimated to exceed $200 million, of which $151 million would be spent for air pollution equipment.

The new town for employees, named Playas, located about 10 miles north of

the smelter, was completed. The site includes 225 homes, 25 apartments, schools, a church, a supermarket, athletic fields, a police force, fire protection, and an airstrip.

Kennecott Copper Corp. completed construction and brought onstream a new 500-ton-per-day sulfuric acid plant at its Hurley smelter in Grant County. This is the first phase of a program to bring the smelter into compliance with air pollution regulations. Fugitive gases and particulate matter in the stack emissions are major problems. These, along with the tightening of standards by both State and Federal agencies, create a serious situation for Kennecott Copper Corp. The smelting facility is old in both principle and construction, and a complete change in smelting method will probably be necessary to reach the standard of 90% followed by 95% removal of sulfur dioxide in stack gases.

Occidental Minerals Corp. continued to investigate the possibility of mining a copper deposit located about 2 miles from Cerrillos. One mining method being considered is acid leaching following a large single-blast operation designed to fracture the entire ore body.

Exxon continued to explore the area north and east of the old mining camp, Pinos Altos. They have announced the finding of a zone containing copper, zinc, and silver ranging in depths from 400 to 1,500 feet. The presently defined area is approximately 4,000 feet long and 1,500 feet wide. They have acquired in fee all the privately owned land in the area and have done extensive claim staking on the national forest land.

Gold.—Output of gold was from 11 operations, mostly as a byproduct of copper mining in Grant, Hildalgo, Santa Fe, and Sandoval Counties. The quantity of gold produced during 1974 was 15,427 ounces, compared with 13,864 ounces in 1973. The value of 1974 production was $2,464,310, while 1973 production was valued at $1,356,038. The marked increase during the year of the value per ounce of gold contributed to the large increase in value of production.

El Oro Mining Ltd. announced its intent to start operating a dry dredge in the Gold Dust area early in 1975. The dredge was being assembled onsite.

Iron Ore.—Modest quantities of magnetite ore produced in the State were consumed at local cement plants. U.V. Industries produced magnetite as a byproduct at the Continental mine in Grant County. This operation has an approximate milling capacity of 7,000 tons per day. Underground copper ore contains from 22% to 23% magnetite, and the surface open pit ore runs from 17% to 19%. Approximately 70% of the magnetite is removed with a grade of 60% iron.

Lead and Zinc.—Hydro Nuclear Corp. of Albuquerque ceased operations about midyear at the Linchburg mine near Kelley, Socorro County. The mine is leased from The New Jersey Zinc Co. who closed it in late 1969 because it was out of ore considered minable at the prevailing metal prices.

The Ground Hog mine, operated by ASARCO Inc. in Grant County, continued to be the only significant lead and zinc producer in the State. Small quantities of lead and zinc were produced in Hidalgo and Santa Fe Counties.

U.V. Industries activated the Hanover #8 shaft and mill, through which they hoisted a zinc-lead ore mined on their adjoining Kearney property. The property was operated by a contract miner for most of 1974. The venture was terminated early in 1975.

Molybdenum.—The Questa mine, operated by the Molybdenum Corp. of America (Molycorp), continued to be the major producer of molybdenum concentrates in the State. Kennecott Copper Corp. produced similar concentrates as a byproduct of its Hurley mill where copper ores mined at the Santa Rita open pit were processed. Kerr-McGee's Ambrosia Lake milling operation also produced a significant tonnage during the uranium concentration cycle.

Molycorp is faced with a serious environmental problem which could cause closing of the property. The Federal Environmental Protection Agency (EPA) and the State Environmental Improvement Agency have set stringent limits on the amount of molybdenum Molycorp is allowed to discharge into the Red River through tailings dam effluent. The EPA permit requires that the present 78 pounds per day be reduced to 25 pounds per day of molybdenum, which is in the form of molybdates. Existing technology does not permit the limitation to be complied with, and the Bureau of Mines is currently investigating

means of removing molybdenum from mill waters, as are several research foundations.

Silver.—Production of silver in the State showed a modest gain of 7.6% in quantity, but due to an increase in price, the total value increased 98%. Most of the silver produced is a byproduct of copper, lead, and zinc mining.

Uranium.—During 1974 New Mexico regained its position as the leading producer of uranium in the United States, accounting for 43% of the U.S. total. The total production of uranium oxide (U_3O_8) was 9,970,786 pounds, recovered from 2,997,660 tons of ore. The value of U_3O_8 produced was $104,693,255. The Energy Research and Development Administration (ERDA) reports that as of January 1, 1975, based on $15.00 per pound of U_3O_8 content, New Mexico reserves stood at 132,913,000 tons of ore averaging 0.16% U_3O_8. This represents 50% of the total U.S. reserves and is contained in 103 deposits.

ERDA reported three uranium processing mills in New Mexico, having a nominal capacity of 13,500 tons of ore per day. The mills, all located in the Ambrosia Lake district in McKinley County, accounted for 50.5% of total U.S. milling capacity. The uranium industry (excluding exploration) employed a total of 2,478 persons, of whom 1,857 worked in underground and open pit mines and 621 worked in uranium mills.[6]

Surface exploration development drilling totaled 4,860,000 feet in New Mexico. This represents 22.1% of the U.S. total and was exceeded only in Wyoming. Acreage held for uranium mining and exploration increased from 3,158,000 acres in 1973 to 3,378,000 in 1974. Five producers—Kerr-McGee Corp., The Anaconda Company, United Nuclear-Homestake Partners, United Nuclear Corp., and Homestake Mining Co.—accounted for 99.3% of the total value of uranium production during the year.

Anaconda's principal activity related to uranium mining in New Mexico continued to be the Jackpile-Paguate mine, the P–10 mine, and the Bluewater uranium mill. Work continued throughout the year on the sinking of the incline and construction of the surface plant facilities of the new P–10 mine on the Paguate property. The $2.5 million project was contracted to Kop-Ran Development Corp., a subsidiary of Ranchers Exploration and Development Corp. Production from this venture was expected to start early in 1975.

The Anaconda Co. is conducting a major exploration effort in the San Juan uranium belt. A large-scale uranium exploration venture was started on the former John Simms Ranch south of Santa Fe. Most of the work was to be accomplished in the first half of 1975.

Gulf Energy and Minerals Co. of Denver, Colo., a division of Gulf Oil Corp., announced late in the year the start of construction on surface facilities for a uranium mine in the Mount Taylor area near Grants. The first phase of the work will include construction of hoisting facilities for the two circular shafts. Also to be constructed are a warehouse, office, shop, and utility facilities. Dravo Corp. has been named to perform the engineering and design work of the mine plant and shaft facilities. Harrison Western Co. of Denver, Colo., will do the shaft sinking.

United Nuclear-Homestake Partners continued to operate its mill in the Ambrosia Lake district of McKinley County. Production was increased to near capacity by custom milling approximately 1,500 tons per day of ore produced by Anaconda. This arrangement was expected to last about 2 years. Towards the end of 1974, metallurgical problems developed which indicated that the agreement might have to be canceled. United Nuclear, outside the partnership, operated two mines in the Ambrosia Lake area and one in the Church Rock area. The Ann Lee mine was operated by solution mining, which proved to be quite successful. The bulk of the ore produced by United Nuclear came from its new mine, Northeast Church Rock. A new ventilation shaft 12 feet in diameter and 1,760 feet deep was sunk at the Northeast Church Rock mine. The shaft was sunk utilizing a 60-inch burn cut, which was drilled and upreamed by Teton Exploration Co. The new ventilation shaft is concrete lined and was sunk in a geographic area considered extremely difficult to work in.

Kerr-McGee, the largest producer of uranium concentrates in New Mexico, completed a new shaft in the Church Rock area and brought it into production as the

[6] Energy Research and Development Administration, Grand Junction Office. Statistical Data of the Uranium Industry. Jan. 1, 1975, 85 pp.

second largest producer among their 17 active mines. Kerr-McGee continued to extract appreciable quantities of U_3O_8 from the mine waters reasonably available to the mill.

Kerr-McGee continued a vigorous exploration campaign in the State as well as taking an active part in bidding on State and Federal mining leases.

Sohio Petroleum Co. started construction of the new L-Bar Ranch mine early in 1974. Sohio, a subsidiary of Standard Oil of Ohio, in a joint venture with Reserve Oil and Mineral Corp. will build a complete operating unit including both the mine and mill along with all support facilities. The combine own 120,000 acres in the area, part of which contain favorable geologic formations indicating potential additional reserves.

The milling process will be conventional with one exception. The hot (180°F) water required for acid leaching of the ore will be heated by solar means in large ponds covering approximately 6 acres. The Livermore Laboratories of ERDA in Berkeley, Calif., are designing the system. Mining will be conventional, using the most modern and efficient methods and equipment. The mine will bottom out at about 650 feet in depth. Production of uranium concentrate was expected to start by late 1976. The joint venture has a sales contract with Gulf Oil for delivery of $51 million worth of concentrates.

Western Nuclear Inc., a wholly owned subsidiary of Phelps Dodge Corp., is currently developing the Western 21 mine in the Smith Lake area, approximately 12 miles north of Thoreau in McKinley County. At yearend plans called for production to be custom-milled.

Ranchers Exploration and Development Corp. is progressing favorably on its new Johnny M mine located in the eastern end of the Ambrosia Lake area near Grants in McKinley County. The project will require in excess of $7 million to open and place in operation this high-grade uranium mine. Deliveries of uranium oxide were expected to start early in 1976. The property is owned 50% each by Ranchers and HNG Oil Co., a wholly owned subsidiary of Houston Natural Gas Corp.

During the year Ranchers Exploration and Development Corp. announced a $3 million uranium exploration venture with Urangesellschaft M. K. B., a West German uranium mining and milling concern. The exploration effort will be concentrated on about 200,000 acres of land owned by Ranchers in several Western States.

Exxon and the Navajo Tribal Council negotiated and signed a contract for rights to explore for and mine uranium ores on 400,000 acres of tribal lands in the northwest corner of New Mexico. The agreement is extensive in coverage of rights of both parties and royalties to be paid and contains a guarantee of $6 million as a cash bonus. Exploration rights continue for 6 years, after which final acreage must be established to a maximum of 52,600 acres in tracts not to exceed 5,260 acres per tract. At yearend final approval was pending in the Secretary of the Interior's office, and some of the tribal chapters in the area involved were objecting to the proposed lease. Exxon had a similar lease pending on the entire Canoncita Reservation of the Canoncita Band of Navajo Indians. The area involved is 62,182 acres with a guaranteed cash bonus of $450,000.

ERDA announced that abandoned uranium mines in New Mexico may be reopened because of increased demands for nuclear fuel. Century Geophysical Corporation is currently probing and logging at various abandoned mines.

NONMETALS

In 1974 the value of nonmetals production was almost $171 million and represented 9% of the State's total value of mineral production. Potassium salts remained the most valuable nonmetallic mineral produced in New Mexico; its share in value of total nonmetals output was 75.2%.

Cement.—The State's only cement plant, located at Tijeras east of Albuquerque, Bernalillo County, was operated by Ideal Cement Co., a division of Ideal Basic Industries, Inc. The plant operated a full capacity all year.

Clays.—Nine operations reported producing clay during the year. Of these nine units, two produce a soil additive made from a carbonaceous shale and humus. The shale carries a high humic acid content, which, along with its water retention capability makes it an excellent soil conditioner.

Fluorspar.—Only one fluorspar facility, The Mining and Milling Co. of America, reported production in 1974, and its operation was closed in the latter part of 1974

because it had run out of ore. Additional surface drilling failed to disclose additional ore. Allied Chemical Co. was very active in exploring for fluorspar in the State in 1974. It bought and drilled out the Lida K mine located on the west slope of the Caballo Mountains. The drilling disclosed an economic ore body, but owing to the grain size, grinding during a milling operation would have to produce a minus 600-mesh product. The mine will be developed at a later date. Allied also took an option on approximately 1,500 acres of potential fluorspar in the Red Rock area of Grant County. The property was successfully drilled out, which included the Grey Eagle mine. The property will be brought into production at a later date.

Gypsum.—White Mesa Gypsum Co., Republic Gypsum Co., and Duke City Gravel Products Co. mined gypsum in Sandoval and Santa Fe Counties for gypsum board products and for portland cement. Output declined to 157,000 tons, 39% below the 1973 record. American Gypsum Co. and Republic Gypsum Co. calcined gypsum in Bernalillo and Santa Fe Counties; output declined 38%.

Republic Gypsum Co. was struck by its employees about mid-1974 and remained closed, the company announcing that the plant would not reopen.

Lime.—Mathis Mining & Exploration Co. constructed a new limekiln in Grant County. Kennecott Copper Corp. and Mathis produced quicklime in Grant County for copper ore concentration. Output was a record 58,000 tons, 32% above the 1973 record. The lime was used in New Mexico. Consumption of lime in New Mexico was 94,750 tons.

Mica.—There was only one mica mine and mill active in the State during 1974. The operation is located in Taos County, and is owned and operated by Mineral Industries Commodities of America, Inc.

Western Energy Corp., operating through a wholly owned subsidiary, did not start operating in 1974 as expected.

Perlite.—New Mexico continued to be the principal producing State with 86% of the total crude perlite ore mined. A total of 480,024 tons of perlite, valued at $6.3 million, was produced during the year. Grefco, Inc., with the El Grandy mine, and Johns-Manville Perlite Corp., with the Seven Hill mine, both in Taos County, were the leading producers, accounting for approximately 89% of the total State output. The balance of the State production came from the Silbrico Corp. plant also in Taos County.

In February the Dicalite Division of Grefco announced plans to open a division at the old Socorro perlite mine. The mine was scheduled to be in operation by late 1975. The ore will be processed elsewhere. The perlite will be used as insulation in masonry blockfill, ceiling tile, insulation boards, paint, and paper. Some will be used as filter aids in many segments of industry.

Potash.—New Mexico continued to be our country's largest producer of potash, contributing about 82% of total U.S. output in 1974. Six companies were engaged in potash production, all in Eddy County, southeastern New Mexico. Production decreased 3.1% from 2,168,000 short tons K_2O equivalent in 1973 to 2,102,000 tons in 1974. The value of 1974 production was $128.6 million, compared with $92 million in 1973.

International Minerals & Chemical Corp. announced the start of a $35 million program that will nearly double the output of its 300,000-ton-per-year Carlsbad operation. The expansion was to be completed by early 1975. Mississippi Chemical Corp. continued rehabilitation operations of the properties it purchased from Teledyne Corp. The old refinery is being completely rebuilt and modernized along with an increase in production capacity. Teledyne is currently seeking permission from the Bureau of Land Management (BLM) to buy several sections of land adjoining its property along with an easement for an entry road to the area. The additional property will allow a new shaft to be sunk and the construction of an all-new modern mill. Noranda Mines Ltd. of Canada has acquired a 32,000-acre property in the Carlsbad area and is conducting a $300,000 exploration program. AMAX Chemical Corp. is carrying on an extensive exploration program in all areas of the Carlsbad basin, using surface core drilling to investigate favorable areas.

Table 12.—New Mexico: Production and sales of potassium salts, 1973–74
(Thousand short tons and thousand dollars)

Period	Crude salts [1] (mine production)		Marketable potassium salts					
			Production			Sold or used		
	Gross weight	K_2O equivalent	Gross weight	K_2O equivalent	Value [2]	Gross weight	K_2O equivalent	Value
1973:								
January-June	8,671	1,411	1,998	1,112	45,075	2,498	1,372	56,291
July-December	8,421	1,335	1,940	1,055	46,920	1,916	1,049	46,747
Total [3]	17,092	2,746	3,938	2,168	91,996	4,414	2,422	103,038
1974:								
January-June	8,442	1,305	1,958	1,042	56,029	2,022	1,075	57,827
July-December	8,764	1,361	1,991	1,060	72,559	1,863	986	68,196
Total	17,206	2,666	3,949	2,102	128,588	3,885	2,061	126,023

[1] Sylvite and langbeinite.
[2] Derived from reported value of "Sold or used."
[3] Data may not add to totals shown because of independent rounding.

Pumice.—New Mexico ranked fourth in the Nation in the production of pumice.[7] There were 13 mines and 5 processing plants in operation. The total value of the pumice produced was $1,466,000. Morton Bros. in Doña Ana County, General Pumice Corp. in Roosevelt County, and Twin Mountain Rock Co. in Union County were the largest producers.

Salt.—Production of salt in various forms continued to be a major byproduct of the potash industry. A total of four operations reported production, with a fifth, a major producer, not reporting.

Sand and Gravel.—Sand and gravel production of 7,413,000 tons resulted in a 30% decrease for 1974, compared with 1973 output. The value of the 1974 production was $10,605,000, which is 33% below the 1973 value. Sand and gravel continued to be the most widespread mining activity in the State and was produced in 27 counties by 121 operations.

Construction aggregate and industrial sand and gravel used in 1974 recorded sharp drops in both tons used and dollar value; tons consumed declined 47%, and dollar value dropped 33%.

Construction aggregate used in publicly funded projects remained practically stable when tons consumed is considered but recorded a sharp decrease of 33% in value.

The marked decrease in both tons produced and value of sand and gravel in New Mexico can be directly attributed to the effects of the economic recession, which resulted in a major decrease in building starts in both the residential and commercial areas.

[7] Statistics designated "pumice" also include such volcanic materials as scoria and volcanic cinder.

Table 13.—New Mexico: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	10,641	15,753	1,880	3,270
Gravel			4,713	6,857
Unprocessed: Sand and gravel			820	454
Industrial:				
Sand	--	--	--	--
Gravel			--	--
Total	10,641	15,753	7,413	10,581

[1] Value data may not be directly comparable to those in tables 1, 14, 15, and 16 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 14.—New Mexico: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			1,903	3,775
Highway and bridge construction			83	209
Other uses (dams, waterworks, airports, etc.)			45	116
Concrete products (cement blocks, bricks, pipe, etc.)	6,604	9,583	399	1,094
Bituminous paving (asphalt and tar paving)			351	522
Roadbase and subbase			497	712
Unprocessed aggregate			358	225
Fill			180	232
Other uses [2]	307	258	7	28
Industrial sand and gravel	292	524	--	--
Total	7,203	10,365	3,823	6,913

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 15.—New Mexico: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			99	191
Highway and bridge construction			59	93
Other uses (dams, waterworks, airports, etc.)			20	31
Concrete products (cement blocks, bricks, pipe, etc.)	1,841	4,037	W	W
Bituminous paving (asphalt and tar paving)			1,481	1,901
Roadbase and subbase			1,314	1,083
Unprocessed aggregate			461	229
Fill	1,587	1,338	94	57
Other uses	10	13	62	107
Total	3,438	5,388	3,590	3,692

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

Table 16.—New Mexico: Sand and gravel sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Bernalillo	9	2,872	3,832	8	2,213	3,551
Catron	3	161	294	--	--	--
Chaves	7	421	398	6	277	347
Colfax	4	107	152	4	206	210
De Baca	--	--	--	2	W	W
Doña Ana	15	596	496	12	435	303
Eddy	W	W	W	2	W	W
Grant	W	W	W	2	W	W
Guadalupe	W	W	W	2	W	W
Hidalgo	3	296	W	2	W	397
Lea	6	487	1,072	4	229	389
Lincoln	4	87	135	7	167	304
Luna	4	124	169	3	44	74
McKinley	1	106	357	2	W	252
Mora	1	43	281	2	29	20
Otero	10	525	568	8	474	466
Quay	2	W	W	2	W	W
Rio Arriba	3	133	179	6	163	146
Sandoval	5	1,710	1,450	3	46	36
San Juan	10	596	947	11	531	966
San Miguel	W	W	W	4	87	122
Santa Fe	9	471	570	10	934	850
Sierra	3	W	W	2	W	W
Socorro	W	W	W	3	W	W
Taos	5	W	93	5	110	273
Torrance	4	48	61	3	63	43
Union	W	W	W	2	W	W
Valencia	7	421	W	4	87	169
Undistributed	16	1,440	4,700	--	1,314	1,686
Total [1]	131	10,641	15,753	121	7,413	10,605

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Data may not add to totals shown because of independent rounding.

Stone.—During 1974 there were 66 stone quarries operating in the State, 32 more than in 1973. Production was 3,531,000 tons valued at $8,359,000, increases of 25% and 41.8% respectively.

The stone industry experienced this marked increase in production primarily owing to continued improvement in the residential, commercial, industrial, and highway construction segments of the State's economy.

Table 17.—New Mexico: Stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974			Kind of stone produced in 1974 [1]
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Catron	1	60	91	--	--	--	
Chaves	--	--	--	2	35	85	Limestone.
De Baca	--	--	--	1	139	457	Do.
Doña Ana	5	115	W	6	W	396	Limestone, sandstone, marble.
Eddy	3	W	W	4	220	641	Limestone.
Grant	2	137	W	2	101	W	Do.
Hidalgo	2	109	164	8	449	844	Other stone.
Lea	3	169	379	4	332	1,170	Limestone.
Lincoln	1	64	96	4	50	154	Do.
McKinley	2	W	W	7	399	784	Limestone, traprock.
Otero	2	148	282	7	190	477	Limestone, sandstone.
Quay	1	20	30	--	--	--	
Rio Arriba	--	--	--	3	14	37	Limestone, granite, other stone.
Roosevelt	3	134	147	--	--	--	
Sandoval	1	W	W	2	497	941	Traprock.
Taos	1	W	43	3	30	62	Limestone, granite.
Valencia	1	36	18	3	146	332	Sandstone, other stone.
Undistributed [2]	6	1,837	4,645	10	930	1,978	
Total [3]	34	2,830	5,894	66	[4] 3,531	8,359	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Limestone used generally to include dolomite.
[2] Includes Barnalillo, Luna, San Juan and Socorro Counties, and production for which no county breakdown is available (1973).
[3] Data may not add to totals shown because of independent rounding.
[4] Data represent crushed stone only.

Table 18.—New Mexico: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Limestone	--	--	W	W
Marble	W	W	W	W
Sandstone	W	W	W	W
Other stone	W	W	W	W
Crushed and broken:				
Limestone [1]	1,118	2,555	2,242	5,619
Granite	--	--	19	36
Marble	W	1	--	--
Sandstone	--	--	141	401
Traprock	W	W	586	1,158
Other stone	967	1,624	543	1,070
Undistributed	744	1,715	W	76
Total [2]	2,830	5,894	[3] 3,531	8,359

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Limestone used generally to include dolomite.
[2] Data may not add to totals shown because of independent rounding.
[3] Data represent crushed stone only.

Sulfur.—Production of sulfur as a by-product of the oil industry increased towards yearend. Environmental laws are continuing to be changed, and the limits of emission are being lowered. This will result in a continuing increase in production. The start of operations of the Phelps Dodge Co.'s Hidalgo copper smelter in Hidalgo County will add to the State production because the smelting process calls for the production of elemental sulfur when not making sulfuric acid.

Table 19.—Principal producers

Commodity and company	Address	Type of activity	County
Carbon dioxide, natural:			
Schwartz Carbonic Co	P.O. Box 9737 El Paso, Tex. 79987	Well and plant	Harding.
S.E.C. Corp	---- do	---- do	Do.
Cement: Ideal Basic Industries, Inc.[1 2 3]	420 Ideal Cement Bldg. Denver, Colo. 80202	Plant	Bernalillo.
Clays: Farm Guard Products	5555 Montgomery NE. Albuquerque, N.Mex. 87110	Pits	Sandoval.
Coal:			
Kaiser Steel Corp	P.O. Box 58 Oakland, Calif. 90604	Underground mine and plant.	Colfax.
Utah International, Inc	550 California St. San Francisco, Calif. 94104	Strip mine and plant.	San Juan.
Copper:			
Kennecott Copper Corp.[4 5 6]	Hurley, N.Mex. 88043	Open pit mine, mill, plant, smelter, refinery.	Grant.
Phelps Dodge Corp.[6]	Drawer B Tyrone, N.Mex. 88065	Open pit mine and mill.	Do.
U.V. Industries[6 7 8]	136 East South Temple St. Salt Lake City, Utah 84111	Underground mine and mill.	Do.
Gypsum: White Mesa Gypsum Co.	124 Jackson NE. Albuquerque, N.Mex. 87108	---- do	Sandoval.
Iron ore: H. N. LaRue & Sons	P.O. Box 1224 Socorro, N.Mex. 87801	Mine and plant	Torrance.
Manganiferous ore: Luck Mining Co.	215 Market St. San Francisco, Calif. 94105	Open pit mine	Grant.
Mica: Mineral Industries Commodities of America, Inc.	P.O. Box 2408, Santa Fe, N.Mex. 87501	---- do	Taos.
Molybdenum: Molybdenum Corp. of America.	280 Park Ave. New York, N.Y. 10017	Open pit mine and mill.	Do.
Peat: Humus Organic Products.	P.O. Box 520 Bernalillo, N.Mex. 27004	Humus bog	Sandoval.
Perlite:			
Grefco, Inc	333 North Michigan Ave. Chicago, Ill. 60601	Open pit mine and plant.	Taos.
Johns-Manville Perlite Corp	2500 Miguelito Rd. Lompoc, Calif. 93436	---- do	Do.
Potash:			
AMAX Chemical Corp	P.O. Box 279 Carlsbad, N.Mex. 88220	Underground mine and refinery.	Eddy.
Duval, Corp	P.O. Box 511 Carlsbad, N.Mex. 88220	Underground mines and refinery.	Do.
International Minerals & Chemical Corp.	P.O. Box 71 Carlsbad, N.Mex. 88220	Underground mine and refinery.	Do.
Kerr-McGee Corp	Kerr-McGee Bldg. Oklahoma City, Okla. 73102	---- do	Do.
National Potash Co	P.O. Box 731 Carlsbad, N.Mex. 88220	---- do	Do.
Pumice:			
General Pumice Corp	P.O. Box 449 Santa Fe, N.Mex. 87501	Open pit mine and plant.	Roosevelt.
Morton Bros	P.O. Box 2000 Las Cruces, N.Mex. 88001	---- do	Doña Ana.
Twin Mountain Rock Co	P.O. Box 1009 Sheridan, Wyo. 82801	---- do	Union.
Salt: Teledyne Potash Co	P.O. Box 101 Carlsbad, N.Mex. 88220	Solar evaporation.	Eddy.
Sand and gravel:			
Albuquerque Gravel Products Co.	P.O. Box 829 Albuquerque, N.Mex. 87103	Plant	Bernalillo.
Springer Corp	P.O. Box 572 Albuquerque, N.Mex. 87103	Pit and plant	Do.
Sam Sanders Sand	P.O. Box 782 Clovis, N.Mex. 88101	Pit	DeBaca.
Wylie Brothers Contracting Co.	P.O. Box 8526 Albuquerque, N.Mex. 87103	Plants	Bernalillo, Lea, Sandoval, Valencia.

See footnotes at end of table.

Table 19.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Stone: G. F. Atkinson Co ----	P.O. Box W Albuquerque, N.Mex. 87103	Quarry ----------	Sandoval.
Uranium:			
The Anaconda Company --	P.O. Box 638 Grants, N.Mex. 87020	Open pit mine --	Valencia.
Kerr-McGee Corp ----------	P.O. Box 218 Grants, N.Mex. 87020	Underground mines and mill.	McKinley.
Zinc: American Smelting and Refining Co.[6 8 9]	120 Broadway New York, N.Y. 10005	---- do --------	Grant.

[1] Also potash.
[2] Also clays.
[3] Also stone.
[4] Also molybdenum.
[5] Also lime.
[6] Also gold and silver.
[7] Also zinc.
[8] Also lead.
[9] Also copper.

The Mineral Industry of New York

By L. F. Heising [1]

The total value of New York's mineral production was $440.6 million in 1974, compared with $375.9 million in the previous year. New York was the sole producing State for aluminum-zirconium oxide and wollastonite in 1974. The State ranked first nationally in the production of zinc, aluminum oxide abrasives, calcium-magnesium chloride, emery, talc, and ilmenite, and continued to be a major producer of cement, garnet, gypsum, salt, sand and gravel, and stone.

[1] State Liaison Officer, Bureau of Mines, Albany, N.Y.

Table 1.—Mineral production in New York [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays [2] ---------- thousand short tons --	1,799	$2,146	1,451	$2,348
Emery ---------- short tons --	2,883	W	W	W
Gem stones ----------	NA	16	NA	16
Gypsum ---------- thousand short tons --	525	3,369	364	2,942
Lead (recoverable content of ores, etc.) short tons --	2,304	751	3,076	1,384
Natural gas ---------- million cubic feet --	4,539	1,590	4,990	2,745
Peat ---------- thousand short tons --	11	166	18	181
Petroleum (crude) thousand 42-gallon barrels --	967	5,412	896	9,538
Salt ---------- thousand short tons --	5,202	42,364	6,464	57,705
Sand and gravel ---------- do ----	29,544	41,396	30,614	46,652
Silver (recoverable content of ores, etc.) thousand troy ounces --	54	139	64	304
Stone ---------- thousand short tons --	44,393	94,693	38,207	87,724
Zinc (recoverable content of ores, etc.) short tons --	81,455	33,657	93,077	66,829
Value of items that cannot be disclosed: Cement, clay (ball), garnet (abrasive), iron ore, lime, mercury (1974), talc, titanium concentrates, wollastonite, and values indicated by symbol W ----------	XX	150,167	XX	162,205
Total ----------	XX	375,866	XX	440,573
Total 1967 constant dollar ----------	XX	275,547	XX	p 210,682

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes ball clay; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in New York, by county [1] [2]

County	1973	1974	Minerals produced in 1974 in order of value
Albany	$39,038	$41,090	Cement, stone, clays, sand and gravel.
Allegany	W	4,044	Petroleum, sand and gravel, natural gas.
Broome	W	W	Sand and gravel, clays, stone.
Cattaraugus	7,189	10,579	Petroleum, sand and gravel, natural gas.
Cayuga	W	W	Sand and gravel, natural gas.
Chautauqua	W	1,460	Petroleum, natural gas, sand and gravel.
Chemung	W	370	Sand and gravel.
Chenango	W	483	Do.
Clinton	W	W	Stone, sand and gravel.
Columbia	16,434	W	Cement, stone, sand and gravel, clays.
Cortland	W	662	Sand and gravel.
Delaware	1,951	1,959	Stone, sand and gravel.
Dutchess	W	W	Stone, sand and gravel, peat.
Erie	15,198	15,175	Stone, lime, sand and gravel, gypsum, natural gas, clays.
Essex	8,699	9,866	Titanium concentrates, wollastonite, iron ore, stone, sand and gravel, garnet.
Franklin	W	W	Sand and gravel, stone.
Fulton	121	110	Sand and gravel.
Genesee	4,558	4,002	Stone, gypsum, sand and gravel, natural gas.
Greene	W	32,582	Cement, stone, sand and gravel.
Herkimer	W	W	Stone, sand and gravel.
Jefferson	W	W	Do.
Lewis	W	W	Do.
Livingston	11,938	W	Salt, stone, sand and gravel, natural gas.
Madison	W	W	Stone, natural gas, sand and gravel.
Monroe	W	W	Stone, sand and gravel, natural gas.
Montgomery	W	1,631	Stone, sand and gravel.
Nassau	W	W	Sand and gravel, clays.
Niagara	W	W	Stone.
Oneida	W	W	Stone, sand and gravel.
Onondaga	27,838	28,673	Lime, stone, cement, salt, sand and gravel, clays.
Ontario	W	2,716	Stone, sand and gravel, natural gas.
Orange	W	W	Sand and gravel, stone, peat.
Orleans	W	W	Sand and gravel, stone.
Oswego	W	1,081	Sand and gravel.
Otsego	W	379	Do.
Putnam	W	W	Stone, sand and gravel.
Rensselaer	W	W	Sand and gravel, stone.
Richmond	W	W	Sand and gravel.
Rockland	9,445	W	Stone, sand and gravel.
St. Lawrence	52,482	91,380	Zinc, iron ore, talc, stone, lead, sand and gravel, silver, mercury.
Saratoga	1,588	1,888	Stone, sand and gravel.
Schenectady	W	W	Sand and gravel.
Schoharie	W	6,783	Cement, stone, clays, sand and gravel.
Schuyler	W	W	Salt, sand and gravel.
Seneca	W	W	Stone, natural gas, peat.
Steuben	W	3,335	Sand and gravel, natural gas, stone, petroleum.
Suffolk	4,519	6,749	Sand and gravel.
Sullivan	W	W	Stone, sand and gravel.
Tioga	968	1,310	Sand and gravel.
Tompkins	5,217	8,067	Salt, stone, sand and gravel.
Ulster	22,942	26,112	Cement, stone, clays, sand and gravel.
Warren	8,764	10,683	Cement, garnet, stone, sand and gravel.
Washington	W	1,248	Stone, sand and gravel.
Wayne	1,225	W	Do.
Westchester	961	126	Stone, emery, peat.
Wyoming	W	W	Salt, natural gas.
Yates	W	W	Salt.
Undistributed [3]	134,792	126,029	
Total [4]	375,866	440,573	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Bronx, Hamilton, Kings, New York, and Queens Counties are not listed because no production was reported.

[2] Value of petroleum and natural gas (1974) is based on an average price per barrel and cubic foot, respectively, for the State.

[3] Includes gem stones, sand and gravel that cannot be assigned to specific counties, and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of New York business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---------- thousands --	7,442.7	NA	NA
Unemployment ---------- do ----	405.2	NA	NA
Employment (nonagricultural):			
Mining ---------- do ----	7.3	7.5	+2.7
Contract construction ---------- do ----	279.0	262.7	—5.8
Manufacturing ---------- do ----	1,618.4	1,581.2	—2.3
Transportation and public utilities ------- do ----	470.2	457.8	—2.6
Wholesale and retail trade ---------- do ----	1,459.7	1,443.0	—1.1
Finance, insurance, and real estate ----- do ----	589.6	587.2	—0.4
Services ---------- do ----	1,434.6	1,453.5	+1.3
Government ---------- do ----	1,265.7	1,292.0	+2.1
Personal income:			
Total ---------- millions --	$104,188	$113,094	+8.5
Per capita ----------	$5,720	$6,244	+9.2
Construction activity: Portland cement shipments to and within New York ---------- thousand short tons --	4,066	3,467	—14.7
Mineral production value ---------- thousands --	$375.9	$440.6	+17.2

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Area Trends in Employment and Unemployment; and U.S. Bureau of Mines.

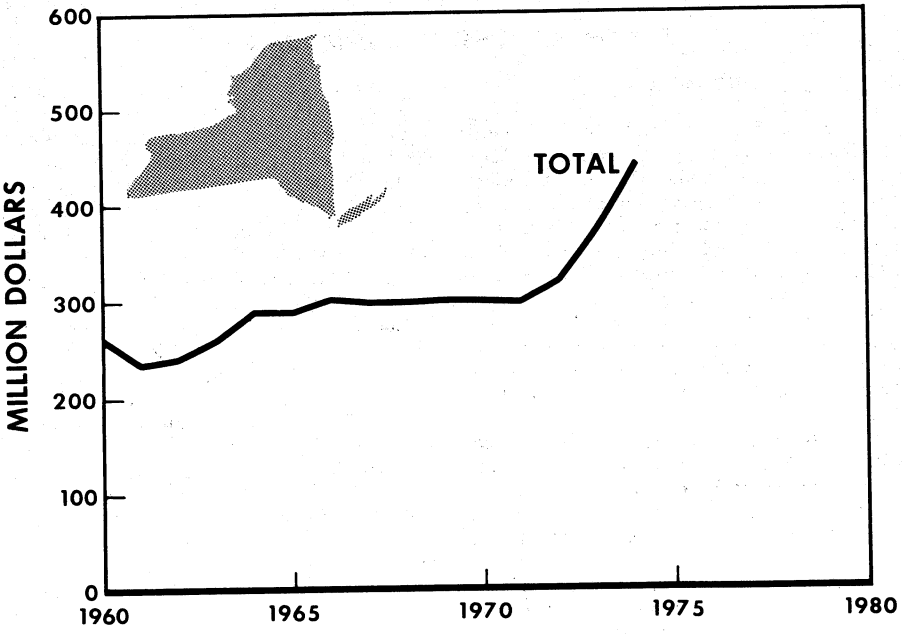

Figure 1.—Total value of mineral production in New York.

Employment.—Total employment in New York State in 1974 was 7,149,000. Total unemployment in December 1974 was 570,000.

A comparison of total nonagricultural employment in the State, in thousands, by various sectors is as follows:

	1974	
	January	December
Manufacturing:		
Durable goods:		
Primary metal industries	74.2	68.4
Stone, clay, and glass products	43.8	41.6
All other durable goods	670.2	655.5
Nondurable goods:		
Chemical and allied products	77.1	77.6
Petroleum refining and related industries	8.3	8.8
All other nondurable	697.8	672.3
Mining	6.5	7.3
Other industries and services	5,406.2	5,548.1
Total employment	6,984.0	7,079.6

Source: New York State Department of Labor.

Legislation and Government Programs.—In 1974, the State legislature enacted and the Governor signed into law a bill requiring operators of strip and open pit mines, mining 1,000 tons or more in 12 successive months, to obtain a permit from the Department of Environmental Conservation to operate after April 1, 1975. In applying for the permit, the company is required to submit a mining and reclamation plan outlining the mining sequence and method proposed to restore the land to a reasonably attractive and useful site when mining is terminated. The law also requires posting of a bond to guarantee performance of the mandated land restoration.

A $250 million railroad bond measure was approved by an overwhelming margin. The bond issue, which with Federal money is expected to produce a total of $811 million, is to allow for improvements in passenger and freight rail systems. Some of the money will be used to save some or all of the 1,800 miles of secondary freight track scheduled for abandonment.

The legislature amended the Workmen's Compensation Law to extend compensation coverage to include partial as well as total disability or death resulting from silicosis.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasives, Manufactured.—The General Abrasives Co., Div. of U.S. Industries, Inc., and The Carborundum Co., Electro Minerals Div., in Niagara County, operated electric furnaces for producing fused aluminum oxide and silicon carbide. The finished products were used in abrasives and in refractories and other nonabrasives.

Metallic abrasives consisting of steel shot and grit, and cut wire shot, were produced by Cleveland Metal Abrasive Co., Div. of Fanner Manufacturing Co., and Pellets, Inc., in Erie County.

Calcium-Magnesium Chloride.—Allied Chemical Corp. produced synthetic calcium-magnesium chloride at Onondaga as a by-product of the manufacture of soda ash. Output increased 19% from that of the previous year.

Cement.—Shipments of all types of cement increased 4.5% in value but declined 17.1% in quantity from that of the previous year. Cement continued to rank first in value among the State's mineral industries. Portland cement accounted for 98% of the cement value; the average price or portland cement was $4.80 per barrel. Shipments of masonry cement decreased 21.6% in quantity and the average price was $4.23 per barrel.

Eleven plants were in operation, of which nine were in eastern and two were in western New York. Four plants produced portland cement exclusively, six produced portland and masonry cements, and one produced masonry cement only. Cement production was from seven counties; Albany ranked first in quantity, followed by Greene, Ulster, Columbia, Schoharie, Warren, and Onondaga Counties.

Clays.—Total production of common and shale clays was 1.45 million short tons valued at $2.35 million. Shale and common clay were mined in Albany, Broome, Columbia, Erie, Nassau, Onondaga, Schoharie, and Ulster Counties. Clay was used for lightweight aggregate and portland cement and for pottery and abrasive bonding.

Emery.—Virtually all of the U.S. emery production was from the DeLuca Emery Mine, Inc., open pit in Westchester County. Output declined in quantity and in value from 1973 levels. Uses were mainly for heavy-duty nonslip floors and pavements and for general abrasive purposes.

Garnet.—The quantity of abrasive garnet decreased 11.3% and value decreased 8.6% from that of 1973. Garnet from the open pit mine in Warren County operated by Barton Mines Corp. was sold for precision uses in coated abrasives, glass grinding and polishing, and metal lapping. Garnet re-

covered as a byproduct of wollastonite mining by Interpace Corp., in Essex County, was sold for use in sandblasting and for general abrasive purposes. New York State ranked second in the production of garnet in 1974.

Gem Stones.—The collection of gem stones and mineral specimens was principally done by amateurs. The value of gem stone production was estimated to be about $16,000.

Graphite, Manufactured.—Graphite manufactured from petroleum coke and other materials was produced by Great Lakes Carbon Corp., Airco Speer Electronics, Carborundum Metals Co., and Union Carbide Corp. The principal uses were for shapes: Anodes, electrodes, electric motor brushes, crucibles, and other refractories. Synthetic graphite powder was used in steelmaking, an additive in nonferrous metallurgy, foundry facings, and in lubricants.

Gypsum.—Output of crude gypsum declined 31% to 364,200 tons. Production came from three mines, two in Erie County and one in Genesee County. Most of the gypsum was calcined in company-owned plants for use in manufacturing building materials. Seven calcining plants located in Bronx, Erie (2), Genesee, Richmond, Rockland, and Westchester Counties were in operation. Output declined 22% to 954,000 tons.

Uses for calcined gypsum other than for building materials included manufacturing plate glass, pottery, molding, and art coating plasters. Some crude gypsum was used as a retarder in portland cement.

The Public Service Commission approved construction of 5 miles of pipeline from natural gas wells in the town of Alabama to the United States Gypsum Co. plant in Genesee County. Under a 10-year agreement, the plant will receive 1.1 million cubic feet of gas per day.

Table 4.—New York: Crude gypsum production

(Thousand short tons and thousand dollars)

Year	Active mines	Quantity	Value
1969	4	492	2,945
1970	3	425	2,737
1971	3	415	2,376
1972	3	486	3,079
1973	3	525	3,369
1974	3	364	2,942

Lime.—Allied Chemical Corp. and Bethlehem Steel Corp. produced quicklime in Onondaga and Erie Counties, respectively, for use in alkalies and the basic oxygen furnace (BOF) steel process. The lime was consumed in New York. Consumption of lime in New York was 986,100 tons.

Perlite.—Crude perlite mined in Western States was expanded at plants of four companies in New York. National Gypsum Co. operated plants in Bronx and Erie Counties; Georgia-Pacific Corp. and Buffalo Perlite Corp., in Erie County; and United States Gypsum Co., in Genesee, Richmond, and Rockland Counties. The most important use was in the manufacture of acoustical building plaster. Other uses included loose fill insulation, soil conditioning, lightweight concrete aggregate, and filtration.

Salt.—The output of salt increased 24% in quantity and 36% in value over that of 1973. The overall value per ton increased slightly. By tonnage, most evaporated salt was used in food processing and seasoning. Another large use for evaporated salt was for manufacturing chlorine and other chemicals. The principal use for rock salt was for ice control on highways in the Northeastern States. Other important uses for rock salt were in the chemical and food industries. Brine was used for the manufacture of soda ash, chlorine, and other chemicals. Salt for chemical manufacture was consumed mainly within the State.

Rock salt was produced from one mine each in Livingston, Tompkins, and Yates Counties. Brine was produced in one operation each in Onondaga and Schuyler Counties. Evaporated salt was produced from two operations in Schuyler County and from one operation in Wyoming County.

Table 5.—New York: Salt sold or used by producers

(Thousand short tons and thousand dollars)

Year	Quantity	Value
1969	5,582	45,561
1970	5,990	47,254
1971	5,303	43,601
1972	5,604	43,866
1973	5,202	42,364
1974	6,464	57,705

Sand and Gravel.—Production of sand and gravel in the State in 1974 was 30.6 million short tons valued at $46.7 million. Sand and gravel was produced at commercial mining operations as well as at locations operated by construction companies and governmental crews working on various Federal, State, county, and local government contracts. More than 1 million tons each were reported from the following counties: Cattaraugus, Dutchess, Monroe, Nassau, Orange, Rensselaer, and Suffolk.

Table 6.—New York: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	29,281	40,218	13,714	21,454
Gravel			8,972	18,897
Unprocessed: Sand and gravel			7,804	5,681
Industrial:				
Sand	263	1,178	124	517
Gravel			W	27
Total	29,544	41,396	30,614	46,576

W Withheld to avoid disclosing individual company confidential data; included with "Industrial sand."

[1] Value data may not be directly comparable to that in tables 1, 7, and 8 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 7.—New York: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	21,338	34,918	10,136	17,960
Highway and bridge construction			1,246	2,442
Other uses (dams, waterworks, airports, etc.)			475	975
Concrete products (cement blocks, bricks, pipe, etc.)			2,205	4,268
Bituminous paving (asphalt and tar paving)			2,222	4,503
Roadbase and subbase			1,340	2,018
Unprocessed aggregate			6,863	5,338
Fill	4,322	2,489	543	607
Other uses [2]	1,691	2,028	406	809
Industrial sand and gravel	263	1,178	124	544
Total	27,614	40,613	25,560	39,464

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).

Table 8.—New York: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	1,013	456	515	920
Highway and bridge construction			915	1,729
Other uses (dams, waterworks, airports, etc.)			349	416
Concrete products (cement blocks, bricks, pipe, etc.)			255	446
Bituminous paving (asphalt and tar paving)			857	1,642
Roadbase and subbase			712	1,066
Unprocessed aggregate			942	344
Fill	494	117	58	21
Other	423	210	451	604
Total	1,930	783	5,054	7,188

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Total stone production decreased 7.4% in value while quantity decreased 13.9%. Stone is the second most valuable mineral commodity produced in the State. Crushed limestone and dolomite, considered together as carbonate rock, were predominate in the State, accounting for 92.2% of the tonnage and 87.6% of the value of all stone produced.

The chief uses for crushed limestone were as an aggregate and for the manufacture of cement and lime. Other uses were agricultural stone, railroad ballast, asphalt filler, and fluxing stone.

Basalt (traprock) ranked second in quantity of stone production within the State. The chief uses were for road metal and concrete aggregate.

Sandstone, which included quartzite, was quarried as dimension stone and as crushed stone. The chief uses of dimension sandstone were for flagging, curbing, and architectural applications. Crushed sandstone was used for concrete aggregate and roadstone. Graphite was quarried and dressed mostly for building stone. Crushed granite was used for concrete aggregate, railroad ballast, and road metal.

Table 9.—New York: Crushed and broken limestone and dolomite sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	7,947	18,213	8,016	20,338
Concrete aggregate	6,487	13,822	4,399	9,586
Dense graded roadbase stone	6,381	13,450	6,585	14,355
Macadam aggregate	507	1,318	583	1,316
Surface treatment aggregate	1,683	3,684	1,111	2,986
Unspecified construction aggregate and roadstone	4,352	9,224	4,063	9,381
Agricultural limestone	348	1,671	317	1,490
Cement manufacture[1]	6,612	8,089	7,513	10,093
Railroad ballast	199	396	177	375
Riprap and jetty stone	895	2,013	448	1,034
Other[2]	4,757	8,264	2,015	5,877
Total[3]	40,168	80,144	35,229	76,829

[1] Data for 1974 includes lime manufacture.
[2] Data include filter stone, flux stone, chemical stone, abrasives, bedding material, drain fields, fill, manufactured fine aggregate (1974), mineral fillers, extenders and whiting (1974), and uses not specified. 1973 data include building products and mine dusting.
[3] Data may not add to totals shown because of independent rounding.

Sulfur.—Ashland Oil, Inc., recovered 3,274 long tons of sulfur at its Buffalo refinery in Erie County in 1974.

Talc.—The sale of the International Talc Co., Inc. to the Gouverneur Talc Co., Inc. a subsidiary of the R. T. Vanderbilt Co., reduced to one the number of companies operating in New York.

In 1974 the output of talc increased 6.6% in quantity and decreased 6.5% in value. Prior to the sale of International Talc, talc was mined at two underground operations and at one open pit, all in St. Lawrence County. Crude talc was ground in company-owned mills and used mainly in ceramics and as a mineral filler in paints. Smaller quantities were used as a mineral filler in floor tile, rubber, paper, and other miscellaneous products.

Vermiculite.—Crude vermiculite mined in other States was exfoliated at the Construction Products Div. plant of W. R. Grace & Co., Weedsport, Cayuga County. The expanded vermiculite was used for loose fill insulation, soil conditioning, ultralightweight concrete aggregate, and building plaster aggregate.

Wollastonite.—The entire U.S. production was mined and beneficiated at the Willsboro mine in Essex County operated by Interpace Corp. Production in 1974 of refined wollastonite decreased 1.7% and value of shipments increased 14.6% above the 1973 levels. The refined wollastonite was used as an ingredient in ceramic products and as a filler in paints and plastics.

METALS

Aluminum.—Production of primary aluminum from the Massena plants, in St. Lawrence County, of the Aluminum Co. of America (Alcoa), and Reynolds Metals Co. increased both in tonnage and value over that of 1973. Alcoa continued its expansion program, which is scheduled for completion in mid-1976 at a cost of $60

million. Upon completion of the expansion program, Alcoa's capacity at its Massena facility will be increased from 135,000 tons of primary aluminum metal to 190,000.

Iron Ore.—Mine production of magnetite increased 19% from the previous year's output. The entire production was from two open pit operations: NL Industries, Inc., in Essex County, as a coproduct from ilmenite production; and Jones & Laughlin Steel Corp., in St. Lawrence County. All of the ore was beneficiated and most of the concentrates were agglomerated before shipment. The principal use for the shipments was in the manufacture of pig iron and steel; some also was used in manufacturing cement, for heavy media separation, and for ballast.

Lead.—Lead was recovered as a by-product of zinc mining at the Balmat and Edwards mines of the St. Joe Minerals Corp., in St. Lawrence County. The lead concentrate is shipped to the company lead smelter at Herculaneum, Mo. Lead recovery varies from year to year and is dependent on the lead content of the vein being mined. Quantity increased 34%, while value increased 84% over that of 1973.

Table 10.—New York: Mine production (recoverable) of silver, lead, and zinc

	1972	1973	1974
Mines producing: Lode	2	2	2
Material sold or treated: Zinc ore, thousand short tons	852	1,094	1,232
Production (recoverable):			
Quantity:			
Silver, troy ounces	25,070	54,345	64,463
Lead, short tons	1,089	2,304	3,076
Zinc, do	60,749	81,455	93,077
Value:			
Silver, thousands	$42	$139	$304
Lead, do	327	751	1,384
Zinc, do	21,566	33,657	66,829
Total, do	21,935	34,547	68,517

Silver.—The quantity of silver recovered from lead concentrates shipped from the Balmat and Edwards mines of St. Joe Minerals Corp., in St. Lawrence County, increased 19% over that of 1973; value increased 119%. Silver recovery usually reflects the demand for silver-free lead.

Titanium Concentrate.—Ilmenite concentrate was produced by the MacIntyre Development of NL Industries, Inc., the largest ilmenite mine in the United States. This open-pit is located near Tahawus, Essex County. The ilmenite was recovered as a coproduct of magnetite from the Tahawus titaniferous magnetite deposit. Shipments and value in 1974 were, respectively, down 15% and up 1.4% compared with the 1973 levels. The output was used principally in the manufacture of titanium dioxide pigment.

Zinc.—New York ranked first in the United States in zinc production, in both value and quantity, passing former first-ranked Tennessee. The entire production in the State was from the Balmat and Edwards mines of St. Joe Minerals Corp. in St. Lawrence County. The Balmat and Edwards mine complex is the largest single zinc mining operation in the United States.

MINERALS FUELS

Natural Gas.—The production of natural gas in New York in 1974 increased 10% over production in the previous year. The quantity and value of natural gas produced in the State for the period 1969–74 were as follows:

Year	Quantity [1] (million cubic feet)	Value (thousand dollars)
1969	4,861	1,458
1970	3,358	1,017
1971	2,202	661
1972	3,679	1,199
1973	4,539	1,590
1974	4,990	2,745

[1] Marketed production of natural gas represents gross withdrawals less gas used for repressuring and quantities vented and flared.

Natural gas was produced in 13 counties; Steuben County was the largest producer, followed by Erie, Chautauqua, Allegany, Cattaraugus, Cayuga, Genesee, Ontario, Madison, Livingston, Seneca, Wyoming, and Monroe Counties. At yearend, there were 700 wells producing natural gas.

Peat.—Sales of peat in 1974 were 18,000 short tons, valued at $181,000. Peat used was mainly for horticultural use. Orange

County was the leading producing area; output was also reported from Westchester and Seneca Counties.

Petroleum.—Crude oil production in the State was 896,000 barrels in 1974, a 7% decrease from 1973 production. The 1974 value of crude oil produced was $9.5 million compared with $5.4 million in the previous year. Cattaraugus was the leading oil-producing county, followed by Allegany, Chautauqua, and Steuben Counties.

At yearend 1974, there were 5,475 producing wells compared to 5,200 wells at the end of 1973.

Table 11.—New York: Oil and gas well drilling in 1974, by county

County	Proved field wells [1]			Exploratory			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Allegany	45	1	1	--	--	--	47	63,529
Cattaraugus	63	2	1	--	6	7	79	138,934
Cayuga	--	2	--	--	--	--	2	3,646
Chautauqua	27	61	5	--	5	1	99	239,665
Chemung	--	--	--	--	--	1	1	10,625
Chenango	--	--	--	--	--	3	3	18,601
Erie	--	3	1	--	3	1	8	21,797
Genesee	--	6	--	--	1	2	9	13,890
Livingston	--	--	--	--	--	2	2	4,881
Monroe	--	--	--	--	1	--	1	2,214
Otsego	--	--	--	--	--	3	3	15,675
Seneca	--	--	--	--	1	1	2	6,767
Steuben	18	3	3	--	2	6	32	78,160
Wyoming	--	--	--	--	--	3	3	11,696
Yates	--	1	--	--	--	--	1	2,982
Total	153	79	11	--	19	30	292	633,062

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 12.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasives:			
The Carborundum Co	P.O. Box 423 Niagara Falls, N.Y. 14302	Plant	Niagara.
U.S. Industries, Inc	2100 College Ave. Niagara Falls, N.Y. 14302	do	Do.
Fanner Mfg. Co	Brookside Park Cleveland, Ohio 44109	do	Erie.
Pellets, Inc	531 South Niagara St. Tonawanda, N.Y. 14150	do	Do.
Aluminum, smelters:			
Aluminum Co. of America	1210 Alcoa Bldg. Pittsburgh, Pa. 15222	do	St. Lawrence.
Reynolds Metals Co	P.O. Box 27003–2A Richmond, Va. 23215	do	Do.
Cement:			
Alpha Portland Cement Co.[1 2]	15 South Third St. Easton, Pa. 18043	do	Greene.
Newmont Mining Corp.[1 2]	P.O. Box 30 Stamford, Conn. 06904	do	Albany.
Flintkote Co	400 Westchester Ave. White Plains, N.Y. 10604	do	Warren.
Lehigh Portland Cement Co	718 Hamilton St. Allentown, Pa. 18105	do	Greene.
Marquette Cement Mfg. Co.[1]	20 North Wacker Dr. Chicago, Ill. 60606	do	Do.
United States Steel Corp.[1 2]	600 Grant St. Pittsburgh, Pa. 12230	do	Columbia.
Clays:			
Lone Star Industries, Inc.[1]	One Greenwich Plaza Greenwich, Conn. 06830	Pits	Ulster.
Nassau Brick Co., Inc	635 Round Swamp Rd. Long Island, N.Y. 11804	do	Nassau.
Norlite Corp	628 South Saratoga St. Cohoes, N.Y. 12047	do	Albany.
Emery:			
De Luca Emery Mine, Inc	926 Constant Ave. Peekskill, N.Y. 10566	Pit	Westchester.

See footnotes at end of table.

Table 12.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Garnet:			
Barton Mines Corp	North Creek, N.Y. 12853	Pit	Warren.
Gypsum:			
Georgia-Pacific Corp.[3]	P.O. Box 311 Portland, Oreg. 97207	Underground mine and plant.	Erie and Westchester.
National Gypsum Co.[3]	325 Delaware Ave. Buffalo, N.Y. 14202	do	Erie and Bronx.
United States Gypsum Co.[3]	101 South Wacker Dr. Chicago, Ill. 60606	do	Genesee, Richmond, Rockland.
Iron ore:			
Jones & Laughlin Steel Corp	Star Lake, N.Y. 13690	Pit	St. Lawrence.
NL Industries, Inc.[4]	Tahawus, N.Y.12879	Pit	Essex.
Lime:			
Allied Chemical Corp.[1 5]	P.O. Box 70 Morristown, N.J. 07960	Plant	Onondaga.
Bethlehem Steel Corp	701 East Third St. Bethlehem, Pa. 18016	do	Erie.
Peat:			
Anderson Peat Co. Inc	Pleasant Hill Rd. Wingdale, N.Y. 12594	Bog	Dutchess.
Sterling Forest Peat Co., Inc	P.O. Box 608 Tuxedo, N.Y. 10987	Bog	Orange.
Petroleum:			
Mobil Oil Corp	Buffalo, N.Y. 14221	Refineries	Erie.
Ashland Oil & Refining Co.[1]	Tonawanda, N.Y. 14150	do	Do.
Salt:			
Cargill, Inc	1620 Northstar Center Minneapolis, Minn. 55402	Underground mine	Tompkins.
International Salt Co	Clarks Summit, Pa. 18411	do	Livingston.
Morton Salt Co	110 North Wacker Dr. Chicago, Ill. 60606	Well	Wyoming.
Watkins Salt Co., Inc	Box 150 Watkins Glen, N.Y. 14891	do	Schuyler.
Sand and gravel:			
Albany Gravel Co	North Pearl St. & Loudonville Albany, N.Y. 12201	Pit	Albany and Rensselaer.
Buffalo Slag Co	111 Great Arrow Ave. Buffalo, N.Y. 14216	Plants	Allegany, Cattaraugus, Steuben.
Colonial Sand & Stone Co., Inc.[1 2 6]	1740 Broadway New York, N.Y. 10019	Pit	Nassau and Dutchess.
General Crushed Stone Co	712 Drake Bldg. Easton, Pa. 18042	Pit	Cattaraugus and Chemung.
Keyway Mason Supply Corp	25 Montclair Ave. St. James, N.Y. 11780	Pit	Suffolk.
Roanoke Marbro Sand & Gravel Corp.	P.O. Box 172 Riverhead, Long Island, N.Y. 11901	Pit	Suffolk.
Stone:			
The Callanan Road Improvement Co.	South Bethlehem, N.Y. 12161	Quarry	Albany and Ulster.
Dolomite Products Co.[7]	1150 Penfield Rd. Rochester, N.Y. 14625	do	Monroe.
General Crushed Stone Co	712 Drake Bldg. Easton, Pa. 18042	do	Genesee, Herkimer, Jefferson, Livingston, Onondaga, Ontario, Wayne.
Martin Marietta Corp	Box 120 Mercersberg, Pa. 17236	do	Rockland.
Talc:			
Gouverneur Talc Co., Inc	Gouverneur, N.Y. 13642	Underground	St. Lawrence.
International Talc Co., Inc	420 Lexington Ave. New York, N.Y. 10006	do	Do.
Wollastonite:			
Interspace Corp.[8]	Willsboro, N.Y. 12996	do	Essex.
Zinc:			
St. Joe Minerals Corp.[9]	250 Park Ave. New York, N.Y. 10017	Mine	St. Lawrence.

[1] Also stone.
[2] Also clays.
[3] Also expanded perlite.
[4] Also ilmenite.
[5] Also salt.
[6] Also cement.
[7] Also sand and gravel.
[8] Also garnet.
[9] Also silver and lead.

The Mineral Industry of North Carolina

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Office of Earth Resources, North Carolina Department of Natural and Economic Resources, for collecting information on all minerals except fuels.

By Lawrence E. Shirley [1] and Eldon P. Allen [2]

North Carolina's mineral production in 1974 was valued at $155.9 million, an increase of $8.9 million or 6% compared with 1973 mineral production value. Large gains in phosphate rock output and value, coupled with renewed interest by several additional companies in the phosphate resources of the State, point to significant mineral production for North Carolina in the future.

Stone was again the leading mineral commodity produced and accounted for 48% of the total mineral production value, followed by sand and gravel which accounted for 13%. Important production of cement, common clay and shale, feldspar, lithium minerals, mica, olivine, and phosphate rock contributed 37% of the State's 1974 total value of mineral production. The remainder was derived from the production of asbestos, gem stones, iron ore, kaolin, and talc.

There was increased production of phosphate rock, lithium minerals, feldspar, talc and pyrophyllite, and olivine. Owing to declines in the construction industry, there were decreases in output of kaolin and common clay, stone, sand and gravel, and scrap mica for the first time in many years.

Legislation and Government Programs.—Realignment of several State Government departments concerned with mineral resources took place during 1974. In the State Department of Natural and Economic Resources, most of the regulatory agencies were placed under one division; some agencies, principally concerned with natural resources, were reorganized to reflect their broader responsibilities. The Office of Earth Resources was renamed the Division of Resource Planning and Evaluation and the new division is now composed of the following sections: Mineral Resources, Water Resource Development, Geodetic Survey, Land Use Planning, Recreation Planning, Soil and Water Conservation Commission, Water Resource Planning, and Groundwater. The Mineral Resource section of the division was actively engaged throughout the year in geologic and other mineral-related investigations concerning North Carolina's mineral industry development. Two 7½-minute quadrangle geologic maps with mineral resource summaries were published.[3]

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[1] State Liaison Officer, Bureau of Mines, Raleigh, N.C.

[2] Chief, Mineral Resources Section, Division of Resource Planning and Evaluation, North Carolina Department of Natural and Economic Resources.

[3] Lemon, R. E., and D. E. Dunn. Geologic Map and Mineral Resources Summary of the Bat Cave Quadrangle, N.C. GM 202–NE and MRS 202–NE, 1973, 4 pp., 1 map.

———. Geologic Map and Mineral Resources Summary of the Fruitand Quadrangle, N.C. GM 202–NW and MRS 202–NW, 1973. 10 pp., 1 map.

Table 1.—Mineral production in North Carolina [1]

Mineral		1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays [2]	thousand short tons	4,109	$5,057	3,422	$4,648
Feldspar	short tons	523,595	8,820	650,684	11,147
Gem stones		NA	40	NA	50
Mica, scrap	thousand short tons	106	4,423	76	3,679
Sand and gravel	do	15,897	19,327	12,784	20,844
Stone	do	38,782	80,065	34,762	75,142
Talc and pyrophyllite	short tons	95,833	1,094	110,978	993
Value of items that cannot be disclosed: Asbestos, cement, clay (kaolin), iron ore, lithium minerals, mica (sheet, 1974), olivine, and phosphate rock		XX	28,104	XX	39,366
Total		XX	146,930	XX	155,869
Total 1967 constant dollars		XX	107,714	XX	p 74,537

p Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes kaolin; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in North Carolina, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Alamance	W	W	Stone, clays, talc.
Alexander	$13	--	
Alleghany	W	--	
Anson	W	W	Sand and gravel, stone.
Ashe	W	W	Stone.
Avery	W	$2,400	Mica, clays, stone, sand and gravel, iron ore.
Beaufort	W	W	Phosphate rock, sand and gravel.
Bertie	W	221	Sand and gravel.
Bladen	46	W	Do.
Brunswick	84	W	Do.
Buncombe	3,907	3,153	Stone, sand and gravel, clays.
Burke	W	W	Stone, sand and gravel.
Cabarrus	W	861	Stone, sand and gravel, clays.
Caldwell	W	752	Do.
Camden	W	7	Sand and gravel.
Caswell	W	W	Stone.
Catawba	W	W	Stone, sand and gravel.
Chatham	W	W	Clays, stone.
Cherokee	W	W	Stone, talc.
Chowan	5	1	Sand and gravel.
Clay	W	--	
Cleveland	8,143	10,946	Stone, feldspar, lithium minerals, mica, clays, sand and gravel.
Craven	W	3,317	Stone, sand and gravel.
Cumberland	W	937	Sand and gravel, clays.
Currituck	18	--	
Davidson	W	W	Stone, clays, sand and gravel.
Davie	W	W	Stone, sand and gravel.
Duplin	W	W	Do.
Durham	W	W	Stone, clays.
Edgecombe	634	412	Sand and gravel.
Forsyth	W	W	Stone.
Franklin	W	117	Sand and gravel.
Gaston	W	6,629	Lithium minerals, stone, sand and gravel.
Gates	20	--	
Granville	W	W	Stone.
Greene	W	W	Sand and gravel.
Guilford	W	W	Stone, clays, sand and gravel.
Halifax	W	W	Clays.
Harnett	W	W	Sand and gravel, clays.
Haywood	W	W	Sand and gravel, stone.
Henderson	W	W	Stone, clays.
Hertford	134	W	Sand and gravel.
Hoke	15	--	
Hyde	20	3	Sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in North Carolina, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Iredell	W	W	Stone, clays.
Jackson	W	W	Stone, asbestos.
Johnston	W	W	Stone, sand and gravel.
Jones	W	$708	Do.
Lee	W	W	Stone, clays, sand and gravel.
Lenoir	W	W	Sand and gravel.
Lincoln	25	--	
McDowell	$501	672	Sand and gravel.
Macon	W	W	Stone, sand and gravel.
Madison	W	W	Sand and gravel.
Martin	14	2	Do.
Mecklenburg	W	W	Stone.
Mitchell	W	8,216	Feldspar, mica, stone.
Montgomery	W	W	Stone, sand and gravel, clays.
Moore	W	W	Talc, sand and gravel, clays.
Nash	W	W	Stone.
New Hanover	18,169	18,310	Cement, stone, clays, sand and gravel.
Northampton	W	73	Sand and gravel.
Onslow	W	1,141	Stone, sand and gravel.
Orange	W	W	Stone, talc, sand and gravel.
Pamlico	8	--	
Pasquotank	29	25	Sand and gravel.
Pender	2	--	
Perquimans	11	--	
Pitt	W	W	Stone, sand and gravel.
Polk	W	--	
Randolph	W	W	Stone.
Richmond	829	W	Stone, sand and gravel.
Robeson	42	185	Sand and gravel.
Rockingham	W	W	Stone, clays, sand and gravel.
Rowan	W	2,171	Do.
Rutherford	W	W	Stone, sand and gravel.
Sampson	W	W	Sand and gravel, clays.
Scotland	33	W	Sand and gravel.
Stanley	592	536	Clays.
Stokes	W	93	Stone, clays.
Surry	W	4,332	Stone, sand and gravel.
Swain	W	W	Do.
Transylvania	W	W	Do.
Tyrrell	--	1	Sand and gravel.
Union	W	W	Stone, clays.
Vance	W	W	Stone.
Wake	W	W	Stone, sand and gravel, clays.
Washington	42	9	Sand and gravel.
Watauga	W	W	Stone.
Wayne	375	335	Sand and gravel.
Wilkes	W	W	Stone, sand and gravel.
Wilson	W	W	Do.
Yadkin	W	W	Stone.
Yancey	1,976	1,845	Olivine, mica, sand and gravel, asbestos.
Undistributed [2]	111,251	87,468	
Total [3]	146,930	155,869	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Carteret, Columbus, Dare, Graham, Person, and Warren.

[2] Includes gem stones, some sand and gravel (1973) and mica (1974) that cannot be assigned to specific counties, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

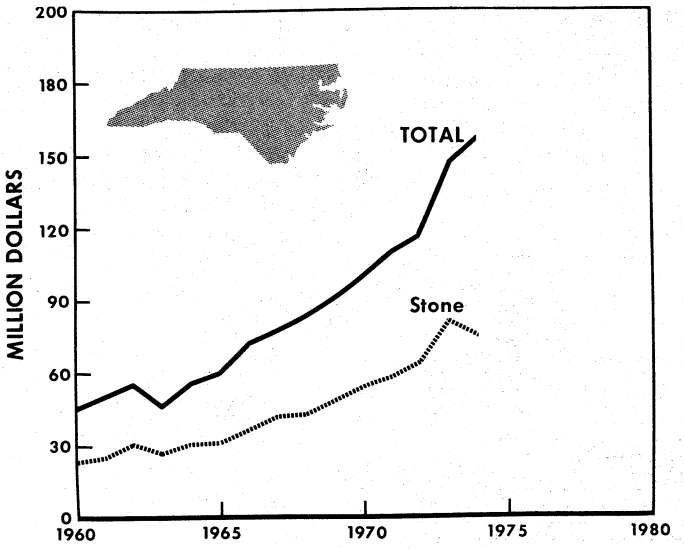

Figure 1.—Value of stone and total value of mineral production in North Carolina.

Another publication showed indexes of geologic and geophysical mapping in North Carolina with a list of key State publications and a list of U.S. Geological Survey publications on the State.[4]

A directory of mineral producers was also updated and published during the year.[5]

Under the State Government reorganization, the Mining Division, a regulatory agency, was removed from the Office of Earth Resources and placed under the Land Quality Section of the Division of Environmental Management. The new Land Quality Section is now composed of the Mine Restoration, Sedimentation, and Dam Safety groups. The Mine Restoration group replaces the Mining Division but retains the same responsibilities as before the reorganization. During 1974, the Mine Restoration group conducted 800 mine inspections as required under the North Carolina Mining Act of 1971. The Act requires mine operators to observe sound conservation practices and to reclaim for useful purposes all lands disturbed by mining. At yearend, mining operations under permit totaled 419 and total affected acreage was 9,259. There were 2,189 acres in tailing ponds, 1,547 in stockpiles, and 804 in waste piles. A total of 865 acres were disturbed, and 475 acres were reclaimed at active mines. The following is a breakdown by commodity of number of mines, acres affected annually and total acres affected:

Commodity	Number of mines	Acres affected annually	Total acres affected
Sand and gravel	202	530	2,639
Crushed stone	97	153	3,532
Clay and shale	44	64	963
Industrial minerals	36	107	1,668
Gem stones	21	6	47
Dimension stone	19	5	410

Minerals research in North Carolina was conducted principally by the Asheville Minerals Research Laboratory of the North Carolina State University. During the year, research was geared toward providing the commercial glass industry in the State with a refined sand that could be used for the manufacture of glass. Considerable flotation research on sand was conducted for several glass sand operations that were interested in providing North Carolina material to the glass industry. Other research conducted by the

[4] Carpenter, P. A., III. Index of Geologic Geophysical Mapping in North Carolina. N.C. Dept. Nat. and Econ. Res., Office of Earth Res., Div. of Miner. Res., 1974, 8 p.

[5] Wilson, W. F. A Directory of the Principal Mineral Producers of North Carolina. N.C. Dept. Nat. and Econ. Res., Office of Earth Res., Div. of Miner. Res., 1974, 19 pp.

laboratory during the year included attrition grinding of several minerals, beneficiation and evaluation of corundum and sericite, recovery of zircon from mineral wastes, separation of feldspar from tailings, pilot plant flotation of pegmatite minerals, and a host of other sponsored projects. Many of the reports from this research are in the form of progress reports and have not been published. A report was published by the laboratory concerning the recovery of heavy minerals from phosphate tailings at a North Carolina phosphate plant.[6]

The coastal area of North Carolina is the most ecologically significant section of the State. During the year, an important piece of legislation affecting this area, the Coastal Management Act of 1974, was enacted into law. The Act asks the local governments in 20 coastal North Carolina counties to prepare a blueprint for future growth and development. The program is a cooperative one between local and State Governments; State level administration and coordination will be handled by the Department of Administration and Department of Natural and Economic Resources. The Act created two citizen agencies: (1) A 15-member Coastal Resources Commission appointed by the Governor and a Coastal Resources Advisory Council, and (2) a 45-member body made up of locally appointed representatives from each coastal county, plus representatives from six State Government departments. The Coastal Resources Commission is responsible for establishing planning guidelines, approving land use plans, and issuing permits for construction when required. Counties included in the Coastal Area Management Act are Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell, and Washington. Preparation of guidelines were underway at yearend.

During a 2-year period, ERTS–1 imagery was evaluated for use in resource planning and management in North Carolina and was found to be useful for general reconnaissance purposes in forestry, geology, and water resources. Objectives of the study included solving regional land-use problems in the three geomorphic and geographic areas of North Carolina, solving regional geologic problems, pinpointing areas of environmental concern as various parts of the State undergo urbanization, and many other uses such as forest and water resource management.[7]

Trends and Developments.—For the tenth consecutive year, capital expenditures in new and expanded industry in North Carolina surpassed the half-billion dollar mark. These investments during 1974 exceeded those of any previous year and brought with them further industrial diversification and higher average wages for new jobs created. The Economic Development Division of the North Carolina Department of Natural and Economic Resources announced that total capital investment in new and expanded industry during 1974 amounted to $872 million, compared with $727 million in 1973. A breakdown of new investments indicated that 85 new plants invested $346 million, while 147 expansions accounted for the remaining $526 million of the total. As during recent years, the trend toward new plant locations outside of the larger metropolitan areas continued. The Economic Development Division has emphasized locations in smaller towns and has continued active programs to prepare more smaller towns for economic growth.

There was a trend toward conserving resources by recycling metals, glass, and paper at a rate unprecedented in the State's history. Recycling centers were established at several locations for handling aluminum scrap and cans, glass, and paper.

The conservation of energy was another trend clearly discernible throughout the State. The mineral-processing industries, particularly brick manufacturers, were looking for new ways of conserving current fuel supplies and for alternate sources of fuel to augment the supplies.

[6] Lewis, R. M. Recovery of Heavy Minerals from N.C. Phosphate Tailings. North Carolina State Univ. School of Eng., Miner. Res. Lab. Rept. No. MRL–4, February 1974, 10 pp.

[7] Welby, C. W., J. O. Lammi, and R. J. Carson III. Utilization of ERTS–A Data In Geological Evaluation, Regional Planning, Forest Management and Water Management in North Carolina. Dept. of Geosciences, North Carolina State Univ. Prepared for Goddard Space Flight Center, Greenbelt, Md., Oct. 1, 1974, 136 pp.

Table 3.—Indicators of North Carolina business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	2,387.0	NA	NA
Unemployment	do	83.0	NA	NA
Employment (nonagricultural)	do	2,014.7	2,047.4	+1.6
Construction	do	122.5	121.5	−0.8
All manufacturing	do	799.8	795.2	−0.6
Mining	do	4.0	4.2	+5.0
Personal income:				
Total	millions	$22,577	$24,736	+9.6
Per capita		$4,258	$4,612	+8.3
Construction activity:				
Value of private nonresidential construction	millions	$345	$328	−4.9
State Highway Commission:				
Value of contracts awarded	do	$127	$145	+14.2
Cement shipments to and within North Carolina	thousand short tons	2,260	1,955	−13.5
Farm marketing receipts	millions	$2,380	NA	NA
Mineral production value	do	$147	$156	+6.1

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and Federal Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Asbestos.—A small quantity of amphibole asbestos was mined by Powhatan Mining Co. at its Hippy mine in Yancey County. This was the only reported production of asbestos in the State.

Cement.—Ideal Basic Industries, Inc., Cement Div., the only producer of portland and masonry cement in the State, continued operation of its cement plant at Castle Hayne in New Hanover County. According to Ideal's annual report,[8] all cement plants operated at close to effective capacity throughout the year and experienced no unusual production curtailments. Annual capacity of the North Carolina plant was listed at 610,000 tons, making it the fourth-largest plant among the company's 14 cement plants. The company also operated cement terminals at Greensboro and Wilmington and a sales office at Raleigh. The company announced that most of its cement plants, formerly using natural gas and fuel oil as primary fuels, would be shifting to coal as the primary kiln fuel because of increasing costs and reduced supplies of natural gas and fuel oil.

Clays.—Common clay and shale for use primarily in the manufacture of face and common brick, sewer pipe, concrete block, structural concrete and cement was mined by 25 companies from 48 mines in 23 counties. Total output was 3.4 million tons, valued at $4.6 million, a decrease of 17% in tonnage and 8% in value below that of 1973. The leading common clay and shale-producing companies by quantity were Solite Corp. (2 mines), Sanford Brick Corp. (3 mines), Pine Hall Brick and Pipe Co. (4 mines), and Boren Clay Products Co. (5 mines). Combined output from these 14 mines accounted for 47% of the total quantity and 39% of the total value of common clay and shale produced during the year.

Seventy-one percent of the common clay and shale was consumed by 28 companies in manufacturing face brick. The leading producing companies were Sanford Brick Corp., Pine Hall Brick and Pipe Co., and Boren Clay Products Co. Together they consumed 46% of the common clay and shale used for this purpose.

Harris Mining Co. continued to be the sole producer of waterwashed kaolin from the Brushy Mountain mine in Avery County. The material was used in the manufacture of sanitary ware, fine china ware, and for several other minor uses. Kings Mountain Mica Co., Inc., produced unprocessed kaolin at its Cleveland County mine. The unprocessed kaolin was used principally in the manufacture of face brick.

[8] Ideal Basic Industries, Inc. 1974 Annual Report. Denver, Colo., Feb. 27, 1975, 32 pp.

Table 4.—North Carolina: Common clay and shale sold or used by producers, by county

County	1973			1974		
	Number of mines	Short tons	Value	Number of mines	Short tons	Value
Alamance	2	89,630	$103,200	--	W	W
Buncombe	1	36,000	41,400	1	36,000	$45,000
Cabarrus and Durham	4	360,788	443,927	4	276,137	396,040
Catawba	1	4,890	5,630	--	--	--
Chatham	4	661,344	785,966	4	596,360	761,563
Cumberland	1	17,700	26,600	1	16,000	25,600
Davidson	1	90,000	90,000	1	75,000	82,500
Guilford	3	122,832	141,300	3	103,548	129,500
Harnett	4	79,412	93,570	4	53,000	68,900
Henderson	1	54,000	62,100	1	54,000	67,500
Iredell	1	38,668	44,500	1	30,509	38,100
Lee	4	540,850	596,950	4	471,800	680,500
Montgomery and New Hanover	3	199,488	421,352	3	169,302	297,598
Rockingham	5	644,673	517,500	5	594,446	599,586
Rowan	4	247,557	285,100	4	146,264	182,100
Sampson	1	44,290	51,000	1	42,096	52,700
Stanly	3	514,564	591,800	3	386,664	536,100
Stokes	1	16,402	8,201	1	28,866	21,650
Union	1	258,500	646,300	1	178,400	446,000
Undistributed [1]	3	87,586	100,770	6	163,433	217,418
Total	48	4,109,174	5,057,166	48	3,421,825	4,648,355

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes Halifax, Moore, and Wake Counties (1974), and data indicated by symbol W.

Feldspar.—North Carolina continued to lead the nation in the production of feldspar, accounting for 76% of total U.S. output and 77% of the value. State production was 651,000 tons valued at $11.1 million, an increase of 24% in quantity and 26% in value over that of 1973. Six companies operated eight mines in Cleveland and Mitchell Counties; no production was reported in Yancey County, as in 1973. Leading producers were, in order of output, The Feldspar Corp., Lawson-United Feldspar and Mineral Co., and Kings Mountain Mica Co., Inc. Production was principally in the form of feldspar-silica mixtures followed by flotation concentrates. Sobin Chemicals, Inc., was the only producer of handcobbed feldspar.

Sobin Chemicals, Inc., early in the year, acquired the Mitchell County operations of International Minerals and Chemical Corp. (IMC), which had served various ceramic and glass industries with raw materials. The transaction reportedly increased IMC stock holdings in the Boston-based firm from 37% to 81%. In the future, the company is to be known as the Ceramics and Glass Products Div. of Sobin Chemicals, Inc., and the IMC company identification will no longer be used. Sobin has been associated with IMC since 1970, when IMC exchanged its industrial chemicals business for a 37% interest in Sobin. Sobin for many years has been an important marketer of imported and domestic industrial and specialty chemicals. This acquisition action is viewed as a major step toward building IMC's Sobin investment into a free-standing chemical business.

Since North Carolina was the leading producer of feldspar in the Nation, an annual review published during the year was especially pertinent to the industry in the State.[9] The report stated that in the spring of 1974, for the first time since World War II, feldspar was in short supply in the United States, especially those grades high in potash. According to the article, the most important event affecting feldspar production in 1974 was the stepped-up activity by the Environmental Protection Agency and State agencies in connection with reduction of water and air pollution, and in implementing mine reclamation programs. The rapid escalation in rail rates during 1974 and the reduction in rail service in many areas caused a dramatic jump in the amount of feldspar shipped by truck. The report concluded by stating that while there is ample feldspar ore in the United States, the withdrawal of much Federal land from mining,

[9] Rogers, C., Jr. Feldspar. Min. Eng., v. 27, No. 2, February 1975, pp. 75–76.

as proposed by current legislation, could make unavailable many large high-quality deposits of this mineral.

Gem Stones.—Amateur collectors of gems and minerals continued combing favorable areas of the State, and accounted for scattered production of precious and semiprecious stones. Ruby, sapphire, and garnet were collected at several commercially operated mines near Franklin, Macon County. Emerald and aquamarine were collected from commercial mines near Spruce Pine, and hiddenite and emerald were collected at mines near Hiddenite. A brochure on North Carolina gems was published by the North Carolina Travel and Promotion Division. An article was published about one of the best known jewel craftsmen in the North Carolina Mountains and his work with native gem stones.[10]

Two books were published during the year concerning occurrences of North Carolina gem stones, particularly the ruby, emerald, and hiddenite localities in the State. In one publication, four emerald localities in the Spruce Pine and Taylorsville areas were described.[11] The other publication described the ruby, garnet, and corundum localities in the Franklin, Macon County, area.[12] Both books contain history, guides to rockhounding, how to mine, what to look for in rough stones, description of nearby accommodations, what to wear, and other detailed information.

Graphite.—Synthetic graphite products, including anodes, electrodes, crucibles and vessels, and graphite specialties were produced by the Great Lakes Carbon Corp. at a plant near Morganton, Burke County, using coal tar pitch from out-of-State sources as raw material.

Gypsum.—National Gypsum Co.'s plant near Wilmington was under construction during the year and the building was nearing completion at yearend. According to company officials, the plant is expected to go into production of gypsum wallboard when unfavorable business conditions in the housing and construction industry improve.

Iodine.—Mallinkrodt Chemical Works near Raleigh, Wake County, consumed crude iodine in the manufacture of ethylenediamine dihydroiodide and diamonbuodobenzoic acid. The company has three plants in the area producing parenteral products, high-purity specialty chemicals, and injection and blow-molded plastics.

Lime.—There was no production of lime in North Carolina in 1974. Total consumption of quicklime and hydrated lime combined was about 152,000 short tons. The lime came from 21 plants in the States of Alabama, Massachusetts, Missouri, Ohio, Tennessee, Texas, Virginia, and Wisconsin.

Lithium Minerals.—North Carolina again accounted for a substantial portion of U.S. lithium production and led the nation in output. Other States reporting lesser production were Nevada and California. Two companies operated lithium mining and processing facilities during 1974.

Lithium Corp. of America, Inc. (Lithcoa), a subsidiary of Gulf Resources and Chemical Corp., near Bessemer City, Gaston County, produced lithium minerals from pegmatite deposits in the general area and shipped concentrates to a nearby lithium chemicals plant. During the year, the plant produced more than 20 lithium products for commercial use.

At the beginning of the year, Lithcoa absorbed the operations of Spartan Minerals Co., near Pacolet, S.C. Spartan, a producer of feldspathic sands, will process feldspar-rich tailings produced and trucked to Pacolet from Lithcoa's North Carolina operations. Most of the feldspathic sands is used by the ceramic and glass container industry. As reported in the company's annual report during 1974,[13] the average grade of concentrate produced in Lithcoa's spodumene flotation mill reached an all-time high.

The chemical plant was expanded in the first half of 1974 to an annual capacity of 27 million pounds of lithium carbonate equivalent and, during the year, the plant produced 7% more lithium carbonate equivalent than during 1973. Chemical plant recovery of lithium from concentrates was higher in 1974 than in the previous year because of process improvements and the availability of higher grade

[10] Parris J. Roaming the Mountains: The Miller who Became the Tiffany of the Hills. Asheville Citizen Times, July 21, 1974, p. 2A.
[11] Harshaw, M. R., Jr. In Search of the Scarce Gem Hiddenite and the Emeralds of North Carolina, The Hexagon Co., Asheville, N.C., 1974, 64 pp.
[12] Harshaw, L. The Rubies of Cowee Valley. The Hexagon Co., Asheville, N.C., 1973, 78 pp.
[13] Gulf Resources and Chemical Corp. 1974 Annual Report. Houston, Tex., March 18, 1975.

flotation concentrates. During 1974, the company obtained control of approximately 225 acres of land adjacent to those properties previously leased or purchased. This additional acreage can be utilized for mineral extraction or waste disposal. During the year, the company continued to improve pollution control in its chemical plant. An exhaust-scrubber system was successfully installed for the removal of ore dust and fluorides in the plant's rotary kiln. A program was also undertaken to meet the Environmental Protection Agency's requirements for plant water discharge. A 5-year summary of Lithcoa's production of major products and its proven and probable ore reserves was shown in the report.

Foote Mineral Co. produced lithium minerals from its mine near Kings Mountain, Cleveland County, and processed the material at its nearby lithium plant. The company reported that its lithium carbonate output was sold out throughout 1974. Site preparation began about mid-year for the company's new 12-million-pound-per-year plant expected to be operational in April 1976. The new plant will permit onsite chemical processing of the spodumene ore to produce lithium carbonate as well as a saleable byproduct, sodium sulfate. An estimated 750,000 to 1 million cubic yards of earth from the mining operation was moved to provide the site for the new plant before construction began late in the year. Full environmental controls, including advanced fume scrubbing, are being built into the plant. The new plant's output is expected to increase the world supply of lithium carbonate by about 20%. The material is used in the production of aluminum, as a component of glass and ceramics, and in the production of other lithium chemicals.

During the year there was a change in control of Foote. As of December 31, 1974, Newmont Mining Corp. had gained ownership of 91.8% of the common stock and 48% of the convertible preferred stock as a result of a tender offering, and Foote became a majority-owned subsidiary of Newmont.

Mica.—North Carolina again lead the nation in scrap mica output. Total production was 76,000 tons, valued at $3.7 million compared with 106,000 tons valued at $4.4 million in 1973. Nine companies reported production of scrap and flake mica from 15 mines in Avery, Cleveland, Mitchell, and Yancey Counties. Leading producers were Harris Mining Co., Kings Mountain Mica Co., The Feldspar Corp., and Lawson-United Feldspar and Mineral Co. Together their six operations accounted for 73% of the scrap mica production by quantity and 85% by value. Only a small quantity of sheet mica was produced during the year.

Ground mica was produced by seven companies in Buncombe, Cleveland, Macon, Mitchell, and Yancey Counties. Ground mica sold or used by producers increased 81% in quantity and 82% in value over that in 1973. Five plants used dry-grinding methods, two used wet-grinding, and one plant used both methods. Leading producers were Harris Mining Co., Diamond Mica Co., and The English Mica Co. These three companies with four plants accounted for 79% of the total output and 75% of the total value of ground mica.

The ground mica was shipped for use in joint cement, well drilling, paint, roofing, rubber, wallpaper, plastics, and other uses.

Table 5.—North Carolina: Ground mica sold or used by producers, by use

Use	1973 r			1974		
	Quantity (short tons)	Value		Quantity (short tons)	Value	
		Total	Average per ton		Total	Average per ton
Roofing	15,340	$598,945	$39.04	9,677	$445,139	$46.00
Paint	17,534	2,347,651	133.89	33,553	3,319,263	98.93
Rubber	5,670	992,929	175.12	6,605	1,427,252	216.09
Wallpaper	W	W	W	W	W	W
Plastics	310	56,967	183.76	W	W	W
Other uses [1]	25,948	1,593,012	61.39	67,528	4,979,357	73.74
Total	64,802	5,589,504	86.26	117,363	10,171,011	86.66

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Includes joint cement, plastics, textile coating, wallpaper, well drilling, other uses, and uses indicated by symbol W.

Olivine.—North Carolina ranked second in the nation in production of olivine; the only other recorded production was in the western United States. International Minerals and Chemical Corp. and Northwest International mined and beneficiated olivine in Yancey County. The material was used for molding sand by the foundry industry.

Phosphate Rock.—The production of phosphate rock at the Texasgulf, Inc., Lee Creek operation near Aurora, Beaufort County, increased considerably in quantity and more than doubled in value over that of 1973. Most of the phosphate concentrate was used in the manufacture of wet phosphoric acid and in dry fertilizer materials; a small tonnage of concentrate was exported. Texasgulf was the only phosphate producing company in North Carolina during the year. According to Texasgulf's 1974 annual report,[14] production capacity for sulfuric and phosphoric acids at Lee Creek increased 50% with the completion of the third 170,000-ton-per-year 100% P_2O_5 unit, bringing annual capacity to 510,000 tons. Construction was in progress on a fourth unit scheduled for completion in 1975. Completion of this unit will boost total capacity to 680,000 tons per year of 100% P_2O_5. Two additional units of comparable size are in the planning stage, which will raise Lee Creek's P_2O_5 capacity to more than 1 million tons per year.

The Lee Creek mining and ore-processing facilities were being expanded to provide phosphate rock for the acid manufacturing expansions and also to make substantial additional rock available for sale. Upon completion of the fourth unit, the company plans to add hydrofluosilicic acid as a salable product at the rate of 8,000 tons of equivalent 100% H_2SiF_6 each year for each 170,000-ton P_2O_5 unit. Dicalcium phosphate (Dical), a solid animal feed supplement utilizing high-purity phosphoric acid from Lee Creek, will also be manufactured. Other new products were under consideration, including purified phosphoric acid to compete with electric furnace acid in the detergent, animal-feed, and food-supplement industries. The feasibility of recycling gypsum to produce sulfuric acid, cement, and wallboard was being studied.

During the year, another phosphate company, North Carolina Phosphate Corp. (NCP), announced plans for a large phosphate mining and fertilizer manufacturing facility also to be located near Aurora, Beaufort County, in close proximity to Texasgulf's operations. NCP is composed jointly of Kennecott Copper Corp. and Agrico Chemical Co., a subsidiary of the Williams Companies of Tulsa, Okla. The new facility, estimated to cost $220 million is said to be the largest investment for a nonutility company ever made in North Carolina. The mining operation reportedly will be capable of producing from 4 to 5 million tons of phosphate rock annually starting in 1977 and will have a phosphoric acid plant with an initial capacity of 400,000 to 600,000 tons per year. The company also plans to produce about 1 million tons per year of ammonium phosphate and diammonium polyphosphate. The company will have its headquarters in Washington, Beaufort County. NCP was formed about 15 years ago as a joint venture and was one of the first companies to conduct exploration on the phosphate deposits in Beaufort County. NCP has extensive land holdings in the area both on the north and south sides of the Pamlico River. The new facility is expected to be under construction by late 1975.

FMC Corp., another company with extensive land holdings in Beaufort County, in a meeting with the Beaufort County Board of Commissioners about midyear divulged plans to start mining phosphate rock in early 1976. FMC is reportedly planning to use a hydraulic system of mining contrasted to the other two companies open pit methods. The company plans to establish its mining operation near the confluence of the Pamlico and Pungo Rivers in Beaufort County.

Sand and Gravel.—Sand and gravel was again the second leading mineral commodity produced in the State, exceeded only by stone. Total production was 12.8 million tons valued at $20.8 million; production was reported from 156 plants. Output decreased 20% in quantity, but value increased slightly above that of 1973.

Construction sand and gravel comprised 92% of the total quantity and 81% of total value. There were 150 commercial sand plants operated during the year. The leading construction sand and gravel producers, listed in order of output were

[14] Texasgulf, Inc. 1974 Annual Report. New York, March 13, 1975, 40 pp.

W. R. Bonsal Co., Becker Sand and Gravel Co., B. V. Hedrick Gravel and Sand Co., Barrus Construction Co., and Nello L. Teer Co. These five operations accounted for 42% of the total sand and gravel produced during the year.

Industrial sand and gravel comprised 8% of the total output and 19% of the total value of sand and gravel production during the year. Production was reported by four companies with six plants. Producers listed in order of output were W. R. Bonsal Co., B. V. Hedrick Gravel and Sand Co., Becker Sand and Gravel Co, and Southern Products and Silica Co.

Table 6.—North Carolina: Sand and gravel sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Alexander	1	18	13	--	--	--
Anson	5	W	W	3	W	W
Avery	3	176	360	1	109	262
Beaufort	2	47	70	3	82	181
Bertie	3	137	W	3	152	221
Bladen	3	97	46	1	W	W
Brunswick	3	40	84	2	W	W
Buncombe	4	934	W	2	W	W
Burke	--	--	--	1	W	W
Cabarrus	2	W	W	2	W	196
Caldwell	2	W	W	1	30	89
Camden	3	29	W	3	5	7
Catawba	6	105	146	5	160	252
Chatham	1	5	5	--	--	--
Chowan	1	5	5	1	2	1
Cleveland	2	W	W	3	136	200
Craven	1	42	21	1	W	W
Cumberland	6	786	W	6	1,065	911
Currituck	1	27	13	--	--	--
Davidson	3	993	853	2	W	W
Davie	4	81	W	1	W	W
Duplin	3	W	W	3	W	W
Edgecombe	8	436	634	4	233	412
Forsyth	2	W	W	--	--	--
Franklin	2	W	W	1	53	117
Gaston	3	W	99	6	82	W
Gates	1	40	20	--	--	--
Greene	2	W	W	1	W	W
Guilford	2	W	W	2	W	W
Halifax	1	51	26	--	--	--
Harnett	4	W	W	2	W	W
Haywood	2	W	234	1	W	W
Hertford	2	201	134	2	W	W
Hoke	1	15	15	--	--	--
Hyde	1	40	20	1	11	3
Iredell	2	W	W	--	--	--
Jackson	1	26	W	--	--	--
Johnston	4	104	74	3	W	W
Jones	2	60	W	1	W	13
Lee	3	W	W	2	W	W
Lenoir	4	149	W	3	W	W
Lincoln	1	33	25	--	--	--
McDowell	6	292	501	5	346	672
Macon	1	27	W	1	34	W
Madison	2	W	W	2	W	W
Martin	1	20	14	1	7	2
Montgomery	4	188	114	3	144	122
Moore	8	754	788	4	372	302
Nash	1	36	2	--	--	--
New Hanover	3	W	W	1	W	W
Northampton	2	W	W	2	187	73
Onslow	2	W	W	2	W	W
Orange	2	W	W	2	W	W
Pamlico	1	12	8	--	--	--
Pasquotank	5	33	29	3	27	25
Pender	1	4	2	--	--	--
Perquimans	2	15	11	--	--	--
Pitt	6	696	455	5	210	314
Polk	1	5	3	--	--	--
Richmond	3	217	255	3	307	351

See footnotes at end of table.

Table 6.—North Carolina: Sand and gravel sold or used by producers, by county—Continued

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Robeson	1	84	42	1	W	185
Rockingham	5	65	89	4	103	125
Rowan	1	W	W	4	21	W
Rutherford	3	W	W	1	W	W
Sampson	6	W	W	4	W	W
Scotland	3	34	33	1	W	W
Stokes	1	92	70	--	--	--
Surry	4	32	24	2	30	30
Swain	--	--	--	1	W	W
Transylvania	1	14	21	1	W	W
Tyrrell	--	--	--	1	3	1
Wake	3	W	W	1	W	W
Washington	2	70	42	1	34	9
Watauga	1	86	147	--	--	--
Wayne	13	516	375	12	266	335
Wilkes	2	132	197	1	122	225
Wilson	3	W	115	1	W	W
Yadkin	1	23	29	--	--	--
Yancey	1	W	W	2	W	W
Other counties [1]	34	7,776	13,063	11	8,451	15,208
Total [2]	213	15,897	19,327	156	12,784	20,844

W Withheld to avoid disclosing individual company confidential data; included with "Other counties."

[1] Includes Alamance (1973), Clay (1973), and Mitchell (1973) Counties, some sand and gravel that cannot be assigned to specific counties, and items indicated by symbol W.

[2] Data may not add to totals because of independent rounding.

Table 7.—North Carolina: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	15,205	17,223	6,003	8,315
Gravel			2,518	5,830
Unprocessed: Sand and gravel			3,215	2,543
Industrial:				
Sand	692	2,104	466	1,684
Gravel			582	2,185
Total	15,897	19,327	12,784	20,557

[1] Value data may not be directly comparable to that in tables 1, 6, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 8.—North Carolina: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	11,125	14,186	3,335	5,646
Highway and bridge construction			288	595
Other uses (dams, waterworks, airports, etc.)			181	339
Concrete products (cement blocks, brick, pipe, etc.)			1,945	2,924
Bituminous paving (asphalt and tar paving)			1,033	1,950
Roadbase and subbase			560	1,019
Unprocessed aggregate			2,870	2,266
Fill	580	364	69	107
Other uses	614	691	87	177
Industrial sand and gravel	692	2,104	1,049	3,869
Total [2]	13,010	17,346	11,417	18,892

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

[2] Data may not add to totals shown because of independent rounding.

Table 9.—North Carolina: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			58	74
Highway and bridge construction			249	376
Other uses (dams, waterworks, airports, etc.)			3	5
Concrete products (cement blocks, brick, pipe, etc.)	1,668	1,171	W	W
Bituminous paving (asphalt and tar paving)			326	530
Roadbase and subbase			387	689
Unprocessed aggregate			344	278
Fill	769	484	--	--
Other	450	326	--	--
Total	2,887	1,981	1,367	1,952

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."
[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

Carolina Silica, Inc., began construction of a new glass silica sand plant on a site of several hundred acres near Hoffman, Richmond County. The new plant, to be equipped with flotation equipment, will supply high-quality glass sand to the developing glass industry in the State. The new plant will have an initial capacity of 60 tons per hour and at full production will produce in excess of one-half million tons annually. In addition to the silica sand for the glass industry, Carolina Silica will also produce industrial sands for filtration and sand blasting, which will be marketed by Southern Products and Silica Co., also of Hoffman.

Stone.—The principal mineral commodity produced in the State, as in 1973, was stone. Total output decreased 10% and total value, 6%, below that of 1973. Production was reported from 54 counties by 55 commercial producers with 103 quarries. Twenty-eight quarries with individual production of more than 500,000 tons each accounted for 69% of the State's total stone production by quantity. The leading stone producers, listed in order of output, were Martin Marietta Aggregates, Vulcan Materials Co., Nello L. Teer Co., Foote Mineral Co., Central Rock Co., Wake Stone Co., and Ideal Basic Industries, Cement Div. The combined operations of these companies accounted for 85% of the total stone output and 81% of the value. Leading counties in production of crushed and broken stone were Guilford, Mecklenberg, and Wake; each of these counties accounted for more than 2 million tons of stone each. Six additional counties were responsible for production in excess of 1 million tons each.

Crushed granite was produced at 66 quarries throughout the State and accounted for 81% of the total stone output and 76% of the value. The average value per ton of crushed granite was $2.02. Dimension granite was produced at nine quarries; total output was 596,000 cubic feet valued at $2.8 million.

Table 10.—North Carolina: Crushed granite sold or used by producers, by county

County	1973			1974		
	Number of quarries	Quantity (short tons)	Value (thousands)	Number of quarries	Quantity (short tons)	Value (thousands)
Cabarrus	1	76,510	$153	1	79,156	$158
Caldwell	1	W	W	1	312,000	663
Guilford	5	4,193,010	7,735	5	3,295,522	6,702
Madison	1	171,000	288	--	--	--
Richmond	1	215,185	574	1	W	W
Surry	3	W	1,580	3	W	1,908
Wake	4	2,471,620	6,397	4	2,381,758	4,888
Undistributed [1]	59	24,118,709	43,512	51	22,086,120	42,679
Total [2]	75	31,246,034	60,241	66	28,154,556	56,999

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes Alamance, Alleghany (1973), Ashe, Avery, Buncombe, Burke, Caswell, Catawba, Chatham, Cleveland, Davidson, Davie, Forsyth, Gaston, Granville, Haywood, Henderson, Iredell, Jackson, Lee, Macon, Mecklenburg, Mitchell, Moore (1973), Nash, Orange, Pitt, Polk (1973), Randolph, Rockingham, Rowan, Rutherford, Stokes, Transylvania, Union, Vance, Watauga, Wilkes, Wilson, Yadkin, and Yancey Counties (1973).

[2] Data may not add to totals shown because of independent rounding.

Crushed limestone was produced at eight quarries; traprock and marl were produced at five quarries each; sandstone, at four quarries; and quartz, quartzite, and slate at one quarry each.

The major uses for crushed and broken stone were as roadbase material (49%), concrete aggregate (14%), bituminous aggregate (13%), and other uses (24%). Shipments of crushed stone were predominately by truck (94%), with small percentages transported by railroad and waterway.

Dimension stone was produced by nine granite quarries, three marble quarries, two sandstone quarries, and one quartzite and slate quarry each. These 16 quarries produced only a minor portion of the State's total stone tonnage, but the variety of stone produced was unusual. Jacob's Creek Stone Co., a unique producer of flagstone from slate and other materials near Denton, Davidson County, supplied slate dimension stone to the building industry, as well as quartzite stone quarried in the Blue Ridge Mountains, and a multicolored sandstone quarried in Montgomery County.

Vulcan Materials, which operates seven large granite quarries in the State published with its annual report for 1974 [15] a supplement listing all of its aggregate operations in the United States. The supplement gave location, product produced, estimated recoverable reserves (in tons), life at current rate of production, nature of interest or ownership, and expiration date of leases of each operation in its construction materials group as well as a company organization chart and descriptive organization text. Corporate management profiles and a plant directory with map were also included in the supplement.

Talc and Pyrophyllite.—The combined production of talc and pyrophyllite increased 16% in quantity but decreased 9% in value below that of 1973. Talc was produced by Hitchcock Corp. near Murphy, Cherokee County, for use in the textile industry and for the manufacture of toilet preparations. Pyrophyllite was produced by four companies that operated six mines in Alamance, Moore, and Orange Counties. The pyrophyllite was used principally by the ceramic and refractory industries and in the manufacture of insecticides. Leading producers were Piedmont Minerals, Inc., near Hillsborough, Orange County, and Standard Minerals Co., Inc., near Robbins in Moore County.

Vermiculite.—Two companies exfoliated vermiculite from crude ore shipped into the state from a nearby mining company. W. R. Grace & Co. operated a plant near High Point, Guilford County and produced vermiculite for use in concrete and plaster aggregate and for loose fill and block insulation. Carolina Wholesale Florists, Inc. near Sanford, Lee County, exfoliated vermiculite for use in horticulture and for loose fill insulation.

[15] Vulcan Materials Co. 1974 Annual Report. Birmingham, Ala., February 25, 1975, 32 pp.

METALS

Aluminum.—Aluminum Co. of America (Alcoa) produced primary aluminum from imported alumina ore at its smelter near Badin, Stanly County. About midyear, Alcoa announced that it would boost primary aluminum capacity at its Badin smelter 60,000 tons per year. The new expansion will increase capacity at Badin to a total of 180,000 tons per year. The additional 60,000 tons would cost an estimated $50 to $505 million dollars and increase employment to 830, according to engineering sources. The expansion will include the installation of a third aluminum-making potline and necessary supporting facilities, including air-pollution-control equipment. The new unit will use the established Hall Process in contrast to the Alcoa Smelting Process, now in use in many company plants. The company stated that the expansion was prompted by an increasing demand for aluminum in a wide variety of markets.

Iron Ore.—Magnetite for use as a heavy media agent in the coal industry was mined and concentrated at the Cranberry mine and plant of Greenback Industries, Inc., near Cranberry, Avery County. Output and value decreased from that of 1973. Late in the year, the company began installing new grinding equipment, including a 10-foot by 72-foot ball mill and classifiers that would increase grinding capacity 12 to 15 tons per hour and increase output to 60,000 tons per year. The company also installed new equipment to increase the grade of magnetite over that now being produced.

Tungsten.—There was no production of tungsten in North Carolina during 1974. Ranchers Exploration and Development Corp. continued to keep its mine dewatered and its mill in standby condition as it has since 1971 when the mine was closed. Ranchers is reportedly ready to reopen the mine as soon as increased consumption and favorable price structure returns to the industry.

MINERAL FUELS

There was no production of mineral fuels in North Carolina during 1974.

Petroleum and Natural Gas.—Five exploratory wells were drilled in North Carolina in 1974; all were dry and subsequently abandoned. Total footage of the five holes was 23,407 feet. Two of the holes totaling 7,217 feet were drilled in Carteret County, two holes totaling 10,842 feet were drilled in Dare County, and one hole was drilled in Lee County to a depth of 5,348 feet. Cities Service Oil Co. and Colonial Oil and Gas Co. continued to lease State-owned submerged lands for oil and gas exploration in the coastal plain region of the State.

Chevron Oil Co., a division of Standard Oil Co. of California, after drilling one dry hole in Lee County, suspended drilling operations until a full analysis could be made on data obtained from the drilling. Last year, Chevron obtained drilling rights to more than 15,000 acres in Lee, Moore, Wake, and Chatham Counties. The Lee County well was reported to be the first attempt at inland oil and gas exploration in many years. Over 100 test wells have been drilled along the North Carolina coast in past years, all of which have been dry holes.

Table 11.—Principal producers

Commodity and company	Address	Type of activity	County
Aluminum, smelter:			
Aluminum Company of America.	1501 Alcoa Bldg. Pittsburgh, Pa. 15219	Plant ----------	Stanly.
Asbestos: Powhatan Mining Co.	6721 Windsor Mill Rd. Baltimore, Md. 21207	Open pit mine -	Yancey.
Cement: Ideal Basic Industries, Inc.[1]	420 Ideal Cement Bldg. Denver, Colo. 80202	Plant ----------	New Hanover.
Clay:			
Boren Clay Products Co --	Pleasand Garden, N.C. 27313	Open pit mines and plant.	Chatham, Guilford, Sampson.
Sanford Brick Corp ------	Box 38 Gulf, N.C. 27256	---- do --------	Chatham, Lee, Stanly.
Solite Corp ----------	Box 9138 Richmond, Va. 23227	---- do --------	Rockingham.

See footnotes at end of table.

Table 11.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Feldspar:			
The Feldspar Corp.[1 3]	Spruce Pine, N.C. 28777	Open pit mines and plants.	Mitchell.
Kings Mountain Mica Co., Inc.[2]	Box 709 Kings Mountain, N.C. 28086	do	Cleveland.
Lawson-United Feldspar and Mineral Co.	Minipro, N.C. 28777	do	Mitchell.
Sobin Chemicals, Inc	Old Orchard Road Skokie, Ill. 60079	do	Do.
Iron ore: Greenback Industries, Inc.	Box 63 Greenback, Tenn. 37742	Underground mine and plant.	Avery.
Lithium minerals:			
Foote Mineral Co.[1]	Box 792 Kings Mountain, N.C. 28086	Open pit mine and plant.	Cleveland.
Lithium Corp. of America, Inc.	Box 428 Bessemer City, N.C. 28016	do	Gaston.
Mica:			
Diamond Mica Co	Box 648 Spruce Pine, N.C. 28777	Plants	Mitchell and Yancey.
The English Mica Co	Ridgeway Center Bldg. Stamford, Conn. 06905	do	Cleveland.
Harris Mining Co.[3]	Box 628 Spruce Pine, N.C. 28777	Open pit mines	Avery and Mitchell.
Olivine:			
International Minerals and Chemical Corp.	State Highway 197 Burnsville, N.C. 28714	do	Yancey.
Northwest International	Box 672 Spruce Pine, N.C. 28777	do	Do.
Perlite, expanded: Carolina Perlite Co., Inc.	Box 741 Hillside, N.J. 07205	Plant	Rowan.
Phosphate Rock: Texasgulf, Inc.	200 Park Ave. New York, N.Y. 10017	Open pit mine and plant.	Beaufort.
Sand and gravel:			
Barrus Construction Co	P.O. Box 399 Kinston, N.C. 28501	Pits	Various.
Becker Sand and Gravel Co	Box 848 Cheraw, S.C. 29520	Pits	Cumberland, Harnett, Moore.
W. R. Bonsal Co	Box 38 Lilesville, N.C. 28091	Pits	Anson.
B. V. Hedrick Gravel and Sand Co.[1]	Swannanoa, N.C. 28778	Pits	Buncombe.
Nello L. Teer Co.[1]	Box 1131 Durham, N.C. 27702	Pits	Harnett.
Stone:			
Central Rock Co	Box 510 Greensboro, N.C. 27409	Quarry	Guilford.
Martin-Marietta Corp	11300 Rockville Pike Rockville, Md. 20852	Quarries	Various.
North Carolina Granite Corp.	Box 151 Mt. Airy, N.C. 27030	Quarry	Surry.
Vulcan Materials Co	Box 7506 Reynolds Station Winston-Salem, N.C. 27106	Quarries	Various.
Talc and pyrophyllite:			
Glendon Pyrophyllite	Box 306 Carthage, N.C. 28327	Open pit mines and plant.	Alamance and Moore.
Standard Minerals Co., Inc	Robbins, N.C. 27325	do	Moore.
Vermiculite, expanded:			
Carolina Wholesale Florists, Inc.	Box 537 Sanford, N.C. 27330	Plant	Lee.
W. R. Grace & Co	62 Whittemore Avenue Cambridge, Mass. 02140	do	Guilford.

[1] Also stone.
[2] Also clays and mica.
[3] Also clays and stone.
[4] Also lithium.

The Mineral Industry of North Dakota

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the North Dakota Geological Survey under a cooperative agreement for collecting information on all minerals and fuels.

By Harold J. Polta [1]

North Dakota's mineral output in 1974, valued at $159.4 million, was 42% above that of 1973. Crude petroleum continued as the principal mineral commodity. It accounted for 75% of the State's mineral output value. Lignite production, valued at $16.4 million, accounted for 10% of the total. Natural gas accounted for 4%, and sand and gravel also for 4%. Total value of petroleum production increased $40.1 million, or 51% over that in 1973; value of lignite increased $2 million or 14%; value of natural gas increased $0.8 million or 14%. The total value of sand and gravel output, the only major nonmetallic mineral, was $6.2 million, $0.2 million more than in 1973.

Legislation and Government Programs.—The State Legislature did not meet in 1974, but the activities of various legislative committees throughout the year indicated that much of the business of the biennial Legislature would be related to lignite mining. At yearend, the majority leader of the House, Representative Earl Strinden, stated that lignite development and natural resources were the main issues confronting the 44th Legislative Assembly when it meets on January 7, 1975.[2] According to Strinden, a severance tax on lignite, production taxes in lieu of property taxes, modification of the State's current mine reclamation laws, and a proposed Department of Natural Resources topped the list of resource-related bills prefiled for the 1975 legislative session.

Indications were that there would be considerable controversy concerning a severance tax on lignite although it appeared certain that some form of severance tax would become law. The issue appeared to be whether the tax should be in the form of a percentage of value or a flat dollar tax per ton, and the amount, and whether or not it should be in lieu of State sales or use taxes.

The proposed production tax would be on lignite conversion plants such as electric power generating plants and gasification plants, etc. This tax would be in lieu of ad valorem property taxes on these facilities.

It appeared certain that the 1975 legislature would increase mine reclamation requirements. The first State mine reclamation bill was passed in 1969 after repeated attempts in prior legislative sessions dating back to the 1940's. The 1969 Act required spoil bank peaks be leveled to at least 25-foot widths and the valleys bottomed out, and required mining companies to either return the land to grassland, forest, or agricultural use. Modifications in 1971 called for leveling the peaks to 35-foot widths and other minor changes. The 1973 legislation strengthened the authority of the Public Service Commission (PSC) which had always been the State administrative agency. It required licensing of mining companies, permits for mining, and approval of reclamation plans. The land must be returned to original topography unless a higher land use is contemplated. Penalties for failure of compliance by a

[1] State Liaison Officer, Bureau of Mines, Bismark, N. Dak.

[2] The Minot Daily News. Coal Development Prime Topic Before Legislature. Dec. 31, 1974, p. 2.

mining company include forfeiture of the $500 per acre reclamation bond, ineligibility for future mining permits, and cessation of any other mining operation in the State. An annual report on reclamation is required.

Several legislative committees worked throughout the year studying various proposals for coordinating activities of natural resource related agencies. One bill would create a Department of Natural Resources (DNR) by combining several State agencies. The DNR would be a policy-making body headed by a commissioner. Another bill would establish a Natural Resources Council, which would be an advisory, rather than a policy-making organization. Such a council had already been established by executive order of Governor Arthur A. Link. This Natural Resources Council included the directors of State agencies having responsibilities for management of the State's natural resources. On December 9, through the Federal Intergovernmental Personnel Act, the Governor appointed Richard A. Ellison, a career Federal Forest Service employee, as first chairman of the council.

In what was labeled a "landmark decision," the North Dakota Supreme Court late in the year ruled that Carl T. Christman of Oliver County could not block the strip mining of his lands for underlying coal deposits leased to a coal company.[3] The Court ruled that a lease for "oil, gas and other minerals" gave the coal company the "right to use surface of the land to whatever extent reasonably necessary to the use of its mineral rights, including the right to remove coal from land by strip mining." Indications were that additional court action and possibly legislation would follow.

In a report released in late September by the U.S. Forest Service, the Badlands Planning Unit study group recommended that the North Dakota Badlands be managed stressing maximum environmental protection while allowing some development for regional needs.[4] The study took nearly 2 years and incorporated the input of 13 public meetings held across North Dakota. The unit includes about 1.2 million acres of Federal, State, and private land in Billings, Golden Valley, Slope, and McKenzie Counties. Earlier the District Ranger of the Little Missouri River National Grasslands, Sam Halvorson, had stated there would be no strip mining in the Badlands area for the next 10 years.[5] According to Halvorson, Badlands lignite will be mined only after all other known lignite reserves in North Dakota have been mined.

At the request of Consolidation Coal Company the Bureau of Land Management (BLM) offered a 320-acre Federal lignite lease for sale on July 9.[6] According to the Montana State Director for BLM at Billings, BLM had not issued a Federal lease since April 1971. However, a February 1973 policy statement by the Secretary of the Interior allows issuances of coal leases when needed for current ongoing mining operations. Because of "tough" leasing conditions the company did not bid at the sale and the lease remained unsold.[7] Later the same month The North American Coal Corp. objected to conditions proposed for a Federal lease tract the company is mining near Beulah.

The North Dakota Geological Survey was compiling a bibliography of its publications and preparing it for publication early in 1975.

On January 19 the Bureau of Mines Research Center at Grand Forks was incorporated into the newly created Energy Research and Development Administration (ERDA). However, the reclamation and metallurgical research being conducted at the center continued under the jurisdiction and direction of the Bureau of Mines. The reclamation research concerned itself with mine spoil bank reclamation problems peculiar to North Dakota; the metallurgical studies, with the drying of low rank coals.

In midyear the ERDA center was authorized $200,000 to rehabilitate and reactivate the slagging fixed-bed gasifier pilot plant the Bureau of Mines had operated successfully from 1958 to 1965. Objective of the research was to extend process efficiency and capability and to evaluate its limitations and detrimental environmental effects. The character and quantities of gasifier effluents were being measured, and a variety of process equip-

[3] The Minot Daily News. Critic Says Court Ruling Encourages Strip Mining. Nov. 14, 1974.
[4] The Bismarck Tribune. Badlands Study Urges Care for Environment. Oct. 1, 1974.
[5] Williston Daily Herald. No Badlands Strip Mining for 10 years. June 26, 1974.
[6] The Minot Daily News. Bids on 320 Acres Sought. June 6, 1974.
[7] The (Fargo-Moorhead) Forum. First Coal Lease for Sale—No Bids. July 11, 1974.

ment designed to reduce detrimental environmental effects, recover byproducts, and achieve maximum recirculation of water was being evaluated. Related research was concerned with liquefaction, combustion, flue gas scrubbing, electrostatic precipitation, and lignite and subbituminous lignite drying.

Table 1.—Mineral production in North Dakota [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Coal thousand short tons	6,906	$14,328	7,463	$16,351
Gem stones	NA	2	NA	2
Natural gas million cubic feet	27,703	5,457	31,206	6,210
Peat short tons	--	--	240	W
Petroleum (crude) thousand 42-gallon barrels	20,235	78,916	19,697	119,022
Sand and gravel thousand short tons	6,011	6,021	4,991	6,211
Stone do	W	W	35	115
Value of items that cannot be disclosed: Clays, lime, natural gas liquids, salt, and values indicated by symbol W	XX	7,129	XX	11,516
Total	XX	111,853	XX	159,427
Total 1967 constant dollars	XX	81,999	XX	p 76,238

p Preliminary. NA Not available. XX Not applicable. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed."
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

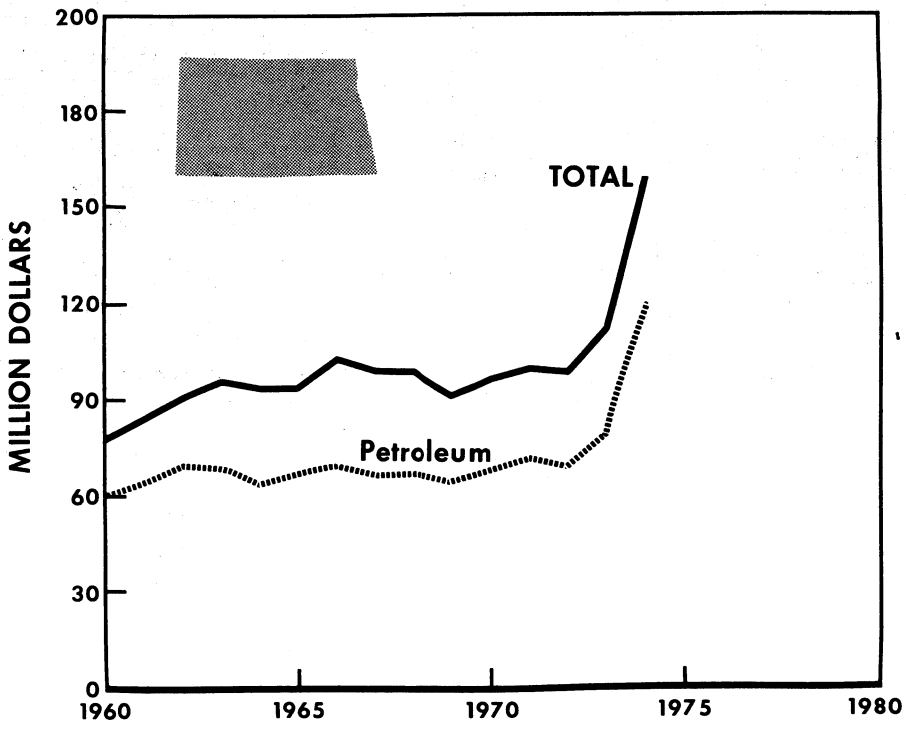

Figure 1.—Value of petroleum and total value of mineral production in North Dakota.

Table 2.—Value of mineral production in North Dakota, by county [1] [2]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	W	W	Coal.
Barnes	$198	$171	Sand and gravel.
Benson	76	47	Do.
Billings	8,654	12,532	Petroleum.
Bottineau	W	W	Petroleum, sand and gravel, peat.
Bowman	6,210	W	Petroleum, coal, sand and gravel.
Burke	7,423	9,140	Petroleum, natural gas liquids, coal.
Burleigh	878	1,368	Sand and gravel.
Cass	50	7	Do.
Cavelier	2	W	Do.
Dickey	20	22	Do.
Divide	W	1,061	Petroleum, sand and gravel.
Dunn	40	25	Sand and gravel, petroleum.
Eddy	W	W	Sand and gravel.
Foster	W	W	Do.
Golden Valley	W	343	Petroleum, sand and gravel.
Grand Forks	W	W	Sand and gravel.
Grant	W	11	Coal.
Griggs	84	45	Sand and gravel.
Kidder	W	W	Do.
Logan	W	W	Do.
McHenry	W	140	Petroleum, sand and gravel.
McIntosh	W	(3)	Sand and gravel.
McKenzie	15,912	26,917	Petroleum, sand and gravel.
McLean	W	300	Sand and gravel.
Mercer	W	10,279	Coal, sand and gravel.
Morton	W	W	Clays, sand and gravel.
Mountrail	1,482	2,072	Petroleum, sand and gravel.
Oliver	W	W	Coal, sand and gravel.
Pembina	W	W	Lime, sand and gravel.
Pierce	28	W	Sand and gravel.
Ransom	85	57	Do.
Renville	W	W	Petroleum, sand and gravel.
Richland	—	12	Sand and gravel.
Rolette	W	W	Do.
Sheridan	W	W	Stone, sand and gravel.
Slope	390	514	Petroleum.
Stark	4,192	W	Petroleum, coal, sand and gravel.
Steele	—	W	Sand and gravel.
Stutsman	259	333	Do.
Towner	W	W	Do.
Traill	339	209	Do.
Walsh	249	187	Do.
Ward	2,925	W	Coal, petroleum, sand and gravel.
Wells	50	77	Sand and gravel.
Williams	23,413	36,009	Petroleum, natural gas liquids, sand and gravel, coal.
Undistributed [4]	38,894	57,549	
Total	111,853	159,427	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported; Emmons, Hettinger, La Moure, Nelson, Ramsey, Sargent, and Sioux.

[2] Value of petroleum for 1974 is based on an average price per barrel for the State.

[3] Less than one half unit.

[4] Includes gem stones, natural gas, stone (1973), some sand and gravel which cannot be assigned to specific counties, and values indicated by symbol W.

Table 3.—Indicators of North Dakota business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	259.0	NA	NA
Employment	do	245.7	NA	NA
Unemployment	do	13.3	NA	NA
Nonagricultural employment:				
Mining	do	1.6	1.7	+6.3
Construction	do	11.4	12.1	+6.1
Manufacturing	do	12.5	14.1	+12.8
Government	do	50.7	51.8	+2.2
Transportation and public utilities	do	12.6	13.0	+3.2
Wholesale and retail trade	do	50.6	52.8	+4.3
Finance, insurance, and real estate	do	7.7	8.2	+6.5
Services	do	35.1	37.1	+5.7
Personal income:				
Total	millions	$3,642	$3,534	−2.9
Per capita		$5,730	$5,547	−3.2
Construction activity:				
Highway construction contracts awarded	millions	$40.9	$48.6	+18.8
Cement shipments to and within North Dakota	thousand short tons	355	330	−7.0
Value of authorized nonresidential construction	millions	$45.8	$47.4	+3.5
Number of authorized residential units		3,375	3,111	−7.8
Farm marketing receipts	millions	$2,040.4	NA	NA
Mineral production value	do	$111.9	$159.4	+42.4

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Lignite.—North Dakota lignite production in 1974 was 7.5 million short tons, up almost 9% from the 6.9 million tons produced in 1973. The quantity represented 1.2% of total U.S. bituminous coal and lignite production in 1974, the same as in 1973. Total value of lignite produced was $16.4 million, compared with $14.3 million in 1973. Average value of lignite, f.o.b. mine, was $2.19 per short ton. This compares with the average value of $2.07 per ton in 1973.

All lignite production was by open pit strip mining methods with the use of large draglines for stripping and power shovels and front end loaders for mining the lignite.

Mercer County continued as the leading lignite producer, accounting for 54% of the State total. Next largest producer was Oliver County. Collectively these two counties accounted for 82% of total State production.

Table 4.—North Dakota: Lignite strip production, by county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines	Production (thousand short tons)	Value (thousands)
Adams	2	W	W
Bowman	1	W	W
Burke	1	W	W
Grant	1	5	$11
Mercer	3	4,058	9,171
Oliver	1	W	W
Stark	2	161	W
Ward	1	548	W
Williams	1	W	W
Undistributed	--	2,691	7,172
Total	13	7,463	[1]16,351

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Data do not add to totals shown because of independent rounding.

Principal lignite producers in the State were the Knife River Coal Mining Co. which operated its Gascoyne mine in Bowman County, and its North and South Beulah mines in Mercer and Oliver Counties; Consolidation Coal Co. which operated its Glenharold mine in Mercer County, and its Velva mine in Ward County; Baukol-Noonan, Inc., which operated its Noonan mine in Burke County, and its Center mine in Oliver County; and The North American Coal Corp. (NACCO) which operated its Indian Head mine in Mercer County. Collectively these four companies accounted for 97% of State lignite production in 1974.

Company announcements, mineral leasing activity, requests for exploration permits, together with applications for State water permits required for expansion of existing, and construction of additional electric generating plants, and for coal gasification plants indicated there will be large increases in North Dakota lignite production.

Estimates by 12 public utility and mining companies which have started building or designing new operations for the State's western lignite fields project expenditures of $3.2 billion in the next 10 years.[8] Additional lignite production required for the proposed plants would increase State output by 50 million tons a year.

The principal producers announcing expansions included Baukol-Noonan, Inc., Consolidation Coal Co., Knife River Coal Mining Co., and NACCO.

Baukol-Noonan, Inc., signed a 50-year contract in midyear to deliver 2.8 million tons per year of lignite coal to the nearby Minnkota Power Cooperative (MPC) Square Butte electric generating plant near Center in Oliver County.[9] Deliveries are scheduled to start in 1977 when the 400-megawatt plant is scheduled for completion. The Square Butte plant is a separate addition to another Minnkota generating unit at Center which is already receiving about 1.5 million tons per year of lignite from Baukol-Noonan, Inc., under an earlier contract. The added production will require surface mining some 300 acres of land in Oliver County each year.

Cost of the Square Butte plant is estimated to be $224.7 million.[10] The plant will be an addition to the 235-megawatt plant now owned and operated by MPC. Financing is part of a long-term lease of the facilities in which subsidiaries or affiliates of the Chase-Manhattan Bank, Chemical Bank, and First National Bank of Chicago have committed $95.2 million and will be owners of the properties. Another $126.5 million was committed by a group of 13 insurance companies in exchange for amortized debt securities, and $3.0 million was loaned by the Rural Electrification Administration.

Consolidation Coal Company's expansion at its Glenharold mine near Stanton in Mercer County was nearing completion at yearend.[11] The reported $8.4 million expansion will increase mine production capacity from 1.3 to 3.3 million tons a year. Lignite from the mine now supplies Basin Electric Power Cooperative's Leland Olds Unit No. 1. The increased production will fuel the cooperative's 460-megawatt Leland Olds Generating Unit No. 2 which is scheduled for completion near Stanton in September 1975. The mine reportedly employed 60 persons in 1973, 92 in 1974, and is expected to employ 120 people in 1975.

Additional large increases in Consolidation's North Dakota lignite production became probable when the company indicated an interest in obtaining 70,000 acre-feet of water for lignite gasification and electric power generation in Bowman, Golden Valley, Grant, Mercer, and Slope Counties.[12] The interest in obtaining water permits was in answer to a survey by the State Water Commission. The company reportedly has 600,000 acres of lignite leased in North Dakota.

Knife River Coal Mining Co. was nearing completion of a $10 million expansion at its Gascoyne mine in Bowman County.[13] Production is expected to increase from about 200,000 tons to 2.5 million tons annually. Principal customer of the mine will be the Big Stone Powerplant in South Dakota. The mine has been supplying coal to the Otter Tail Power Co. generating plant at Ortonville, Minn.

Further coal production increases for the

[8] The Minot Daily News. $3.2 Billion for Coal Developing. July 22, 1974.
[9] Coal Age. Three Contracts Signed for Coal and Lignite. V. 79, No. 8, August 1974, p. 29.
[10] The Minot Daily News. Finances for Power Plant Are Arranged. May 17, 1974.
[11] The Minot Daily News. Consol's Stanton Mine Expansion Nearly Complete. Dec. 26, 1974, p. 13.
[12] The Bismarck Tribune. Industrial Water Need Surveyed. Feb. 4, 1974.
[13] Williston Daily Herald. Firms Preparing for Lignite Coal Delivery. Dec. 2, 1974.

Knife River Coal Mining Co. are indicated by press releases and water permit requests by its parent company, Montana-Dakota Utilities Co. (MDU). Early in the year MDU had applied to the North Dakota Water Commission for a water permit for 22,500 acre-feet of water for up to three 440-megawatt power generating units.[14] At yearend, when it appeared the commission would grant a water permit sufficient for one 440-megawatt unit, the company requested its permit application be held in abeyance. MDU asked for additional time in order to complete studies relating to an alternate source of water. Plans call for construction of the first unit of the Beulah plant to start in early 1977, with completion expected sometime in 1981. The plant will be owned jointly by MDU, Otter Tail Power Company, and Northwestern Public Service Company.

NACCO would increase its lignite production in North Dakota greatly according to terms of a tentative agreement between its wholly owned subsidiary The Falkirk Mining Co. and two power cooperatives: United Power Association (UPA), Elk River, Minn., and Cooperative Power Association (CPA), Minneapolis.[15] Under the terms of the tentative agreement, Falkirk will provide the cooperatives with 5.5 million tons of lignite annually over a 35-year period beginning in November 1978. The lignite will be used at the two-unit 1000-megawatt Coal Creek electric generating complex under construction adjacent to lignite deposits near Underwood in McLean County. The power will be sold to 33 rural electric cooperatives in Minnesota. The Coal Creek project is reportedly the largest energy project financed by the Rural Electrification Administration and the first financed under a newly enacted loan guarantee program. Coal Creek has received an $83 million loan and a guarantee of $454 million in additional loans. The first unit is scheduled to begin operation in 1978; the second in 1979.

Another large lignite production increase by NACCO was indicated by announcements beginning early in the year. After months of controversy and debate, the State Water Commission in February granted a water permit for 17,000 acre-feet of water annually to the Michigan-Wisconsin Pipeline Company for use in a proposed lignite gasification plant near Beulah in Mercer County.[16] NACCO will provide the 10 million tons of lignite annually required by the proposed plant. By yearend it appeared that the proposed North American Coal Corp.-Michigan Wisconsin Pipeline Co. lignite production-coal gasification complex would be the first such complex operating in the State. Indications were that actual plant construction might start as early as late 1976 but more probably in 1977; that the gasification plant could be in operation as early as 1981; and that the total cost of the mine-gasification complex would amount to about $1.5 billion.

El Paso Natural Gas Co. of Texas requested water permits for four proposed lignite gasification plants from the North Dakota Water Commission in early April.[17] The plants would be located near lignite deposits in Dunn, Bowman, and Stark Counties. Each of the plants would consume some 10 million tons of lignite annually beginning in the early 1980's.

Natural Gas Pipeline Company (NGPL) was the third applicant for lignite gasification water when it also filed its application with the State Water Commission in early April.[18] Its application was for 70,000 acre-feet of water annually to serve four proposed gasification plants in west-central Dunn County. The first plant would begin operation in about 1982, with successive plants starting at 3- to 5-year intervals. Each of the plants would consume about 13 million tons of lignite annually and produce 250 million cubic feet of synthetic natural gas daily.

In October, the company filed an application with BLM seeking to acquire lignite rights held by the Federal Government on about 44,000 acres in Dunn County. Under a long-term agreement with the Nokota Co. of Bismarck, NGPL reportedly already had an interest in about 100,000 acres in central Dunn County.

A survey by the North Dakota Water Commission indicated additional companies interested in obtaining water for proposed lignite-energy conversion plants as follows:[19]

Minnkota Power Cooperative—100,000 acre-feet for eight 800-megawatt electric

[14] Williston Daily Herald. MDU Mulls Other Water Source. Dec. 11, 1974.
[15] Coal Mining and Processing. North American Plans Lignite Supply to Co-ops. V. 12, No. 1, January 1975. p. 34.
[16] The Minot Daily News. Pipeline Company Ready for Starting Development. Feb. 20, 1974, p. 3.
[17] The Bismarck Tribune. El Paso Asks Permits for 4 Gas Plants. Apr. 2, 1974.
[18] The Bismarck Tribune. Pipeline Firm Hopes Federal Leases Open. Apr. 20, 1974.
[19] The Bismarck Tribune. Industrial Water Need Surveyed. Feb. 4, 1974.

generating plants in Hettinger County where the cooperative and three other power firms have lignite reserves totaling about 1 billion tons.

Tenneco, Inc.—80,000 acre-feet for lignite gasification from reserves in Golden Valley County.

Industrial Coal Co.—70,000 acre-feet for electric power generation and gasification in Adams, Grant, and Hettinger Counties. The company and its affiliates reportedly have leases on about 200,000 acres of lignite.

Kerr-McGee Corp.—25,000 acre-feet for power generation and gasification. According to reports the corporation has about 10,000 acres of lignite leased in Bowman County.

Amax Coal indicated an interest in State lignite when it made application to the U.S. Forest Service for a lignite exploration permit on about 12 sections of land in the Little Missouri National Grasslands.[20]

The national energy problem together with environmental and social concerns combined to make North Dakota lignite production and processing the subject of much research and study.

The North Dakota State University (NDSU) and the State Planning Division released its Little Missouri Grasslands Study early in the year. The $242,000 nine-county land use study, funded by the U.S. Department of Housing and Urban Development, recommended public disclosure of quantity and location of lignite lease holdings; proof that energy development would not disrupt or contaminate groundwater; lignite severance taxes be placed in a State permanent trust fund; uniform air-quality standards for western coal-lignite states; and an exchange of Federal coal-lignite leases for private leases.[21] The report noted the need for additional ground water studies and geologic information concerning the location and quantities of lignite reserves. It also recommended Federal or State legislation to force public disclosure of privately held lignite information.

In midyear NDSU scientists were granted $318,000 by the Old West Regional Commission to intensify their studies on the characteristics of spoil banks and their reclamation.[22] Objectives of the 2-year project which started July 1 were threefold: Determine the relationship between present growth of grass and the depth at which undesirable materials for plant rooting are found; evaluate intake, movement, and water runoff from shaped spoil banks with different slopes and materials; and evaluate different thicknesses of suitable rooting materials on the performance of grass, small grain crops, and legumes.

In another NDSU research effort a three-man team consisting of an economist, a sociologist, and a geologist was compiling information to help determine the feasibility and impact of gasification and electric power complexes using North Dakota lignite.[23] The $98,000 study is being financed by the State and the Economic Development Administration.

Another NDSU research effort was a 4-year, $300,000 study of frontal systems and weather patterns in North Dakota.[24] Objectives are to assess frequency and intensity of deep radiational inversions and other meteorological factors affecting pollutant dispersal and thereby assist planners in siting lignite conversion plants. NDSU scientists were also researching the extent to which metals are transferred from lignite to process water during lignite gasification with a $63,200 grant from the Department of the Interior.[25]

The Department of Agricultural Economics at NDSU was studying employment, population growth, tax revenues, and other economic aspects of potential lignite production and processing. The project is funded, in part, by the Northern Plains Resource Program.

At the University of North Dakota (UND) the chemical engineering department was researching ways to refine lignite into gaseous or liquid products.[26] This 5-year project is financed by a $3 million grant from the Federal Office of Coal Research, since consolidated into ERDA. Other lignite related research underway at UND under grants, includes a project to study the sodium problem in burning lignite, another to study the factors affecting

[20] The Bismarck Tribune. Coal Firm Asks for Exploration Permit in Slope. Nov. 13, 1974.
[21] Williston Daily Herald. Little Missouri Grasslands Study Urges Policy Changes. Mar. 21, 1974.
[22] The (Fargo-Moorhead) Forum. Spoil Bank Study to be Intensified. Nov. 8, 1974, p. 9.
[23] The Bismarck Tribune. Researchers Begin Coal Impact Study. May 16, 1974.
[24] The Minot Daily News. NDSU Predicts Impacts of Energy Development. July 12, 1974, p. 20.
[25] The Bismarck Tribune. NDSU Gets Grant for Coal Research. Sept. 10, 1974.
[26] The Bismarck Tribune. Research Proliferates on State Resources. Apr. 4, 1974.

lignite heating values, and still another to investigate the feasibility of converting lignite to coke for use in iron and steel making.

At Minot State College several projects were underway to study the sociological impacts of large-scale increases in North Dakota lignite production and processing. The Old West Regional Commission approved a $50,000 federally funded study to assess the social and economic effects of a lignite gasification project proposed by Michigan-Wisconsin Pipeline Co.[27]

In cooperation with The North American Coal Corp., the North Dakota Geological Survey made detailed logs of test holes drilled by the coal corporation.[28] The Survey prepared three-dimensional drawings showing the different soil strata and chemical analyses of the area tested and pointed out the need for this type of study before any realistic reclamation plan can be made.

The U.S. Department of Agriculture started a 5-year mined land reclamation research program at its Northern Great Plains Research Center at Mandan.[29] Consolidation Coal Co. and Basin Electric Power Cooperative each contributed $15,000 to help finance the project which has as its objective the determination of the effects of returning various depths of surface and subsoil to strip mined lands on the productivity of reclaimed areas.

The Michigan-Wisconsin Pipeline Company reported favorable results from a test run of North Dakota lignite at a South African coal gasification plant.[30] According to reports the test of the 150-car trainload of lignite cost the company $1.6 million. The test was needed to compile data required to design a proposed North Dakota gasification plant.

Battelle Research Foundation was retained by Governor Arthur A. Link's Coal Gasification Task Force to compile all available information relating to North Dakota lignites. Battelle proposed to follow this $18,000 base line study with a 2-year, million dollar project to assess the full impact of State lignite development.[31]

Natural Gas.—Marketed natural gas (defined as gross production from both gas and oil wells less the volume used for repressurizing and venting) totaled 31,206 million cubic feet, 13% more than in 1973. The average wellhead value of 19.9 cents per thousand cubic feet was only fractionally above that the year before. Most of the gas was processed by the State's four wet gas processing plants.

Natural Gas Liquids.—Production of natural gas liquids declined 10%, but their value increased 69%. Farmers Union Central Exchange Coop. (CENEX) constructed a new wet gas processing plant west of Bowman in the Coyote Creek-Red River Pool to bring the number of such plants in the State to five. The plant, which went into operation in September, was designed for processing about 3 million cubic feet of wet gas per day. Other plants processing wet gas were the Lignite Gas Plant, at Lignite; North Tioga Gas Plant at McGregor; Red Wing Creek Gas Plant south of Watford City; and the Burmah Oil and Gas Co. plant at Tioga which was formerly owned by the Signal Companies, Inc.

Peat.—Peat Products Co. produced reed-sedge peat in Bottineau County. Production was small because of the limited market in the four-state marketing area. The entire production was used for horticultural purposes.

Petroleum.—North Dakota crude oil production in 1974 was 19.7 million barrels, down 2.5% from the 20.2 million barrels produced in 1973. This was 7.4 million or 27.3% below the record high of 27.1 million barrels produced in 1966. North Dakota's 1974 production represented 0.6% of total U.S. production. Total value of crude oil produced in North Dakota in 1974 was $119.0 million, compared with $78.9 million in 1973. According to the State Geological Survey, at the end of the year North Dakota had 1,988 wells capable of production dispersed through 132 oil pools. Their combined monthly production rate at year-end was about 1,650,000 barrels.

The higher prices for "new crude," together with less favorable economic incentives across the border in Canada, combined to make 1974 oil well drilling in North Dakota reach a 5-year high. The North Dakota State Geological Survey issued 174 new drilling permits during the year. This was 35% above the 129 permits issued in 1973 and the highest since 1969 when 206 permits were issued. Oil well drilling had hit a 20-year low in 1972 when only 99 wells were drilled, compared to 1958 when a record high of 437 wells were drilled.

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[27] The Bismarck Tribune. Old West Commission Will Study Gasification. Feb. 13, 1974.
[28] The Minot Daily News. Geological Survey Boost to Reclamation Efforts. Sept. 24, 1974.
[29] The Bismarck Tribune. Reclamation Study Set. Sept. 6, 1974.
[30] The Bismarck Tribune. Gasification Testing Proves Successful. Sept. 25, 1974.
[31] Williston Daily Herald. Comprehensive Study of N.D. Coal Development Endorsed. Feb. 12, 1974, p. 1.

Table 5.—North Dakota: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Billings	2	--	--	1	--	1	4	37,984
Bottineau	5	--	3	2	--	7	17	65,969
Bowman	1	--	1	3	--	3	8	76,531
Burke	2	--	--	--	--	--	2	14,646
Divide	1	--	--	--	--	1	2	16,846
Dunn	--	--	--	--	--	6	6	52,894
Foster	--	--	--	--	--	1	1	2,280
Golden Valley	--	--	--	--	--	1	1	11,892
Grant	--	--	--	--	--	1	1	9,325
Hettinger	--	--	--	--	--	1	1	8,200
Logan	--	--	--	--	--	1	1	4,000
McHenry	--	--	--	--	--	4	4	18,740
McKenzie	6	--	3	--	--	5	14	143,917
McLean	--	--	--	--	--	1	1	4,570
Mercer	--	--	--	--	--	1	1	9,594
Morton	--	--	--	--	--	1	1	8,000
Mountrail	1	--	--	--	--	2	3	24,089
Renville	2	--	3	3	--	7	15	71,814
Rolette	--	--	--	--	--	1	1	1,600
Slope	--	--	1	--	--	--	1	8,100
Stark	2	--	7	2	--	11	22	181,065
Ward	--	--	3	--	--	6	9	57,360
Williams	9	--	1	--	--	1	11	118,297
Total	31	--	22	11	--	63	127	947,713

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 6.—North Dakota: Crude oil production, by county
(Thousand 42-gallon barrels and thousand dollars)

County	Quantity		Principal fields in 1974 in order of production
	1973	1974	
Billings	2,221	2,074	Fryburg, Medora, Rocky Ridge.
Bottineau	2,842	2,634	Newburgh, South Westhope, Wiley.
Bowman	1,457	1,437	Cedar Creek, Medicine Pole Hills, Coyote Creek.
Burke	1,486	1,186	Rival, North Tioga, Northeast Foothills, Black Slough.
Divide	188	169	North Tioga, Hamlet.
Dunn	8	1	Lost Bridge.
Golden Valley	70	56	Square Butte.
McHenry	20	15	Pratt.
McKenzie	4,057	4,441	Antelope, Charlson, Blue Buttes, Hawkeye, Clear Creek.
Mountrail	381	342	Tioga.
Renville	1,755	1,581	Sherwood, Glenburn.
Slope	104	85	Eleven Bar.
Stark	915	1,050	Dickinson, West Dickinson, Zenith.
Ward	298	231	South Lone Tree, Lone Tree.
Williams	4,488	4,394	Beaver Lodge, Tioga, Grenora, Capa.
Total	20,235	[1]19,697	
Value	$78,916	$119,022	

[1] Data do not add to total shown because of independent rounding.

Exploration for petroleum in North Dakota in 1974 resulted in the discovery of seven new oil pools. Four of the discoveries were by wildcats and three by outpost wells located one-half to one-and-a-half miles from producing wells. This compares with only two new oil discoveries during all of 1973. The seven new pools discovered were the West Sherwood-Madison pool in Renville County by Chandler and Associates, Inc., on April 5; the Green River-Heath pool in Stark County by Farmers Union Central Exchange, Inc., on April 24; the Swartwood (since renamed Haley)-Red River pool in Bowman County by Kenneth Luff, Inc., and Hanover Planning, Inc., on

June 28; the South Landa-Madison pool in Bottineau County by Tolco Oil and Gas Co. on July 2; the Elkhorn Ranch-Madison pool in Billings County by Farmers Union Central Exchange, Inc., on October 11; the Pleasant-Madison pool in Renville County by Kissinger Petroleum Corp. on October 23; and the Little Deep Creek-Madison pool in Renville County by Kissinger Petroleum Corp. on December 27. Initial production reports from the seven new oil pools totaled nearly 1,000 barrels per day.

The West Sherwood well in Renville County by Chandler and Associates, Inc., in April showed an initial reservoir pressure of 2,277 psig according to the North Dakota Geological Survey.[32] Production statistics for the year show the well produced 6,367 barrels of oil, 6,519 barrels of water, and no gas. Oil API gravity was 27.8°. The well is producing from the Madison formation.

The Green River well in Stark County by Farmers Union Central Exchange, Inc., was followed by several successful pool development wells. North Dakota Geological Survey statistics show that by the end of the year the three wells in the pool were all flowing and producing 36.1° gravity oil from the Heath formation.[33] At yearend the pool had produced 97,934 barrels of oil, 6,424 barrels of water and 27,826 MCF of gas.

The Haley discovery in Bowman County by Kenneth Luff, Inc., and Hanover Planning, Inc., is 17 miles southeast of Bowman and 9 miles east of nearest production in the State Line field. According to reports, the discovery well, the Jett 1–28 tested the Red River formation in the interval between 9,200 feet to nearly 9,400 feet. Initial hopes were that the well might produce 150 barrels of crude daily. At yearend the well had produced 13,934 barrels of oil, 1,001 barrels of water, and 1,682 MCF gas according to the North Dakota Geological Survey.[34]

The South Landa discovery in Bottineau County by Tolco Oil and Gas Co. was followed by another producer later in the year. Total production for the year for the two new wells was reported at 10,104 barrels of oil, 617 barrels of water, and zero cubic feet of gas.[35] All production was from the Madison formation. Initial reservoir pressure was 1,498 psig, temperature was 110° F, oil gravity 38.0°, and reservoir porosity 20%. The net pay thickness of the pool is 14 feet.

The Elkhorn Ranch discovery well in northern Billings County by Farmers Union Central Exchange, Inc., reportedly was perforated from 9,410 to 9,414 feet in the Nesson zone of the Madison formation. Initial indications were that the discovery well, the Federal No. 14–32, was capable of producing 200 barrels of oil a day. By the end of the year the flowing well had produced 10,799 barrels of oil, 4,139 barrels of water, and 10,873 MCF of gas according to North Dakota Geological Survey statistics.[36] Initial reservoir pressure was reported as 4,350 psig. North Dakota Geological Survey statistics show the 40.0° gravity oil with a temperature of 240° F flowed from an 8-foot net pay thickness in the Madison having a porosity of 16%.

The Pleasant discovery in Renville County by Kissinger Petroleum Corp. is 6 miles northwest of the Bluell Field. The North Dakota Geological Survey reported that the discovery well, Aarhus No. 4–12, had an indicated initial reservoir pressure of 2,115 psig.[37] By the end of the year the well had produced 6,570 barrels of oil and 179 barrels of water. No gas production was reported. The producing horizon is in the Madison formation.

Since the Little Deep Creek-Madison pool was discovered only a few days before the end of the year, no production was reported during 1974.

The increased interest in North Dakota oil was shown by the success of lease sales held by the State Land Board for the North Dakota Board of University and School Lands, and by the Bank of North Dakota. After four lease sales starting in February, the State Land Department and the Bank of North Dakota reported collecting nearly $2.4 million, making 1974 the record high year.[38] Leases on about 500,000 acres in more than 20 counties had been sold at the request of oil companies and brokers.

According to the State Land Department, and the Bank of North Dakota, lease sales in prior years may have involved

[32] North Dakota Geological Survey. Official Oil in North Dakota. May 1975, p. 239.
[33] North Dakota Geological Survey. Official Oil in North Dakota. May 1975, p. 100.
[34] North Dakota Geological Survey. Official Oil in North Dakota. May 1975, p. 223.
[35] North Dakota Geological Survey. Official Oil in North Dakota. May 1975, p. 203.
[36] North Dakota Geological Survey. Official Oil in North Dakota. May 1975, p. 79.
[37] North Dakota Geological Survey. Official Oil in North Dakota. May 1975, p. 169.
[38] Minot Daily News. Best Year for State on Leases. Nov. 11, 1975.

greater acreages, but not nearly as high bonus payments. During the 1950's and early 1960's bonuses paid for State leases averaged under $2.00 an acre. In 1974 the Land Department received bonuses averaging $4.60 an acre and the Bank of North Dakota bonuses averaging $3.82 an acre. The Land Department, whose gas and oil proceeds go to schools, collected about $1.8 million in bonuses and $97,000 in rentals in 1974; the Bank of North Dakota, whose revenues go to the State general fund, collected about $467,000 in bonuses and $33,000 in rentals. The two institutions control about 3 million mineral acres in North Dakota with about one-third now under lease. The State institutions collect rentals of 25 cents an acre, bonuses, and a one-eighth royalty on any oil and gas produced on mineral lands leased by the State.

In the first State lease offering of the year on February 19, the State Land Board leased 18,421 acres for $193,000 which included bonuses of $188.051.[39] High bonus bid was $130 per acre; average bonus per acre $10.21. On the same day, the Bank of North Dakota sold leases on 5,784 mineral acres for a total of $63,435.93 which included bonus payments of $61,742.37. High bonus bid was $100 per acre; average bonus per acre $10.63.

On May 7 the State had its second lease sale of the year. In this sale the State Land Board received bonus offerings totaling $1,311,094.17 for leases on 295,777.23 acres and the Bank of North Dakota $283,160.83 for leases on 100,079.18 acres.

In the State's third mineral lease sale on August 6, the State Land Board received a total of $161,622.37 from the sale of oil and gas leases covering about 37,000 mineral acres.[40] Average bonus paid was $4.10 an acre. The top bonus was $29 an acre paid by Texaco for a 320-acre tract in Stark County. The Bank of North Dakota received a total of $70,160.77 for leases on 16,477 acres. Bonuses averaged $3.94 an acre. Highest bonus paid was $20 an acre for a tract in Dunn County

In the fourth and last State mineral lease sale on November 19, the State Land Board received $145,333 from the sale of 143 tracts totaling 28,090 mineral acres.[41] Bonuses averaged $4.90 an acre. Highest bonus paid, and the highest for the year, was $151 an acre for an 80-acre tract in Renville County. The Bank of North Dakota received $61,034.72 from the sale of 99 lease tracts totaling 9,043 mineral acres. Bonuses averaged $6.42 an acre. Top bonus paid was $30 an acre for a tract in Dunn County.

BLM also reported increased interest in oil and gas leases. On August 27 the Billings, Mont., office of BLM received bonus bids totaling $524,000 for leases on three parcels of land within the Upper Souris National Wildlife Refuge.[42] The bids on the three parcels ranged from $138 per acre for a lease of 80 acres to $2,593 per acre on 160 acres. Later in the year, on November 18, BLM received bonus bids totaling $1,276,816 for the first federal oil and gas leases offered in the Theodore Roosevelt National Park South Unit near Medora.[43] Amerada Hess offered the high bid which averaged $991 per acre for 1,288 acres in the nine-park lease parcels. The leases carry stipulations prohibiting wells on the Roosevelt Park surface so that all wells will require directional drilling.

In what was reported as one of the largest single lease transactions in the Northern Rockies Region, oil and gas leases on about 1.25 million acres were acquired by Kelsch and Donlin, Inc., Bismarck, and Home Petroleum Corp., Calgary, Canada, in midyear.[44] The leases were acquired from the Federal Land Bank, St. Paul, Minn., and Spokane, Wash. The acquisition included about 700,000 acres in 29 North Dakota counties, the rest in Montana. The leases are for 5 years with renewal option for an additional 5 years. The leases reportedly provide for a 12.5% royalty to the Federal Land Bank on oil and gas marketed.

Although oil and gas production declined during fiscal 1973–74 from that in the previous fiscal year, tax revenue increased. According to State tax officials the 39% increase, from $3.14 million in fiscal 1972–73 to $4.36 million in fiscal 1973–74, was a result of crude oil price hikes.[45] The

[39] The Bismarck Tribune. School Land Minerals Net $193,000. Feb. 20, 1974.
[40] The Bismarck Tribune. Lease Sales Net $231.000. Aug. 7, 1974, p. 11.
[41] The Bismarck Tribune. Lease Sale Nets State $61,000. Nov. 20, 1974.
[42] The Minot Daily News. Souris Refuge Oil, Gas Bids Total $524.000. Aug. 31, 1975.
[43] The Bismarck Tribune. Amerada Bids High on TR Park Leases. Nov. 19, 1974.
[44] The (Fargo-Moorhead) Forum. 2 Firms Acquire 1.25 Million Acres of Oil and Gas Leases. May 14, 1975.
[45] The Bismarck Tribune. Oil, Gas Tax Revenues Jump. July 13, 1974.

State tax on oil and gas production is 5% of the value of oil and gas at the wellhead The production tax revenue is distributed among the State general fund and 15 producing counties.

NONMETALS

Clays.—Production of common clay and shale increased 51%, its value 112%. It accounted for less than 1% of total North Dakota mineral production value. Most of the clay was used in the production of lightweight aggregate and brick.

Gem Stones.—Agate, chalcedony, jasper, petrified wood, and similar semiprecious gem stones gathered by amateur collectors accounted for all State gem stone production.

Lime.—American Crystal Sugar Co. produced quicklime in Pembina County for use in sugar refining. Output increased 32% and was 9% above the 1969 record. The lime was consumed in North Dakota. Consumption of lime in North Dakota was 104,400 tons.

Salt.—Production of salt increased 4%; its value 13%. It accounted for less than 1% of State mineral production value. During the year Hardy Salt Co., the State's only producer, completed a 4,000-ton-capacity storage facility for storing bulk salt during summer months and reported good progress in construction of its new spray pond cooling system which is scheduled for completion early in 1975.[46]

Sand and Gravel.—The quantity of sand and gravel produced in 1974 was 4,991,000 short tons valued at $6.2 million. Compared with 1973, production decreased 17% while value increased less than 3%. Sand and gravel accounted for 4% of the value of all mineral commodities produced in the State. It was outranked in both output and value only by petroleum and lignite. Average value was $1.24 per ton compared with $1.00 per ton in 1973.

[46] Williston Daily Herald. Local Firm Slates Construction Work. Sept. 30, 1974.

Table 7.—North Dakota: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	6,011	6,021	782	1,416
Gravel			3,700	4,216
Unprocessed: Sand and gravel			509	486
Industrial:				
Sand	--	--	--	--
Gravel			--	--
Total	6,011	6,021	4,991	6,118

[1] Value data may not be directly comparable to that in tables 1, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 8.—North Dakota: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction	3,770	4,194	848	2,228
Highway and bridge construction			89	144
Other uses such as dams, waterworks, airports, etc			56	106
Concrete products (cement blocks, bricks, pipe, etc.)			72	212
Bituminous paving (asphalt and tar paving)			509	446
Roadbase and subbase			322	285
Unprocessed aggregate			436	413
Fill	404	422	111	169
Other uses[2]	111	191	11	15
Industrial sand and gravel	--	--	--	--
Total	4,285	4,807	2,454	4,018

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 9.—North Dakota: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction			W	W
Highway and bridge construction			42	165
Other uses such as dams, waterworks, airports, etc.			W	W
Concrete products (cement blocks, bricks, pipe, etc.)	1,468	1,093	--	--
Bituminous paving (asphalt and tar paving)			493	584
Roadbase and subbase			1,771	1,313
Unprocessed aggregate			73	73
Fill	251	119	96	58
Other	7	2	62	W
Total	1,726	1,214	2,537	2,193

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—The only stone production in the State consisted of "field stone" (glacial erratics collected from farmers' fields), and "scoria" a baked clay formed by a naturally occurring process whereby burning lignite strata bake the overlying clay formations. The "field stone" is used sporadically as riprap in the construction of dams, canals, and similar structures; the "scoria" as a kind of low-quality traprock in road construction by county highway departments and ranchers.

Sulfur.—Natural gas processing plants at Lignite, Burke County, owned by Texaco, Inc., and at Tioga, Williams County, owned by Burmah Oil and Gas Co., recovered elemental sulfur as a byproduct.

Vermiculite.—In 1974 vermiculite continued to be shipped into the State and was exfoliated and sold by Robinson Insulation Co. at Minot. The material was used for block insulation, loose fill insulation, concrete aggregate, plaster aggregate, and litter (agriculture).

Table 10.—Principal producers

Commodity and company	Address	Type of activity	County
Clays: Hebron Brick Co	Hebron, N. Dak. 58638	Open pit mine.	Morton.
Coal:			
Baukol Noonan, Inc.[1]	Noonan, N. Dak. 58765	Strip mine and plant.	Burke and Oliver.
Consolidation Coal Co	Box 200 Stanton, N. Dak. 58571	Plants and strip mine.	Mercer and Ward.
Knife River Coal Mining Co	Bismarck, N. Dak. 58501	do	Bowman and Oliver.
The North American Coal Corp	12800 Shaker Blvd Cleveland, Ohio 44120	do	Mercer.
Lime: American Crystal Sugar Co	P.O. Box 419 Denver, Colo. 80201	Plant	Pembina.
Natural gas and petroleum, crude:			
Amerada Hess Corp	Box 2040 Tulsa, Okla. 74102	Wells	Billings, Dunn, McKenzie, Williams.
Amoco Production Co	Box 591 Tulsa, Okla. 74102	do	Burke.
Burmah Oil and Gas Co	2800 North Loop West Houston, Tex. 77018	do	Williams.
Chandler & Associates, Inc	1401 Denver Club Bldg. Denver, Colo. 80202	do	Bottineau.
Chevron Oil Co	1700 Broadway Denver, Colo. 80202	do	Renville.
Hunt Industries	1401 Elm Street Dallas, Tex. 75202	do	Burke.
Petroleum, Inc	300 West Douglas Wichita, Kans. 67202	do	Bottineau.
Shell Oil Co	50 West 50th St. New York, N.Y. 10020	do	Bowman.

See footnote at end of table.

Table 10.—Principal producers—Conitnued

Commodity and company	Address	Type of activity	County
Natural gas and petroleum, crude—Continued			
Tenneco Oil Co	Box 2511 Houston, Tex. 77051	Wells	Renville.
Texaco, Inc	Box 52332 Houston, Tex. 77052	do	McKenzie and Burke.
Union Oil Co. of California	Box 7600 Los Angeles, Calif. 90017	do	Renville.
Salt: Hardy Salt Co	P.O. Drawer 449 St. Louis, Mo. 63166	Well and plant.	Williams.
Sand and gravel:			
Dakota Sand & Gravel Co	Box 22 Bismarck,N. Dak. 58801	Pit and plant	Burleigh.
Lindteiger Construction Co	Turtle Lake, N. Dak. 58575	Pit	McLean.
Joe Mayo & Son	Box 310 Cavalier, N. Dak. 58220	do	Pembina.
Minot Sand and Gravel Co	Box 116 Minot, N. Dak. 58702	Pit and plant	Ward.
Northern Improvement Co	Box 1254 Bismarck N. Dak. 58801	do	Various.
Shriock Construction, Inc	Rural Route 3, Radio City Minot, N. Dak. 58701	do	Do.

[1] Also clays.

The Mineral Industry of Ohio

By Henry E. Stipp [1]

Mineral production in Ohio during 1974, generally decreased in quantity compared with that of 1973, but increased sharply in value to $1,108 million compared with $807 million in 1973. It was the 13th consecutive year that the total value of Ohio's mineral output increased, mainly because of higher values for bituminous coal, crude petroleum, natural gas, clay, and salt. Mineral production was reported by all of Ohio's 88 counties in 1974, except Fulton. The State's leading mineral producing counties were Belmont and Muskingum with output valued at $189,976 million and $79,336 million, respectively. Ohio ranked high nationally as a producer of bituminous coal, stone, lime, salt, and clay. Bituminous coal continued to be the major mineral commodity produced in Ohio, and together with crude oil and natural gas, accounted for the largest part of the increase in total value of mineral output. Nonmetallic minerals, which comprise the second most valuable type of minerals produced in Ohio, generally decreased in quantity, owing to an economic recession which affected the building and chemical industries. The increase in value for many of Ohio's mineral commodities resulted mainly from the effects of inflation and consequent price rises.

Employment and Injuries.—Preliminary data for 1974 and final data for 1973 on employment in the mineral industry, excluding the petroleum industry, are given in table 3.

Legislation and Government Programs.—Amended Substitute House Bill 216 was enacted effective September 23, 1974. The act requires oil and gas well drillers to perform prescribed land surface restoration after drilling or plugging a well. It revises surety requirements, authorizes the Chief, Division of Oil and Gas, to set expiration dates on permits for the plugging and abandonment of an oil or gas well, and requires a well drilling permit to be obtained before converting a well to a use other than its original purpose.

Amended House Bill 1231, which became effective September 30, 1974, exempted coal interests from the operation of the Marketable Title Act. Also, it allows the surface owner to acquire coal interests under his land through foreclosure proceedings.

Amended Senate Bill 165, effective July 1, 1975, requires a 10-year permit to surface mine sand, gravel, clay, shale, gypsum, halite, limestone and dolomite, sandstone, other stone, or other metallic or nonmetallic ore. Also, it requires reclamation of surface mined lands and imposes standards for surface mining and reclamation, provides for the inspection of surface mining operations and reclamation work done, and for the administration and enforcement of surface mining permit requirements and standards. It prescribes penalties and sets forth application procedures. Beginning July 1, 1975, the bill exempts from the Coal Strip Mine Law surface mining operations where the coal produced is less than one-sixth of the total weight of minerals removed during the year, and requires such operations to comply with standards for surface mining and reclamation.

Amended Senate Bill 467, effective June 27, 1974, extends to July 1, 1978, the prohibition on state issuance of permits or leases to take oil or gas from or under the bed of Lake Erie.

Appointees to the Energy Emergency

[1] Henry E. Stipp, Physical scientist, Division of Ferrous Metals.

Commission, which will deal with the State's response to the energy crises through yearend 1975, were announced. The Commission, which has a budget of $453,541, will be mainly responsible for collecting energy information and drafting energy contingency plans to submit to the General Assembly. The Energy Emergency Commission is authorized to declare energy emergencies when Congress declares an emergency, or when the health, welfare, and safety of Ohio citizens is threatened by any aspect of an energy shortage. An 18-member Energy Advisory Council, representing a cross section of Ohio industries and other enterprises, will support the Commission.

Table 1.—Mineral production in Ohio [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Masonry ---- thousand short tons	176	$5,641	158	$5,227
Portland ---- do	3,456	73,362	2,884	73,815
Clays ---- do	4,732	12,456	4,325	13,488
Coal (bituminous) ---- do	45,783	338,792	45,409	559,519
Gem stones	NA	8	NA	8
Lime ---- thousand short tons	4,389	77,028	4,171	93,695
Natural gas ---- million cubic feet	93,610	39,786	92,055	44,371
Peat ---- thousand short tons	4	64	5	74
Petroleum (crude) --- thousand 42-gallon barrels	8,796	44,690	9,088	89,348
Salt ---- thousand short tons	4,657	41,643	5,029	49,089
Sand and gravel ---- do	48,987	69,982	41,353	68,258
Stone [2] ---- do	55,107	98,009	51,709	105,098
Value of items that cannot be disclosed:				
Other nonmetals	XX	5,518	XX	5,680
Total	XX	806,979	XX	1,107,670
Total 1967 constant dollars	XX	591,596	XX	p 529,688

p Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes dimension stone; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Ohio, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	$1,790	W	Stone.
Allen	W	$2,564	Stone, sand and gravel.
Ashland	W	345	Sand and gravel.
Ashtabula	W	W	Lime, sand and gravel.
Athens	987	W	Stone, coal, sand and gravel, clays.
Auglaize	W	W	Sand and gravel, stone, clays.
Belmont	W	189,976	Coal, stone.
Brown	W	W	Sand and gravel, stone.
Butler	4,787	3,988	Sand and gravel.
Carroll	2,234	3,155	Coal, stone, clays, sand and gravel.
Champaign	W	W	Sand and gravel, peat.
Clark	W	W	Sand and gravel, stone.
Clermont	W	W	Do.
Clinton	W	W	Stone, sand and gravel.
Columbiana	W	10,701	Coal, clays, sand and gravel.
Coshocton	W	W	Coal, sand and gravel, stone.
Crawford	W	W	Stone, sand and gravel.
Cuyahoga	10,503	16,374	Salt, lime, clays, sand and gravel, peat.
Darke	W	W	Sand and gravel, clays.
Defiance	W	W	Sand and gravel.
Delaware	W	3,123	Stone, clays.
Erie	11,247	12,861	Lime, stone, sand and gravel.
Fairfield	650	586	Sand and gravel.
Fayette	W	W	Stone.
Franklin	12,534	10,787	Sand and gravel, stone, clays, peat.

See footnotes at end of table.

Table 2.—Value of mineral production in Ohio, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Gallia	W	W	Coal, stone, sand and gravel.
Geauga	W	W	Stone, sand and gravel.
Greene	$28,872	$29,600	Cement, stone, sand and gravel, clays.
Guernsey	2,497	12,735	Coal.
Hamilton	7,170	6,912	Sand and gravel.
Hancock	W	1,218	Stone, lime.
Hardin	W	W	Stone.
Harrison	57,451	W	Coal, stone, clays.
Henry	W	W	Sand and gravel, clays.
Highland	W	1,083	Stone, sand and gravel.
Hocking	W	W	Coal, sand and gravel, clays.
Holmes	4,425	8,282	Coal, stone, clays, sand and gravel.
Huron	W	W	Sand and gravel, stone.
Jackson	W	8,297	Coal, clays, stone, sand and gravel.
Jefferson	34,758	70,136	Coal, clays.
Knox	W	W	Stone, sand and gravel.
Lake	26,306	30,626	Lime, salt, sand and gravel.
Lawrence	W	9,330	Cement, coal, clays, sand and gravel, stone.
Licking	W	W	Sand and gravel, clays, stone.
Logan	1,121	1,048	Stone, sand and gravel.
Lorain	10,050	14,060	Lime, stone, sand and gravel, grindstone.
Lucas	W	10,609	Cement, stone, sand and gravel, clays.
Madison	W	W	Stone, sand and gravel.
Mahoning	9,377	13,221	Stone, coal, clays, sand and gravel, peat.
Marion	2,083	2,298	Stone, sand and gravel, clays.
Medina	W	W	Sand and gravel, clays.
Meigs	5,294	W	Coal, sand and gravel, salt.
Mercer	W	W	Stone.
Miami	W	W	Stone, sand and gravel.
Monroe	W	12,659	Coal, stone, sand and gravel.
Montgomery	W	W	Sand and gravel, stone.
Morgan	W	6,413	Coal, sand and gravel, stone.
Morrow	98	123	Sand and gravel.
Muskingum	47,812	79,336	Coal, cement, stone, sand and gravel, clays.
Noble	4,966	W	Coal, stone, clays.
Ottawa	13,559	15,631	Stone, lime, gypsum.
Paulding	16,313	W	Cement, stone, clays.
Perry	W	25,107	Coal, stone, clays.
Pickaway	W	W	Sand and gravel, stone.
Pike	1,045	W	Do.
Portage	5,419	5,939	Sand and gravel.
Preble	W	W	Sand and gravel, stone.
Putnam	W	664	Stone, clays.
Richland	W	W	Sand and gravel, clays, peat.
Ross	W	W	Sand and gravel, stone.
Sandusky	35,684	44,265	Lime, stone.
Scioto	1,425	1,368	Stone, clays, sand and gravel.
Seneca	W	13,314	Lime, stone, clays.
Shelby	414	W	Stone, sand and gravel.
Stark	15,219	18,174	Cement, coal, sand and gravel, stone, clays.
Summit	19,186	W	Salt, sand and gravel, stone.
Trumbull	W	W	Sand and gravel.
Tuscarawas	14,808	24,219	Coal, clays, sand and gravel, stone.
Union	W	W	Sand and gravel.
Van Wert	W	848	Stone, clays.
Vinton	W	13,263	Coal, clays.
Warren	W	W	Sand and gravel, stone.
Washington	782	W	Do.
Wayne	16,420	18,425	Salt, sand and gravel, stone, coal, clays.
Williams	W	585	Sand and gravel, peat.
Wood	2,587	2,622	Stone.
Wyandot	10,666	10,733	Stone, lime, sand and gravel, clays, peat.
Undistributed [2]	366,345	340,069	
Total [3]	806,979	1,107,670	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Fulton County is not listed because no production was reported. Individual county data for natural gas and petroleum values are not available, included with "Undistributed."

[2] Includes natural gas, petroleum, gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Ohio business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	4,617.0	NA	NA
Unemployment	do	197.0	NA	NA
Employment (nonagricultural):				
Manufacturing	do	1,423.9	1,415.4	−0.6
Transportation and public utilities	do	225.2	229.9	+2.1
Wholesale and retail trade	do	853.1	876.1	+2.7
Financial, insurance, and real estate	do	173.4	176.9	+2.0
Services	do	648.6	675.5	+4.1
Government	do	597.8	613.7	+2.7
Contract construction	do	167.7	169.2	+0.9
Mining	do	23.1	24.4	+5.6
Personal income:				
Total	millions	$54,474	$59,580	+9.4
Per capita	do	$5,070	$5,549	+9.4
Construction activity:				
Number of housing units authorized		60,556	42,642	−29.6
Value of private nonresidential construction	millions	$802.9	$810.1	+0.9
Cement shipments to and within the State	thousand short tons	4,074	3,530	−13.4
Mineral production value	millions	$807	$1,107.7	+37.3

p Preliminary.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

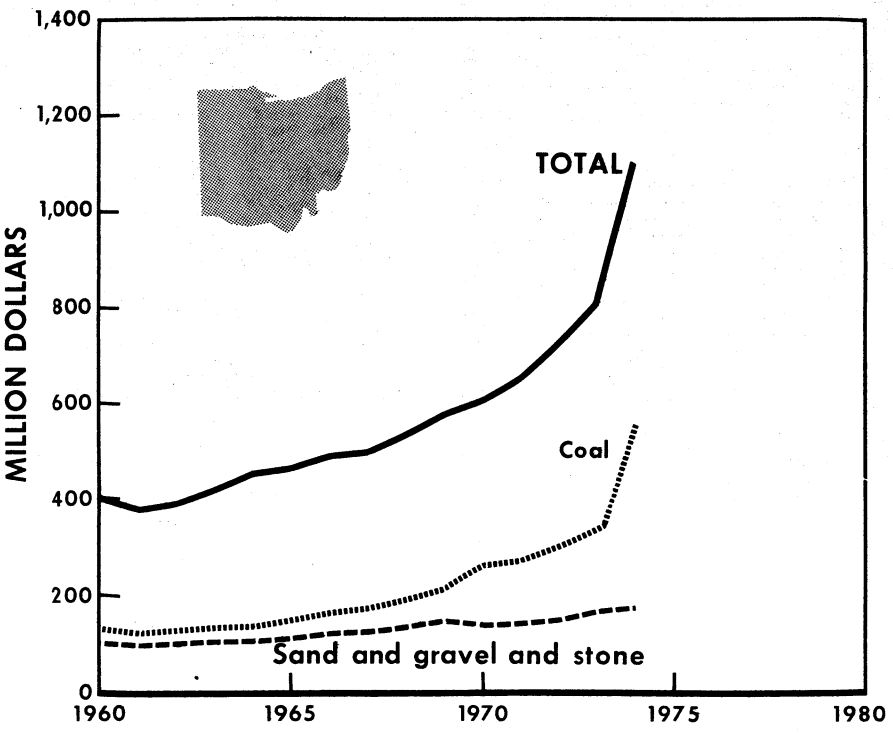

Figure 1.—Value of coal, sand and gravel, and stone, and total value of mineral production in Ohio.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasive Stones.—Cleveland Quarries Co. produced abrasive stone (grindstone) as a byproduct of sandstone quarrying at its South Amhurst Quarries, Lorain County. Output of abrasive stone decreased somewhat from that of 1973; however, value increased. Data on production and value of abrasive stone were withheld in order to protect confidential company information. Grindstones from Ohio are known throughout the world, but synthetic abrasives have captured much of their market in recent years. Manufactured abrasives such as iron and steel shot and grit also are produced in Ohio.

Cement.—Ohio ranked seventh nationally in the production of portland cement and eighth in output of masonry cement. Eight plants produced portland cement and five of these plants also produced masonry cement. Production and shipments of portland cement decreased 6.4% and 16.6%, respectively, to 2,918,233 tons and 2,883,997 tons from those of 1973. Value of shipments was up 0.6% to $73.8 million, and the average value per ton of portland cement increased 21% to $25.59 compared with $21.23 in 1973. Consumption of portland cement in the State totaled 3,327,254 tons, a 13.3% decrease compared with 3,837,000 tons in the preceding year. Domestic producers supplied 87% of the State's consumption of portland cement. Stocks of portland cement at yearend 1974 were 272,863 tons; 26.7% larger than yearend 1973. Raw materials consumed in producing portland cement were limestone and cement rock, clay and shale, sand, iron ore, mill scale, gypsum and anhydrite, slag, and other materials. Shipments of portland cement by type of customer were ready-mix companies, 1.9 million tons; concrete products manufacturers, 0.55 million tons; highway contractors, 0.29 million tons; building materials dealers, 0.13 million tons; other contractors and miscellaneous, 0.03 million tons. The major portion of portland cement shipments was delivered in bulk form. About 2.7 million tons was shipped by truck and 0.14 million tons by rail.

Production and shipments of masonry cement decreased 5.7% and 10.6%, respectively, from those of 1973 to 159,621 tons and 157,845 tons. The value of shipments decreased 7.4% to about $5.2 million, compared with the 1973 value of $5.6 million. The average value of masonry cement increased 3.6% to $33.11 per ton compared with $31.97 per ton in 1973. Consumption of masonry cement in Ohio totaled 202,706 tons, a decrease of 14.8% from the 238,000 tons of 1973. About 77.9% of Ohio's consumption of masonry cement was supplied by domestic producers. Stocks of masonry cement at yearend totaled 11,553 tons; 1,761 tons larger than those of 1973.

MCQ Industries, Inc., announced plans for construction of its sixth ready-mix concrete plant. The plant will be located on a 50-acre site on the Madison-Franklin County border near Plain City, and is expected to be producing within a year.

National Cement Products Co., Toledo, developed a new automated curing process for manufacturing concrete blocks, which cuts natural gas consumption in half. Reportedly, the new process, called Petro-Cure, produces concrete blocks that are stronger and cheaper than other methods.

Table 4.—Ohio: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	8	8
Production	3,117,065	2,918,233
Shipments from mills:		
Quantity	3,456,120	2,883,997
Value	$73,361,539	$73,814,615
Stocks at mills, Dec. 31	215,371	272,863

Table 5.—Ohio: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	5	5
Production	169,259	159,621
Shipments from mills:		
Quantity	176,460	157,860
Value	$5,641,298	$5,226,681
Stocks at mills, Dec. 31	9,792	11,553

Clays.—Production of clay and shale (common clay and shale and fire clay) decreased 8.6% or 406,641 tons below

that of 1973; however, value increased 8.3% or about $1 million more than that of 1973. Total clay production in 1974 consisted of 3,201,636 tons of common clay and shale, 74% of total, and 1,123,506 tons of fire clay, 26% of total. Common clay was used mainly for manufacturing products such as face brick, tile, and sewer pipe; while fire clay was used chiefly for refractories, firebrick, block, shapes, and foundry sand. Of the 35 counties producing common clay and shale in 1974, the principal counties were Tuscarawas, 1,082,814 tons; Stark, 251,514 tons; Cuyahoga, 225,980 tons; and Greene, 221,357 tons. The leading counties producing fire clay were Jefferson, 254,600 tons; Jackson, 207,514 tons; and Tuscarawas, 169,243 tons. Common clay and shale accounted for about 46% of the total value of Ohio's output in 1974, and fire clay accounted for the remaining 54%. The unit value for all clay produced in Ohio was $3.12 per ton, about 49 cents per ton more than the unit value in 1973. The unit value for common clay in 1974 was $1.96 per ton, and for fire clay $6.43 per ton. Ohio ranked third in the Nation in the output of common clay and shale and first nationally in the production of fire clay.

Gem Stones.—Gem and mineral specimen collectors were active at mines and quarries throughout the State. Value remained the same as that of 1973. Specimens collected included calcite, celestite, flint, and jasper. Flint, the State's official gem stone, was obtained chiefly at Flint Ridge in southeastern Licking County and the adjacent area of Muskingum County.

Graphite (Synthetic).—Graphite shapes were produced from petroleum and pitch coke by The Ohio Carbon Company at Cleveland. Output and value increased from that of 1973; however, data were withheld to avoid disclosing confidential company information.

Gypsum.—United States Gypsum Co. and The Celotex Corp. mined crude gypsum in Ottawa County. Output declined 9% and was 14% below the 1972 record. Celotex, U.S. Gypsum, and National Gypsum Co. calcined gypsum in Lorain and Ottawa Counties for consumption mainly in building products. Calcined output declined 13% to 379,200 tons. Nationally Ohio ranked 10th in the output of crude gypsum and 13th in production of calcined gypsum.

Lime.—Sixteen companies produced lime at 17 plants in 10 counties. Leading counties were Sandusky, Lake, and Lorain. Leading producers were United States Steel Corp., Diamond Shamrock Chemical Co., Martin Marietta Corp., and Republic Steel Corp. Output decreased 5% to 4.2 million tons and was 5% below the 1972 record. Although Ohio's output of lime decreased in 1974, value increased 21.6% to $93.7 million compared with value of $77.0 million in 1973. Among the States, Ohio was the leading lime producer. The lime was used for basic oxygen furnaces, refractory dolomite, alkalies, glass, and other uses. The lime was consumed in Ohio, Pennsylvania, West Virginia, Michigan, and other destinations. Consumption of lime in Ohio was 3,596,000 tons.

Table 6.—Ohio: Lime sold or used by producers, by use
(Short tons)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Steel BOF	1,935,000	$31,870,000	1,991,000	$42,850,000
Refractory dolomite	803,600	15,750,000	738,000	18,770,000
Glass	345,200	5,685,000	296,300	6,376,000
Steel, electric	81,020	1,334,000	96,390	2,074,000
Finishing lime	101,600	2,903,000	91,250	2,545,000
Steel, open-hearth	130,500	2,149,000	51,340	1,105,000
Masons lime	63,530	1,815,000	50,710	1,414,000
Sewage treatment	12,830	211,300	14,480	311,600
Agriculture	13,550	335,600	14,160	411,800
Water purification	50,990	839,800	W	W
Other uses[1]	851,700	14,140,000	827,700	17,840,000
Total[2]	4,389,000	77,028,000	4,171,000	93,700,000

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes alkalies, magnesite, calcium carbide, sugar refining, soil stabilization, water purification, fertilizer, other metallurgical uses (1973), whiting (1973), rubber, paint (1974), and uses indicated by symbol W.
[2] Data may not add to totals shown because of independent rounding.

Perlite (Expanded).—Four firms with plants located in Ottawa, Lorain, Hamilton, and Cuyahoga Counties processed crude perlite shipped from Western States. The quantity of perlite sold or used, 12,099 tons, remained about the same as that of 1973, but the value increased 10.2% to $824,505. Average value per ton increased to $67.93 compared with $61.85 in 1973. The major portion of the expanded perlite was used for insulation and plaster aggregate.

Salt.—Ohio ranked fourth in national output of salt. Production (as measured by quantity sold or used) increased 8%; 372,000 tons more than that of 1973. The value of salt production increased 17.9%, about $7.4 million more than value in 1973. Salt was produced by six firms with seven operations located in five counties. Underground mines in Cuyahoga and Lake Counties produced rock salt, which was used mainly for control of ice on highways and for chemical applications. Operations in Cuyahoga, Meigs, Summit, and Wayne Counties produced evaporated salt by the open pan and vacuum pan methods. Evaporated salt was used for a wide variety of applications that included human and animal consumption. Brine was produced also from wells in Lake and Summit Counties. Lake County continued as the major producing area with two salt operations.

Sand and Gravel.—Production of construction and industrial sand and gravel (as measured by producers' sales or use) decreased 15.6% in quantity compared with production in the previous year. The value also decreased 2.5% below that of 1973. Average value per ton was $1.65 compared with $1.43 per ton in 1973.

Commercial sale or use of construction aggregate and industrial sand and gravel, by producers, was down 31% compared with that of 1973, and the value was 20.7% less than that of the previous year. Major uses for construction aggregates included bituminous paving, nonresidential and residential construction, unprocessed aggregate, concrete products, roadbase and subbase, and fill. Uses for industrial sand and gravel were mainly flux, refractory, and abrasive materials.

The number of operations producing sand and gravel in 1974 totaled 348 compared with 342 mines or quarries in 1973. Of the 348 operations, 16 had output in excess of 4.5 million tons, 37 exceeded output of 3.4 million tons, 24 produced more than 2.2 million tons, and 87 exceeded output of 1.1 million tons. The remaining 184 mines produced from 2,000 tons to more than 800,000 tons.

Sand and gravel was produced in 67 counties, 22 more than in 1973. The leading counties producing sand and gravel in 1974 were Hamilton, Franklin, Portage, and Butler, with output in excess of 2.8 million tons each. Nine other counties recorded output of more than 1.1 million tons each.

Commercial producers accounted for 80.8% of the total output of construction aggregate. The remaining 19.2% of total aggregate output was sold or used for publicly funded projects. This material was processed by washing, screening, crushing, and sizing.

Table 7.—Ohio: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	48,408	67,347	16,114	24,904
Gravel			20,367	35,584
Unprocessed: Sand and gravel			4,016	3,780
Industrial:				
Sand	579	2,635	856	3,954
Gravel			W	W
Total	48,987	69,982	41,353	68,222

W Withheld to avoid disclosing individual company confidential data; included with "Industrial sand."

[1] Value data may not be directly comparable to that in tables 1, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 8.—Ohio: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction			9,983	16,881
Highway and bridge construction			659	1,107
Other uses (dams, waterworks, airports, etc.)			227	391
Concrete products (cement blocks, bricks, pipe, etc.)	41,773	60,491	3,333	5,720
Bituminous paving (asphalt and tar paving)			10,283	16,299
Roadbase and subbase			2,613	4,336
Unprocessed aggregate			3,758	3,570
Fill	4,431	3,784	1,436	2,248
Other uses[2]	1,965	2,823	466	761
Industrial sand and gravel	579	2,635	857	3,954
Total	48,748	69,733	33,615	55,267

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast and miscellaneous (1973).

Table 9.—Ohio: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction			994	1,541
Highway and bridge construction			2,027	3,626
Other uses (dams, waterworks, airports, etc.)			446	863
Concrete products (cement blocks, bricks, pipe, etc.)			213	351
Bituminous paving (asphalt and tar paving)	230	235	2,607	4,514
Roadbase and subbase			937	1,517
Unprocessed aggregate			258	210
Fill	9	14	235	335
Other			21	34
Industrial sand and gravel				
Total	239	249	7,738	12,991

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Slag (Iron-Blast-Furnace).—Ohio ranked first nationally in the production of processed slag, accounting for 20% of U.S. output. Production of iron-blast-furnace slag (all types) totaled 6.1 million tons valued at $15.6 million, according to the National Slag Association. Output was 11.5% less than the previous year; however, value increased 5.6% over that of 1973. The average unit price increased from $2.15 to $2.56 per ton, which exceeded the national average of $2.28 per ton. Screened air-cooled slag comprised 82.5% of the total processed material, with granulated and lightweight (expanded) slag making up the remainder. Air-cooled slag was used chiefly as aggregate for concrete and bituminous construction, highway and airport construction, and as railroad ballast. Granulated slag was used mainly in highway construction. The major use for expanded slag was as an aggregate in concrete block and lightweight concrete.

Stone.—Total production of stone (limestone, dolomite, and sandstone) decreased 6% in quantity, but increased 7% in value compared with that of 1973. Decreased output was attributed to slackness in the construction industry, which required less aggregate (bituminous, concrete, macadam, and surface) mainly for building highways and smaller quantities of crushed limestone and dolomite for roadbase stone. Price increases accounted for most of the rise in total value of stone. The largest part of Ohio's stone output (97%) consisted of crushed and broken limestone and dolomite, which decreased 7% in quantity from the previous year. Crushed and broken dolomite accounted for 15% of the State's production of stone and increased 11% in quantity and 33% in value over 1973. The average unit value of crushed and broken limestone was $1.96 per ton, 21 cents above that of 1973; whereas crushed and broken dolomite averaged $2.12 per ton, 35 cents above the

previous year. Sandusky, with output of 5.3 million tons of crushed and broken limestone and dolomite, was the leading county among the 62 producing counties, with Ottawa, Wyandot, Mahoning, and Erie also important producers.

Crushed and broken sandstone and quartzite production of 1,624,017 tons, valued at more than $5.6 million, was 475,017 tons in quantity and $2.0 million in value greater than those in 1973. The quantity of crushed and broken sandstone and quartzite output represented 3% of the total quantity of stone produced in Ohio. Dimension sandstone production decreased in quantity and value. Output totaled 80,851 tons valued at about $2.8 million compared with 105,922 tons valued at almost $3.0 million in 1973. Sandstone and quartzite were quarried in 17 counties of which Geauga, Perry, and Knox were the leading producers of crushed and broken material, and Coshocton, Lorain, and Scioto were the chief producers of dimension sandstone and quartzite.

France Stone Co. established a materials testing laboratory at Waterville. The laboratory was set up to ensure quality products for customers, develop information on the quality and quantity of reserves and mineral properties, and to develop new products and new uses for existing products.

Table 10.—Ohio: Crushed and broken limestone and dolomite sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	3,666	6,194	2,909	5,733
Concrete aggregate	8,336	13,589	6,331	11,870
Dense graded roadbase stone	7,502	12,514	4,587	8,564
Macadam aggregate	8,000	13,053	7,173	12,676
Surface treatment aggregate	2,441	4,546	2,127	4,525
Unspecified construction aggregate and roadstone	4,091	6,751	6,423	12,170
Agricultural purposes [1]	1,429	2,680	2,051	4,400
Cement manufacture	4,878	8,321	5,677	11,232
Dead-burned dolomite	2,513	4,213	1,314	2,338
Filter stone	W	W	39	66
Glass manufacture	W	W	570	2,815
Lime manufacture	2,250	4,290	1,965	3,545
Manufactured fine aggregate (stone sand)	281	420	342	662
Mine dusting	W	W	166	858
Flux stone	3,387	5,784	4,698	9,424
Railroad ballast	1,191	1,643	1,235	1,873
Riprap and jetty stone	1,464	2,953	1,141	3,132
Other uses [2]	2,529	7,416	1,388	3,686
Total [3]	53,957	94,368	50,085	99,517

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Data include agricultural limestone, other, soil conditioners, and poultry grit and mineral food.
[2] Includes terrazzo and exposed aggregate, refractory stone, chemical stone, other fillers, whiting, other uses not specified. In 1973 data also include stone used in asphalt filler, building products, acid neutralization, and fill.
[3] Data may not add to totals shown because of independent rounding.

Sulfur (Recovered Elemental).—Production of elemental sulfur increased 37% to 9,596 long tons compared with 6,993 long tons in 1973. Sales also rose 36% to 9,694 long tons valued at $291,790 from 7,103 long tons valued at $110,520 in 1973. Sulfur was recovered in Allen, Lucas, and Stark Counties as a byproduct of petroleum refining operations.

Vermiculite (Exfoliated).—Crude vermiculite, mined out-of-State and shipped into Ohio, was processed by Cleveland Builders and Supply Co. at its Cleveland plant. Production decreased sharply from that of 1973; however, value increased moderately. The processed vermiculite was used for concrete and plaster aggregate, insulation, and soil conditioning.

MINERAL FUELS

Coal (Bituminous).—Production of bituminous coal, the State's major mineral commodity, decreased 0.8% in quantity, but increased 65% in value compared with 1973. Nationally the State ranked fifth in coal production and sixth in value of coal output in 1974. Ohio's coal averaged $12.32 per ton at the mine in 1974 compared with $7.40 per ton in 1973. Of the 257 mines that produced coal 199 strip

mines accounted for 46% of total output, 28 underground mines 32%, strip-auger mines 22%, and auger mines 0.6%. Belmont County with production of 15.9 million tons of coal valued at about $189.7 million was Ohio's principal producer, followed by Harrison County with coal production of 5.7 million tons valued at $70.6 million, and Jefferson County with coal output of 5.1 million tons valued at about $67.3 million. Tuscarawas and Vinton also were major coal producing areas of Ohio. The Federal Bureau of Mines estimated the total reserve base of bituminous coal in Ohio at 17,423.26 million tons.[2]

[2] Bureau of Mines Staff. The Reserve Base of Bituminous Coal and Anthracite for Underground Mining in the Eastern United States. BuMines IC 8655, 1974, 428 pp.

Table 11.—Ohio: Bituminous coal production, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines					Production (Thousand short tons)					Total (thousands)
	Underground	Strip	Auger	Strip-auger	Total	Underground	Strip	Auger	Strip-auger	Total	
Athens	--	1	--	--	1	--	37	--	--	37	$469
Belmont	7	41	3	2	53	6,088	5,569	W	W	15,905	189,656
Carroll	--	2	--	--	2	--	217	--	--	217	2,750
Columbiana	3	18	2	3	26	W	608	W	107	784	10,012
Coshocton	1	11	1	--	13	W	1,117	W	--	1,894	25,069
Gallia	--	2	1	--	3	--	W	W	--	110	1,387
Guernsey	--	5	--	--	5	--	865	--	--	865	12,735
Harrison	5	13	--	2	20	2,969	1,588	--	1,121	5,678	70,569
Hocking	--	7	--	--	7	--	304	--	--	304	2,978
Holmes	--	4	--	1	5	--	W	--	W	699	7,659
Jackson	3	6	--	--	9	63	407	--	--	470	5,685
Jefferson	2	25	4	2	33	W	3,355	92	W	5,132	67,282
Lawrence	--	3	--	--	3	--	92	--	--	92	1,690
Mahoning	--	8	--	1	9	--	W	--	W	482	6,112
Meigs	2	--	--	--	2	W	--	--	--	W	W
Monroe	1	--	--	--	1	W	--	--	--	W	W
Morgan	--	1	--	--	1	--	531	--	--	531	5,769
Muskingum	1	8	1	3	13	W	1,443	W	2,917	4,471	51,331
Noble	--	4	--	--	4	--	780	--	--	780	9,328
Perry	1	6	--	--	7	W	W	--	--	2,166	22,846
Stark	--	9	--	--	9	--	429	--	--	429	5,443
Tuscarawas	--	16	2	2	20	--	1,228	W	W	1,475	19,103
Vinton	2	8	--	--	10	W	W	--	--	1,236	13,246
Wayne	--	1	--	--	1	--	W	--	--	W	W
Undistributed	--	--	--	--	--	5,249	2,284	173	5,784	1,654	28,399
Total [1]	28	199	14	16	257	14,365	20,852	265	9,928	45,409	559,519

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Data may not add to totals shown because of independing rounding.

Coke and Coal Chemicals.—Production (as represented by quantity sold and used) of oven coke totaled 8,843,000 tons valued at about $655 million compared with 9,438,000 tons valued at about $348 million in the previous year. Ohio ranked third in the nation in output of oven coke. The principal use for oven coke was in blast furnaces. A small quantity was consumed in foundries and other industrial plants. The quantity of coke breeze produced totaled 868,000 tons, of which 659,000 tons was sold at a value of $11.4 million.

Peat.—Production of peat (as represented by sales) totaled 4,652 tons valued at $73.9 million compared with 3,899 tons valued at $64.3 million in 1973. Output was from seven counties with seven operations; Williams County, with one operation, ranked first in quantity produced. Total sales of peat were as follows: Humus, 68.5%; moss peat, 23.6%; and reed-sedge peat, 7.8%. The major portion of peat sales was in bulk for soil conditioning. Other uses included potting soils and worm culture.

Petroleum and Natural Gas.—Production of crude petroleum increased 3% and value increased 100% compared with that of 1973. Ohio ranked 19th nationally in the production of crude oil (including lease condensate), and in output of natural gas it ranked eleventh. Natural gas output decreased 1.7% and value increased 12% over that of 1973.

Total well completions increased 18.9% to 1,788 wells and footage drilled increased 16.8% to 7.4 million feet, according to the American Petroleum Institute. Well completions were divided into 1,616 development wells and 172 wildcat wells, representing an increasing trend for the third consecutive year. A total of 44 counties reported development well drilling and 28 counties reported wildcat drilling, as shown in table 12. Development well drilling was located principally in Muskingum, Tuscarawas, and Coshocton Counties; while wildcat drilling was reported mainly in Tuscarawas, Mahoning, Trumbull, and Ashtabula. A majority of the wells were drilled to the Medina sandstone of Silurian Age, or the Berea sandstone of Mississippian Age. A few wells were completed in the Upper Devonian shale formations.

Ohio's reserves of natural gas, as of December 31, 1974, were 1,308,210 million cubic feet (14.73 pounds per square inch absolute, at 60°F) and reserves of crude petroleum were 124 million barrels, according to the American Gas Association and the American Petroleum Institute.

Compared with yearend 1973, reserves of natural gas in Ohio increased by 128,819 million cubic feet, and proved reserves of crude petroleum were reduced by 1,040,000 barrels. Natural gas held in underground storage at yearend 1974 totaled 347,548 million cubic feet.

Total crude throughput capacity of Ohio's petroleum refineries as of January 1, 1974, was 569,400 barrels per calendar day, an increase of 32,100 barrels over that of 1973. Cracking, reforming, coking, and alkylation operating capacity expressed in terms of gasoline production totaled 277,700 barrels per calendar day compared with 292,090 barrels in 1973. Other petroleum products produced by Ohio's refineries included asphalt, coke, lubricants, and wax. Petroleum refineries were located at Canton, Findlay, Toledo, Lima, and Cleves (Cincinnati).

The first updated map in 10 years of known oil and gas fields in Ohio was published by the Ohio Geological Survey. A total of 25 new fields have been added since the last map was published in 1964.

A new $6 million asphalt plant was completed in late November by Standard Oil Co. of Ohio at its Toledo refinery. The new plant is part of a $140 million project to convert the refinery to process high-sulfur crude oil. Reportedly, sulfur improves the durability of asphalt, and its use in asphalt will help to prevent contamination of the environment. The new plant will produce about 84,000 gallons of asphalt per day. In late December, Standard Oil Co. suspended for reevaluation the second phase of its project to convert its Toledo refinery to process high-sulfur crude. The action was taken because world growth in demand for crude oil decreased during 1974. About one-third of the refinery's capacity or about 45,000 barrels per day has been converted to processing high-sulfur crude oil.

At yearend, industries in northeast Ohio faced reductions in natural gas supplies.[3] East Ohio Gas Co., Cleveland, requested

[3] American Metal Market. It Looks Like Another Winter of Gas Worries for Ohio Mills and Foundries. V. 81, No. 234, Dec. 3, 1974, p. 4.

mandatory cutback authority from the Public Utilities Commission of Ohio to reduce gas supplied to industrial users 18% or 28 billion cubic feet. Columbia Gas System, which supplies natural gas to the remainder of Ohio, cut its allocations a total of 35%, effective December 1. Iron and steel producers and foundries were expected to be affected more than other firms by the reductions in natural gas supply.

Table 12.—Ohio: Oil and gas well drilling completions in 1974, by county

County	Proved field wells [1]			Exploratory			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Ashland	3	--	--	--	--	--	3	2,132
Ashtabula	1	37	2	--	16	--	56	203,570
Athens	9	6	3	--	--	1	19	39,267
Belmont	--	--	--	--	--	1	1	6,050
Carroll	66	--	--	7	--	1	74	408,063
Columbiana	--	2	--	--	--	4	6	43,325
Coshocton	79	81	17	--	6	7	190	615,602
Crawford	--	--	1	--	--	--	1	3,048
Cuyahoga	--	1	--	--	--	--	1	229
Delaware	--	--	1	--	--	--	1	3,400
Erie	--	2	--	--	5	2	9	13,719
Fairfield	1	5	4	--	--	1	11	31,982
Gallia	--	3	--	--	--	--	3	4,699
Geauga	1	6	--	1	9	--	17	68,091
Guernsey	21	34	2	--	--	--	57	299,640
Harrison	2	35	1	--	--	--	38	213,345
Henry	--	2	--	--	--	1	3	6,912
Hocking	67	8	3	--	--	1	79	235,534
Holmes	20	53	10	--	--	2	85	326,223
Jackson	--	--	--	--	--	1	1	6,100
Jefferson	--	--	2	--	--	--	2	2,321
Knox	20	7	3	--	1	2	33	91,846
Lake	--	4	--	--	1	--	5	15,238
Lawrence	--	1	1	--	--	--	2	5,420
Licking	21	10	4	--	--	--	35	100,076
Lorain	--	1	--	--	1	--	2	1,363
Mahoning	31	38	1	7	15	2	94	486,873
Marion	1	--	--	--	--	--	1	2,903
Medina	--	19	1	--	--	--	20	64,203
Meigs	1	11	2	--	--	--	14	25,161
Monroe	1	4	--	--	--	--	5	10,497
Morgan	4	37	3	--	1	--	45	198,747
Morrow	2	--	13	--	--	--	15	45,277
Muskingum	53	179	25	--	4	--	261	1,114,517
Noble	5	31	4	--	1	1	42	214,985
Perry	58	49	8	--	1	--	116	374,273
Portage	2	19	2	--	3	1	27	119,472
Putnam	--	--	--	1	--	--	1	1,393
Richland	--	2	3	--	1	--	6	16,582
Scioto	--	3	2	--	--	--	5	2,147
Stark	54	14	--	1	2	--	71	356,814
Summit	--	--	1	--	--	--	1	4,584
Trumbull	--	30	1	--	11	5	47	224,280
Tuscarawas	22	178	4	3	39	--	241	1,199,151
Vinton	1	1	--	--	--	--	2	2,271
Washington	--	3	1	--	--	--	4	6,492
Wayne	1	22	11	--	--	2	36	141,802
Total	547	933	136	20	117	35	1,788	7,359,619

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

METALS

Aluminum.—Production of primary aluminum at the Hannibal reduction plant of Ormet Corp. decreased slightly compared with 1973. Value increased sharply above that of 1973, mainly because of price increases. However, at yearend three potlines were shut down and about 920 workers were laid off, owing to slack economic conditions. Annual plant capacity was cut 50% to about 125,000 tons of aluminum. Ormet Corp., jointly owned by Olin Corp. and Revere Copper & Brass Inc., produced aluminum by reducing alumina obtained by barge from a company-owned plant at Burnside, La.

Beryllium.—Brush Wellman, Inc., produced beryllium metal, alloys, and compounds from beryllium hydroxide at its Elmore plant. Bertrandite ore mined at the corporation's Roadside mine near Delta, Utah, was processed into beryllium hydroxide and shipped to Elmore. Brush Wellman also maintains facilities for processing beryl ore at the Elmore plant.

Ferroalloys.—Ohio continued to lead the United States in production of ferroalloys; however, output decreased 7.7% to 782,837 tons compared with 848,252 tons in 1973. The ferroalloys produced consisted mainly of alloys of iron and boron, chromium, columbium, manganese, silicon, and silvery pig iron. Ohio Ferro-Alloys Corp. was constructing a new manganese alloys furnace at its Philo, Ohio works. The electric furnace, which has been rated at 30,000 kilowatts per month, reportedly will boost manganese alloy capacity 33%. In April the firm permanently closed its Tacoma, Wash., plant. Operations were consolidated in its three Ohio plants. Ohio Ferro-Alloys expected to have a new ferrosilicon furnace operating by October at a production rate of 40,000 tons per year.

The Pesses Co. was equipping a 40,000-square-foot plant at Solon for manufacturing ferroalloys of tungsten, molybdenum, and tantalum.[4] The firm expected operations to begin in early 1975.

Iron and Steel.—Ohio's production of raw steel totaled 25.3 million tons, a decrease of 4.7% from the previous year, according to the American Iron and Steel Institute. Pig iron production was about 17.5 million tons, a decrease of 5% from the 18.4 million tons of 1973. Shipments of pig iron decreased to about 17.6 million tons valued at $2.8 billion, 4.8% less than shipments in 1973. As of Jan. 1, 1974, thirty-one blast furnaces were active out of a total of 42 blast furnaces in the State. Receipts of domestic iron ore at Ohio plants were 4.8 million tons, and foreign iron ore receipts were about 3.2 million tons, totaling about 8 million tons; 7% less than the previous year. Receipts of agglomerates totaled about 18.1 million tons, 1.1 million tons less than those of 1973. Domestic regular iron ore pellets totaling 16.4 million tons and foreign agglomerate receipts of 1.5 million tons comprised the major share of agglomerate receipts. Domestic iron ore consumed in blast furnaces totaled about 4.1 million tons; foreign iron ore consumption in blast furnaces was about 1.5 million tons, and blast furnace consumption of agglomerates totaled 21.1 million tons. In addition, 2.3 million tons of limestone and 1.4 million tons of dolomite were consumed as fluxing material. Other materials consumed in blast furnaces included coke and coke breeze, 11.5 million tons; home and purchased scrap, 718,553 tons; slag scrap, 479,669 tons; mill cinder and roll scale, 572,026 tons; open-hearth, basic oxygen, and Bessemer slag, 623,176 tons; and raw flue dust, 16,793 tons. About 3.6 million tons of slag and 477,400 tons of scrap iron were produced at blast furnaces. In addition, 611,047 tons of flue dust were recovered. Substantial quantities of supplemental fuels, which included natural gas, bunker fuel oil, coal, coal-oil slurry, and fuel tar, were consumed by Ohio blast furnaces.

Titanium.—The RMI Company produced titanium sponge metal by sodium reduction of titanium tetrachloride at its Ashtabula plant. Titanium sponge was shipped to the company's plant at Niles for melting and processing. Primary titanium metal shipped from Henderson, Nev., was rolled and fabricated at Toronto by Titanium Metals Corporation of America. The Glidden-Durkee Div. of SCM Corporation produced titanium pigments (titanium dioxide) for use in manufacturing paint.

Tungsten, Tantalum, and Cobalt.—Kennametal, Inc., installed additional equipment and enlarged the plant space by 6,300 square feet at its Willoughby, Ohio,

[4] American Metal Market. Pesses Setting Up 1st Manufacturing Operation. V. 81, No. 154, Aug. 8, 1974, p. 5.

works. The firm produces cemented carbides of tungsten, tantalum, and cobalt for manufacture of machine cutting tools.

Zirconium.—Foote Mineral Co. processed zircon at its Cambridge plant to produce magnesium-zirconium alloys. Harshaw Chemical Co., Inc., recovered zirconium oxide at its Cleveland plant for use as ceramic-base colors. Ohio Ferro-Alloys Corp. produced zirconium-silicon alloys at Brilliant. Zirconium Corporation of America produced zirconium oxide as well as zirconia refractories at its Cleveland plant. The Chas. Taylor Sons Company of Cincinnati produced zircon refractories. Continental Minerals Processing Corp. milled zircon at Sharonville for use by iron and steel foundries and the ceramic industry. TRW Inc. and Sherwood Refractories Co. produced zircon cores and molds for investment casting of high-temperature alloys. TRW Inc. also produced zircon concentrates for sand blasting.

Table 13.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Flintkote Co.[1]	Middle Branch Ohio 44652	Plant	Stark.
General Portland Cement Co.[1 2]	709 Clay St. Ft. Wayne, Ind. 46802	---- do	Paulding.
Marquette Cement Manufacturing Co.[2]	20 North Wacker Dr. Chicago, Ill. 60606	---- do	Lawrence.
Medusa Corp.[1 2 3]	P.O. Box 5668 Cleveland, Ohio 44101	---- do	Lucas.
Southwestern Portland Cement Co.[1 2]	P.O. Box 191 Fairborn, Ohio 45324	---- do	Greene.
United States Steel Corp.[1 2 4]	600 Grant St. Pittsburgh, Pa. 15230	---- do	Do.
Clays:			
Belden Brick Co	P.O. Box 910 Canton, Ohio 44701	Pits	Holmes and Tuscarawas.
Cedar Heights Clay Co	P.O. Box 368 Oak Hill, Ohio 45656	---- do	Jackson.
H. K. Porter Co	Porter Bldg. Pittsburgh, Pa. 15219	Underground mines.	Columbiana and Jefferson.
Coal:			
Central Ohio Coal Co	Box 18, Bowling Green Station, New York, N.Y. 10004	Strip	Morgan and Muskingum.
Consolidated Coal Co	Cadiz, Ohio 43907	Strip, auger, underground mines.	Belmont, Jefferson, Harrison.
Hardy Coal Co	Berlin, Ohio 44160	Strip mines	Coshocton, Holmes, Tuscarawas.
Ohio River Collieries Co	Route 1 Bloomingdale, Ohio 43910	Strip and auger	Belmont.
Peabody Coal Co	301 North Memorial Dr. St. Louis, Mo. 63102	Strip mines	Coshocton and Perry.
R&F Coal Co	Box 218 Cadiz, Ohio 43907	---- do	Belmont, Harrison, Noble.
Ferroalloys:			
Foote Mineral Co	Route 100 Exton, Pa. 19341	Plants	Guernsey and Jefferson.
Interlake Steel Corp	13–5th & Perry Ave. Chicago, Ill. 60604	---- do	Washington.
Ohio Ferro-Alloys Corp	839 30th Northwest Canton, Ohio 44709	---- do	Jefferson, Monroe, Muskingum.
Union Carbide Corp.[4]	P.O. Box 176 Marietta, Ohio 45750	---- do	Ashtabula and Washington.
Graphite, synthetic:			
The Ohio Carbon Co	12508 Berea Rd. Cleveland, Ohio 44111	---- do	Cuyahoga.
Gypsum:			
The Celotex Corp.[5]	1500 North Dale Mabry Tampa, Fla. 33607	Pit	Ottawa.
National Gypsum Co.[4 5]	325 Delaware Ave. Buffalo, N.Y. 14202	Plant	Lorain.
United States Gypsum Co.[4 5]	101 South Wacker Dr. Chicago, Ill. 60606	Underground	Ottawa.

See footnotes at end of table.

Table 13.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Lime:			
Huron Lime Co	P.O. Box 428 Huron, Ohio 44839	Plant	Erie.
Martin-Marietta Chemicals	Executive Plaza II Hunt Valley, Md. 21030	---- do	Sandusky.
Ohio Lime Co	Woodville, Ohio 43469	---- do	Do.
Pfizer, Inc	Box 46 Gibsonburg, Ohio 43431	---- do	Do.
Republic Steel Corp	Box 6778 Cleveland, Ohio 44101	---- do	Lake.
Peat: The Humus Co	2628 South Michigan St. South Bend, Ind. 46614	Bog	Wyandot.
Perlite, expanded: Cleveland Builders and Supply Co.[6]	2100 West Third St. Cleveland, Ohio 44113	Plant	Cuyahoga.
Petroleum refineries:			
Ashland Oil and Refining Co.	1409 Winchester Ave. Ashland, Ky. 41101	Plants	Hancock and Stark.
Chevron Asphalt Co	555 Market St. San Francisco, Calif. 94105	Plant	Hamilton.
Gulf Oil Corp	Pittsburgh, Pa. 15219	Plants	Hamilton and Lucas.
Standard Oil Co. of Ohio	Midland Bldg. Cleveland, Ohio 44115	---- do	Allen and Lucas.
Sun Oil Co	1608 Walnut St. Philadelphia, Pa. 19103	Plant	Lucas.
Salt:			
Diamond Shamrock Corp.[4]	300 Union Commerce Bldg. Cleveland, Ohio 44115	Well	Lake.
International Salt Co	Clarks Summit, Pa. 18411	Underground	Cuyahoga.
Morton International Inc	110 North Wacker Dr. Chicago, Ill. 60606	---- do	Lake and Wayne.
Sand and gravel:			
American Aggregates Corp.[1]	Garst Ave. at Ave. B Greenville, Ohio 45331	Pits and dredge	Champaign, Clark, Darke, Franklin, Licking, Montgomery.
American Materials Corp	P.O. Box 154 Hamilton, Ohio 45010	Pits	Butler and Hamilton.
F. H. Brewer Co	P.O. Box 128 Lancaster, Ohio 43130	---- do	Athens and Fairfield.
Dravo Corp	5253 Wooster Rd. Cincinnati, Ohio 45226	---- do	Butler, Hamilton, Warren.
Standard Slag Co	1200 Stambargh Bldg. Youngstown, Ohio 44501	---- do	Pike and Scioto.
Tri-State Materials Corp	Box 1933 Parkersburg, W.Va. 26100	Pit	Meigs.
Stone:			
Carbon Limestone Co	Lowellville, Ohio 44436	Quarries	Mahoning.
France Stone Co	1800 Toledo Trust Bldg. Toledo, Ohio 43604	---- do	Lucas, Ottawa, Paulding, Sandusky, Seneca, Wood.
Kraemer Co	Bolander Rd. Clay Center, Ohio 43408	---- do	Ottawa.
Maumee Stone Co	P.O. Box 369 Maumee, Ohio 43537	---- do	Lucas, Ottawa, Paulding, Wood.
MCQ Industries, Inc	2100 Tremont Center Columbus, Ohio 43221	---- do	Franklin.
National Lime & Stone Co.[4]	First National Bank Bldg. Findlay, Ohio 45840	---- do	Various.
Sandusky Lime & Stone Co.[4]	P.O. Box 527 Sandusky, Ohio 44870	Quarry	Erie.

[1] Also stone.
[2] Also clay.
[3] Also sand and gravel.
[4] Also lime.
[5] Also perlite.
[6] Also exfoliated vermiculite.

The Mineral Industry of Oklahoma

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Oklahoma Geological Survey under a cooperative agreement for collecting information on all minerals except fuels.

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Led by a gain of 64.7% in the value of fuels, the value of minerals produced in the State exceeded $2 billion for the first time, thereby surpassing the value of agriculture production, the State's other major industry. With a value of $2.124 billion for all minerals, 60.4% above that of 1973, Oklahoma ranked seventh among all States in value of mineral production. Except for a decrease in the value of high-purity helium, fuels showed increases of value above those of 1973 ranging from 16.5% for crude helium to 76.6% for petroleum. Value of nonmetallic minerals increased by 6.2%, and value of metals increased by 40%.

However, increases in value were illusory as indicators of mineral production volume in an inflating economy. Among fuels, only coal, crude helium, and liquefied petroleum gases experienced increases in quantitative output in 1974. Production of petroleum decreased by 7%, natural gas by 7.5%, and natural gasoline and cycle products by 14.3% from the levels of 1973. Among the construction materials, combined tonnages of clay, gypsum, stone, and sand and gravel decreased by 10.1%.

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Table 1.—Mineral production in Oklahoma [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons	[2] 1,298	[2] $1,871	1,289	$2,105
Coal (bituminous) ---- do	2,183	16,779	2,356	24,759
Gypsum ---- do	1,429	5,796	1,225	5,622
Helium:				
High purity ---- million cubic feet	181	6,335	169	5,915
Crude ---- do	115	1,380	134	1,608
Natural gas ---- do	1,770,980	334,110	1,638,942	458,904
Natural gas liquids:				
Natural gasoline and cycle products thousand 42-gallon barrels	14,674	49,070	12,581	84,638
LP gases ---- do	29,044	95,264	31,231	166,461
Petroleum (crude) ---- do	191,204	723,273	177,785	1,277,076
Pumice ---- thousand short tons	1	W	W	W
Salt ---- do	5	36	W	W
Sand and gravel ---- do	12,154	14,941	8,708	13,772
Stone ---- do	22,316	34,999	22,228	36,599
Value of items that cannot be disclosed: Cement, clay (bentonite 1973), copper, feldspar (1974), lead (1974), lime, silver, tripoli, zinc (1974), and values indicated by symbol W	XX	39,772	XX	46,231
Total	XX	1,323,626	XX	2,123,690
Total 1967 constant dollars	XX	970,350	XX	p 1,015,549

p Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes bentonite; included with "Value of items that cannot be disclosed."

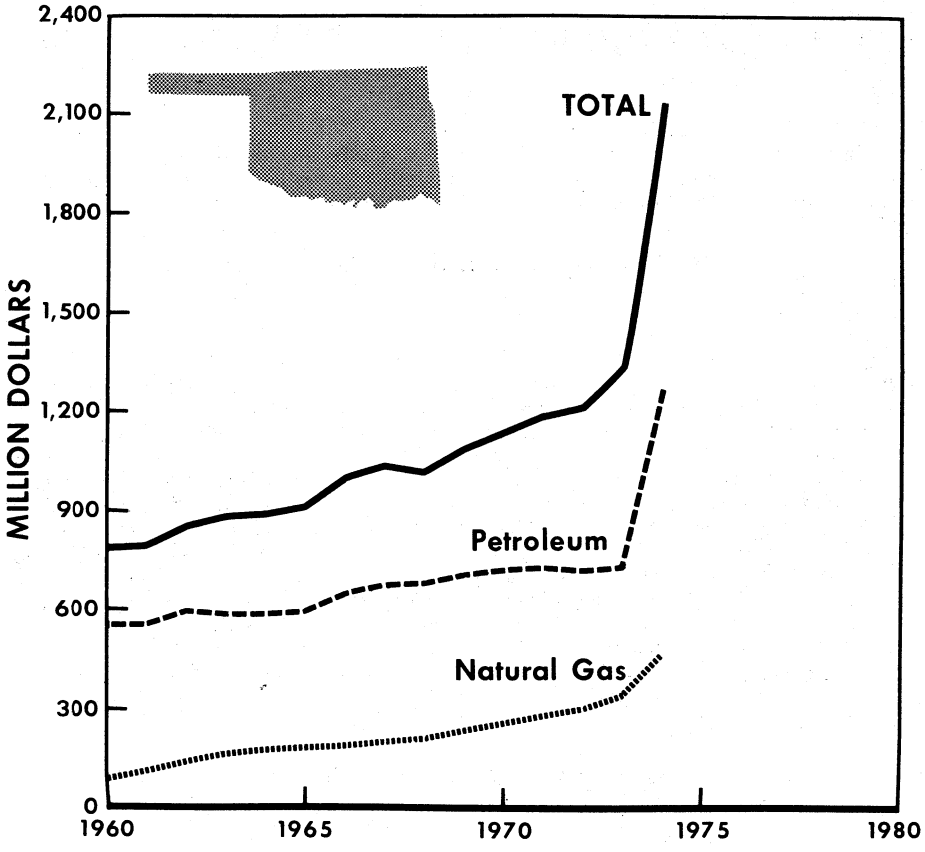

Figure 1.—Value of natural gas, petroleum, and total value of mineral production in Oklahoma.

Table 2.—Value of mineral production in Oklahoma, by county [1]
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adair	W	--	
Alfalfa	$15,082	$23,185	Petroleum, natural gas, natural gas liquids, sand and gravel.
Atoka	W	W	Stone, petroleum.
Beaver	52,314	77,273	Natural gas, petroleum, natural gas liquids, pumice.
Beckham	9,922	10,690	Natural gas, natural gas liquids, petroleum.
Blaine	29,735	44,053	Natural gas, petroleum, natural gas liquids, gypsum, sand and gravel.
Bryan	2,231	3,198	Petroleum, natural gas, stone, sand and gravel.
Caddo	20,807	34,230	Petroleum, natural gas, natural gas liquids, gypsum, sand and gravel.
Canadian	27,396	41,643	Natural gas, petroleum, natural gas liquids, clays, sand and gravel, gypsum.
Carter	99,353	188,534	Petroleum, natural gas liquids, natural gas, sand and gravel, stone.

See footnotes at end of table.

Table 2.—Value of mineral production in Oklahoma, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Cherokee	W	$1,311	Stone.
Choctaw	$195	W	Do.
Cimarron	16,724	20,784	Natural gas, helium, petroleum, natural gas liquids.
Cleveland	12,923	18,023	Petroleum, natural gas, natural gas liquids, sand and gravel.
Coal	2,361	4,560	Petroleum, natural gas, stone.
Comanche	5,388	6,521	Stone, petroleum, gypsum, natural gas.
Cotton	W	W	Petroleum, sand and gravel, natural gas.
Craig	4,927	6,973	Coal, petroleum, natural gas.
Creek	33,848	61,014	Petroleum, natural gas liquids, stone, natural gas, clays.
Custer	6,880	11,687	Natural gas liquids, natural gas, petroleum, clays.
Delaware	1	W	Stone, sand and gravel.
Dewey	36,957	52,931	Natural gas, petroleum, natural gas liquids.
Ellis	11,363	15,891	Natural gas, petroleum.
Garfield	30,364	53,416	Petroleum, natural gas liquids, natural gas, sand and gravel.
Garvin	79,875	115,230	Petroleum, natural gas liquids, natural gas.
Grady	49,078	57,344	Petroleum, natural gas, natural gas liquids.
Grant	6,114	10,935	Do.
Greer	282	586	Natural gas, petroleum, stone, clays, sand and gravel.
Harmon	10	W	Salt, natural gas.
Harper	29,421	42,051	Natural gas, natural gas liquids, petroleum, sand and gravel.
Haskell	W	W	Natural gas, coal.
Hughes	4,195	8,001	Petroleum, natural gas, sand and gravel.
Jackson	3,795	5,423	Copper, gypsum, petroleum, sand and gravel, silver.
Jefferson	W	5,508	Petroleum, sand and gravel, natural gas.
Johnston	W	4,277	Sand and gravel, stone, petroleum.
Kay	20,189	36,874	Petroleum, natural gas liquids, stone, natural gas, sand and gravel.
Kingfisher	73,527	116,163	Petroleum, natural gas, natural gas liquids, sand and gravel.
Kiowa	1,858	2,817	Stone, petroleum, natural gas.
Latimer	W	22,961	Natural gas, sand and gravel.
Le Flore	5,281	7,786	Natural gas, coal, sand and gravel, clays.
Lincoln	9,139	17,052	Petroleum, natural gas, natural gas liquids.
Logan	6,978	13,686	Petroleum, natural gas, natural gas liquids, sand and gravel.
Love	6,940	11,792	Petroleum, natural gas, natural gas liquids.
McClain	22,178	36,704	Petroleum, natural gas, natural gas liquids, sand and gravel.
McCurtain	W	W	Sand and gravel, stone.
McIntosh	W	1,301	Natural gas, stone, petroleum.
Major	51,490	71,511	Petroleum, natural gas, natural gas liquids, sand and gravel.
Marshall	5,671	8,944	Petroleum, natural gas liquids, natural gas, stone.
Mayes	W	10,005	Cement, stone, clays, sand and gravel, petroleum.
Murray	9,113	11,326	Petroleum, stone, natural gas.
Muskogee	1,964	3,964	Petroleum, sand and gravel, coal, stone.
Noble	6,726	13,559	Petroleum, natural gas, sand and gravel.
Nowata	1,469	3,847	Petroleum, natural gas, stone.
Okfuskee	3,660	7,608	Petroleum, natural gas, natural gas liquids.
Oklahoma	29,366	49,617	Petroleum, natural gas liquids, natural gas, sand and gravel, clays.
Okmulgee	3,569	7,846	Petroleum, natural gas.
Osage	41,260	78,471	Petroleum, stone, natural gas.
Ottawa	W	W	Tripoli, stone, sand and gravel, zinc, lead.

See footnotes at end of table.

Table 2.—Value of mineral production in Oklahoma, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Pawnee	$5,196	$10,087	Petroleum, stone, natural gas, sand and gravel.
Payne	10,402	15,144	Petroleum, natural gas, stone, sand and gravel.
Pittsburg	9,686	13,845	Natural gas, stone, coal, petroleum, sand and gravel.
Pontotoc	34,191	60,046	Petroleum, cement, stone, sand and gravel, natural gas, clays, natural gas liquids.
Pottawatomie	8,469	17,617	Petroleum, natural gas, sand and gravel.
Pushmataha	W	5	Sand and gravel.
Roger Mills	3,260	5,279	Natural gas, petroleum.
Rogers	19,905	26,307	Cement, coal, petroleum, stone, clays, natural gas.
Seminole	30,553	52,595	Petroleum, natural gas liquids, stone, natural gas, sand and gravel, clays.
Sequoyah	3,277	W	Lime, natural gas, stone, sand and gravel.
Stephens	109,123	217,933	Petroleum, natural gas liquids, natural gas.
Texas	97,224	144,270	Natural gas, petroleum, natural gas liquids, sand and gravel.
Tillman	875	1,179	Petroleum, sand and gravel, stone.
Tulsa	11,909	16,176	Petroleum, stone, sand and gravel, clays, natural gas.
Wagoner	W	844	Petroleum, sand and gravel.
Washington	2,514	6,206	Petroleum, stone, sand and gravel, natural gas.
Washita	W	850	Natural gas, petroleum.
Woods	12,541	14,766	Natural gas, petroleum, sand and gravel, salt.
Woodward	17,666	27,737	Natural gas, natural gas liquids, petroleum, sand and gravel.
Undistributed [2]	54,919	33,710	
Total [3]	1,323,626	2,123,690	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Petroleum values are based on an average price per barrel for the State and natural gas values are based on an average price per cubic foot for the State.

[2] Includes value of items that cannot be assigned to specific counties and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Oklahoma business activity

		1973	1974 [p]	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	1,111.2	1,125.0	+1.2
Unemployment	do	47.1	49.0	+4.0
Employment:				
Construction	do	46.7	46.8	+0.2
Manufacturing	do	151.6	155.9	+2.8
Mining	do	35.9	38.5	+7.2
Other [1]	do	618.0	637.7	+3.2
Personal income:				
Total	millions	$11,558	$12,371	+7.0
Per capita		$4,331	$4,566	+5.4
Construction activity:				
Building permits:				
Number of new units authorized		17,202	11,272	−34.5
Value of authorized nonresidential construction	millions	$281	$321	+14.2
Cement shipments to and within Oklahoma	thousand short tons	1,485	1,530	+3.0
Mineral production value	millions	$1,323.6	$2,123.7	+60.4

[p] Preliminary.

[1] Includes services; wholesale and retail trade; finance, insurance, and real estate; transportation and public utilities; and government.

Sources: Employment and Earnings; Construction Review; Survey of Current Business; Oklahoma Employment Security Commission; and U.S. Bureau of Mines.

Employment and Wages.—Average employment in mining in 1974 was 38,500. The Oklahoma Employment Security Commission reported that accelerated drilling for oil and gas raised the number of oilfield workers to 39,400 in December 1974, 10.4% above such employment in the previous December. Workers engaged in other mining ranged from 1,900 to 2,200 per month with the lowest number in December, 9.5% below employment for the same month in 1973, and directly reflecting decreased demand for construction materials in a depressed construction industry.

Average hourly earnings of oilfield workers increased during the year about 13.3% to $5.01 in December. Only the wages of workers in petroleum refining and those of construction workers among 14 manufacturing industries and 5 nonmanufacturing industries, exceeded those of oilfield workers.

Transportation.—Mineral materials were transported on the McClellan-Kerr Arkansas River Navigation System both for commercial purposes and for operations of the U.S. Army Corps of Engineers. Coal was estimated at 175,000 short tons, a decrease of 3.4% from the quantity shipped in 1973. Shipments were made from the Port of Keota in Haskell County and from facilities near Webbers Falls in Muskogee County. Much of the coal was shipped to New Orleans for transshipment to foreign markets. Commercial sand and gravel, mostly dredged from the riverbed and transported for short distances, amounted to 120,000 tons. A reduction of 42% from the quantity of sand and gravel barged in 1973 corresponded to the general reduction in sand and gravel produced in the State. Riprap was used by the Corps of Engineers as jettystone. Barges were used in transporting about 118,000 short tons of rock to construction sites. About 13,000 tons of petroleum products were barged.

Legislation and Government Programs.—The Oklahoma Legislature passed three bills that related to conservation of oil and gas resources. House Bill 1771 raised the State Excise Tax on produced oil from 7/32 to 1/4 of one cent per barrel, and on natural gas from 2/100 to 5/100 of one cent per Mcf to help support activities of the Conservation Department of the Oklahoma Corporation Commission (OCC) and the participation of the State in activities of the Interstate Oil Compact Commission. Senate Bill 457 directed the OCC to determine the State's known oil and gas reserves and propose legislation to conserve them. Senate Bill 574 created the Office of Director for the State Board of Pollution Control, and defined his qualifications, duties, and powers.

Recognizing the unsuitability of many provisions of HR 11500 in the Congress of the United States to coal strip mining in Oklahoma, the Legislature's Soil and Water Resources Committee chose to oppose the bill through a legislation resolution. The committee concluded that regulation is the prerogative of the State, that any special tax for reclamation should be levied, administered, and dispersed by the State, and that standardization of reclamation laws be achieved through the Interstate Mining Compact Commission.

The Oklahoma Water Resources Board was authorized and funded by the State Legislature to study the feasibility of transporting water from abundant supplies in eastern Oklahoma to western Oklahoma, where water supplies are deficient or potentially deficient to support present and projected domestic, municipal, industrial, and agricultural requirements. Phase I of the study, covering the drainage basin of the Red River, was scheduled for completion in 1975.

The Oklahoma Energy Advisory Council, completing its review of the State's present and projected needs for energy, and the availability of energy supplies, recommended establishment of a State Department of Energy and encouraged support for organization of an interstate energy compact commission. The report revealed that Oklahoma is uniquely capable of meeting its own needs for petroleum, natural gas, and natural gas liquids until 1990, has partial capability for meeting its future coal needs, has capability in processing nuclear materials, but has very little potential for additional hydropower. Basing its projections on energy demand equivalent to 871.8 trillion Btu in 1972 and expected economic growth, the Council found State demand for energy in 1990 would be about 1,944 trillion Btu. Capital investment of $15 billion to $20 billion (1970 dollars) would be necessary between 1974 and 1990 to meet the demand.

The State Department of Energy was created by the legislature through HB

1628, principally to allocate fuels in coordination with the Federal Mandatory Fuel Allocation Program and other energy programs. Conservation of crude oil and petroleum products was addressed through the establishment of a maximum highway speed of 55 miles per hour in concert with Federal standards.

A survey of the coal resources of Oklahoma to determine availability of coal for a coal gasification industry was completed by the Oklahoma Geological Survey aided by a grant from the Ozarks Regional Commission. The State Legislature, however, declined to provide further support for technical studies in coal gasification that had been previously sponsored by the State Industrial Development Department with the aid of a $300,000 grant from the Federal Office of Coal Research.

A program of training and annual retraining for coal miners in a mobile classroom was established under the administration of the State Chief Mine Inspector with funds provided by the Federal Mining Enforcement and Safety Administration.

Oklahoma City initiated studies to formulate standards, regulations, and a city ordinance for environmental control of sand and gravel mining.

Three companies were engaged in contractual research for the Federal Bureau of Mines. Continental Oil Co., Ponca City, continued work on application of an experimental mine surveillance system to aid in the location of trapped miners and on the development of a technique for controlling methane in coal gob areas. James H. Cobbs Engineering of Tulsa continued technical services to management. Fenix & Scisson, Inc., Tulsa, undertook a study of an underground mining, rubbilization, and in situ retorting system for deep oil shale deposits.

A cooperative program between the Oklahoma Geological Survey and the Bureau of Mines was continued for the collection of mineral information and for mineral studies. Similar programs with the U.S. Geological Survey related to evaluation of surface water and ground water resources.

Research to augment the short-term supply of petroleum and natural gas was one of the prime activities of the Bureau of Mines Energy Research Center in Bartlesville. Production research included exploration techniques related to radioactive halos around oilfields and the geochemistry of oilfield brines, enhancement of petroleum recovery by applying fracturing and solution techniques to free heavy oils from reservoir formations, and disposal of oilfield and industrial waste by underground injection. Several cooperative programs were established with petroleum companies for field testing techniques in tertiary recovery of oil. Research dealing with the detection, identification, and measurement of air pollutants in underground mines, and development of monitoring equipment were conducted to further health and safety in underground coal mining.

Research in the chemistry and refining of petroleum related to quality control of petroleum-based fuels sold in the United States. Individual and aggregate chemical characteristics of crude oils were identified and correlated by source. High-boiling fractions of crude oil were studied for conversion to more valuable products. Methods of re-refining used oil were studied to provide dependable lubricants and reduce oil consumption.

Research toward a more complete and effective use of energy contained in fuels involved recognition and identification of the energy values in various hydrocarbon components of petroleum and natural gas.

Studies in engine design, fuel characteristics, manner of fuel introduction, and exotic fuel mixes sought to enhance fuel economy and minimize exhaust pollutants in the operation of gasoline and diesel engines.

Basic research of the Bartlesville Energy Research Center was augmented by contractual arrangements and special cooperation with the Atomic Energy Commission, Air Force Office of Scientific Research, Environmental Protection Agency, Department of Transportation, Office of Coal Research, American Gas Association, Utah Mineralogical and Geological Survey, American Petroleum Institute, Coordinating Research Council, and the State of Oklahoma.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Rapidly escalating prices of mineral fuels raised the total value of mineral fuels produced in Oklahoma to an alltime high record of $2 billion. Output of helium, liquefied petroleum gases (LPG), and coal increased but production of crude oil and natural gas declined.

Drilling for oil and gas was intensified in 1974, as 3,057 wells penetrated a total of 16,721,354 feet of strata, according to the American Petroleum Institute (API). Drilled footage increased by 34.5%. Completed wells included 1,149 oil wells, 744 gas wells, and 1,164 dry holes. The number of exploratory wells drilled increased 12.5% over 1973 projects, with a success ratio of 28.3% for the 396 drilling projects. Osage County continued to lead other counties in number of wells completed with 358, followed in order by Kingfisher and Stephens Counties.

The press reported that oil and gas leases were offered for public bid in 54 counties, with State lands offered in 40 counties, and Indian lands in 26 counties. The majority of the offerings were in the Anadarko Basin. Two sales by the Osage Indian Tribe in Osage County drew total bonus bids exceeding $2 million, one of which exceeded $1 million. State lands in Lake Murray State Park in Carter and Love Counties brought bonus bids of $2,082,418.14, the largest income from a single public sale during 1974. The maximum bonus bid reported in public sales was $653.88 per acre for a 160-acre tract in Southeast Cogar field in Caddo County.

Increases in the price of coal encouraged the opening of new coal mines, and the total number of mines with annual production of more than 1,000 short tons rose to 14. Permits were issued by the State's Chief Mine Inspector to operate 22 mines, including those in development and inactive status. Production increased by 7.9%.

Carbon Black.—Continental Carbon Co., the only producer of carbon black in Oklahoma, continued production from liquid hydrocarbons at its Ponca City plant in Kay County. Output of carbon black decreased slightly in 1974 from that of 1973 but value increased by 52%. Carbon black is used by the rubber industry in the manufacture of tires, shoe soles and heels, gaskets, conveyor belts, and other products.

Coal.—Coal mining expanded moderately in 1974. Production rose above that of 1973 by 7.9% to 2.4 million tons. Value grew dramatically by 47.6% to $24.8 million with rapidly expanding prices. Production of more than 1,000 tons was recorded at 14 strip mines. The State Chief Mine Inspector issued permits to 20 companies to mine coal.

A majority of newly permitted mining operations were clustered south of the Arkansas and Canadian Rivers on sites near Rock Island, Shady Point, and Milton in Le Flore County, Keota and Briartown in Haskell County, and Blocker in Pittsburg County. Three new permits issued for mines in the northern part of the coalbelt included sites near Inola in Rogers County, Alluwe in Nowata County, and Welch in Craig County. The southern sites involved Lower Hartshorne, Cavanal, Briartown, and unspecified coalbeds. Northern sites involved Rowe, Sequoyah, and Ft. Scott coalbeds.

Coal was mined in six counties. More than half was mined in Rogers and Craig Counties where average mine values were $8.02 and $8.88 per ton of coal sold mainly for power generation. Coal mined under contract in Haskell County had an average mine value of $19.63 per ton, reflecting higher Btu and fixed carbon content, and lower volatile and sulfur content that promote its use in metallurgy or in a blend with higher volatile coal to make coke. Lower and Upper Hartshorne, Stigler, and Croweburg (Sequoyah) coals were mined principally for metallurgical purposes and coke manufacture. Stigler coal was used extensively in a Texas steel plant and shipped to foreign markets. Cavanal, Rowe, and Ft. Scott (Iron Post) coals were commonly mined for electric power generation and industrial applications such as the preparation of cement and paper manufacture.

Production of coal by three major coal companies was curtailed when members of the United Mine Workers (UMW) participated in a national week of memorial for victims of black lung disease and past mine disasters. Because of a three-way conflict between miners, the UMW, and mine operators over union representation, Lone Star Steel Co.'s Pocahontas

mine was inactive for much of the year.

The Oklahoma Geological Survey completed and published "Investigations of the Coal Reserves in the Ozarks Section of Oklahoma and Their Potential Uses." The investigation found 7.2 billion tons of coal resources, of which 3.8 billion tons is recoverable reserves and 2.3 billion tons is net recoverable reserves. Strippable resources amounted to 684 million tons, of which 496 million tons is net recoverable. Quantities of the net recoverable reserves by suitability for specific use included 1.3 billion tons for coke manufacture, 657 million tons for electric power generation, and 240 million tons for gasification. Average cost of underground coal mining would be about 61% greater than the cost of strip mining at 1973 costs. Weighted average costs generated in producing a ton of coal in the State in 1973 as calculated from company data were mining, $6.91; cleaning coal, $0.40; and reclaiming strip-mined areas, $0.76 per ton or $1,457 per acre. The weighted average selling price was $10.57 per ton. Weighted average sulfur content of remaining coal resources is 2.2%; of strippable resources it is 2.9%. Coal produced and partly cleaned had an average sulfur content of 2.8% in 1973.

Garland Coal & Mining Co. commenced construction of a coal preparation plant to remove pyritic sulfur and shale partings from Upper and Lower Hartshorne coal mined in its No. 10 mine near Bokoshe. The plant, with an estimated cost of $750,000, reportedly will have a production capacity of about 200,000 short tons per year. Washing by water bath, vibrating tables, screens, and heavy media will be controlled from a central panel. Lone Star Steel Co. began preparing ground to strip mine Upper and Lower Hartshorne coal near Dow in Pittsburg County. Kerr-McGee Corp.'s Choctaw mine in Haskell County, the only underground coal mine in Oklahoma, remained on standby.

Helium.—The Bureau of Mines produced 169 million cubic feet of high-purity helium valued at $5.9 million, and 134 million cubic feet of crude helium valued at $1.6 million from natural gas at its plant near Keyes in Cimarron County. Volumes of high-purity helium and crude helium decreased by 6.6% and increased by 16.5%, respectively, from output in 1973. Under stable prices of $35 per thousand cubic feet for high-purity helium and $12 per thousand cubic feet for crude helium, total values of product changed by the same proportions in 1974. Pure helium is produced to meet the needs of agencies of the Federal Government. Excess production is stored as crude helium by the Bureau of Mines in the Cliffside gasfield in Texas.

Natural Gas.—Despite heavy demand and the highest prices on record, production of natural gas fell for the second consecutive year. The volume of marketed natural gas was 7.5% below the 1973 volume, and 9.3% below the record 1,807 trillion cubic feet of natural gas marketed in 1972. Under the impact of minor price increases allowed for interstate sales and accelerated competitive prices in intrastate sales, the total value of marketed gas rose 37.4% above 1973 value to an alltime high of $458.9 million. Average wellhead value was 28.0 cents per thousand cubic feet contrasted with 18.9 cents per thousand cubic feet in 1973. Natural gas was obtained from 9,401 wells in 63 counties. Texas County, followed by Beaver and Harper Counties were the foremost sources. Oklahoma remained in third place among producing States behind Texas and Louisiana and provided 7.6% of the Nation's marketed natural gas.

Exploratory drilling activities completed 61 gas wells, the most significant of which were on the north flank of the Anadarko Basin. Helmerich & Payne No. 1 Cupp in Beckham County had a calculated open flow potential of 32 million cubic feet per day of natural gas from a perforated zone in the Arbuckle Group (Upper Cambrian and Lower Ordovician) at depths of 16,850 to 17,476 feet. Lone Star Producing Co. No. 1 Bertha Rogers in Washita County reached a world's record depth at 31,441 feet in Arbuckle dolomite. An influx of molten sulfur at depth caused the well to be plugged back and completed as a shut-in gas well with perforations in granite wash from 13,000 to 13,110 feet.

Owing to an excess of withdrawals of natural gas over the amount added to reserves by discoveries, extensions, and revisions, reserves estimated by the American Gas Association (AGA) were reduced to 13.39 trillion cubic feet as of December 31, 1974. The ratio of remaining reserves to production remained at 8.2:1.

Deliveries of gas by Oklahoma Natural Gas Co. (ONG), an intrastate firm, to

State customers in January were about 31.75 billion cubic feet, the largest volume on record, because of both cold weather and the addition of 6,000 new customers in 1973. Cities Service Gas Co., having experienced winter shortages for interstate deliveries, levied a 15% to 20% summer curtailment on company mainline industrial customers and local gas distributing companies. Savings were diverted to underground storage for use during the winter of 1974–75.

Oklahoma Natural Gas Co. agreed to supply natural gas to five major industries. W. R. Grace & Co. was constructing an anhydrous ammonia plant at Woodward that reportedly will produce 400,000 tons of ammonia after completion in 1977, and will require 50 million cubic feet of natural gas daily. A 1,200-ton-per-day ammonia plant near Enid that was completed in July by Farmland Industries, Inc., an adjacent 1,250-ton-per-day ammonia fertilizer plant to be constructed jointly by Farmland Industries, Inc., and Agrico Chemical Co., and a $46 million ammonium nitrate complex to be built by Agrico Chemical Co. near Tulsa's Port of Catoosa will each take 50 million cubic feet of natural gas per day. Ford Motor Co.'s glass plant at Tulsa will take 17 million cubic feet of gas per day at peak production. Contrastingly, ONG announced that it would not negotiate any new contracts to provide boiler fuel for new or expanded electric power generation.

Oklahoma Natural Gas Co. completed the mainline and major gathering lines for transmitting gas from the Anadarko basin to a link with the company's general system near Edmond. The new system includes 200 miles of 16- to 30-inch pipe and 61 miles of 12- to 16-inch pipe. Capacity of 300 million cubic feet per day can be expanded to 500 million cubic feet of gas per day upon installation of compressors. Construction was started on a 20-million-cubic-foot-per-day natural gas gathering system in the Arkoma Basin by Texas Oil & Gas Corp. The system, known as Intrastate Kinta Gas Gathering System, scheduled deliveries from Haskell County to Oklahoma Natural Gas Co. to begin in 1975. Contracts were let and construction was started by Mustang Fuel Corp., principal supplier of natural gas to Oklahoma Gas and Electric Co. (OG&E), on a 120-mile, 20-inch natural gas transmission line from Calumet in Canadian County to an OG&E electric generating unit at Konawa in Seminole County. An additional 58 miles of 2¾- to 26-inch gathering lines were under construction in Coal, Pottawatomie, and Woodward Counties. Pioneer Gas Products Co., a subsidiary of Pioneer Natural Gas Co., was expanding a natural gas gathering system in Alfalfa and Major Counties. Phillips Petroleum Co. was building a natural gas gathering system in Osage County to tap newly discovered gas resources largely for company operating needs.

Natural Gas Liquids.—Oklahoma retained its third place in production of natural gas liquids behind Texas and Louisiana. Output of 43,812,000 barrels of liquefied petroleum gas (LPG) and natural gas and cycle products, an increase of 0.2% above that of 1973, constituted 7.5% of the national production. Value was $251.1 million. Ethane, propane, butane, isobutane, natural gasoline, isopentane, plant condensate, and other products were recovered, of which LPG accounted for 71.3% of the volume and 66.3% of the value. At yearend, 84 natural gas processing plants were in operation. Proved reserves of natural gas liquids at yearend were estimated by AGA to be 290,327,000 barrels, an increase of 0.4% over 1973 reserves.

Continental Oil Co. announced the award of construction contracts to modernize a natural gas processing plant at Hennessey in Kingfisher County in 1975. A natural gas processing plant at Enid was moved to Fay in Dewey County by LVO Corp. of Tulsa, due to depleted supply of natural gas in the Enid field.

Petroleum.—Despite a decrease in output of crude oil for the seventh consecutive year, Oklahoma maintained its nationwide position as fourth among producing States. Production in 1974 was 177.8 million barrels, a decline of 7% from production in 1973, and 22.9% below that in 1967. Contrastingly, average wellhead value of crude oil rose from $3.78 per barrel in 1973 to $7.18 per barrel in 1974. Stephens County, the most productive area, accounted for 27.0 million barrels of oil, an increase of 1.4 million barrels over 1973 production. Carter County with 24.1 million barrels, and Garvin County with 14.6 million barrels, remained in second and third positions in 1974, despite declines from 1973 production levels.

Producing wells decreased in number

to 71,797 from 72,880 in 1973. Stripper wells increased 4.9% in number in Oklahoma to 59,817 at yearend, according to a joint national survey by the Interstate Oil Compact Commission and the National Stripper Well Association. Rated at 10 barrels per day or less, these wells yielded 73.7 million barrels of oil or 42.6% of the State's total crude oil production. The State's average daily production per well based on all wells was 6.7 barrels of crude oil. Under an indicated demand that exceeded production, the OCC continued its orders permitting production at 200% of that allowable by the depth-acreage formula.

Stocks of crude oil produced and held in Oklahoma at the beginning of the year were 12.3 million barrels. At yearend, stocks were 12.9 million barrels of crude oil.

Exploratory drilling brought in 51 oil wells scattered through 28 counties, according to the API. More than half of these were either in the Ardmore Basin of southern Oklahoma or the Anadarko Basin of central and central-western Oklahoma, and included notably three successes in Carter County, seven in Canadian County, and four in Dewey County. Osage County in the northeast had four successful exploratory oil wells.

Although reserves of crude oil were increased by discoveries, extensions, and revisions at a rate exceeding that in 1973, the increase was less than withdrawals. According to the API, net reserves diminished by 38,587,000 barrels during the year. Oklahoma's remaining reserves of crude oil at yearend were 1,232,377,000 barrels. The ratio of remaining reserves to production was 6.9:1.

At the request of more than 63% of the royalty owners, the OCC ordered unitization of Norge oilfield in Grady County. Sun Oil Co. was authorized to install secondary recovery by waterflooding to facilitate additional recovery of more than 25 million barrels of oil. Opponents of the plan appealed the order to the State Supreme Court.

Table 4.—Oklahoma: Estimated proved recoverable reserves of crude oil, natural gas liquids, and natural gas

Commodity	Proved reserves Dec. 31, 1973	Changes in proved reserves due to extensions, revisions, and new discoveries in 1974	Proved reserves Dec. 31, 1974	Change from 1973 (percent)
Crude oil thousand 42-gallon barrels	1,270,964	74,124	1,232,377	−3.0
Natural gas liquids do	289,102	43,003	290,327	+0.4
Natural gas million cubic feet	14,098,735	1,022,551	13,390,312	−5.0

Source: American Petroleum Institute and American Gas Association.

Table 5.—Oklahoma: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Alfalfa	23	23	5	2	--	3	56	351,769
Beaver	6	44	46	1	--	5	102	717,433
Beckham	--	8	4	--	2	2	16	106,371
Blaine	14	49	24	2	1	6	96	892,083
Bryan	--	--	1	1	--	1	3	16,932
Caddo	6	12	14	--	3	9	44	331,215
Canadian	16	20	26	7	2	7	78	756,332
Carter	73	1	16	3	1	7	101	468,543
Cherokee	--	--	--	--	--	1	1	1,020
Cimarron	2	6	16	--	--	3	27	122,206
Cleveland	2	--	2	1	--	4	9	69,477
Coal	10	2	2	1	--	5	20	104,539
Comanche	6	4	9	--	--	1	20	39,851

See footnotes at end of table.

Table 5.—Oklahoma: Oil and gas well drilling completions, by county—Continued

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Cotton	7	--	6	--	--	5	18	45,230
Craig	--	1	--	--	4	3	8	4,462
Creek	50	5	20	1	--	6	82	201,593
Custer	--	4	1	--	1	3	9	101,268
Dewey	19	26	30	4	4	3	86	852,638
Ellis	4	31	26	2	5	9	77	793,068
Garfield	21	15	9	1	--	4	50	303,993
Garvin	18	--	18	2	--	21	59	285,945
Grady	16	18	10	2	2	11	59	593,790
Grant	13	1	8	2	--	15	39	194,225
Greer	--	8	4	--	1	7	20	30,734
Harmon	--	1	--	--	--	--	1	6,500
Harper	3	28	24	1	1	7	64	418,782
Haskell	--	16	7	--	1	1	25	164,876
Hughes	5	11	13	--	2	3	34	126,324
Jackson	--	--	--	--	--	2	2	7,365
Jefferson	5	--	3	--	--	2	10	74,473
Johnston	1	--	1	1	--	--	3	8,878
Kay	12	2	14	--	--	6	34	123,377
Kingfisher	130	18	18	1	2	--	169	1,289,903
Kiowa	10	--	37	1	--	2	50	43,007
Latimer	--	3	7	--	--	--	10	89,632
Le Flore	--	10	7	--	--	3	20	150,437
Lincoln	12	--	23	--	--	9	44	185,086
Logan	14	3	12	1	1	5	36	186,074
Love	12	--	4	--	--	1	17	77,676
McClain	16	1	4	2	--	3	26	262,925
McIntosh	--	16	6	--	--	5	27	66,538
Major	44	31	19	1	--	1	96	723,441
Marshall	1	--	--	--	--	4	5	9,975
Murray	2	--	9	1	--	3	15	50,604
Muskogee	9	--	3	--	--	4	16	31,141
Noble	32	10	14	--	1	6	63	225,238
Nowata	11	--	3	--	--	--	14	12,156
Okfuskee	9	5	8	--	--	--	22	66,261
Oklahoma	4	2	5	--	2	2	15	88,993
Okmulgee	27	23	14	--	1	1	66	139,936
Osage	160	74	112	4	2	6	358	837,654
Ottawa	1	--	--	--	--	--	1	2,712
Pawnee	19	2	9	--	--	1	31	97,726
Payne	28	8	13	2	--	7	58	225,719
Pittsburg	--	35	12	--	5	8	60	299,283
Pontotoc	27	1	9	--	--	--	37	102,124
Pottawatomie	15	4	13	1	1	4	38	177,840
Pushmataha	--	1	--	--	--	--	1	8,236
Roger Mills	2	5	--	--	3	2	12	188,681
Rogers	11	--	--	--	--	--	11	6,961
Seminole	36	5	25	--	--	3	69	259,137
Sequoyah	--	3	--	--	--	--	3	18,813
Stephens	78	6	25	2	2	6	119	649,263
Texas	14	22	23	--	2	5	66	356,945
Tillman	--	--	--	--	--	1	1	3,416
Tulsa	21	1	7	--	--	--	29	47,066
Wagoner	1	--	3	--	--	--	4	5,354
Washington	6	--	--	--	--	--	6	6,168
Washita	--	--	--	--	2	2	4	88,741
Woods	6	20	30	1	2	12	71	408,213
Woodward	8	38	47	--	5	16	114	922,987
Total	1,098	683	880	51	61	284	3,057	16,721,354

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 6.—Oklahoma: Crude oil production, indicated demand, and stocks, in 1974, by month
(Thousand 42-gallon barrels)

Month	Production	Indicated demand	End-of-month stocks originating within Oklahoma
January	14,807	15,153	11,907
February	15,459	15,193	12,172
March	15,454	12,766	14,859
April	13,981	15,450	13,389
May	15,308	13,245	15,451
June	14,755	14,327	15,878
July	15,295	17,419	13,753
August	14,324	14,747	13,330
September	14,577	14,818	12,830
October	14,318	13,870	13,537
November	14,016	14,200	13,353
December	15,491	15,889	12,945
Total			
1974	177,785	177,077	XX
1973	191,204	192,094	XX

XX Not applicable.

Table 7.—Oklahoma: Crude petroleum production, by field
(Thousand 42-gallon barrels)

Field	1973	1974	Cumulative to Dec. 31, 1974
Allen	2,645	2,540	126,921
Bowlegs	1,750	1,665	158,492
Burbank	3,870	3,685	504,039
Cement	2,470	1,280	140,236
Cushing	3,245	2,965	463,182
Edmond, West	715	625	155,147
Eola-Robberson	4,355	3,720	107,977
Fitts	2,180	2,565	150,873
Glenn Pool	2,150	1,980	309,421
Golden Trend	9,875	8,135	402,011
Healdton	6,880	7,575	294,240
Hewitt	6,880	6,595	218,986
Oklahoma City	1,860	2,000	733,896
Seminole Greater	1,190	1,010	199,456
Sho-Vel-Tum	33,320	34,250	1,002,456
Sooner Trend	11,480	9,810	199,414
St. Louis	1,185	1,100	216,145
Other Fields	95,154	86,285	NA
Total	191,204	177,785	--

NA Not available.

Source: Oil and Gas Journal data adjusted to Bureau of Mines total.

Cities Service Oil Co. installed an almost completely concealed waterflood system in the Oklahoma City oilfield on the site of a major commercial center and under parts of two interstate highways. The system incorporates downhole pumps, buried lines, elimination of old structures, slant drilling, use of stainless steel tanks for drilling fluid, complete electrification, and radio alarms to warn of failures.

A grant from API enabled Sun Oil Co. to undertake experiments for disposal of refinery wastes by dispersal in soil at the company's West Tulsa refinery. Degradation of crankcase, diesel, fuel, residual, and several crude oils by soil bacteria and residue of tracemetals in soil, plants, and water were being studied.

Contracts were awarded and construction was undertaken on Texoma pipeline, a 30-inch, 476-mile-long pipeline, designated to carry domestic and foreign crude oil from near Nederland, Tex., to Cushing, Okla. Design capacity is 640,000 barrels of oil per day. The plan includes spur lines to Tyler, Tex., and Wynnewood, Okla. Kerr-McGee Pipeline Corp., Rock Island Refining Corp., Texas Eastern Transmission Corp., Sun Oil Co., Lion Oil Co., Skelly Pipe Line Co., United Refining Co., and Western Crude Oil Co., sponsored the $96.5 million project of

Texoma Pipe Line Co. Completion was scheduled for January 1, 1975.

Plans of Seaway Pipeline Inc., owned by Apco Oil Corp., Continental Pipe Line Co., CRA Inc., Diamond Shamrock Corp., Midland Cooperatives Inc., National Cooperative Refinery Association, and Phillips Investment Co., were approved by the owners. The 30-inch, 510-mile-long pipeline would have an initial capacity to transmit 240,000 barrels of crude oil per day from Freeport, Tex., to Cushing, Okla., for redistribution by existing connections to refineries in the Texas Panhandle, Oklahoma, Kansas, and Illinois. Construction was scheduled to start in 1975 and to be completed in 1976. The estimated cost was $160 million.

Sagebrush Pipeline Co. of Tulsa organized Tulsa Hydro Testing Co. to test existing pipelines for upgrading to higher use. In a joint venture with Williams Bros. Pipeline Co., the firm tested a 300-mile-long, 10½-inch Williams Bros. petroleum products line that had been unused for several years.

In May, a fire caused by malfunction of equipment that controls flow of feedstocks, extensively damaged a $9 million alkylation unit at the Ponca City refinery of Continental Oil Co. Loss of the unit cut refinery capacity by about 15% and reduced the allocable supply of high-octane aviation and automobile gasoline to dealers in six States by about 17%. The unit was returned to service by August 1.

Groundbreaking ceremonies were held at the Ardmore refinery of Vickers Petroleum Corp. in August. New facilities to increase the capacity of the refinery from 32,500 barrels of crude oil per day to 60,000 barrels of crude oil per day at a projected cost of $25 million were scheduled for completion in 1975.

Construction was started on a 16,000-barrel-per-day atmospheric crude topping unit at Kerr-McGee Corp.'s Wynnewood refinery. In the first phase, the unit will be able to process about 10,000 barrels per day of Oklahoma sweet crude oil. Completion of sulfurization facilities will add another 6,000 barrels to daily capacity, and raise the total plant capacity to about 50,000 barrels of crude oil per day. The $2.5 million expansion anticipates an increased supply of crude oil to be delivered from the Texas Gulf Coast Region through connections with the Texoma pipeline. The entire expansion is expected to take 3 to 5 years.

The Osage Indian Tribe rejected an evaluation of oil and gas rights, royalties, future income therefrom, and properties in the Birch Creek reservoir site, Osage County, by a consultant for the U.S. Army Corps of Engineers. The Corps of Engineers' minimum value of $81,969 was countered by one of $1,085,782 prepared by the Osage Tribe. Failure to resolve the dispute forced it into Federal District Court where a hearing will be held by a court-appointed commission in 1975.

The Government also filed condemnation proceedings on 8,045 acres of land in Osage County required for Kaw Lake, placing a compensation value of $182,431 on land, buildings, and improvements. Included in the suits are natural gas, oil, coal, and other mineral rights owned by the Osage Indian Tribe, and mineral leases held mainly by Phillips Petroleum Co. The suits were assigned to U.S. District Court in Oklahoma City.

NONMETALS

Cement.—Portland and masonry cement were prepared at three plants. Shipments of portland cement decreased by 3.4% with an increase of 14.7% in value relative to that of 1973. Masonry cement experienced a decrease of 10.5% in shipments and an increase of 4.5% in value in 1974 relative to 1973 levels.

Portland cement and masonry cement were prepared at all plants. Types of portland cement included white cement and gray cements such as general purpose, moderate-heat, high-early-strength, high-sulfate-resistance, oil-well and waterproof. Consumption of cement within the State was 1,530,000 short tons. Distribution of cement to customers included ready-mixed concrete firms, 58%; concrete product manufacturers, 9%; building material dealers, 10%; and contractors and other users, 22%.

Each plant was equipped with 2 kilns and total maximum kiln capacity for the State was 5,128 short tons per 24 hours. Ideal Cement Co. Div. of Ideal Basic Industries, Inc. operated wet process kilns equipped with electrostatic precipitators for air quality control at its Ada plant. Martin Marietta Cement, Martin Marietta Corp., and OKC Corp. operated dry process kilns equipped with glass bag dust

collectors at their respective plants near Tulsa and Pryor.

Preparation of cement required 2.7 million tons of essential raw materials including limestone, shale, clay, bauxite, sand, iron ore, and gypsum. The three plants consumed 8.2 billion cubic feet of natural gas, and 203.1 million kwhr of electrical energy in 1974.

Clay and Shale.—The quantity of common clay and shale mined in Oklahoma was 1,288,938 short tons in 1974, a reduction of 0.7% from that of 1973. Contrastingly, the value of $2,105,382, representing an average mine value of $1.63 per short ton, was 13% higher. Clay and shale were mined by 12 firms with a total of 17 mines in 11 counties. Maximum output was in Canadian County (fire brick), followed successively by Pontotoc (fire brick and cement), and Rogers (cement and lightweight aggregate) Counties. Products included common and face brick, pottery, lightweight aggregate in concrete block and structural concrete, sewer pipe, and clay used in the preparation of portland cement. Face brick accounted for 45.2% of the clay and shale used, followed by cement preparation 31.7%, and lightweight aggregate in concrete block and structural concrete 17%.

A production capacity of 27 million face brick per year is the goal of a new plant that Commercial Brick Co. put under construction at Wewoka in Seminole County. Automated from feeder through unloader and strapper, the processing line includes a crusher, dry pan, double roll mill with smooth rolls, extruder, and continuous tunnel kiln. Plans anticipate completion in 1975. The plant will use local clay and shale.

Gypsum.—After three successive years of growth, output of gypsum declined in 1974 correlative with reduced production of other construction materials of mineral origin. While production decreased 14.3%, value decreased by only 3% because of an increase in the average mine value of crude gypsum from $4.06 per ton in 1973 to $4.59 per ton in 1974. Oklahoma ranked fifth among producing States. Three companies mined gypsum in Blaine County, and four other companies, each operating only one mine, accounted for production in Caddo, Canadian, Comanche, and Jackson Counties. All mines were open pits. Gypsum was obtained from two widespread formations of the Permian System, the Blaine Formation in Blaine, Canadian, and Jackson Counties, and the Cloud Chief Formation in Caddo and Comanche Counties.

Crude, processed gypsum, and gypsum products were shipped. Gypsum board and calcined gypsum were produced by United States Gypsum Co. at Southard, and Republic Gypsum Co. at Duke. Three concerns supplied gypsum as retarder for portland cement. Retarder was the sole product of Universal Atlas Cement Div. of United States Steel Corp. at Watonga. Other uses were as filler and soil conditioner.

Iodine.—Exploration and development of iodine-bearing brine resources in northwestern Oklahoma hold promise of making the Nation largely independent of imports to supply required iodine. Ethyl Corp. reworked a well drilled in 1973 and completed a second well near Vici in northern Dewey County to establish a closed withdrawal-reinjection system for iodine-bearing brine. Brine is extracted from about 70 to 120 feet of sand above Chester strata which were encountered at 10,250 feet. It is reinjected into the same sand. In a joint venture with Houston Chemical Co., Amoco Production Co. undertook exploration and drilling for iodine-bearing brine on the north flank of the North Boiling Springs gasfield near Woodward in Woodward County. Five wells were drilled to the brine-bearing formation. Houston Chemical Co. assumed charge of iodine-extraction processes and marketing. Ford Bacon & Davis of Dallas, Tex., was selected to design the plant system that will have an initial capacity of about 2 million pounds of iodine per year. Extraction, processing, and reinjection of brine to the subsurface will be achieved without any loss at the surface. Construction was scheduled for 1975, with full operation anticipated in 1976. Information about presence and quantity of iodine in gas- and oilfield brines in western Oklahoma generated through research by the Bureau of Mines was instrumental in the new development.

Lime.—St. Clair Lime Co. continued producing lime at its Marble City plant in Sequoyah County. Output was 12% below that of 1973, and 49% below the company's record quantity achieved in 1971. The company mined stone from the Quarry Mountain Formation of Silurian

age at underground workings near Marble City. Both quicklime and hydrated lime were prepared. Consumption of lime in the State was 193,000 short tons. Principal uses were as a soil stabilizer in construction, as pH control for agricultural soils, and for chemical purposes.

Salt.—Springs and wells in Harmon and Woods Counties yielded brines from which two firms recovered salt by solar evaporation. Production of salt, both in crystal form and as a component of salable brines, increased from the amount recovered in 1973; value also increased.

Salt is dissolved as ground water flows through interbedded layers of shale and salt relatively close to the surface in the Blaine Formation of Permian age. Resulting brine fills subterranean solution cavities in the source beds, reaches the surface as springs, and locally saturates alluvium in stream valleys. Resources have been estimated at 20 trillion tons by the Oklahoma Geological Survey. Brines produced by Blackmon Salt Co. in Woods County contain about 337 grams of NaCl per liter. The State Geological Survey has ascertained that produced salt is about 98% NaCl, with 1.8% gypsum and a minor quantity of quartz that is blown into evaporating pans as dust. Crystallized salt is sold for stockfeed, as a recharger for zeolite-charged water softeners, and as a road de-icer. Brine is sold for use in drilling oil and gas wells.

Sand and Gravel.—Curtailed construction caused total sales and use of sand and gravel to plummet to 8.7 million short tons valued at $13.8 million in 1974. These were reductions of 28.4% in quantity and 7.8% in value from 1973 levels. Average values of construction aggregates sold or used commercially by producers ranged from $0.65 per ton for fill to $1.67 per ton for highway and bridge construction. Industrial sand and gravel had an average value of $5.04 per ton. Tulsa County, leading in production, was followed by Oklahoma, Johnston, McClain, and Muskogee Counties, generally reflecting construction needs of the associated metropolitan areas and central Oklahoma. Industrial sand made up an increment of production from Muskogee County and all of the Johnston County production. Except for 10.3% of the sand and gravel sold or used by producers, the commodity was transported by truck. Producers in Johnston and Pontotoc Counties shipped industrial sand to State, regional, and national users by rail. Construction sand was also shipped from McCurtain and Tulsa Counties by rail and other means. The U.S. Army Corps of Engineers reported shipment of 120,000 tons of dredged sand and gravel for short distances on the McClellan-Kerr Arkansas River Navigation System.

Since 1964 it was reported that highly productive sand and gravel resources in the bed of the Arkansas River below Keystone Dam near Tulsa would be depleted by bottom scour and mining. The U.S. Army Corps of Engineers had predicted that after 1964 an annual scour rate of about 1 mile would occur in the streambed. Significant flooding did not occur between 1964 and 1973 and the rate of scouring was not achieved, despite the exclusion of additional sediment from the reach below Keystone Dam. Based on past experience, sand and gravel producers predicted an additional life expectancy of 10 to 15 years for worked deposits in the river near Tulsa. No appreciable loss in quality was observed in the product. Movement of sediment downstream at Muskogee diminished to 12.7 million tons annually after the closing of Keystone Dam on the Arkansas River, and Oologah Dam on the Verdigris River, an important tributary above Muskogee. Sand deposits in the Arkansas River near Muskogee are a source of construction materials and feldspathic sand for making glass.

Ford Motor Co.'s Tulsa Glass plant went onstream in August. At full capacity the plant will utilize two production lines to manufacture float glass for automobiles, windows, mirrors, and other commercial and domestic applications.

Table 8.—Oklahoma: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	11,244	11,158	5,130	6,582
Gravel			672	1,491
Unprocessed:				
Sand and gravel			1,999	1,115
Industrial:				
Sand	910	3,783	907	4,572
Gravel			--	--
Total	12,154	14,941	8,708	13,760

[1] Value data may not be directly comparable to that in tables 1, 9, and 10 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 9.—Oklahoma: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	7,500	8,508	3,302	4,726
Highway and bridge construction			350	584
Other uses (dams, waterworks, airports, etc.)			179	268
Concrete products (cement blocks, bricks, pipe, etc.)			429	526
Bituminous paving (asphalt and tar paving)			289	423
Roadbase and subbase			156	232
Unprocessed aggregate			1,735	896
Fill	2,603	1,293	222	145
Other uses [2]	99	66	W	W
Industrial sand and gravel	910	3,783	907	4,572
Total	11,112	13,650	7,569	12,372

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes miscellaneous (1973).

Table 10.—Oklahoma: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	307	185	85	87
Highway and bridge construction			432	595
Other uses (dams, waterworks, airports, etc.)			195	356
Concrete products (cement blocks, bricks, pipe, etc.)			--	--
Bituminous paving (asphalt and tar paving)			26	43
Roadbase and subbase			78	70
Unprocessed aggregate			264	219
Fill	712	1,101	W	W
Other	23	5	59	30
Total	1,042	1,291	1,139	1,400

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Despite a 0.4% decrease in 1974 from the quantity of stone produced in 1973, the commodity registered a 4.6% increase in value to $36.6 million and remained the State's single most valuable nonfuel mineral substance. Thirty-eight firms and several State agencies were involved in 72 mining operations scattered through 32 counties. Tulsa, Murray, and Comanche Counties in order, responding largely to the construction demands of the Tulsa area and central Oklahoma, led all other counties with combined output of 47.4% of the State's stone production. Limestone, sandstone, and chat were produced largely to satisfy the needs for crushed and broken stone including construction aggregates, agricultural limestone, riprap, and dimension stone. Granite was shipped as rough blocks and monument stone to both in-State and out-of-State markets. Both limestone and dolomite were produced for glass manufacture and filler, and an appreciable quantity of limestone was used in the State's three cement plants and one lime plant.

Principal sources of limestone and dolomite are Cambro-Ordovician and Ordovician formations in the Ouachita, Arbuckle, and Wichita Mountains of south-central counties; Cretaceous formations in the Coastal Plain Province of southeastern counties; Ordovician, Silurian, and Mississippian formations of the Boston Mountains and Ozarks region in east-central and northeastern counties; and Pennsylvanian and Permian formations in the northeastern and north-central counties. Collectively, the Cambro-Ordovician, Ordovician, and Pennsylvanian formations yielded more than half of the total product.

Table 11.—Oklahoma: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Limestone [1]	2	24	W	W
Granite	4	443	W	W
Total	6	467	15	637
Crushed and broken:				
Limestone [1]	21,242	33,010	21,120	34,777
Other stone [2]	1,068	1,522	1,093	1,185
Total	22,310	34,532	22,213	35,962
Grand total	22,316	34,999	22,228	36,599

W Withheld to avoid disclosing individual company confidential data.
[1] Data include dolomite.
[2] Data include sandstone, quartz (1973), and traprock (1973).

Sulfur.—As a result of installation of sulful controls at the Texaco, Inc., West Tulsa refinery, the quantity of sulfur recovered was increased severalfold over that of 1973. Previously only Pioneer Gas Producing Co. had recovered sulfur by treating sour gas at its Madill plant in Marshall County.

Tripoli.—Soft, fine-grained, porous microcrystalline silica was mined in Ottawa County by The Carborundum Co. Output decreased in 1974. The Oklahoma Geological Survey has reported that the deposits are stratiform in the cherty limestones of the Boone Formation of Mississippian age, and display both large-scale and small-scale gradation to surrounding chert and included chert nodules. Tripoli is most commonly used in buffing, polishing, and filling compounds, and less commonly as foundry facings and as a component of oil well drilling mud.

Volcanic Ash (Pumice).—An increase was recorded by Axtell Mining Corp. for the value of volcanic glass mined and processed in 1974. Past studies by the Oklahoma Geological Survey of samples of ash from deposits mined near Gate in Woodward County found they are composed of more than 97% shards of volcanic glass, with minor amounts of orthoclase, clay aggregates, quartz, and traces of mica and diatoms. Presence of diatoms and scarce detrital quartz suggest the deposits originated as windblown volcanic dust that collected in lakes during the Pleistocene.

METALS

Copper.—The quantity of copper-bearing shale mined in Jackson County decreased for the third successive year. However, the output and value of recoverable copper increased. Oklahoma's Chief Mine Inspector reported that 170,380 tons of ore was strip mined by Eagle-Picher Industries, Inc., at its Creta mine, contrasted with 186,687 tons in 1973. All operations were dormant at a copper-shale property of Lobaris Copper Co. near Mangum in Greer County.

Wolverine Tube Div. of Universal Oil Products Co. completed construction of a $10 million plant at Shawnee. The firm manufactures copper tubing, in diameters to a maximum of 3½ inches.

Silver.—The quantity and value of silver produced as a byproduct in smelting concentrates by Eagle-Picher Industries, Inc. in Jackson County, increased in 1974.

Zinc and Lead.—Minor quantities of zinc and lead were recovered from ore and concentrates collected through cleanup operations in Ottawa County.

Smelters.—National Zinc Co., a subsidiary of Engelhard Minerals and Chemicals Corp., began construction of an electrolytic zinc plant at Bartlesville, with projected completion in February of 1976. The plant, which has a design capacity of 56,000 tons of slab zinc per year, will retain the roasting and sulfuric acid facilities of the original plant. Retorts, sintering, and other facilities of the original plant will be dismantled. Zinc concentrate will be supplied by domestic producers. No provision has been made for utilizing industrial residues such as skimmings from galvanizing plants and flue dust. The plant will discharge no water and will retain leached solid residues for potential future commercial applications. Meanwhile the company continued smelting operations under scheduled variances granted by the Air Quality Service of the State Department of Health in anticipation of shutting down old retorts on May 31, 1976.

Two firms completed facilities announced in 1973. APEX Smelting (Amax group) completed a secondary aluminum and zinc alloy plant at Checotah in McIntosh County. Maximum annual capacity is about 40 million pounds of alloy. An electric foundry was completed on part of an abandoned zinc smelter site in Blackwell, Kay County, by Electron Corp. of Littleton, Colo.

Uranium.—Kerr-McGee Nuclear Corp. will convert 26.9 million pounds of uranium oxide to uranium hexafluoride for the Tennessee Valley Authority in the years 1979–85. The company began expanding the Sequoyah Facility near Gore in Sequoyah County to an annual capacity of 23 million pounds of uranium hexafluoride to satisfy the $26 million contract.

Table 12.—Principal producers

Commodity and company	Address	Type of activity	County
Carbon black:			
Continental Carbon Co	P.O. Box 22085 Houston, Tex. 77027	Furnace	Kay.
Cement:			
Martin Marietta Corp.[1 2]	11300 Rockville Pike Rockville, Md. 20852	Plant	Rogers.
Ideal Basic Industries, Inc.[1 2]	420 Ideal Cement Bldg. Denver, Colo. 80202	---- do	Pontotoc.
OKC Corp.[1 2]	P.O. Box 68 Pryor, Okla. 74361	---- do	Mayes.
Clays:			
Acme Brick Co	P.O. Box 425 Fort Worth, Tex. 76101	Mine and plant	Canadian, Custer, Oklahoma, Tulsa.
Chandler Materials Co	Box 627 Tulsa, Okla. 74101	---- do	Oklahoma and Rogers.
Oklahoma Brick Corp	Box 87 Union City, Okla. 73090	---- do	Canadian.
Coal:			
Bills Coal Co., Inc	Route 1 Welch, Okla. 74369	Strip mine	Craig.
Garland Coal & Mining Co	Box 186 Fort Smith, Okla. 72901	---- do	Haskell.
Lone Star Steel Co	301 North Memorial Dr. St. Louis, Mo. 63102	---- do	Craig and Rogers.

See footnotes at end of table.

Table 12.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Copper:			
Eagle-Picher Industries, Inc.[2 3 4]	P.O. Box 910 Miami, Okla. 74354	Strip mine.	Jackson.
Gypsum:			
Republican Gypsum Co	1100 Mercantile Bank Bldg. Dallas, Tex. 75201	Quarry and plant.	Do.
United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	---- do ----	Blaine.
United States Steel Corp	600 Grant St., Box 2969 Pittsburgh, Pa. 15230	Quarry	Do.
Helium: U.S. Bureau of Mines.	P.O. Box 46 Keyes, Okla. 73947	Helium processing.	Cimarron.
Lime: St. Clair Lime Co	Box 569 Sallisaw, Okla. 74955	Plant and quarry.	Sequoyah.
Natural gas and petroleum: [5]			
Salt:			
Blackmon Salt Co	Freedom, Okla. 73842	Solar evaporation.	Woods.
Western Salt Co	Route 2 Erick, Okla. 73645	---- do ----	Harmon.
Sand and gravel:			
Anderson-Dunham, Inc	No. 1 Park Dr. Idabel, Okla. 74745	Pit and plant	McCurtain.
Arkhola Sand & Gravel Co	323 Merchants Bank Bldg. Ft. Smith, Ark. 72901	---- do ----	Muskogee.
The Dolese Co.[2]	13 Northwest 13th St. Oklahoma City, Okla. 73103	---- do ----	Canadian, Garfield, Kingfisher, Logan, McClain.
E & A Materials	P.O. Box 365 Wichita Falls, Tex. 76307	---- do ----	Cotton.
Leco Material Inc.[2]	P.O. Box 236 Dewey, Okla. 74209	---- do ----	Washington.
Shoffner Sand & Gravel Co	P.O. Box 863 Edmond, Okla. 73034	---- do ----	Oklahoma.
Stone:			
Anchor Stone Co.[6]	P.O. Box 1680 Tulsa, Okla. 74106	Quarry	Tulsa.
McMichael Concrete Co	Box 9486 Tulsa, Okla. 74107	---- do ----	Do.
Martin-Marietta Corp	11300 Rockville Pike Rockville, Md. 20852	---- do ----	Rogers.
The Quapaw Co	Box 72 Drumright, Okla. 74115	---- do ----	Creek.
Standard Industries, Inc	P.O. Box 15670 Tulsa, Okla. 74115	---- do ----	Kay, Osage, Tulsa.
Tripoli: The Carborundum Co	Seneca, Md. 64865	Open pit	Ottawa.
Volcanic ash: Axtell Mining Corp.	Laverne, Okla. 73848	---- do ----	Beaver.

[1] Also clays.
[2] Also stone.
[3] Also gallium.
[4] Also silver.
[5] Most of the major oil and gas companies and some smaller companies operate in Oklahoma, and several commercial directories contain lists of them.
[6] Also sand and gravel.

The Mineral Industry of Oregon

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Department of Geology and Mineral Industries of Oregon, for collecting information on all minerals except fuels.

By Scott F. Sibley [1]

The value of minerals produced in Oregon in 1974 increased to $104 million, 27% over that of the 1973 value of $82 million. Nonmetals accounted for 91% of the total value of mineral production in 1974, compared with 88% in 1973. Higher production value of cement, lime, stone, pumice, and gold accounted for the increase and offset value losses in production of nickel, clay, gem stones, and sand and gravel.

In the metals mining industries, Oregon remained the sole producer of nickel in the United States. The average nickel content of mined ore was 1.19% on a dry weight basis. Reynolds Metals Co. began operation of the fifth potline at its Troutdale aluminum plant, bringing all units into production. Announced capacity of the five potlines totaled 130,000 tons per year of primary aluminum ingot. The location of AMAX Aluminum Co.'s proposed plant in Oregon remained unresolved at yearend. The State set a new fluoride emission standard for the Warrenton site, and the company was unable to meet the standard.

Nonmetals accounted for 91% of the total value of minerals produced in Oregon in 1974. Production value of sand and gravel decreased 6% in 1974, while production value of stone increased 99% compared with that of 1973. Stone and sand and gravel accounted for 78% of the total value of the nonmetals produced. Limestone, barged from Texada Island, British Columbia, Canada, was used by the lime and cement producing companies in the Portland area. At yearend, U.S. Pumice Co. had not yet received permission to mine on Rock Mesa in the Three Sisters Wilderness area.

Portland General Electric Co. (PGE) filed an application for a site certificate on a nuclear plant to be built at Pebble Springs near Arlington, with a scheduled completion date given as late 1981. Pacific Power & Light Co. (PP&L) also filed a letter of intent with the State to build a 1.2-million-kilowatt nuclear power plant 5 miles northeast of Lebanon in the Willamette Valley.

[1] Physical scientist, Division of Ferrous Metals.

Table 1.—Mineral production in Oregon [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons --	168	$291	140	$243
Gem stones ----	NA	700	NA	500
Lime ---- thousand short tons --	106	2,552	98	2,818
Mercury ---- 76-pound flasks --	W	W	--	--
Nickel (content of ores and concentrates) short tons --	18,272	W	16,618	W
Pumice ---- thousand short tons --	r 1,171	r 2,013	915	1,887
Sand and gravel ---- do ----	22,802	32,751	18,558	30,948
Silver (recoverable content of ores, etc.) thousand troy ounces --	1	3	9	42
Stone ---- thousand short tons --	13,411	21,843	23,353	43,406
Value of items that cannot be disclosed: Cement, copper, diatomite, gold, lead, talc, zinc, and values indicated by symbol W --	XX	21,424	XX	24,076
Total ----	XX	r 81,577	XX	103,920
Total 1967 constant dollars ----	XX	59,804	XX	p 49,695

p Preliminary. r Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

Table 2.—Value of mineral production in Oregon, by county

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Baker	$5,655	$7,448	Cement, stone, sand and gravel, gold, clays, silver, pumice, copper, lead, zinc.
Benton	628	686	Stone, sand and gravel, stone, clays.
Clackamas	11,117	15,150	Cement, sand and gravel, stone, clays.
Clatsop	1,000	1,310	Stone, sand and gravel.
Columbia	W	2,430	Sand and gravel, stone.
Coos	1,513	1,488	Stone, sand and gravel.
Crook	W	W	Stone, sand and gravel, clays.
Curry	960	132	Stone, sand and gravel.
Deschutes	r 1,846	1,852	Pumice, sand and gravel, stone.
Douglas	13,696	14,617	Nickel, stone, sand and gravel, pumice.
Gilliam	19	219	Stone.
Grant	W	W	Sand and gravel, stone.
Harney	W	W	Stone.
Hood River	250	W	Do.
Jackson	2,282	5,883	Stone, sand and gravel.
Jefferson	W	W	Do.
Josephine	1,132	274	Sand and gravel, stone, gold, talc, copper, silver.
Klamath	r 2,307	W	Stone, sand and gravel, pumice, clays.
Lake	r 719	W	Diatomite, stone, pumice, sand and gravel.
Lane	W	7,713	Sand and gravel, stone, gold, lead, copper, silver.
Lincoln	1,135	1,190	Stone, sand and gravel, silver, copper, gold.
Linn	1,490	3,920	Stone, sand and gravel.
Malheur	W	W	Lime, sand and gravel, stone.
Marion	W	1,899	Sand and gravel, stone, clays.
Morrow	W	W	Sand and gravel, stone.
Multnomah	9,225	W	Sand and gravel, lime, stone, clays.
Polk	W	535	Sand and gravel, stone.
Sherman	148	--	
Tillamook	781	W	Do.
Umatilla	1,096	2,369	Stone, sand and gravel.
Union	527	W	Sand and gravel, stone.
Wallowa	29	W	Stone, sand and gravel.
Wasco	W	305	Do.

See footnotes and end of table.

Table 2.—Value of mineral production in Oregon, by county—Continued
(Thousands)

County	1973	1974	Materials produced in 1974 in order of value
Washington	$6,126	$4,030	Stone, sand and gravel, clays.
Wheeler	90	W	Sand and gravel.
Yamhill	W	2,079	Stone, sand and gravel, clays.
Undistributed [1]	18,303	28,392	
Total [2]	r 81,577	103,920	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed".
[1] Includes gem stones, some sand and gravel (1973), and stone (1974) that cannot be assigned to specific counties, and values indicated by symbol W.
[2] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Oregon business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands	991	NA	NA
Unemployment ---- do	25.6	NA	NA
Employment:			
Construction ---- do	38.4	39.0	+1.6
Lumber and wood products ---- do	76.0	NA	NA
Food products ---- do	21.3	NA	NA
Mining ---- do	1.6	1.8	+12.5
Manufacturing ---- do	197.0	197.4	+0.2
Personal income:			
Total ---- millions	$10,753	$11,941	+11.0
Per capita	$4,845	$5,270	+8.8
Construction activity:			
Number of authorized private and public residential units	22,814	14,913	−34.6
Value of nonresidential construction ---- millions	$239.5	$204.3	−14.7
Value of highway contracts awarded ---- do	$64.7	$67.0	+3.6
Cements shipments to and within Oregon thousand short tons	835	826	−1.1
Cash receipts from farm marketings ---- millions	$979.6	NA	NA
Mineral production value ---- do	r $81.6	$103.9	+27.3

p Preliminary. r Revised. NA Not available.

Sources: Oregon's Labor Force Trends; Survey of Current Business; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

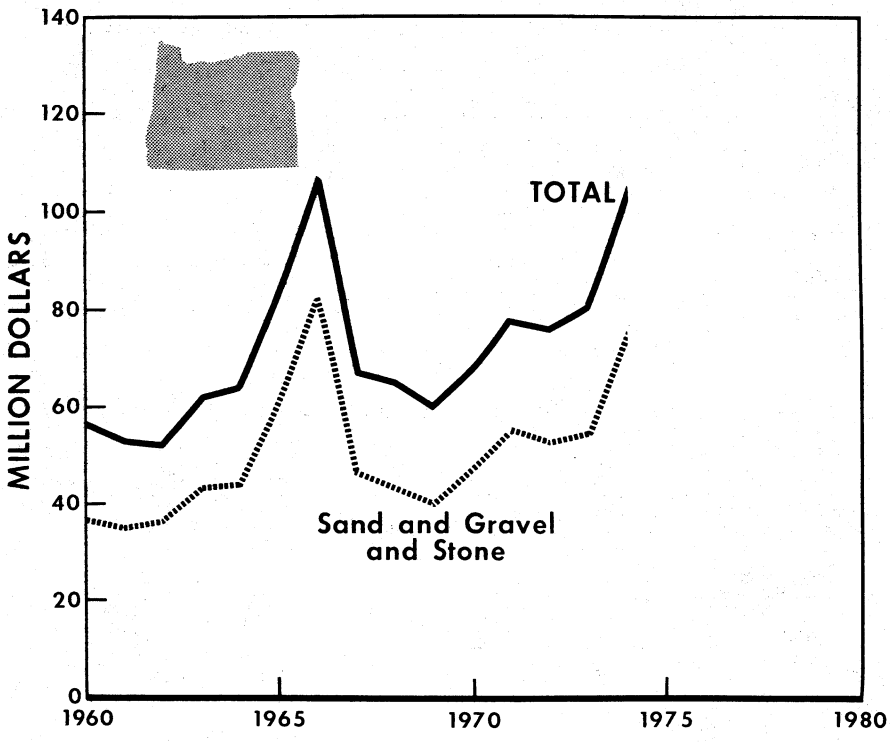

Figure 1.—Value of sand and gravel and stone, and total value of mineral production in Oregon.

Government Programs.—In July the Land Conservation and Development Commission (LCDC) identified seven areas in Oregon as areas of critical concern; in mid-October, the LCDC dropped the areas of critical concern and adopted goals for comprehensive land-use plans that had been developed by the 1969 legislature. Apparently, these goals were to be broad guidelines for county and city land-use planners. In September, the Public Utilities Commissioner issued an order to natural gas companies in Oregon to refuse to serve new firm customers or to provide increased gas supplies to current firm customers. However, under the order, the gas companies were permitted to maintain their current level of firm customers.

The Board Chairman of the Department of Geology and Mineral Industries stated at a Board meeting that the proper enforcement of Oregon's mined-land reclamation law was impossible with the income from the current fee structure. Multnomah County Commissioners passed an ordinance in December providing that mining uses be permitted in any county district where the Planning Commission finds an economic deposit of sand, gravel, rock, or earthen material to exist.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Oregon Portland Cement Co., the only cement producer in Oregon, continued to operate its two plants at Lime in Baker County and Lake Oswego in Clackamas County. Production of portland cement in 1974 was about the same as that produced in 1973.

Combined shipments from three plants located in Oregon and Nevada totaled 912,000 tons of finished portland cement, compared with 923,000 tons shipped in 1973. Average value of portland cement shipped from these plants in 1974 decreased from that of 1973.

Extensions of the runways at Portland International Airport were constructed of a mixture of lime, cement, pozzolan, and filler, similar to that used to construct the Great Wall of China and the Appian Way in Italy. Sand for the project was obtained from the Columbia River, pozzolan from a nearby shale quarry, and lime from the plants at Lime. After water was added, the mixture was filled and compacted.

To improve the overall image of the industry, the Oregon Concrete and Aggregate Producers Association initiated a public relations program. Included in the program were subjects dealing with excavation sites, landscaping, recycling of scrap metal, and the State mined-land reclamation act.

Clays.—Production of clay and shale decreased 17% in quantity and value compared with that produced in 1973. Seventeen mines were responsible for the 139,768 tons of clay and shale produced in 1974. Nine counties accounted for Oregon's clay and shale production in 1974, with the major portion being produced in Baker, Washington, Clackamas, and Multnomah Counties. Consumption of clay and shale occurred principally in the manufacture of cement, lightweight aggregate, drain tile, and building bricks.

Lime.—Ash Grove Lime & Portland Cement Co., Amalgamated Sugar Co., and Pacific Carbide & Alloys Co. produced 98,000 tons of lime valued at $2.8 million in 1974, compared with 106,000 tons valued at $2.6 million in 1973. The plants were located in Multnomah and Malheur Counties. The lime was used principally in sugar refining, pulp and paper, and calcium carbide manufacturing. The major portion was consumed in Oregon and Washington.

Ash Grove Lime & Portland Cement Co., Pacific Carbide & Alloys Co., both located in Portland, and Oregon Portland Cement Co., Lake Oswego, continued to utilize limestone shipped in 12,000-ton barges from Texada Island, British Columbia, Canada.

Pumice and Volcanic Cinder.—Output of pumice decreased 22% in 1974 compared with that of 1973. The major portion of the 914,871 tons produced in 1974 was used in road construction, but other uses included concrete aggregate, concrete admixture (pozzolan), and landscaping.

The issue of mining pumice on Rock Mesa in the Three Sisters Wilderness area remained unresolved at yearend. The U.S. Forest Service denied permission for U.S. Pumice Co. to mine in the area at midyear. This was reportedly due to the lack of any environmental impact statement as required by the Wilderness Act. However, a Forest Service team reportedly gathered data for preparing the environmental statement on a proposal to mine. U.S. Pumice Co. had indicated that it would like to begin mining in 1975.

Sand and Gravel.—Output of sand and gravel decreased to 18.6 million tons in 1974, a decrease of 18.6% from that of 1973. Production for the preceding years was 17.5 million tons in 1970, 20.2 million tons in 1971, 24.5 million tons in 1972, and 22.8 million tons in 1973. The average price per ton increased from $1.44 in 1973 to $1.67 in 1974.

All but Gilliam, Harney, Hood River, and Sherman Counties reported production of sand and gravel in 1974. A total of 165 mines and pits was in operation in 1974, compared with 180 in 1973 and 150 in 1972. Production came principally from Multnomah, Clackamas, and Lane Counties. On December 13, the Multnomah County Commissioners adopted a mineral extraction ordinance which set regulations for mining sand, gravel, rock, and earthen materials in the county. The ordinance provided that mining uses could be permitted in any district where the Planning Commission finds that economic deposits of the resource can be shown to exist.

Table 4.—Oregon: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	22,719	32,558	3,152	6,015
Gravel			12,908	22,681
Unprocessed:				
Sand and gravel			2,498	2,101
Industrial:				
Sand	83	193	W	W
Gravel			--	--
Total	22,802	32,751	18,558	30,797

W Withheld to avoid disclosing individual company confidential data; included with "Construction."

[1] Value data may not be directly comparable to that in tables 1, 5, and 6 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 5.—Oregon: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction	14,043	21,516	3,149	6,013
Highway and bridge construction			580	802
Other uses such as dams, waterworks, airports, etc.			295	507
Concrete products (cement blocks, bricks, pipe, etc.)			813	1,708
Bituminous paving (asphalt and tar paving)			2,317	3,860
Roadbase and subbase			2,276	4,032
Unprocessed aggregate	--	--	1,986	1,827
Fill	3,175	2,781	787	1,108
Other uses	1,748	2,494	311	538
Industrial sand and gravel	83	193	W	W
Total	19,049	26,984	12,464	20,895

W Withheld to avoid disclosing individual company confidential data; other uses includes industrial sand and gravel.

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 6.—Oregon: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction	3,654	5,705	261	601
Highway and bridge construction			721	1,258
Other uses such as dams, waterworks, airports, etc.			18	39
Concrete products (cement blocks, bricks, pipe, etc.)			--	--
Bituminous paving (asphalt and tar paving)			1,366	2,649
Roadbase and subbase			3,041	5,455
Unprocessed aggregate	--	--	511	274
Fill	48	35	130	162
Other	51	27	46	114
Total	3,753	5,767	6,094	10,552

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Production of stone increased 74% in tonnage and 99% in value in 1974, compared with that of 1973. Major uses of stone were dense graded roadbase stone, riprap and jetty stone, aggregate and roadstone, and bituminous aggregate. Those uses showing the greatest decrease in tonnage sold or used in 1974 compared with those of 1973 were fill (83%) and macadam aggregate (22%). Use showing a significant increase in tonnage sold or used in 1974 were riprap and jetty stone (363%), concrete aggregate (107%), and dense graded roadbase stone (76%).

Table 7.—Oregon: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total	1	58	2	100
Crushed and broken:				
Bituminous aggregate	1,406	2,098	1,554	2,776
Concrete aggregate	675	1,738	1,395	2,817
Dense graded roadbase stone	4,311	7,753	7,586	14,538
Macadam aggregate	369	578	288	430
Surface treatment aggregate	1,221	1,956	1,152	2,150
Unspecified construction aggregate and roadstone	2,585	3,422	4,727	9,781
Fill	363	135	62	75
Railroad ballast	525	843	820	1,360
Riprap and jetty stone	1,037	1,725	4,805	7,144
Other uses [1]	918	1,537	962	2,236
Crushed total [2]	13,410	21,784	23,351	43,306
Grand total [2]	13,411	21,843	23,353	43,406

[1] Includes stone used in agricultural limestone, poultry grit and mineral food, filter stone, manufactured fine aggregate, terrazzo (1973), cement and lime manufacture, flux (1973), bedding material, building products (1974), drain fields, ferrosilicon (1974), glass, waste material (1974), and unspecified uses.
[2] Data may not add to totals shown because of independent rounding.

METALS

Aluminum.—A report prepared by Arthur D. Little, Inc. discussed the economic and fiscal impacts of the aluminum industry in the Pacific Northwest. The focus of the analysis was on the 10 primary aluminum reduction plants located in Washington, Oregon, and Montana. In terms of employment, the industry's 11,300 workers in 1973 supported a nonbasic force of 29,400. The industry's pollution abatement expenditures (to date and anticipated) exceed $160 million.

In June, AMAX Pacific Aluminum Corp. (AMAX) announced that its proposed Warrenton aluminum reduction facility would meet the Department of Environmental Quality (DEQ) emission standards for fluoride and particulates. These requirements were 1 pound of fluoride emissions for each ton of aluminum produced on a yearly average and an annual average of 5 pounds of dust per ton of aluminum produced. Although AMAX planned to proceed with plans to build the 187,000-ton-per-year smelter, environmental groups were expected to press their opposition, particularly with regard to effects on the lower Columbia estuary area.

In December, the Environmental Quality Commission (EQC) announced its intention to designate the proposed plant site as being within a special environmental problem area where no emissions of fluorides would be allowed. AMAX announced it was unable to meet the zero emission standard. At yearend, the issue of power, location, and pollution requirements had not been resolved. The plant would cost over $200 million and employ nearly 800 persons, with an annual payroll of $12 million.

AMAX also discussed plans to build a $2 million extrusion plant to process primary aluminum produced at its proposed Warrenton reduction facility. In an unrelated development in January, AMAX and Mitsui and Co., Ltd. completed negotiations for sale by AMAX of a one-half interest in AMAX's extensive aluminum operations, which the Japanese firm bought for $125 million. The newly formed company was named Alumax Pacific Corp.

On November 6, an official of Reynolds Metals Co. announced that the company may begin mining ferruginous bauxite de-

posits in Oregon, as well as build an alumina production plant in either Washington or Oregon by 1980. Reynolds Metals Co. restarted its fifth potline at the Troutdale aluminum plant after power cutbacks by Bonneville Power Administration (BPA) in 1973 and early 1974. Operating at full capacity of 130,000 tons per year of aluminum ingot, the plant employed a total of 900 persons. According to BPA officials, a stable electric power situation was to prevail throughout most of the year, thus avoiding layoffs due to shutdowns. However, rate hikes still posed a serious problem for the industry. On December 20, a 27% raise was imposed on industrial customers by BPA. The rate was to apply through 1975 until approval was received from the Federal Power Commission. Nuclear energy was to provide a long-range solution to the industry's power problem.

Martin Marietta Aluminum, Inc. completed its $750,000 expansion program at The Dalles plant. The new plant was expected to boost extrusion billet capacity by 30% and included the installation of a new electrically fired homogenizing furnace with a load capacity of 140,000 pounds of 92-inch billets per heat cycle.

Gold and Silver.—Gold mining resumed at the Bald Mountain mine near Sumpter in Baker County. Crude ore was shipped to the American Smelting and Refining Co. smelter at Tacoma, Wash., at the rate of about 50 tons per day. Silver recovered from all the gold ores produced in the State amounted to 9,000 troy ounces valued at $42,000. The average unit price was $159.36 per troy ounce for gold and $4.67 per troy ounce for silver. Most of the gold and silver production came from Baker County; production was also reported in Josephine, Lane, and Lincoln Counties. Small quantities of copper, lead, and zinc were recovered from the gold-silver ores.

Rules governing placer mining and the operation of suction dredges were proposed by the EQC in December. Recreational and industrial gold miners joined in protests against the Commission's plan to employ the restrictive standards adopted in 1962 to govern mining in wildernesses. At yearend, the Commission had not reached a final decision on the matter. Tapin Copper Mines, Ltd. started exploration by core drilling near the old Bonanza mine in the Greenhorn district.

Iron and Steel.—Cascade Steel Rolling Mills, Inc., the largest producer of steel reinforcing bars in Oregon, was forced to shut down operations on December 31, because of the drop in Northwest construction activity. The company normally produces about 900 tons of steel per month from scrap metal. A total of 215 workers was affected by the closure.

Gilmore Steel Corp. took over operation of the Midland-Ross metallized pellet production facility at the Rivergate Industrial Complex in Portland. The unit was renamed the Direct Reduction Div. of Gilmore Steel Corp. The facility converts iron ore to metallized material suitable for use as electric furnace feed by the MIDREX direct reduction process.

Chicago Bridge & Iron Co. purchased 10 acres of land in north Portland as a site for a proposed steel fabricating plant. Total cost of the proposed plant was estimated to be $2.5 million, and construction was to begin early in 1975. The plant was to specialize in the fabrication of storage tanks for water, liquid nitrogen, and liquefied natural gas.

Magnesium.—Oregon Metallurgical Corp. (Oremet) planned to reopen its magnesium plant at Albany in September. Annual capacity of the plant was 4 million pounds of magnesium and 4,000 tons of chlorine. The magnesium was to be sold to a single Northwest customer. Additional magnesium cells were to be added when Oremet brings its sponge plant back into operation.

Manganese.—Columbia Steel Casting Co., a Portland-based manufacturer of manganese replacement parts for the mining and aggregate industries, planned a major expansion of its facilities. Completion of additions to production facilities, to cost in excess of $1 million, was scheduled for late 1974. Included was installation of two electric arc melting furnaces, heat-treating equipment, addition of 22,000 square feet of main bay foundry area, and 140 feet of yard craneway. Pollution control equipment was also to be a major expense.

Nickel.—Hanna Mining Co. processed 1,249,484 dry short tons of nickel laterite ore containing 1.33% nickel from its Nickel Mountain mine in Douglas County. The ore contained 16,618 tons of nickel, of which 13,220 tons were recovered in 26,440 tons of ferronickel. This represented a 2% increase in nickel recovered from that in 1973.

The Department of Geology and Mineral Industries, in conjunction with the Federal Bureau of Mines, participated in a nickel

project designed to identify all known and potential areas of nickel-bearing laterites in the State.

Titanium.—Oremet of Albany operated at full capacity of 10 to 12 million pounds of titanium in 1974. Oremet had planned to reopen its mothballed titanium sponge facility, which was closed in September 1971, but plans were indefinite on this at yearend. Between 80% and 85% of company sales reportedly were aerospace related. Precision Cast Parts Corp., a Portland manufacturer of investment castings, began a $2 million expansion of its facilities. Plans included construction of a new vacuum melt furnace five times larger than the existing facility, foundry expansion, and expansion of titanium casting. The new vacuum furnace weighs 70 tons, is 19 feet high, and has a capacity of 5,000 pounds.

Bureau of Mines researchers at the Albany (Oreg.) Metallurgy Research Center were awarded a U.S. patent for an invention dealing with industrial melting of reactive and refractory metals in cold crucibles. The patent covered a new method of electrically melting metals, such as titanium and molybdenum, that have strong tendencies to react chemically with surrounding materials or that melt only at extremely high temperatures.

Zirconium.—Teledyne-Wah Chang Albany Corp. (Wah Chang) planned to install six additional sand chlorinators and the accompanying pollution control equipment to maintain production levels necessary to meet sales commitments. The Mid-Willamette Valley Air Pollution Authority granted approval for the installations. However, the EQC proposed to impose strict effluent emission requirements on Wah Chang. The Federal Environmental Protection Agency recommended more lenient levels for four types of effluent after the company requested the determination.

Wah Chang also announced plans to expand onto a 7-acre tract bought from D. E. Nebergall Meat Co. The Nebergall facility was to be used primarily for research and development. The firm manufactures zirconium structural materials and containers for uranium oxide utilized in nuclear reactors. Requirements in the nuclear industry are increasing for these materials, indicating a steady growth pattern for the company well into the future.

MINERAL FUELS

Coal.—Mitsui Mining Co., Ltd., and Tokai Shipping Co. were granted a 3-year option on 50 acres of land for construction of a coal-loading facility at the Port of Astoria. The Japanese companies have reportedly been negotiating for Montana coal. The facility would be used to transfer coal from rail cars to ships.

The Oregon Department of Geology and Mineral Industries reexamined the coal deposits in Coos County to determine cost of mining, land ownership, and environmental problems. In another attempt at exploiting coal resources, PGE acquired permits to prospect on more than 45,000 acres, 100 miles north of Anchorage, Alaska. The company supplies power to about 400,000 customers in the Willamette Valley. If the new project proves feasible, the company reportedly would build a 25-mile branch to the Alaska Railroad; at the Port of Seward, the coal would be located onto ships for the 1,500-mile journey to a port on the Columbia River. The company has announced plans for a 500,000-kilowatt, coal-fired generating plant near Boardman, in eastern Oregon.

Geothermal.—The International Conference on Geothermal Energy was held in Klamath Falls in October. About 200 persons from 20 States and 6 nations participated in the conference, at which a wide range of geothermal applications was discussed. Experts from government and industry made presentations on industrial, commercial, residential, and agricultural uses of geothermal energy. Sessions were held at the Oregon Institute of Technology. As one example, Robert Wilson of Tosman Pulp and Paper Co., New Zealand, stated that his company saved over $6 million per year in fuel using geothermal energy.

Many applications were filed during the year with the Bureau of Land Management for lease of potential geothermal sites. On March 1, geothermal lease offerings in Oregon totaled 42 in 8 counties, and covered about 459,000 acres. The greatest interest was for lands in southern Lake County where nearly 100 applications were filed. Bidders included Chevron Oil Co., Gulf Oil Co., and Sun Oil Co. Lease offers through March totaled 102, covering 10 counties, and close to 1.5 million acres.

The Division of State Lands announced on September 7 that another set of sealed bids to lease 12,342 acres of State lands in southeast Oregon were to be opened October 1. Anticipating the use of State lands, the State Land Board prepared guidelines for environmental impact reports and issued regulations governing geothermal exploration and production.

AMAX Exploration, Inc. announced at midyear that it had agreed to conduct surface exploration on five geothermal sites covering 112,000 acres in Malheur, Lake, and Harney Counties in Oregon. Leases were also acquired for prospecting activities in Baker and Union Counties. An agreement covering the exploration effort, which was to start prior to 1976, was signed by AMAX, LVO Corp., Earth Power Corp., and Thermal Resources, Inc.

Magma Energy, Inc., a Los Angeles-based geothermal energy developer, drilled an exploratory well near La Grande, but encountered difficulty at a depth of 1,800 feet. Because of difficult drilling conditions and a cost of more than twice that expected, the hole was plugged at 2,800 feet. The company moved to a site south of the Oregon-Nevada line for further drilling. This was the only geothermal test drilling that took place in Oregon during 1974.

The Federal Bureau of Land Management announced a schedule for competitive leasing in 1975. The areas covered were Vale, Mickey, Alvord, Borax Lake Hot Springs, and Warner Valley. In October, a geothermal lease was awarded on a 1,347-acre site in the Vale area to Republic Geothermal Co. of Whittier, Calif., for a bid of $13,831; the lease term was 10 years, renewable for an additional 40 years. Drilling was not expected to take place until late 1975.

Nuclear.—PGE filed application for a State site certificate on a $650 million, 1,250-megawatt nuclear plant at the Pebble Springs location. The plant was to be located near Arlington, and was scheduled to be completed by late 1981. It would utilize a 1,900-acre cooling reservoir filled with water from the John Day Dam pool on the Columbia River. At yearend, the State Nuclear and Thermal Energy Council was holding public hearings on the State site certificate for PGE's plant. The company has filed an environmental report on the construction permit stage with the Atomic Energy Commission.

A 1.2-million-kilowatt nuclear powerplant was planned by PP&L for a location 5 miles northeast of Lebanon in the Willamette Valley. A notice of intent was filed with the State Nuclear and Thermal Energy Council on February 7, 1974. The plant was expected to cost between $700 and $900 million. The Nuclear and Thermal Energy Council adopted a general thermal siting policy on November 26. Broad geographical areas designated as suitable will be considered for siting. The size of future thermal plants was limited to 25,000 acres in eastern Oregon.

Chem-Nuclear Systems, Inc., was granted a license to dispose of hazardous chemical wastes near Arlington. However, the company refused the offer because, officials claimed, a dual license to store both chemical wastes and low-level radioactive wastes was needed.

Exxon Co. obtained permission from the Federal Government to explore for uranium in the Fremont National Forest in an area which surrounds a privately owned parcel of 240 acres on which the State holds mineral rights. The State Land Board agreed to allow the company to explore the privately owned parcel for uranium. Environmental impact statements will be required on both the Federal land and the privately owned parcel if Exxon finds uranium and wants to mine it.

Petroleum and Natural Gas.—Although there was renewed leasing activity in the State in 1974, no new permits were issued for oil and gas drilling by the Department of Geology and Mineral Industries.

The Bureau of Mines officially began construction of its organic waste-to-oil conversion plant on September 27 at Albany. MAECON Construction Co., Los Angeles, Calif., was awarded the contract to build the facility for $3 million. In the process, organic wastes are treated with carbon monoxide and steam under high temperature and pressure. The Albany facility is expected to convert up to 3 tons of waste per day into approximately 6 barrels of low-sulfur oil. Wood waste was to be used first, followed at a later date by other organic wastes.

Permits for construction of refining facilities were pending before the EQC at yearend. Among those having requested permits were Columbia Independent Refining, Inc. in the Portland-Rivergate area; Charter Oil Co. in Columbia County; and Cascade Energy Co. near Rainier. Columbia Inde-

pendent Refining Co. planned to build on a 250-acre site leased from the Port of Portland, and construction was expected to start in 1975. The project was expected to take 2½ years to complete, cost about $100 million, and process about 50,000 barrels of crude oil per day, producing gasoline, diesel and fuel oil, and marine and jet aircraft fuels.

Charter Oil Co., Monterey, Calif., applied for a permit to build an oil refinery near Deer Island. The refinery would have a daily output of between 60,000 and 100,000 barrels. Charter Oil had already spent about $250,000 on preliminary engineering studies.

Most of the Federal lands off the Oregon coast were not scheduled for leasing until after 1980. Environmental concerns were considered the main factor delaying the work. Texaco, Inc., Standard Oil Co., Mobil Oil Co., and Shell Oil Co. held the largest on-shore leased areas.

Northwest Natural Gas Co. signed contracts for its first major sales of liquefied natural gas from Alaska. The receipts were to run through mid-1984 and total $100 million. Shipments of LNG from the Kenai Peninsula were expected to increase Northwest Natural Gas' supply in Oregon by 15%. The arrangement lessens the company's dependence on imports of liquefied natural gas from Canada.

Table 8.—Principal producers

Commodity and company	Address	Type of Activity	County
Aluminum:			
Martin-Marietta Aluminum, Inc.	11300 Rockville Pike Rockville, Md. 20852	Smelter	Wasco.
Reynolds Metals Co	Troutdale, Oreg. 97060	Plant	Multnomah.
Cement:			
Oregon Portland Cement Co.[1,2]	111 Southeast Madison St. Portland, Oreg. 97214	Plants	Baker and Clackamas.
Diatomite: A. M. Matlock	P.O. Box 3307 Eugene, Oreg. 97402	Mine and plant	Lake.
Ferroalloys:			
National Metallurgical Co	Springfield, Oreg. 97477	---- do	Lane.
Union Carbide Corp	Portland, Oreg. 97200	---- do	Multnomah.
Lime:			
Amalgamated Sugar Co	Nyssa, Oreg. 97913	Plant	Malheur.
Ash Grove Lime & Portland Cement Co.	101 West 11th St. Kansas City, Mo. 64105	---- do	Multnomah.
Pacific Carbide & Alloys Co	P.O. Box 17008 Portland, Oreg. 97200	---- do	Do.
Nickel: Hanna Mining Co	Riddle, Oreg. 97469	---- do	Douglas.
Perlite (expanded): Supreme Perlite Co.	P.O. Box 66 North Portland, Oreg. 97043	---- do	Do.
Pumice:			
Central Oregon Pumice Co	5 Greenwood Ave. Bend, Oreg. 97701	Mine and plant	Deschutes.
Graystone Corp	Box 1087 Bend, Oreg. 97701	---- do	Do.
Sand and gravel:			
L. V. Anderson[1]	P.O. Box 757 Oakridge, Oreg. 97463	Pit and plant	Lane.
Eugene Sand and Gravel Co	Box 1067 Eugene, Oreg. 97401	---- do	Do.
Glacier Sand and Gravel Co	5979 East Marginal Way Seattle, Wash. 98134	---- do	Multnomah.
Ross Island Sand and Gravel Co.	4129 S. E. McLoughlin Blvd. Portland, Oreg. 97222	Pit	Do.
Umpqua River Navigation Co	P.O. Box 1819 Eugene, Oreg. 97401	Dredge and plant.	Douglas.
Wildish Sand and Gravel	P.O. Box 1106 Eugene, Oreg. 97401	Pit	Lane.
Willamette Hi-Grade Concrete Co.	Foot North Portsmouth Ave. Portland, Oreg. 97203	Dredge and plant.	Multnomah.
Steel:			
Cascade Steel Rolling Mills, Inc.	McMinnville, Oreg. 97128	Plant	Yamhill.
Oregon Steel Mills	Portland, Oreg. 97200	---- do	Multnomah.
Stone:			
Clackamas County Public Works	902 Abernathy Oregon City, Oreg. 97045	Quarry	Clackamas.
L. H. Cobb	8275 Southwest 145th Ave. Beaverton, Oreg. 97005	Quarry and plant.	Washington.

See footnotes at end of table.

Table 8.—Principal producers—Continued

Commodity and company	Address	Type of Activity	County
Stone—Continued			
Progress Quarry, Inc	14515 Scholls Ferry Rd. Beaverton, Oreg. 97005	Quarry and plant.	Washington.
Rivergate Rock Products	7881 N. W. St. Helens Rd. Portland, Oreg. 97229	Quarry	Multnomah.
Rogers Construction Co	P.O. Box 16537 Portland, Oreg. 97216	Quarries	Multnomah and Washington.
Talc and soapstone: John H. Pugh	2891 Elk Lane Grants Pass, Oreg. 97526	Mine	Josephine.
Vermiculite (exfoliated):			
Supreme Perlite Co	P.O. Box 66 North Portland, Oreg. 97643	Plant	Do.
Vermiculite-Northwest, Inc	P.O. Box A Auburn, Wash. 98002	---- do	Do.
Zirconium:			
Oregon Metallurgical Corp	P.O. Box 580 Albany, Oreg. 97321	---- do	Linn.
Teledyne Wah-Chang Albany Corp.	P.O. Box 460 Albany, Oreg. 97321	---- do	Do.

[1] Also stone.
[2] Also clay.

The Mineral Industry of Pennsylvania

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior, and the Pennsylvania Bureau of Topographic and Geologic Survey, Department of Environmental Resources, under a cooperative agreement for collecting information covering the mineral production from mines, quarries, and wells.

By William Kebblish [1]

Pennsylvania's mineral production reached a record output value of $2,374 million, $973 million above that of 1973. Compared with 1973, increases in value were attained by nearly all commodities except clays, which declined slightly. The major increases in value were due to the more than doubling of fuel prices. Solid fuel output represented 75% of the total State mineral production value; output of all fossil fuels equaled 78% of the total.

The following counties, Greene, Clearfield, Armstrong, Somerset, and Northampton, were the leading mineral producers; their combined output was 28.7% of the total value.

Pennsylvania continued to lead the Nation in output of stone and anthracite coal, ranked second in lime output, third in shipments of portland cement, and was the third largest coal producing state.

[1] State Liaison Officer, Bureau of Mines, Harrisburg, Pa.

Table 1.—Mineral production in Pennsylvania [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Masonry ---- thousand short tons --	490	$14,443	404	$14,642
Portland ---- do ----	8,563	171,653	7,448	191,594
Clays [2] ---- do ----	2,975	16,664	2,732	16,496
Coal:				
Anthracite ---- do ----	6,830	90,260	6,617	144,695
Bituminous ---- do ----	76,403	786,792	80,462	1,637,394
Copper (recoverable content of ores, etc.) short tons --	1,845	2,195	--	--
Gem stones ----	NA	9	NA	9
Lime ---- thousand short tons --	2,260	40,949	2,080	50,147
Natural gas ---- million cubic feet --	78,514	32,976	82,637	36,360
Peat ---- thousand short tons --	28	411	30	515
Petroleum (crude) ---- thousand 42-gallon barrels --	3,282	18,440	3,478	36,220
Sand and gravel ---- thousand short tons --	20,576	42,830	18,071	45,181
Stone ---- do ----	78,564	150,346	73,092	159,615
Zinc (recoverable content of ores, etc.) - short tons --	18,857	7,792	20,288	14,567
Value of items that cannot be disclosed:				
Clay (kaolin), iron ore, natural gas liquids, tripoli -	XX	26,140	XX	26,983
Total ----	XX	1,401,900	XX	2,374,418
Total 1967 constant dollars ----	XX	1,027,733	XX	p1,135,492

p Preliminary. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes kaolin; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Pennsylvania, by county[1 2]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	W	$14,488	Stone, lime, clays.
Allegheny	$69,481	92,741	Coal, cement, petroleum, stone, clays, sand and gravel, natural gas liquids.
Armstrong	59,184	115,804	Coal, sand and gravel, clays, stone, petroleum.
Beaver	W	W	Coal, sand and gravel, clays, petroleum.
Bedford	1,862	2,663	Stone, coal, sand and gravel.
Berks	40,951	47,274	Iron ore, cement, stone, clays, sand and gravel.
Blair	W	3,569	Stone, sand and gravel, clays.
Bradford	W	W	Sand and gravel.
Bucks	17,471	19,293	Stone, sand and gravel, clays.
Butler	W	48,061	Coal, cement, stone, lime, petroleum, sand and gravel, clays.
Cambria	W	W	Coal, stone.
Carbon	3,492	6,825	Coal, sand and gravel, stone.
Centre	W	W	Coal, lime, stone.
Chester	W	13,777	Stone, lime, clays.
Clarion	37,481	96,284	Coal, stone, petroleum, clays, sand and gravel.
Clearfield	57,277	147,144	Coal, clays.
Clinton	W	11,011	Coal, stone, clays.
Columbia	W	1,780	Coal, stone, sand and gravel.
Crawford	1,339	W	Sand and gravel, petroleum.
Cumberland	4,255	4,460	Stone, sand and gravel, clays.
Dauphin	W	5,007	Stone, coal, sand and gravel.
Delaware	W	W	Stone.
Elk	W	W	Coal, petroleum, sand and gravel, natural gas liquids, stone.
Erie	2,146	W	Sand and gravel, peat, petroleum.
Fayette	22,712	56,523	Coal, stone, clays, petroleum.
Forest	W	W	Petroleum, sand and gravel.
Franklin	W	W	Stone, sand and gravel.
Fulton	W	W	Do.
Greene	112,527	206,949	Coal, petroleum.
Huntingdon	W	7,599	Sand and gravel, stone, clays, coal.
Indiana	88,032	W	Coal, stone.
Jefferson	W	W	Coal, clay, stone, petroleum.
Juniata	432	--	
Lackawanna	W	W	Coal, stone, peat.
Lancaster	14,843	13,021	Stone, sand and gravel, clays.
Lawrence	W	43,914	Cement, coal, stone, sand and gravel, clays, peat.
Lebanon	W	W	Lime, stone.
Lehigh	W	44,354	Cement, zinc, stone.
Luzerne	32,922	42,709	Coal, stone, sand and gravel, clays, peat.
Lycoming	5,015	8,455	Coal, stone, sand and gravel, tripoli.
McKean	W	W	Petroleum, clay, stone.
Mercer	W	W	Coal, sand and gravel, stone, petroleum.
Mifflin	W	834	Stone, sand and gravel, lime.
Monroe	2,359	2,285	Stone, sand and gravel, clays, peat.
Montgomery	W	24,314	Stone, cement, lime, clays.
Montour	W	W	Stone.
Northampton	W	101,468	Cement, stone, sand and gravel.
Northumberland	95,514	23,782	Coal, stone, sand and gravel, clays.
Perry	W	W	Sand and gravel, stone.
Pike	518	795	Sand and gravel, stone.
Potter	W	252	Petroleum, sand and gravel, stone.
Schuylkill	W	W	Coal, stone, sand and gravel.
Snyder	W	W	Stone.
Somerset	42,296	112,149	Coal, stone, clays, sand and gravel.
Sullivan	381	W	Coal.
Susquehanna	739	999	Stone, coal.
Tioga	3,130	W	Coal, sand and gravel, stone.
Union	W	W	Stone, clays.
Venango	W	W	Coal, petroleum, sand and gravel, natural gas liquids.
Warren	3,430	W	Petroleum, sand and gravel, natural gas liquids.
Washington	W	W	Coal, petroleum, clays.
Wayne	W	W	Stone, sand and gravel, peat.
Westmoreland	W	58,744	Coal, stone, sand and gravel.
Wyoming	W	1,950	Sand and gravel.
York	31,305	34,288	Cement, stone, lime, clays, sand and gravel.
Undistributed[3]	650,804	958,853	
Total[4]	1,401,900	2,374,418	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Cameron and Philadelphia Counties are not listed because no production was reported.

[2] Value of petroleum is based on an average price per barrel for the State.

[3] Includes some stone (1973), coal (1974), and petroleum that cannot be assigned to specific counties, natural gas, gem stones, and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Pennsylvania business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	5,010.2	NA	NA
Unemployment	do	242.2	NA	NA
Employment (nonagricultural):				
Manufacturing	do	1,473.7	1,466.6	−.5
Construction	do	209.4	209.7	+.1
Mining	do	39.8	42.2	+6.0
Transportation and public utilities	do	265.5	265.8	+.1
Wholesale and retail trade	do	894.9	896.3	+.2
Finance, insurance, real estate	do	206.3	209.5	+1.6
Services	do	741.2	761.7	+2.8
Government	do	658.1	673.7	+2.4
Personal income:				
Total	millions	$59,427	$64,976	+9.3
Per capita		$5,010	$5,490	+9.6
Construction activity:				
Value of authorized nonresidential construction	millions	$575.9	$514.4	−10.7
Number of new residential units authorized		59,670	38,821	−34.9
Cement shipments to and within Pennsylvania	thousand short tons	3,658	3,350	−8.4
Mineral production value	millions	$1,401.9	$2,374.4	+69.4

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

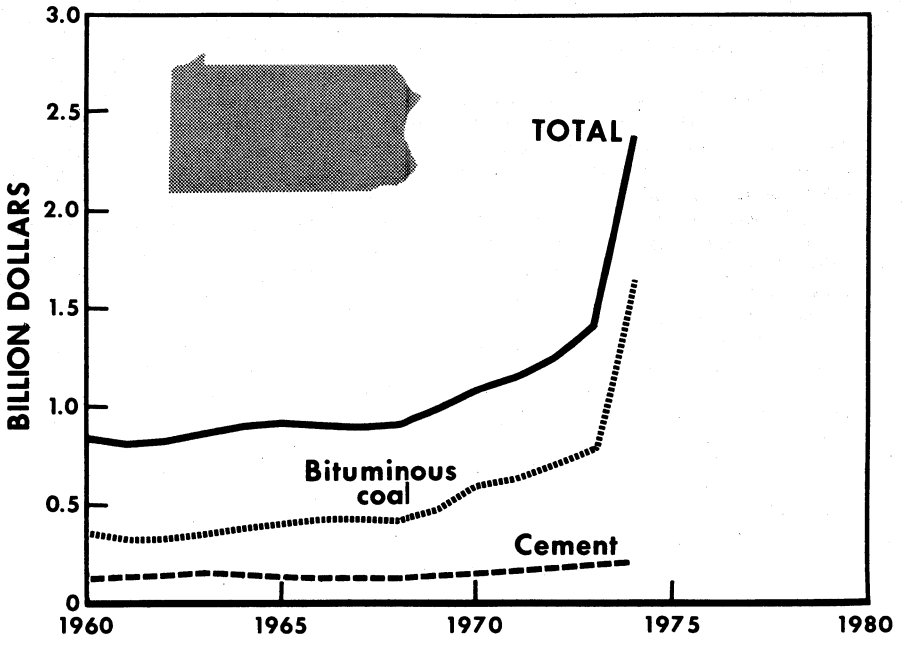

Figure 1.—Value of bituminous coal, cement, and total value of mineral production in Pennsylvania.

Legislation and Government Programs.—Legislation of interest to the mineral industry passed by the General Assembly and signed into law during 1974 comprised the following:

Act 186, "Tax Reform Code of 1971," provides the mechanism through which salvage and recycling plant equipment may receive tax exemption.

Act 198, establishing the Pennsylvania Solid Waste-Resource Recovery Development Fund to provide loans for development of large-scale resource recovery centers to serve communities.

Acts 208 and 288, which amend the "Pennsylvania Sewage Facilities Act" to provide for the planning and regulation of individual as well as community sewage systems and to provide for certification of all sewage enforcement officers by March 15, 1975. The act also eliminates certain restrictions on the Environmental Quality Board and provides appropriations to the Department of Environmental Resources (DER) for erosion control of Presque Isle State Park.

Act 311, amending the "Pennsylvania Bituminous Coal Mine Act," to provide for certification and use of noncertified persons under certain temporary conditions in underground coal mines.

Act 319, pertained to procedures under which an owner may have land devoted to agricultural use, agricultural reserve use, or forest reserve use, valued for tax purposes and provided for reassessment and certain interest payments when such land is applied to other uses.

In June the Governor signed bills giving $50,000 to the Governor's Energy Council for use in the last half of the year and $280,000 to the Community Affairs Office for its fuel allocation system.

The Land and Water Conservation and Reclamation Act, sometimes known as "The Bond Issue," "Project 500," or "Operation Scarlift," provided for the expenditure of $200 million over a 10-year period for mine area restoration. The seventh year of this 10-year program was completed on June 30, 1974; stream pollution abatement received $150 million, air pollution control (burning banks) $20 million, and extinguishment of underground mine fires and mine subsidence control $30 million.

During the 7½-year period ending December 31, 1974, 320 projects were completed at a cost in excess of $44 million, 204 projects were for stream pollution abatement, 54 for mine subsidence, 44 for underground mine fires, and 18 for air pollution abatement as shown in table 4.

During the last 4 years, 1971-74, 90 stream pollution abatement projects costing in excess of $16 million were completed; 8 air pollution projects were completed in excess of $3.5 million; 18 mine fires, at a cost of $8.7 million; and 32 mine subsidence projects, for a total of $2.0 million as shown in table 5. Of the total, 34 projects costing over $14 million were completed in calendar year 1974; 8 of these projects were in the anthracite region, and 26 were in the bituminous area as shown in table 6.

The Pennsylvania State University (PSU) under a $24,999 contract from the Federal Bureau of Mines conducted a study for recommending Government policies that would encourage private investment as a way to increase production in the domestic iron and steel industry.

The Federal Highway Administration (FHA) reported in late August that all but 123 miles of the 1,567 miles of Pennsylvania Interstate Highway System was open to traffic. The incomplete 123 miles comprised 72 miles under construction and 51 miles in the engineering and preliminary status stages.

Table 4.—Pennsylvania: Project 500 (Operation Scarlift) contracts completed (June 30, 1967 to December 31, 1974)

Project	Anthracite		Bituminous		Total	
	Number	Cost	Number	Cost	Number	Cost
Stream pollution abatement	35	$7,583,681.81	169	$19,577,097.67	204	$27,160,779.48
Air pollution abatement	10	12,197,938.54	8	181,011.96	18	12,378,950.50
Underground mine fires	5	86,430.38	30	1,068,190.10	35	1,154,620.48
	3	[1]514,200.00	6	[1]100,952.19	9	[1]615,152.19
Prevention of mine subsidence	13	1,103,649.02	41	1,929,051.27	54	3,032,700.29
Total	66	21,485,899.75	254	22,856,303.19	320	44,342,202.94

[1] State Share Appalachian Agreements.

Source: Bond Issue Report December 1974, p. 104.

Table 5.—Pennsylvania: Project 500 (Operation Scarlift) contracts completed 1971–74

Project	1971		1972		1973		1974		Total	
	Number	Cost	Number	Cost	Number	Cost	Number	Cost	Number	Cost
Stream pollution abatement	30	$3,793,985	7	$1,232,209	27	$5,363,745	26	$6,196,634	90	$16,586,573
Air pollution abatement	3	19,350	3	2,678,314	1	182,972	1	648,220	8	3,528,856
Underground mine fires	6	451,158	5	195,114	4	75,461	3	7,947,832	18	8,669,565
Prevention of mine subsidence	5	627,507	13	553,801	10	776,372	4	44,197	32	2,001,877
Total	44	4,892,000	28	4,659,438	42	6,398,550	34	14,836,883	148	30,786,871

Source: Department of Environmental Resources 1974 Annual Report.

Table 6.—Pennsylvania: Operation Scarlift cost data 1974

Project	Contracts and agreements awarded or approved in 1974						Construction projects completed in 1974					
	Anthracite	Cost	Bituminous	Cost	Total		Anthracite	Cost	Bituminous	Cost	Total	
					Number	Cost					Number	Cost
Stream pollution abatement	3	$649,343	10	$793,795	13	$1,443,138	4	$2,030,014	22	$4,166,620	26	$6,196,634
Air pollution	--	--	--	--	--	--	1	648,220	--	--	1	648,220
Underground mine fires	--	--	2	104,449	2	104,449	1	7,926,183	2	21,649	3	7,947,832
Subsidence	2	16,754	3	120,336	5	137,090	2	14,675	2	29,521	4	44,196
Total	5	666,097	15	1,018,580	20	1,684,677	8	10,619,092	26	4,217,790	34	[1]14,836,883

[1] Data do not add to total shown because of independent rounding.

Publications released in 1973 and 1974 that relate to the mineral industry of Pennsylvania include five by the Bureau of Mines,[2] two by the U.S. Geological Survey,[3] six by the Pennsylvania Bureau of Topographic and Geologic Survey,[4] and eight miscellaneous papers.[5]

Environment.—*Air Quality.*—DER's Bureau of Air Quality and Noise Control is responsible for air and noise pollution control within the State. During the past 4 years, 711 air pollution abatement orders were issued that resulted in 409 cases of compliance. Many of the 409 orders were minor in nature, but litigation involving major polluters, such as the steel industry, were unresolved. The coke ovens in Western Pennsylvania are a major source of uncontrolled air pollution and a significant health problem to the Commonwealth.

The use of desulfurization devices and scrubbers to control sulfur dioxide emissions was the main issue in the Commonwealth's case against Pennsylvania Power and Light Co. (PP&L). DER recommended scrubbers, but the power company claimed they were not feasible. The commonwealth Court ruled in favor of PP&L, but DER appealed to the State Supreme Court.

In 1974, an automated 17-station network known as the Commonwealth of Pennsylvania Air Monitoring System became fully operational to measure ambient levels of air pollutants and meteorological variables.

The average sulfur dioxide level in Allegheny County was 15% less than that in 1973. Three-fourths of the County's 55 air monitoring stations measuring sulfur dioxide met the Federal ambient air quality standard of 0.03 parts per million, but three areas located near steel mills had average annual sulfur dioxide levels of 0.05 parts per million. The 15% reduction was attributed to stringent county regulations requiring industries and electric utilities to convert to low-sulfur fuels, phase out inefficient coal-fired power stations, and expand use of gas cleaning equipment. All but 2 of the County's 25 particulate monitoring stations recorded levels above the Federal standard (75 micrograms per cubic meter). The Clairton and Braddock areas had average monthly levels four to six times the County standard of 23 tons per square mile. Three ozone measuring monitors were installed in 1974. During the summer the Federal ozone standard (0.08 parts per million for 1 hour) was exceeded in one day out of three in Lawrenceville and at the Monroeville airport, and one day out of

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[2] Bolstad, D. D., J. R. Alldredge, and M. A. Mahtab. Procedures Used for Sampling Fracture Orientations in an Underground Coal Mine. BuMines RI 7763, 1973, 9 pp.

McCulloch, C.M., and M. Deul. Geologic Factors Causing Roof Instability and Methane Emission Problems. The Lower Kittanning Coalbed, Cambria County, Pa. BuMines RI 7769, 1973, 25 pp.

Kim, A. G. Methane in the Pittsburgh Coalbed, Washington County, Pa. BuMines RI 7969, 1974, 16 pp.

Magnuson, M. O. Control of Fires in Abandoned Mines in the Eastern Bituminous Region of the United States. A Supplement to Bulletin 590. BuMines IC 8620, 1974, 53 pp.

Seibel, R. J., and F. E. McCall. The Dustiness of Different Coal Seams. BuMines TPR 75, 1974, 9 pp.

[3] Epstein, J. B. Map Showing Slate Quarries and Dumps in the Stroudsburg Quadrangle, Pennsylvania–New Jersey, With a Discussion of Their Environmental Significance. U.S. Geol. Survey Misc. Field Studies Map MF 578A, July 1974.

Wood, G. H. Jr. Geologic Map on Anthracite-Bearing Rocks in the Southern Half of the Delano Quadrangle, Schuylkill County, Pa. U.S. Geol. Survey Misc. Invest. Series I–737, September 1974.

[4] Kent, B. H. Isopach Maps of Overburden on the Pittsburgh Coalbed in Southwestern Pennsylvania and Northern West Virginia. Pa. Geol. Survey Open-File Rept. 74–132, September 1974, 6 pp.

Kent, B. H. Geologic Causes and Preventions of Roof Falls in Room-and-Pillar Coal Mines. Pa. Geol. Survey 4th Series IC 75, 1974, 17 pp.

Lapham, D., and C. Gray. Geology and Origin of the Triassic Magnetite Deposit and Diabase at Cornwall, Pennsylvania. Pa. Geol. Survey Bull. M56, 1974, 343 pp.

Lytle, W. S., and L. Heeren. Oil and Gas Pipelines in Pennsylvania. Pa. Geol. Survey Map updated to October 1974.

Lytle, W. S. Oil and Gas Developments in 1973. Pa. Geol. Survey. September 1974, 44 pp.

L'Neill, B. J., Jr. Greater Pittsburgh Construction Aggregates. Pa. Geol. Survey Miner. Res. Rept. 67, 1974, 60 pp.

[5] Bleakley, W. B. Penn Grade Crude Oil Yields to Steam Drive. Oil and Gas J., v. 72, No. 12, Mar. 25, 1974, pp. 89–90, 92, 94, 96.

Cloos, E. Mining Cambrian Limestone at Thomasville, Pennsylvania. Dept. of Earth and Planetary Sci., Johns Hopkins Univ., Baltimore, Md., 1974.

Glaeser, J. D. Alternative Sedimentary Associations of Uranium in Devonian Catskill Deposits in Pennsylvania. Dept. of Geology, Univ. of North Carolina, Chapel Hill, N.C., 1973.

Federal Power Commission. Water Resources of the Clarion River Basin in Pennsylvania. Rept. No. 20324, May 20, 1974.

Gold, D. P., S. S. Alexander, and R. R. Parizek. Applications of Remote Sensing to Natural Resource and Environmental Problems in Pennsylvania. Earth Miner. Sci., v. 43, No. 7, April 1974, pp. 49–53.

Lovell, H. L. Coal Mine Drainage Pollution. Earth Miner. Sci., v. 42, No. 7, April 1973, pp. 54–JJ.

Thakur, P. C. Mass Distribution of Respirable Dusts From U.S. Cools. Colliery Guardian, v. 222, No. 7, July 1974, pp. 2–3.

Weaver, O. D., Y. Hande, and J. D. Hea. Cambro-Ordovician Objectives: Appalachian Valley and Ridge Gas. Oil and Gas J., v. 72, No. 31, Aug. 5, 1974, pp. 96–99.

four in Penn Hills, all areas downwind of downtown Pittsburgh. Ozone is produced by the action of sunlight on hydrocarbons and nitrogen oxides. The County Health Department's long-standing complaint against United States Steel Corp. Clairton coke works was upheld in a unanimous decision by Commonwealth Court. The corporation's subsequent appeal to the Pennsylvania Supreme Court was rejected. The county air pollution variance board upheld the Health Department's compliance order to control fugitive emissions at United States Steel's Thomson works in North Braddock and the Duquesne works. The firm pledged a $5 million cleanup within 30 months. The County Health Department filed two civil complaints against United States Steel for exceeding particulate limits at its National works in McKeesport and its Homestead works in Homestead and Rankin. The firm promised a cleanup plan by yearend for particulate emissions from all of the coal-fired boiler plants in the Monongahela Valley and placed $87,000 in escrow to be forfeited if the plan was not acceptable. United States Steel also agreed to pay the county the $15,000 cost of testing smokestack emissions. The firm said it would either convert from coal to fuel oil at an estimated cost of $10 million or install electrostatic precipitators costing about $23 million.

Short-term variances for the 1973-74 winter heating season for firms that could not obtain low-sulfur fuels because of the fuel shortage were granted by the Allegheny County Commissioners to Duquesne Light Co.'s steam heating plant, Edgewater Steel Corp., Pittsburgh Brewing Co., and United States Steel's Irvin works.

Variances originally denied United States Steel for particulate emissions from sintering plants at the Homestead works and the Edgar Thomson works were granted on a short-term provisional basis after the firm submitted a plan calling for enlarged electrostatic precipitors and new baghouse collection systems.

Expenditures for both actual and planned emission reduction equipment to be completed in Philadelphia County in the 1974-75 period comprised $350,000 for two baghouse systems to collect 12.25 tons per year of particulates from ferrous electric arc furnaces, equipment costing $1,250,000 to collect 18 tons per year of particulates from one nonferrous electric induction furnace, a baghouse costing $200,000 to collect 4,250 tons per year of dusts at an asphalt batching plant, a baghouse costing $400,000 to collect 365 tons per year at a coke manufacturing plant, and equipment costing a total of $6,000,000 to recover 2,190 tons per year of hydrocarbons at two petroleum refineries.

In testimony before a regional Federal Energy Administration public hearing board in September, the Penn Central Transportation Co. charged that the Clean Air Act reduced the company's coal traffic from 96.6 million tons in 1968 to 79.0 million tons in 1973. A study made by the railroad showed that powerplants on its lines could save more than 100 million barrels of oil annually by using coal. The railroad company showed that the sulfur-limiting standards of the Environmental Protection Agency (EPA) would bar the use of most Pennsylvania coal completely after mid-1975.

In March, the Pennsylvania Commonwealth Court unanimously upheld a lower court opinion that emission control technology was not commercially available for the removal of sulfur oxides from stack gases.

Mined Land Reclamation.—A total of 13,831 acres were restored in Pennsylvania during 1974. Of this total, mine operators restored 12,800 acres, and the State, 1,031 acres. The DER's Div. of Mine Area Restoration reported plantings on lands at abandoned mines in 1974 using State funds under Pennsylvania Act 443, known as "The Land and Water Conservation and Reclamation Act." The plantings comprised 100 acres planted with grasses in the anthracite region costing $183,300 and 931 acres in the bituminous region of which 831 were planted with grasses and 100 acres with trees at a total cost of $3,471,000. According to a DER Forester, the majority of the anthracite acreage was planted with a grass-legume, and the remaining acreage, with 8,440 tree seedlings and 35,050 shrubs.

The leading county in the bituminous region was Clearfield with a total reclaimed acreage of 1,758.43 followed by Clarion, Armstrong, Somerset, and Jefferson.

In 1974, DER issued 1,138 strip mining permits, 31 for the anthracite area and 1,107 for the bituminous region. Table 7 shows the permits issued and acres affected and restored by active mines during the year.

Table 7.—Pennsylvania: Mining permits issued and total acreage affected and restored in 1974

	Number of permits issued	Coal production	Mine operators		State			
			Acres affected	Acres restored	Acres restored	Acres planted		Cost
						Grass	Trees	
Anthracite	31	2,812,618	350	300	100	100	--	$183,300
Bituminous	1,107	36,056,422	14,000	12,500	931	831	100	3,471,000
Total	1,138	38,869,040	14,350	12,800	1,031	931	100	3,654,300

Table 8 shows the number of acres planted with trees, grasses, and trees and grasses in the bituminous region. Current reclamation practices in Pennsylvania are thoroughly described.[6]

The Bituminous Subsidence and Land Conservation Act of 1966 requires coal supports underground to protect surface structures. During the past 4 years the Subsidence Regulations Div. permitted the mining of approximately 200 million tons of coal while providing surface protection for nearly 5,000 structures valued at more than $50 million.

The Coal and Clay Mine Subsidence Insurance Act of 1962 insures home owners against damage resulting from mine subsidence both for commercial as well as residential structures. During 1974 the insurance rates were reduced. The amount of insurance that can be purchased ranges from $5,000 to $50,000, at a cost of from $15 to $51 per year for anthracite dwellings with slightly lower rates for homes in the bituminous region. The deductible clause has been set at $250. At the present time the fund has approximately 7,200 insurance policies in force with a total volume of insurance of $170 million

[6] Jones, W. G. Reclamation Today in Pennsylvania. Coal Min. and Process., v. 11, No. 6, June 1974, pp. 33–35, 58, 60.

Table 8.—Pennsylvania: Surface mine reclamation at bituminous coal mines, trees and grasses planted, January 1–December 31, 1974

County	Trees		Grasses		Trees and grasses	
	Number of sites	Acres	Number of sites	Acres	Number of sites	Acres
Allegheny	--	--	5	251.30	--	--
Armstrong	2	32.10	35	699.63	1	18.90
Butler	--	--	13	255.02	--	--
Cambria	--	--	4	31.60	1	6.60
Centre	--	--	1	20.00	--	--
Clarion	11	368.80	19	556.06	3	42.30
Clearfield	24	503.57	35	645.74	26	609.12
Clinton	1	26.00	--	--	--	--
Elk	--	--	4	140.20	1	22.70
Fayette	--	--	15	78.85	--	--
Greene	--	--	6	256.66	--	--
Huntingdon	1	1.00	--	--	--	--
Indiana	2	17.50	12	315.69	--	--
Jefferson	3	20.00	23	363.70	9	132.40
Lawrence	--	--	3	106.60	--	--
Lycoming	--	--	2	18.20	--	--
Mercer	--	--	4	146.20	--	--
Somerset	5	84.71	23	436.13	1	30.00
Tioga	--	--	4	111.27	--	--
Venango	--	--	9	196.30	--	--
Washington	1	2.94	4	115.50	1	15.50
Westmoreland	--	--	16	192.18	--	--
Total	50	1,056.62	237	4,935.83	43	872.52

The Div. of Licensing and Bonding of the Bureau of Surface Mine Reclamation issued mining permits to those operators meeting State filing requirements. During 1974, 37 applications were received and 31 issued to anthracite operators while 1,431 applications were filed in the bituminous region and 1,107 permits issued. The amount of bond required to insure effective reclamation of all mined land totaled over $300,000 in the anthracite region and over $13 million in the bituminous area. Bonds are released if reclamation is completed, and during 1974 only three bonds totaling $15,000 were forfeited by mine operators.

Pursuant to the Appalachian Regional Development Act of 1965, as amended, the status of projects approved by the Appalachian Regional Commission (ARC) in fiscal year 1974 is shown in table 9.

Table 9.—Pennsylvania: Status of ARC projects in fiscal year 1974

Project	Status	County	Cost
Mine fire control	Completed	Allegheny	$50,502.46
Do	Started	Washington	63,222.90
Do	do	Allegheny	63,405.60
Do	Completed	Indiana	77,210.38
Do	do	Luzerne	732,818.60
Subsidence control	Started	Lackawanna	1,603,783.50
Do	In progress	do	2,592,121.29
Do	Started	do	6,590,977.00
Do	Completed	Luzerne	475,611.30
Mine refuse bank reclamation	do	Lackawanna	62,532.05
Well sealing	Started	Clarion	54,570.00

Solid Waste Management.—Act 241, Pennsylvania Solid Waste Management Act, provides for the planning and regulation of solid waste storage, collection, transportation, processing, and disposal. In November, the State's Community Affairs Office issued a $28,303 grant for an experimental program to remove an estimated 1,000 junked automobiles from urban, suburban, and rural areas of Erie County and recycle them into useful products.

Water.—To fulfill requirements of the Clean Streams Act and the 1972 amendments to the Federal Water Pollution Control Act, the Bureau of Water Quality Management is undertaking a Comprehensive Water Quality Management Plan. This study divides the State into nine areas to provide the people an opportunity to relate land and water uses to water quality management in a comprehensive planning effort.

Accomplishments of water planning show a net gain of more than 185 miles of the State's stream improvements of more than 600 miles. About 75 miles of the Monongahela River improved as a result of mine drainage treatment and abatement activities. This improvement was significant enough to make possible stocking of muskellunge and taking of bass by fishermen.

Section 16 of Act 443 "The Land and Water Conservation and Reclamation Act" empowers and authorizes construction and operation of water treatment plants for the control and treatment of water pollution resulting from mine drainage. The act permits mine operators to discharge mine drainage to water treatment plants at a charge based upon their proportional share of the capital and operating costs and the quantity and quality of the pollutant as shown in table 10. Presently, mine operators are being charged at a rate of 15 cents per salable ton. (Salable tons equal total tons produced times percent of recovery.)

Table 10.—Pennsylvania: Aggregate total of payments received from mine operators since the inception of water pollution control programs

County	Number of operators	Tonnage	Amount
Dauphin	5	139,927	$20,853.40
Northumberland	34	260,364	38,775.26
Schuylkill	91	2,446,792	366,747.37
Total	130	2,847,083	426,376.03

Mine sealing and other abatement measures resulted in a cleanup of 12 miles of Raccoon Creek and 19 miles of Crooked Creek in Indiana County.

The responsibility of mining companies underwent extensive litigation during the year. In mid-February, the U.S. Supreme Court refused to grant oral arguments in the case of the Commonwealth versus Harmar Coal Co. on the ground that it presented no substantial Federal question. Harmar Coal was pumping contaminated water that did not originate in the company's mines. The Commonwealth Court ruled in favor of Harmar, but the Pennsylvania Supreme Court reversed the decision and held the mining company responsible for treating all acid mine drainage discharged as a result of active mining operations. The U.S. Supreme Court refused to hear this case.

In another case the Commonwealth Court decided in favor of the Barnes and Tucker Coal Co., but was reversed by the State Supreme Court. This case involved acid mine drainage over a 4-year period from a mine in Cambria County. The exact amount of Barnes and Tucker's liability wasn't determined at the end of the year and one unresolved issue was the payment of the State's estimated $4 million spent to protect the Susquehanna River over the 4-year period.

In mid February, DER and the Leechburgh Mining Co. agreed to a plan whereby the company would reclaim a 200-acre refuse disposal area near the Kiski River. DER agreed to expedite a permit for mine drainage, a disposal permit for a new coal refuse dump, and a water quality management permit for related treatment facilities.

A mine drainage treatment lagoon, costing $204,000 started operations in December near the old Wildwood mine near North Park. Stainless steel aerating trays will be used to oxidize ferrous iron in the mine drainage by contact with air.

By midsummer, a new DER treatment plant was producing 800,000 gallons per day of potable water at a reasonable cost from one of the abandoned mines in the Philipsburg area. The Hawk Run plant used Amberlite ion-exchange resins in a modified Desal process developed by Rohm and Haas Co.

The Rausch Creek treatment plant located in Schuylkill County was commissioned in 1974. The facility in the anthracite region cost $2.5 million and has a capacity to treat 10 million gallons per day of acid mine drainage.

The Altoona water treatment plant was built to treat all of Kittanning Run to stream quality and to blend four sources to potable quality for use by the City of Altoona. This plant will be turned over to the city in early 1975. Table 11 is a list of treatment plants in Pennsylvania funded under Act 443.

Table 11.—Pennsylvania: Water treatment plants

County	Plants		Contract amount	Status
	Number	Name		
Blair	1	Altoona	$5,022,403.03	Construction.
Butler	1	Slippery Rock	809,834.45	Operating.
Carbon	1	Buck Mountain	40,025.00	Do.
Clearfield	1	Hawk Run	2,717,588.55	Construction.
Elk	1	Swamp Creek	76,729.50	Operating.
Indiana	1	Crooked Creek	119,000.00	Design.
Luzerne	1	Sandy Run	48,995.00	Completed.
Schuylkill	1	Rausch Creek	2,488,663.57	Construction.
Washington	1	Smith Township	823,289.00	Operating.
Do	1	Pigeon Creek	53,187.48	Do.
Total	10		12,199,715.58	

The status of DER watershed studies for 1974 according to the Div. of Mine Area Restoration is shown in table 12. DER and the Wheeling-Pittsburgh Steel Corp. reached a consent agreement covering installation of water pollution control equipment at the firm's Monessen works. The partially closed system to be completed by December 31, 1975, will prevent the discharge of waste from coke oven and blast furnace operations. Under the agreement the firm will pay $500 per month into the Clean Water Fund until the facilities are operating satisfactorily. In late October the DER identified the source of naphthalene in the Western Pennsylvania Water Co.'s system to the byproduct section of the Jones & Laughlin (J&L) coke plant on the Monongahela River. DER revoked the industrial waste permit of the Mill Services near Yukon, a processor of steel plant spent pickling liquor following a Clean Stream Law violation on November 14.

Table 12.—Pennsylvania: Status of DER watershed studies for 1974

Description	Initiated		In progress		Completed	
	Number	Cost	Number	Cost	Number	Cost
Acid mine drainage studies in the anthracite coalfield.	1	$79,000	5	$692,000	2	$106,500
Acid mine drainage studies in the bituminous coalfield.	2	190,000	28	3,070,000	4	162,500

The Federal Coastal Zone Management Act of 1972 will provide Pennsylvania, one of the 30 coastal States, including the States of the Great Lakes, with resources necessary to develop the 48-mile Lake Erie shoreline and the 45-mile section of the Delaware River influenced by tides. DER's Coastal Zone Management Program is concerned with the uses of all the States' coastal waters and with the uses of the land in a comparatively narrow strip along these waters.

The three-member Environmental Hearing Board considered an appeal from a DER decision to restrict dredging operations for sand and gravel in the Upper Allegheny River. The Board found that minimal long-range economic disruption would result from restricting dredging and that the recreational values thus preserved would far outweigh it. However, the Board granted the companies an extension for approximately 1 year for dredging into natural and untouched areas, based on its conclusion that the "substantial risk of severe temporary economic impact of continuing to limit dredging to previously dredged areas justified an extension." Both sides appealed this decision to Commonwealth Court.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Anthracite).—Production at the Glen Nan Coal Co.'s 16-year-old Forge Slope, the last large-scale deep mine in Luzerne County, terminated February 21 with the loss of 200 jobs. Dewatering pumps were kept in operation until late April. Reportedly, the mine was shut down because of Federal mine safety issues. A company spokesman said that reserves of high-quality coal in the mine were sufficient to assure a 500,000-ton-per-year production for 100 years.

Closure of the Blue Coal Corp. Wanamie stripping and Huber breaker operations in late May resulted in lost production of 580,000 tons per year and 340 jobs. Purchasers of Blue Coal Corp. holdings announced in midyear that the Huber breaker and nearby underground and surface mines were being leased to independent operators. Production was not expected to resume in time or be of sufficient quantity to provide the approaching winter needs. Independent truckers started bringing in anthracite for home heating from the Hazleton area and southern producing regions. Blue Coal's closing prompted a rush toward residential gas heating in Luzerne and Lackawanna Counties. However, the Pennsylvania Gas and Water Co. discontinued approval of new residential customers because its 1974 quota had been filled.

In October, Beltrami Enterprises, operator of the leased Huber breaker in Ashley, increased the prices of small sizes by $3.00 per ton to $48.00 per ton, and the prices of stove and chestnut sizes by $3.00 per ton to $53.75 per ton. Delivery charges, varying according to trucking distances, were added to these prices.

Anthracite valued at about $5 million was delivered to 29 State institutions. The anthracite was of better quality than that delivered in prior years according to samples submitted to independent testing laboratories. However, domestic consumer complaints on quality and billing weights increased. In many cases the coal companies replaced the coal or refunded the purchasers' money.

In late May, anthracite producers in the Wilkes-Barre region started retroactive wage payments to miners for an increase due under an April 16, 1972, agreement. The backpay, averaging $300 to $350 per miner, was to be paid in six installments.

In mid-December, Bethlehem Steel Corp. acquired 8,000 acres of reserves in Schuylkill and Carbon Counties, three operating strip mines, and two coal processing plants from the Greenwood Stripping Corp. Greenwood in 1973 employed 300 workers producing 420,000 tons. Bethlehem promised to honor Greenwood's unexpired contracts, about 70% of which were with industrial users and the rest for domestic heating.

Counsel for the Pensioned Anthracite Miners Committee, representing 15,000 pensioners, filed suit in the U.S. District Court in July asking $9 million in uncollected production royalty payments and $9 million in interest. The suit claimed mismanagement of the pension fund by officials of the United Mine Workers of America (UMWA) in the 1950's.

In June, Blue Coal Corp. and related coal companies agreed to pay in full all royalties due the Anthracite Health and Welfare Fund. The payment dismissed eight suits filed in the preceeding 3 years.

On August 16, the Swoyersville Borough Council adopted ordinances controlling the storage of coal refuse in the Borough, defining various terms and usage, detailing violations, and establishing penalties. On September 17, the Sullivan Trail Coal Co., West Pittston, requested an injunction against enforcement of the ordinances.

Helker Construction Co., Mt. Carmel, continued work to extinguish fires in mine refuse banks and to recontour 3 million cubic yards of refuse at the onetime Williamstown Colliery. The entire area was to be seeded with grass to provide a recreational area.

In September, legal problems delayed the allocation of Federal funds to extinguish burning areas of the Glen Burn culm bank and three underlying coal seams in Northumberland County.

On August 19, the Secretary of the Interior established the Anthracite Production Assistance Office to aid producers in increasing their production. The Office initiated a producer canvass on the availability of mining equipment for purchase or lease. The Office also forwarded complaints from homeowners and businesses to the proper State agency and visited

active and temporarily inactive operations to determine the problems exising in all parts of the industry.

Representatives of the Department of the Interior, Federal Energy Administration (FEA), and Small Business Administration (SBA) met in Scranton November 2. They agreed to (1) contact the Wage and Price Stabilization Office to investigate price gouging; (2) initiate a waste bank sampling program to determine economic values; (3) survey possible sources of financial assistance to bring into production key coal processing facilities; (4) evaluate the authority and usefulness of commencing demonstration projects with improved coal processing; (5) ask the Department of Defense to review its short-term delivery schedules to see if further reductions in deliveries could be made in the 4-month period ending February 28, 1975; and (6) have the Bureau of Mines assess the practicability of adopting advanced augering or boring systems for steeply pitching seams in underground mines.

The president of the Independent Miners and Associates recommended that the Federal Government (1) guarantee an adequate future market, (2) underwrite a miners' training program, (3) lower the water level in mines, (4) take remedial action to change mine safety laws, (5) subsidize production for stockpiling purposes, and (6) make any allocations.

In October, the University of Scranton received a research grant from the Office of Coal Research (OCR) to conduct an advanced anthracite technology research conference in January 1975. The primary objective of the grant was to determine priority areas for research and development most likely to demonstrate the feasibility of increased anthracite use.

The first of a series of reports evaluating the energy situation in northeastern Pennsylvania was released in November 1973 by the Economic Development Council of Northeastern Pennsylvania, Avoca. The 24-page report is titled "The Residential Uses of Energy in Northeastern Pennsylvania."

The Secretary of the Interior on August 30 ordered new efforts, including expanded research and development by the Bureau of Mines, aimed at reversing the decline of the Pennsylvania anthracite industry, the Nation's only source of clean-burning, high-energy hard coal.

Production of anthracite has been declining since 1917 when over 100 million tons were produced with approximately 156,000 employees as compared to 6.61 million tons and 3,800 employees in 1974. Bank production totaled 2.9 million tons; stripping production, 2.9 million; and deep mine production, 657,000 tons; anthracite production in 1974 was the lowest since 1870, when statistics were first recorded by the State.

During 1974, anthracite was produced in 11 northeastern counties. Schuylkill produced over 3 million tons followed by Luzerne with 1.5 million; Northumberland, 1.2 million; Carbon, 0.2 million; Lackawanna, 0.17 million; Dauphin, 0.09 million; followed by Berks and Snyder, Columbia, Sullivan, and Susquehanna Counties.

Total employment in the anthracite region in 1974 was 3,831. Strip operations accounted for 1,376 employees; breaker and washery, 1,366; deep mines, 699; and banks, 390.

According to State sources, during 1974 there were 174 anthracite operators, which included 38 companies operating strip mines. Twenty-seven mining companies produced over 5 million tons or more than 80% of the total production from the anthracite region while the top 10 companies produced 3.69 million or more than 60% of the total. See table 13.

Table 13.—Pennsylvania: Leading anthracite producing companies in 1974

Company	Short tons
Reading Anthracite Co	775,521
Jeddo-Highland Co	699,735
Hecla Machinery and Equipment Co	350,955
Greenwood Stripping Corp	346,322
Leon E. Kocher Coal Co	336,817
Gilbertson Coal Co	275,896
Manbeck Dredging Co. Inc	258,420
Beltrami Enterprises, Inc	240,457
B & D Mining Co	210,698
Lehigh Valley Anthracite Inc	201,695
Total	3,696,516

Source: Commonwealth of Pennsylvania, Dept. of Environmental Resources. Annual Report on Mining, Oil and Gas, and Land Reclamation and Conservation Activities, 1974.

Table 14.—Pennsylvania: Summary of anthracite operations in 1974

District	Operators	Number of mines			
		Deep mines	Bank mines	Strip mines	Breaker and washery plants
1	7	--	--	13	--
2	8	--	--	15	--
3	12	--	--	31	--
4	15	--	--	25	--
5	24	3	21	--	20
6	19	5	20	--	11
7	27	[1]16	6	--	11
8	12	7	5	--	4
9	22	4	22	--	20
10	29	18	5	--	9
11	14	9	3	--	4
12	24	17	3	--	5
Total	[2]213	79	85	84	84

[1] One deep mine is a tourist attraction.
[2] Some companies operate in more than one district. The total number of anthracite operators is 174, which includes 38 companies operating strip mines.

Source: Commonwealth of Pennsylvania, Dept. of Environmental Resources. Annual Report on Mining, Oil and Gas, and Land Reclamation and Conservation Activities, 1974.

Over 4.2 million tons of coal was shipped to market by truck, 2.4 million was shipped by rail, and 12,000 tons was used for colliery fuel.

Two fatal accidents occurred in the anthracite region during the year; one was an underground fatality caused by a blast, and the other, a stripping fatality. The number of nonfatal accidents totaled 262.

Coal (Bituminous).—Bituminous production for the year was in excess of 80 million tons, an increase of over 4 million tons from that of 1973.

This was due to an increase in strip production in excess of 6 million tons with slight increases also in augering and refuse production. A decline of approximately 4 million tons occurred from deep mine production caused by contract negotiations, unauthorized work stoppages, and wildcat strikes throughout the bituminous coalfields.

In early January a strike over job bidding involving a continuous miner idled 500 miners at the Jane and Emily mines operated by the Rochester and Pittsburgh Coal Co. In early February both of these mines were again idle. Company officials said they had no idea why the miners stopped work, but a union spokesman said it involved "idle time work" when machinery was being repaired. Later in the year another work stoppage was caused by a safety issue over transportation procedures of injured miners.

At the Blacklick and Robinson portals of the Florence Mining Co. near Seward, the two mines were idled for a period of time over seniority protection and the problem of two separate union locals when the two mines are connected underground. A Federal judge in Pittsburgh ordered the 750 miners to return to work immediately.

A 1-day strike over unsafe equipment occurred at U.S. Steel's Maple Creek mine near Monongahela in Washington County. A U.S. District Court judge ordered the miners back to work. Another order was also issued returning about 830 coal miners to work ending a 6-day strike at the Greenwich Collieries located in Cambria County.

Approximately 10,000 miners were idled in western Pennsylvania and parts of West Virginia in late April resulting in a daily production loss of approximately 200,000 tons of coal. The strike began at the Florence No. 2 mine in Indiana County over picketing activities that resulted in the dismissal of two miners. Court orders to return to work were ignored by the miners.

Near Ebensburg, about 600 coal miners employed at Bethlehem Mines Nos. 32 and 33 mine as well as the preparation plant walked off the job over bathing facilities for three women co-workers. The miners protested the loss of part of their locker room area for a separate shower for the women employees. The three women had been showering in a trailer provided by the company.

Early in the year the U.S. Supreme Court in an 8-to-1 decision denied the right of coal miners to strike over poten-

tially unsafe conditions in the mines and ruled they must submit to arbitration in such disputes, as required by the contract between the United Mine Workers of America (UMWA) and coal operators. The court reversed an appeals court ruling that miners at a Gateway coal mine could strike over the return to work of three foremen who had been suspended after State inspectors charged them with a safety violation. The Court suggested that the Congress did not intend that the "public policy favoring arbitration and peaceful resolution of labor disputes be circumvented by so slender a thread as subjective judgement."

With the November 12th expiration date of the coal contract, an estimated 22,500 union miners within the State were idle. Some nonunion strip mines remained open, but many shut down to avoid confrontations with union members. The railroads, barge crews, and truckers were among the first to feel the impact of the strike. Negotiations between the union and Bituminous Coal Operators' Association continued, and on December 5 a 3-year contract was signed; however, the mines did not return to full production until a contract was signed on December 10 with the 4,000-member mine construction workers who build mining shafts, tipples, and bathhouses.

Even though underground mine production declined during the year, mine operators remained optimistic and continued to plan new mine openings to meet the energy needs.

United States Steel will open a mine on its Cumberland coal reserve lands in Greene County to supply Ontario Hydro of Canada with 3 million tons per year for a 30-year period. Initial production is planned in 1976 with coal being shipped over a new 17-mile railroad from the mine to the Monongahela River, then by barge and finally by rail to the Lake Erie port for loading aboard ship. Employment at the mining operation will be approximately 850. The average sulfur content of the coal will be about 1.8%. Dravo Corp. has been awarded a turnkey contract to engineer and construct the coal preparation and unit-train loading systems. Dravo's work will begin at the coal seam and terminate at the rail loading point.

North American Coal Corp. plans to open its Josephine No. 2 mine with an annual capacity of 250,000 tons.

Solar Fuel Co. will open the No. 7 mine producing 240,000 tons per year and plans to open the No. 9 mine with a 144,000-ton capacity.

Lykes-Youngstown Corp. has announced that a newly formed subsidiary, Emerald Mines Corp., will develop and operate two new metallurgical coal mines within the State. The Emerald mine will reach full production of 2 million tons per year within a 3-year period. Roberts and Schafer Co. has recently been selected as the prime contractor for construction of the $18 million preparation plant.

Consolidation Coal Co. plans to open the 750,000-ton-per-year Laurel mine located near Central City in late 1974. A two-compartment slope will be used for coal haulage and for transportation of men and supplies while the 360-foot, 20-foot-diameter, two-compartment shaft will be used for both intake and return airways. The 7.5-foot-thick Lower Kittanning "B" seam will be mined.

In December, Alco Standard Corp. announced new lease agreements with three Penn Central Transportation Co. subsidiaries covering 54,000 acres of coal land in central Pennsylvania to be mined by its Barnes and Tucker subsidiary. Barnes & Tucker will make fixed lease payments of $9 million to Manor Real Estate Co., Clearfield Bituminous Coal Corp., and Western Warehousing Co. for mining rights to an estimated 184 million tons of recoverable coal reserves. Additional payments will also be made based on production from the properties.

Alco Standard also agreed to sell the Barnes and Tucker Lancashire mine located near Barnesboro, Cambria County, to an Inland Steel subsidiary.

Cerro Corp. has also become interested in coal production and has acquired an option to buy Fetterolf Coal Co. and related companies for $32 million in cash.

Gulf Resources and Chemical Corp. of Houston, Tex., has purchased coal lands and equipment in Cambria and Clearfield Counties. The properties were acquired by two subsidiaries, GRC Coal Co. and Cambria Coal Co., for $4.2 million, of which $3 million is represented by an installment note of the acquiring companies secured by the properties. Production will be increased from 150,000 tons to 600,000 tons per year by investing approximately $4.6 million for additional mining equipment and related facilities.

Consolidated Natural Gas Co.'s subsidiary, Consolidated Gas Supply Corp., has agreed to buy more than 150 million tons of recoverable coal reserves in southwest Pennsylvania from Manor Real Estate Co., a subsidiary of Penn Central Transportation Co. The reserves will be used for coal gasification purposes. Manor Real Estate Co. has also agreed to sell bituminous coal reserves to PP&L.

Pullman Inc. said it has sold its 80% interest in Aloe Coal Co., a surface mining operation in the western part of the State, to a minority stockholder of Aloe.

Bethlehem Mines Corp. recently began planning for mine 78, a drift mine located near Windber with full production by late 1975. Bethlehem has also acquired the Fawn mine located near Saxonburg from Union Carbide Corp. The Ellsworth Div. of Bethlehem Mines Corp. will operate the mine, which has an estimated life of 12 to 15 years and will be known as mine No. 91.

Table 15.—Pennsylvania: Major new coal mine developments in 1974

Company	Mine		Opening date	Full capacity (short tons)
	Name	Type		
Bethlehem Mines Corp	Cambria No. 78	Deep	1974	484,000
	Cambria No. 91	do	1974	450,000
Consolidation Coal Co	Laurel	do	1974	750,000
S & D Trucking Co	Cookhouse	Strip	1974	100,000
U.S. Steel Corp	Dilworth	Deep	1975	3,000,000
Helvita Coal Co	Lucerne No. 8	do	1975	300,000
Do	Lucerne No. 9	do	1976	85,000
Emerald Mines Corp	Emerald	do	1977	2,000,000
North American Coal Corp	Josephine No. 2	do	NA	250,000
Solar Fuel Co	No. 7	do	NA	240,000
Do	No. 9	do	NA	144,000
Total				7,803,000

NA Not available.

Shipments of new equipment to the State's underground coal mines in 1974 included 43 continuous miners, one longwall unit, 47 shuttle cars, 18 rubber-tired tractors, 65 battery-powered front-end loaders, and 26 gathering and haulage conveyor units. There were no loaders or cutting machine shipments to the underground mines during the year. The increase in continuous miners from 33 in 1973 to 43 in 1974 and the decline in mobile loaders and cutting machines reflects recent continuous miner design improvements that give greater coal-cutting strength and higher capacity.

Joy Manufacturing Co., a major producer of mining machinery, will increase the size of its Franklin plant to meet future equipment needs. The president of the company said completion of the project is expected during the first half of 1975.

Babcock and Wilcox Ltd., London, has acquired the Irwin Sensenich Div. of the Whittaker Corp., a manufacturer of longwall mining systems, mine cars, and other mining equipment. The Irwin, Pa., based division is changing its name to Huwood-Irwin Co. Ltd.

Surface mine operators may be faced with parts and replacement shortages. The president of the Western Pennsylvania Surface Coal Miners Association called for a 3- to 6-month moratorium on the State's backfilling requirements because bulldozer undercarriage parts are in short supply due to heavy orders of new bulldozers to foreign countries as well as to Alaska. State reclamation officials stated there would be no such moratorium.

Jefferson County residents are concerned with possible stripping operations on the watershed of the north fork of the Redbank Creek, one of the few remaining unpolluted streams in the area. Two miles of the stream is a "Fish for Fun" project, and another 2 miles is a fish nursery. The coal in question is from the highly acid lower Kittanning seam and tests prove a threat of acid pollution.

Environmental organizations are also concerned with possible stripping operations on the border of McConnells Mill State Park. They say that the Hells Run

and Skunk Run tributaries of the Slippery Rock Creek would become polluted and destroy the esthetic quality of that section of the park.

Although coal mines located in Washington County had a net decline of 274,000 tons from the 1973 totals, it ranked number one in production within the State and 3,901,000 tons ahead of second-place Indiana County, which produced in excess of 9 million tons. Other counties with production in excess of 5 million tons per year included Greene 8.3, Clearfield 7.9, Cambria 5.5, Armstrong 6.7, Somerset 7.7, and Clarion with 5.2 million tons.

Deep mine production totaled in excess of 42 million tons with 36 million tons from strip mines, 1.2 million from refuse production, and less than one-half million from augering for a total bituminous production in excess of 80 million tons. This coal was produced at 148 deep mines, 1,029 strip mines, 51 auger mines and 13 refuse operations. Employees at deep mines totaled in excess of 19,000, more than 6,000 at strip operations, 123 at auger mines, and 151 employed at refuse operations for a total of 29,108 bituminous employees.

Coal loaded by hand has been decreasing, and during the year 87 employees were reported in this type of mining in the bituminous regions. Eleven were shot firers, 11 were pick miners, 10 were cutting machine operators, and 55 were classified as machine hand loading miners. Mechanical loading accounted for 11,640 employees while 5,399 were classified as other inside employees for a total of 17,126.

A breakdown of outside employees showed 2,386 listed as superintendents, foremen, and clerks; 49 as coke employees; and 9,547 as all others for a total of 11,982.

Total bituminous coal employees during the year was 29,108 as compared with 26,722 in 1973, an increase of 2,386.

The number of nonfatal accidents in the bituminous region decreased from 1,349 in 1973 to 1,185 in 1974, but fatal accidents increased by 3 for a total of 20.

Outside fatalities totaled eight; four were the result of stripping operations, two by outside loading, and one each by electricity and transportation.

Underground fatalities totaled 12 with falls of roofs resulting in 5 fatalities, machinery caused 4, and transportation was the primary reason for 3.

Fatalities occurred in every month of the year except July and November. Vacation periods for miners usually begin in late June and end in late July which reduces miner exposure for the 1-month period.

Although the number of deep mines in 1973–74 decreased by a total of two, employment increased by 801 due mainly to additional employees required for compliance with the Federal and State underground mining regulations.

During the year 30.4 million tons of coal were shipped to market by rail, 30.4 by truck, and 18.2 million by water. Less than one-half million tons were used locally for domestic purposes.

Many steel producers feared that a lengthy coal strike late in the year would reduce metallurgical coal stockpiles and force plant shutdowns. Roof bolts used in the support of mine roof were also reported to be in short supply. Governor Milton J. Shapp in early January said that several mines might close owing to the roof bolt scarcity. Producers said that the steel used was in short supply causing shortages at the underground mines. To meet the energy shortage Governor Shapp sponsored a conference and one committee reported the possibility of increasing coal production to 100 million tons within a 5-year period.

The number of tipples and cleaning plants totaled 185 during the year with additional plants proposed. North American Coal is currently operating the Oneida cleaning plant at Conemaugh No. 4 mine after 3 years of construction.

Duquesne Light Co. is operating a new coal preparation plant at its Warwick mine located in Greene County with a capacity of 1,000 tons per hour designed to recycle all water used in the washing process.

The thickest coal seam being mined underground is the 108-inch-thick Freeport in Armstrong County and the 108-inch Pittsburgh seam in Fayette County. The thinnest seam is the 30-inch lower Freeport being mined in Jefferson County and the 29-inch lower Kittanning seam in Clearfield County.

In early 1974 the State Insurance Department set black lung rates that will cost coal mine operators $9.48 for every $100 in employee salaries. These rates were set

in compliance with the State law that requires coal companies or their insurers to pay 100% of the costs of working coal miners.

A total communications and monitoring system developed by the Pittsburgh Mining and Safety Research Center is being installed at United States Steel's Robena mine. The installation will have 40 underground and 20 surface pushbutton dial phones, 30 carbon monoxide monitors along haulageways, 4 section monitors for carbon monoxide, air, and methane, 24 call alert pagers, and controls for the ventilation and mine pumps. The entire system operates from a single community antenna coaxial cable, with microwave loopback in case of accident to the cable.

Also being tested at the Robena mine is an emergency beacon that could be used to locate trapped miners underground. The locating beacon, powered by the cap lamp battery, is slightly larger than a cigarette pack and sends out low-frequency radio impulses that can penetrate up to 600 feet of strata. Receivers located on the surface pick up the signals. Rescue teams will determine if the trapped miner can be rescued underground or whether it will be necessary to drill a shaft from the surface.

At another United States Steel mine, the "Sentinels of Safety" award was presented to the Maple Creek No. 2 mine for working 674,468 man-hours during 1973 without a disabling injury. The award is the Nation's highest for mine safety presented jointly by MESA and the American Mining Congress.

Other research endeavors to protect the underground worker include standardization of mining machine controls and emergency breathing devices that could replace the self-rescuer. The new emergency breathing devices generate oxygen from chemicals contained in canisters as compared with the self-rescuers, which protect miners from carbon monoxide, but provide no oxygen and offer no protection against other toxic gases.

At three Pennsylvania mines, the exhaust from the surface fans is being monitored continuously to accurately determine methane liberation. The three mines are the Homer City mine, Helen Mining Co., North American Coal; the Lucerne No. 6, Helvetia Coal Co., Rochester and Pittsburgh Coal Co.; and the Marion mine, Tunnelton Mining Co. Results of tests are reported in Bureau of Mines Report of Investigations 7951.

Dr. Robert Stefanko of the Pennsylvania State University (PSU) suggests that methane should not be released to the outside atmosphere, but that it should be recovered in advance of mining to help ease the Nation's energy shortages in addition to improving underground mining efficiency by relieving a safety hazard. Dr. Stefanko also urged State officials to develop a methane data bank for all Pennsylvania coal seams as the first step toward utilization of the vast amounts of the gas occurring in underground mines. State officials said that several mining companies are interested in extracting methane from southwestern Pennsylvania coal mines. Tests at 40 of Pennsylvania's coal mines showed nearly 16 billion cubic feet per year of methane being exhausted to the outside atmosphere. State and corporate attorneys are working on several potential problems involving ownership of the methane. The State Attorney General recently provided an opinion that the methane gas released in bituminous as well as anthracite mines belongs to the holders of the gas rights rather than the coal operators. At the end of 1974 this issue had not been resolved.

Since 1964 the Bureau of Mines has conducted an active degasification program to improve coal mine health and safety by eliminating fatalities due to gas ignition and explosions; however, with the shortage of natural gas it became economical to use the product being exhausted to the outside atmosphere. Recently J&L's Vesta-Shanopin mine in southwestern Pennsylvania and the Federal Bureau of Mines are considering a project involving the drilling of 300 holes for degasification purposes. At first 60 holes will be drilled and hydrofractured for maximum methane release.

Coal Gasification.—Westinghouse Electric Corp., under contract from the Department of the Interior's Office of Coal Research, is building a demonstration plant to prove the feasibility of converting high-sulfur coal to a clean, low-Btu nonpolluting gas for electric power generation. The plant, at Waltz Mill, is nearing completion, and by 1978 a commercial size gasification plant will be built at the Dresser station of Public Service Indiana near

Terre Haute, Ind. The commercial plant when completed will use 55 to 60 tons of coal per hour to supply gas to a Westinghouse turbine, to be part of a combined cycle generating plant.

In April of 1974, Bituminous Coal Research Inc. (BCR), a subsidiary of the National Coal Association, was awarded a $2,575,000 contract to cover laboratory scale process and equipment development for the design of a low-Btu coal-gasification pilot plant. This low-Btu gas will have a heat content of 150 to 200 Btu per cubic foot and will be used for power generation purposes. BCR has recently developed a high-Btu process called BI-GAS, which is being tested in a pilot plant nearing completion at Homer City.

A $2,438,000 contract was awarded to the Lummus Co. of Bloomfield, N.J., the original designer of the plant nearing completion at Bruceton, Pa., to prove the feasibility of using coal to produce a high-quality pipeline gas.

At Johnstown, a pilot plant capable of turning 500 tons of coal into gas each day is being planned. This plant will be put into operation after further research is completed on a small plant being constructed near Pittsburgh. In Harrisburg, the State Senate is considering a bill authorizing the State to build coal conversion plants and leasing them to industry.

Continental Oil Co. is also taking an active part in coal conversion processes. A new subsidiary, Conoco Coal Developing Co., was formed utilizing research facilities at Library. Coal development activities include gasification of coal, production of high-Btu gas from raw synthesis gas, production of methanol from coal, development and commercialization of coal liquefaction, a new coke making process designed to minimize gas and dust emissions and permit processing of lower grades of coal, and a full-scale demonstration of a Consol process to remove SO_2 from powerplant stack gases.

Interest has been shown by oil companies in the Bureau of Mines Synthoil process, which can produce 0.2% sulfur fuel oil from coal containing as much as 5.5% sulfur. This process can convert 1 ton of coal to 3 barrels of liquid fuel per day. The one-half-ton-per-day unit at Bruceton is now being designed as an 8-ton-per-day pilot unit.

Gulf Oil Corp. is also planning a pilot coal liquefaction plant scheduled for completion by the end of 1974 located in Harmarville. This plant uses Gulf's Catalytic Coal Liquefaction process (CCL). This process builds on the Solvent Refined Coal (SRC) process developed by Gulf's subsidiary, Pittsburg & Midway Mining Co. In CCL a coal slurry is forged upward through an arrangement of fixed catalysts upon a stream of hydrogen at about 2,000 pounds per square inch pressure. This process is similar to the Synthoil process, except for differences in the arrangement of the catalysts.

For a 2-year period, Bethlehem Steel, under a cost-sharing cooperative arrangement with the Bureau of Mines, will operate a plant to test Synthoil technology at the Bruceton facility to develop a framework for early industrial use of the process.

Coke.—Pennsylvania ranked first in oven coke production with 27% of the U.S. production. Total coal received by the 12 plants was 23,981,000 tons and comprised 2,511,000 tons from Kentucky mines, 4,000 tons from Maryland mines, 13,565,000 tons from Pennsylvania mines, 5,000 tons from Tennessee mines, 1,068,000 tons from Virginia mines, 6,282,000 tons from West Virginia mines and 547,000 tons from West Germany. Oven coke plants received a total of 16,511,000 tons of high-volatile coal, 2,500,000 tons of medium-volatile coal, and 4,970,000 tons of low-volatile coal. The average value per short ton of coal carbonized at oven coke plants in 1974 was $36.44 as compared to $17.95 in 1973. The 12 plants carbonized 23,304,000 tons of bituminous coal and 493,000 tons of anthracite to produce 16,323,000 tons of breeze-free metallurgical coke of which 96.42% was blast furnace grade valued at $80.62 (average) per ton. The 12 plants also produced 834,000 tons of coke breeze and byproducts comprising fuel gas, nitrogenous compounds, tar, naphthalene, pitch, and crude light oil and its derivatives.

Electricity Generation.—*Nuclear.*—Duquesne Light Co.'s 90-megawatt nuclear powerplant at Shippingport was taken out of service February 5 for about 2 years because of an explosion of coolant hydrogen within the housing of the electric generator.

Duquesne's president reported in May that Unit No. 1 at the firm's Beaver

Valley nuclear power station would cost $418 million by the time it would be in operation in 1975, and that an identical twin, Unit No. 2, would cost $570 million. Unit No. 2, authorized by the Atomic Energy Commission (AEC) on May 3, was expected to attain commercial operation in 1981. Both units will produce 852 megawatts of electricity from conventional pressurized water reactors.

At an October 16 public meeting before the Advisory Committee on Reactor Safeguards, an AEC licensing project manager testified that operation of the Beaver Valley Unit No. 1 posed no danger to public health if safety plans were followed. Only three major areas of disagreement on safeguards remained between Duquesne and the AEC.

On November 13, PP&L signed a $50 million contract with an Exxon Corp. unit for nuclear fuel assemblies to be used for eight fuel reloadings beginning in 1981 of the twin 1,050-megawatt units at its Susquehanna station near Berwick, Luzerne County. General Electric (GE) will supply the initial fuel loadings for the generating units scheduled for commercial operation in 1980 and 1982.

The Philadelphia Electric Co. shut down its No. 1 40-megawatt gas-cooled nuclear reactor in early June for repairs after discovery of an oil leak in the control rod drive assembly. Peachbottom Units 2 and 3, each rated at 1,065 megawatts with boiler water reactors, began operation in late 1974. Construction costs were first estimated at $250 million and final costs were nearly $900 million.

In June the AEC's Safety and Licensing Board issued an operating license to Philadelphia Electric Co. that permitted the construction of two 1,065-megawatt generating units in Limerick Township. The units located at Pottstown were scheduled for commercial operation in 1981 and 1982. The utility announced in September that it would reduce its construction budget for the 1974–78 period from $3.3 billion to $2.7 billion because of economic conditions.

In May, construction of two nuclear plants on the lower Susquehanna River was up to 5 years behind schedule and estimated final costs were tripled according to the Federal Power Commission (FPC) and the owner-utility companies. Metropolitan Edison Co.'s Unit No. 1 at Three Mile Island was 41 months behind schedule and its Unit No. 2 was 62 months behind schedule. The total cost of the two units, originally estimated at $200 million, was revised to $920 million.

In Pennsylvania there are four operable nuclear electrical generating units, seven under construction, and applications to build two additional units are undergoing AEC review. Total installed nuclear generating capacity is almost 3,200 megawatts or nearly 10% of the Nation's total nuclear generating capability. The nine plants either under construction or under review will add more than 9,000 additional megawatts to the State's nuclear capability by the early 1980's based on current schedules.

Hydroelectric.—In mid-June, the FPC approved a proposed St. Petersburg dam on the Clarion River. The project will provide 420 megawatts of capacity as well as flood control and a recreational area. The proposed dam would inundate the existing Piney 125-foot-high concrete dam that has an installed capacity of 28.8 megawatts.

Fossil fueled.—In late December, the Central Area Power Coordination Group (CAPCO), comprising five Ohio and Pennsylvania electric utilities, announced plans, which had previously been cancelled, to build a $341 million, 825-megawatt coal-fired steam-electric unit at the Shippingport site with completion scheduled for 1979.

On August 1, at the Brunot Island plant of the Duquesne Light Co. three 65-megawatt oil-fired combustion turbines were put into operation to help make up for the loss of generating capacity caused by construction delays at the 852-megawatt Beaver Valley nuclear power station at Shippingport. Hot exhaust gases from the three combustion turbines were used to produce enough steam in heat recovery equipment to generate an additional 148 megawatts of electricity. The use of low-sulfur oil together with other pollution control devices enabled the Brunot Island plant to meet all air and water standards.

At a seminar sponsored by the EPA at Atlanta, Ga., in November, Duquesne's manager of environmental affairs testified that the company will spend about $80 million for equipment to eliminate particulates and sulfur dioxide at its Phillips power station. The process in operation on only two of six boilers produced 7,000

tons of sludge per week, about twice the amount estimated. Although work started on the air pollution control system in September 1970, the work was 1.5 years behind schedule because of faulty materials and delays on delivery of equipment.

On August 7, PP&L said that the company would reduce total construction expenditures from about $4.5 billion to about $3.2 billion over the next 10-year period. Two 800-megawatt oil-fired units being built at Martins Creek were scheduled to attain full operation in 1975 and 1977, but the schedule for two 1,050-megawatt nuclear units being built near Berwick will be rescheduled for completion of one in 1980 and the other in 1982.

Six generating plants originally planned for mid-1980 will be delayed a few years.

Pennsylvania Electric Corp. (Penelec) announced June 14 that it would construct a $350 million, 800-megawatt steam-electric unit near its Seward Station in Indiana County. The new plant will require 2.5 million tons of coal annually. This announcement cancelled plans announced in January to build a $250 million oil-fueled 800-megawatt station near Lake City.

In June, EPA charged four Penelec stations in violation of the Clean Air Act. The stations were located at Seward, Erie, Warren, and Clearfield. A 1,216-foot chimney, the tallest in the United States, was completed at a 650-megawatt plant jointly owned by Penelec and the New York State Electric & Gas Corp. in Homer City. The stack embodied a new approach to meet environmental needs at ground level.

In its Valley Forge Space Sciences Laboratory, General Electric Co. developed a magnetohydrodynamic (MHD) generator that in a series of experiments was able to convert 20% of the heat energy in coal to electricity, a significant increase above the 8% conversion attained by earlier MHD equipment. The experiments indicated that the generator theoretically could reach an efficiency of 30% or higher, which is in the range where MHD power would become practical and useful. The experiments sponsored by GE and the U.S. Office of Naval Research (ONR) produced 1,800 kilowatts of electricity in 0.01-second bursts.

West Penn Power Co., Springdale Borough station was converted to oil from coal at a cost of $3.5 million instead of installing sulfur dioxide wet scrubbing equipment estimated to cost $10.0 million.

The projected use of fuels through 1980 by Pennsylvania electric utilities was reported in an issue of Keystone News Bulletin.[7]

United States Steel Corp. shut down one blast furnace at its Fairless works near Philadelphia in mid-March because of a coal strike in West Virginia. Seven blast furnaces were shut down by United States Steel in the Pittsburgh area by November 25 following a 50% reduction in coke production caused by the coal miners' strike that started November 12. The firm's rolling mills in the Monongahela Valley were affected immediately by the cutback in steelmaking. In March, the firm charged some coal into ovens of the Clairton coke works after spraying the coal with used oils discarded from the firm's nearby steelmaking plants. The oil addition increased the bulk density of the coal charged by 5%.

At the Clairton works, the firm installed experimental coke dust and smoke collecting equipment on the discharge sides of No. 16 and No. 17 batteries of coke ovens. The firm agreed to construct two 165-foot smokestacks at a boilerhouse at the Clairton works at the insistence of the Allegheny County Air Pollution Control Board, which carried its demand to the Commonwealth Court. In mid-year, construction was about 25% complete on a complex for extracting hydrogen sulfide from coke oven gases produced at the Clairton works. The new recovery units will also be capable of converting the hydrogen sulfide into liquid elemental sulfur.

In early November, United States Steel and the United Steelworkers of America agreed on a plan for improving working conditions for 700 workers at the Clairton coke works. One clause of the agreement required an increase in crew size that would add about 130 workers at the coke works.

On November 24, the Occupational Safety and Health Review Commission held United States Steel in violation of a safety regulation requiring control of coal tar pitch emissions at the Clairton works.

In late December, Bethlehem Steel Corp. laid off 200 workers at its Bethlehem plant because of the uncertain coal supply situation.

[7] Keystone News Bulletin. V. 32, No. 6, June 1974, p. 3.

Peat.—At least 90% of the peat found in Pennsylvania occurs in areas north of the glacial terminal moraine. Nine operations in six counties reported a total production of 33,519 short tons, 10.6% more than that in 1973. Of the total production, 33,369 tons was shredded and 150 tons was unprepared. Lackawanna County was the leading producer, followed by Wayne, Luzerne, Erie, Lawrence, and Monroe. Total sales by type are as follows: 11,000 tons of moss peat, 12,519 tons of reed-sedge and 6,815 tons of humus.

Petroleum and Natural Gas.—Annual 1974 Pennsylvania production of crude oil, including lease condensate, totaled 3,478,000 barrels valued at $36,220,000, an increase in output of 6% over that of 1973.

A total of 1,208 wells with a total footage of 2,628,627 feet were drilled in 1974, 1,107 were in proved fields and 101 being listed as exploratory. Six hundred and sixty of the 1,107 wells were oil, 426 were gas, and 21 were listed as dry wells. Exploratory well totalled 11 oil, 42 gas, and 48 as dry as shown in table 16.

Table 16.—Pennsylvania: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Armstrong	--	14	1	--	1	2	18	55,688
Butler	--	1	1	--	1	2	5	13,800
Cambria	--	1	--	--	--	1	2	7,626
Cameron	--	--	1	--	1	2	4	19,774
Centre	--	--	--	--	--	1	1	7,138
Clarion	--	2	1	--	--	--	3	6,242
Clearfield	--	15	--	--	5	4	24	88,267
Crawford	6	7	--	1	1	4	19	72,358
Elk	--	3	--	--	2	4	9	24,037
Erie	--	--	--	--	3	3	6	20,629
Fayette	--	3	--	--	2	5	10	50,068
Forest	104	--	--	2	--	2	108	91,435
Greene	--	1	--	--	--	--	1	1,733
Indiana	--	321	1	--	12	3	337	1,196,921
Jefferson	1	23	1	1	3	--	29	82,616
Lawrence	--	--	--	--	--	1	1	945
McKean	141	6	7	2	5	2	163	297,015
Mercer	12	2	--	--	--	--	14	21,137
Potter	3	--	--	--	--	4	7	33,748
Somerset	--	--	--	--	1	1	2	14,747
Tioga	--	--	--	--	--	2	2	21,384
Venango	223	1	5	2	1	3	235	188,431
Warren	170	--	3	3	--	--	176	192,256
Washington	--	2	--	--	--	--	2	8,871
Westmoreland	--	24	--	--	4	2	30	111,761
Total	660	426	21	11	42	48	1,208	2,628,627

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

The No. 1 McLaughlin well in Erie County drilled into the Oriskany sandstone produced an estimated 15 million cubic feet of gas. Two gas discoveries in the Lower Silurian sandstone in Venango County were also significant.

In late March, Bengal Oil and Gas Corp., Midland, Tex., and Energy Minerals Inc. announced immediate commencement of drilling on 10,000 acres of oil and gas leases in northwestern Pennsylvania. Bengal also has eight producing wells in the Ambrose area of Indiana County.

Natural gas production from approximately 17,000 wells in 1974 totaled 82.7 billion cubic feet, an increase of 5% from that of 1973. A total of 69.7 billion cubic feet was produced from the shallow Upper Devonian or younger reservoirs with 13 billion cubic feet produced from the Middle Devonian or older formations. Estimated proven reserves totaled 1,492 billion cubic feet at yearend 1974.

Estimated proven recoverable reserves of crude oil at yearend totaled 50.4 million barrels, an increase of 10.8 million barrels from that of yearend 1973.[8]

[8] Pennsylvania Department of Environmental Resources. Oil and Gas Statistics.
Oil and Gas Journal. V. 73, No. 14, Apr. 7, 1975.

Oil City, where the Nation's first crude oil refinery was built, is experiencing an oil shortage. Quaker State and Pennzoil are paying $10 per barrel as compared to $5 a year ago for Pennsylvania crude. Seventy percent of the crude processed by Quaker State is used to make lubricants, heating oil, and grease; the remaining crude is refined into gasoline.

Deep drilling throughout the State decreased from 69 wells in 1973 to 52 wells in 1974 with the greatest concentration in the Medina gas area of Crawford County where 7 gas wells, 4 oil and gas, and 2 dry holes were drilled. Production of Corning-grade crude from the Medina wells amounted to 57,527 barrels with 258 barrels from wells in Erie County.

Most of the activity in the shallow gas field occurred in Indiana, Westmoreland, Jefferson, Clearfield, and Armstrong Counties, with shallow oil development in Venango from the Red Valley and Venango Second Sandstones, Warren with oil wells in Glade sand, McKean with production from the Second and Third Bradford, and Forest County with oil production from the Red Valley and Venango Second sandstones.[9]

Seismic activities occurred in 28 of the 67 counties of the State with 123 crew-weeks of seismic activity in 1974 as compared to 161 crew-weeks in 1973 for a total cost to operators of $2.5 million.

The Pennsylvania Game Commission leased 12,957 acres in 1974 for exploration or development of oil and gas with a total leased acreage of 45,857 acres involving 43 active leases with 46 active wells on 17 of the 43 leases.

State Forest or Park lands included six tracts leased during the year. First-year rentals for the six tracts totaled over $200,000 with an average leasing cost of $17.28 per acre. After the first year the rental is $1.00 per acre with royalties equal to one eighth of all production. Total income of leased State Forest and Park lands was in excess of $900,000 involving over 280,000 acres.

Abandoned oil and gas wells in the Cook Forest State Park and in the Upper Paint Creek watershed located in Clarion County will be sealed to stop acid pollution of the ground water. Seventy-five percent of the Federal funds will be provided under the terms of the Appalachian Regional Development Act of 1965 with the State providing the remaining 25%.

Pennzoil Co. is using the Maraflood oil recovery process in the previously waterflood oil-wet Bradford third sand reservoir, Bradford field, McKean County, which is an economical process at present-day crude oil prices.

The No. 1 Leonard Svetz wildcat well drilled in Middlecreek Township, Somerset County, by AMOCO Production Co. to a depth of 21,460 feet was plugged and abandoned. This well was the deepest drilled in the Appalachian Basin probably reaching the Gatesburg, Upper Cambrian, which was its target.

Quaker State's Farmers Valley refinery located in McKean County is processing 5,500 barrels of crude per day, 1,350 barrels below capacity. Pennsylvania crude is paraffin-based as compared to most oils, which are asphalt-based. Paraffin-based or "sweet" crude is low in impurities and ideal for high-quality motor oil. Independents supply 80% of the crude mainly from "stripper" wells that produce less than 10 barrels per day. In Pennsylvania the average well produces four-tenths of a barrel per day. A well near Bruin, Butler County, drilled 99 years ago is still producing an average of one-half to 1 barrel per day. About 13 tons of waxes per day used in candlemaking and coating for water-resistant corrugated cardboard are produced at the Farmers Valley refinery.

At the end of 1973, Pennsylvania ranked 13th nationally in "stripper" well production with 31,539 wells producing 3,282,000 barrels per year averaging 0.29 barrels per well. Abandonments totaled 1,951 wells. "Stripper" well reserves listed primarily at 18,390,000 barrels and secondary at 21,323,000 barrels for a total of 39,713,000 barrels.[10]

Owing to a shortage of oil drillers the Tri-County Manpower Administration is training potential drillers at facilities of the Myone Oil and Gas Co. located near Mars. Trainees receive 3 weeks of classroom instruction and 17 weeks in the field. The training program funded by Federal and State monies is one of four such training programs in the United States.

Methane in Pennsylvania coalbeds may supplement commercial supplies of natural

[9] Pennsylvania Department of Environmental Resources. Oil and Gas Statistics.

[10] Oil and Gas Journal. Stripper Reserves Up, Production Down. V. 7, No. 51, Dec. 23, 1974, p. 32.

gas. Researchers estimate 130 billion cubic feet of methane in the Pittsburgh coalbed located in Washington County and 350 billion cubic feet under Greene County. Pennsylvania mines produced an average of 42 million cubic feet of methane per day during mining operations last year. Results of Federal Bureau of Mines coal degasification projects are detailed in Information Circular 8659 and Reports of Investigations 7968 and 7969.

Delaware Bay Transportation Co. plans to install a crude oil line approximately 90 miles in length from the Delaware Bay terminal to Philadelphia.

Northern Border Pipeline, a six-company consortium, plans to construct a 1,600-mile natural gas pipeline costing $1.8 billion from the Montana-Canada border to Delmont, Pa. Construction of the line is contingent upon the Canadian Government approving an Arctic pipeline from Alaska to Montana.

Sun Oil Co. is planning the largest storage area for propane gas, costing $16 million, in the Eastern United States south of Philadelphia. The underground cavern 450 feet below the surface in solid granite will have tunnels 30 feet wide and 40 feet high capable of holding a million and a quarter barrels of propane.

BP Oil Corp. has scheduled a mid-1974 completion date for modernization of Fluid Catalytic Cracking unit costing $5.5 to $6 million, producing refinery products at the Marcus Hook location. BP also has under construction at Marcus Hook a 160-ton-per-day sulfur recovery and tail gas treating plant scheduled for completion in late 1974.[11]

Baumgardner Oil Co., Fayetteville, Pa., has installed a recycle clarifier to increase production of fuel oil reclaimed from used lubricants and similar petroleum wastes from 1,500 to 6,000 gallons per hour with annual production exceeding 7.5 million gallons of fuel oil.

Production of natural gas liquids increased 16% with proved reserves totaling 580,000 barrels at the end of 1974.

Oil spills continue to affect Pennsylvania waterways. A locomotive derailment in the B&O railroad yards in Connellsville caused a break in the locomotive's 3,500-gallon fuel tank allowing 1,500 gallons to flow into a tributary of the Monongahela River. At ARCO's Fort Mifflin depot located in South Philadelphia, the 650-foot Greek oil tanker *Elias* exploded in early April while pumping off its cargo of Venezuelan crude causing an oil spill said to be 3 miles long. Another oil spill totaling 285,000 gallons occurred in late February when the French *Athos* was involved in a collision with another tanker in the Delaware River south of Philadelphia.

In May a Federal administrative law judge ordered Texas Eastern Transmission Corp. not to curtail gas deliveries below 41,240,000 cubic feet daily to Carnegie Natural Gas Co., a subsidiary of United States Steel, on the grounds that curtailment of natural gas would impair the operation of the ammonia plant at Clairton, which produces fertilizer for the agriculture industry and ammonia nitrate for the mining industry. At the end of the year the FPC ordered the Carnegie Natural Gas Co. to reduce the gas delivered to United States Steel by 12 million cubic feet per day. To continue operations United States Steel converted the Duquesne plant from gas to oil.

Columbia Gas of Pennsylvania notified 92 industrial customers in September of a 10% cut in natural gas for a 5-month period and later in the year announced a further reduction totaling 40% to insure adequate gas supplies for residential customers.

Equitable Gas Co. of Pittsburgh announced late in the year a 3-month extension of the 25% cutback to 23 large industrial users in the western part of the State.

Peoples Natural Gas Co. also announced gas curtailments to 224 industrial users in southwest Pennsylvania at the end of the year.

In the northeastern part of the State, Pennsylvania Gas and Water Co. (Penn Gas), Wilkes-Barre, notified industrial users of gas that curtailments may exceed 25%. Industrial leaders estimate 6,200 jobs may be affected by the gas shortage.

On January 16, 1975, Governor Milton J. Shapp proclaimed a "natural gas shortage in Pennsylvania." Homeowners were required to turn down thermostats to 68° F to conserve the natural gas supply to help industries to continue operating without major layoffs.

[11] Chemical Engineering. V. 81, No. 20, Sept. 30, 1974; v. 81, No. 7, Apr. 1, 1974.

NONMETALS

Abrasives.—Metallic abrasives were produced by five companies operating five plants in three cities in three western Pennsylvania counties. Steel shot and grit were manufactured at two plants, annealed iron shot and grit at two others, and one plant manufactured both annealed and chilled iron shot and grit. Leading producers of metallic abrasives were as follows:

In Allegheny County, Abrasive Metals Co., Industrial Corp., and Copperweld Steel Co.; in Butler County, Carborundum Co.; in Westmoreland County, Durasteel Abrasive Co.

Cement.—Portland cement shipments from 19 plants in 8 counties were 13% less in tonnage and 12% greater in value because of an average increase of $5.69 per ton compared with 1973. Masonry cement shipments from 15 plants were 18% less in tonnage but about 1% greater in value because of an average increase in value of $6.80 per short ton. Thirteen companies located in eight counties operated 65 kilns with a total rated maximum 24-hour capacity totaling 28,232 short tons. These plants consumed 103,151,000 cubic feet of natural gas; 732,000 barrels of fuel oil; 1,545,000 tons of bituminous coal; 22,000 tons of anthracite; and 18,676,000 kilowatt-hours of purchased electricity. Pollution control at the kilns consisted of 20 glass bags and 23 electric precipitators. Pennsylvania ranked second among portland cement producing States. Northampton and Lawrence Counties accounted for 54.8% of the total portland cement shipments and 48.4% of the total masonry cement shipments.

Raw materials used in the manufacture of portland and masonry cements totaled 13,549,513 tons and comprised 7,330,216 tons of cement rock, 4,677,381 tons of limestone, 105,623 tons of clay, 214,963 tons of shale, 307,885 tons of sand, 319,722 tons of domestic clinker, 23,438 tons of ferrous materials, 570,285 and tons of other materials.

The mode of transportation, type of packaging, and destinations of finished portland cement shipments is shown in table 18.

National Gypsum Co.'s Evansville plant located near Allentown will have installed a new finish grinding facility and pollution control equipment by early 1975 to comply with health and saftey regulations.

Table 17.—Cement plants in Pennsylvania

Name of plant	Parent company	County	Nearest town	Cement produced [1]	Process
Allentown Cement Div	National Gypsum Co.	Berks	Evansville	P-M	Dry.
		Montgomery	W. Conshohocken	P	Grinding plant.
Bessemer Cement Co	Louisville Cement Co.	Lawrence	Bessemer	P-M	Wet.
Coplay Cement Manufacturing Co.		Lehigh	Coplay	P-M	Dry.
		Northampton	Nazareth	P	Do.
G. & W. H. Corson, Inc	International Utilities.	Montgomery	Plymouth Meeting.	P-M	Grinding plant.
Hercules Cement Co	Amcord, Inc	Northampton	Stockertown	P-M	Dry.
Keystone Portland Cement Co.		do	Bath	P-M	Wet.
Lone Star Industries Inc		do	Nazareth	P-M	Dry.
Marquette Cement Manufacturing Co.		Allegheny	Pittsburgh	P-M	Wet.
Martin Marietta Cement	Martin Marietta Corp.	Northampton	Northampton	P	Dry.
Medusa Cement Co	Medusa Corp	Lawrence	Wampum	P-M	Do.
		York	York (2)	P-W-M	Dry and wet.
The National Portland Co		Northampton	Brodhead	P	Wet.
Penn-Dixie Industries, Inc.		do	Nazareth	P-M	Dry.
		Butler	W. Winfield	P-M	Wet.
Universal Atlas Cement Div.	United States Steel Corp.	Northampton	Northampton	P-W-M	Do.
		Allegheny	Universal	P-M	Dry.
The Whitehall Cement Manufacturing Co.		Lehigh	Cementon	P-M	Do.

[1] M Masonry; P Gray portland; W White portland.

Table 18.—Pennsylvania: Portland cement shipments, by mode of transport and type of package
(Short tons)

Mode of transportation	Plant to terminal		Terminal to consumer		Plant to consumer	
	Bulk	Container	Bulk	Container	Bulk	Container
Railroad	377,944	20,685	1,642	2,869	804,660	45,615
Truck	66,197	3,146	523,909	30,511	5,255,363	773,192
Barge	123,788	--	--	--	9,220	--
Other	--	--	--	--	117	405
Total	567,929	23,831	525,551	33,380	6,069,360	819,212

Clays.—Excluding kaolin, the total production of all clays and shales was 8.2% less in tonnage compared with that of 1973 because of reduced demand. Clays sold or used by producers, by use for 1973–74 are shown in table 19.

Clay-shale samples from six counties in the Greater Pittsburgh Region indicate a promising potential as a source of lightweight aggregate as reported in a Phase IV report of the Pennsylvania Geological Survey in cooperation with the U.S. Geological Survey, State Bulletins M-63 and M-51.

The Bureau of Topographic and Geologic Survey of DER is releasing to open file a detailed compilation of sources of coarse aggregate within a 30-mile radius of Franklin and Warren.

Table 19.—Pennsylvania: Clays sold or used by producers, by use[1]
(Short tons)

Use	1973	1974
Common brick	238,078	53,495
Face brick	1,378,052	1,417,532
Firebrick, block, shapes	750,534	707,966
Flue linings	52,236	41,444
Brakes, clutches, linoleum, other fillers	1,858	3,128
Lightweight aggregate	80,000	W
Mortar and cement, refractory	14,286	12,948
Portland and other cements	224,532	172,432
Pottery	490	192
Sewer pipe	98,892	101,988
Floor and wall tile, ceramic	--	6,000
Drain, quarry, structural tile	29,234	33,947
Other uses[2]	41,706	113,853
Exports:		
Face brick	28,171	28,984
Refractories	8,949	9,087
Sewer pipe	28,170	28,984
Total	2,975,188	2,731,980

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Excludes kaolin.
[2] Includes high alumina refractories, refractory grogs and crudes (1973); terra cotta; and data indicated by symbol W.

Graphite.—Three companies collectively produced synthetic graphite used for electric motor brushes and machined shapes, pyrolytic graph plate, and crucibles and vessels. The principal raw materials used for synthetic graphite comprised petroleum coke, lampblack, pitch coke, black oil, hydrocarbon gases, and unspecified additives.

Gypsum.—Crude gypsum was not produced in Pennsylvania during 1974, but was calcined at the United States Gypsum Co. Philadelphia plant. Output and value were approximately 32% less than that in 1973.

Iodine.—Inorganic and organic iodine compounds were produced from crude iodine by the Foote Mineral Co., near Frazer, Chester County; the Whitmoyer Laboratories, Inc., near Myerstown, Lebanon County; and the West Agro-Chemical Inc., near Eighty Four, Washington County.

Lime.—Eight companies produced lime

at 10 plants in 8 counties. Leading counties were Centre, Lebanon, and Butler. Leading producers were Bethlehem Mines Corp. in Adams and Lebanon Counties, Warner Co. in Centre and Chester Counties, and Marblehead Lime Co. in Centre County. Output decreased 8% below the 1973 record, to 2.1 million tons. Among the States, Ohio ranked first and Pennsylvania second in lime production. The lime was used for basic oxygen steel furnaces, water purification, refractory dolomite, electric steel furnaces, and other uses. The lime was consumed in Pennsylvania, Maryland, Ohio, New Jersey, and other destinations. Consumption of lime in Pennsylvania was 2,350,000 tons.

Mullite.—The Remmey Div. of A. P. Green Refractory Co. in Philadelphia County produced high-temperature synthetic mullite.

Perlite.—Crude perlite was shipped into the State and expanded at plants operated by five companies in six counties as compared with seven plants in 1973. Production in 1974 totaled 38,204 tons valued at $2,683,849 and averaged $70.25 per ton. Expanded perlite was sold or used chiefly for roof insulating board and other formed products.

Sand and Gravel.—One hundred and one companies produced sand and gravel at 111 operations in 42 counties. Leading producers were Bucks, Armstrong, Erie, and Beaver Counties, which accounted for 39% of the total quantity and 38% of the total value. The quantity of sand and gravel produced was 12% less, but its value was 5% greater than that in 1973. Average value increased from $2.08 in 1973 to $2.50 per ton.

Of the total sand and gravel produced in 1974, 13,189,000 tons valued at $33,762,000 were sold or used commercially by producers as construction and industrial sand and gravel, the remaining 4,882,000 tons valued at $11,419,000 were sold for publicly funded projects. Nearly one-half of the construction aggregate for public projects went for bituminous paving with highway and bridge construction accounting for 31% of the total, which is shown in table 22.

Table 20.—Pennsylvania: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	18,621	36,211	8,949	20,922
Gravel			7,359	16,838
Unprocessed: Sand and gravel			664	673
Industrial:				
Sand	1,955	6,619	1,099	6,508
Gravel			--	--
Total	20,576	42,830	18,071	44,941

[1] Value data may not be directly comparable to that in tables 1, 21, and 22 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 21.—Pennsylvania: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			5,639	12,977
Highway and bridge construction			749	1,939
Other uses (dams, waterworks, airports, etc.)			257	822
Concrete products (cement blocks, bricks, pipe, etc.)	16,229	32,692	2,437	5,687
Bituminous paving (asphalt and tar paving)			1,219	2,738
Roadbase and subbase			778	1,623
Unprocessed aggregate			661	671
Fill	585	645	160	346
Other uses [2]	1,808	2,874	190	451
Industrial sand and gravel	1,955	6,619	1,099	6,508
Total	[3]20,576	42,830	13,189	33,762

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes miscellaneous (1973).
[3] Data do not add to total shown because of independent rounding.

Table 22.—Pennsylvania: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1974	
	Quantity	Value [1]
Construction aggregate:		
Nonresidential and residential construction	195	440
Highway and bridge construction	1,559	3,510
Other uses (dams, waterworks, airports, etc.)	129	292
Concrete products (cement blocks, bricks, pipe, etc.)	W	W
Bituminous paving (asphalt and tar paving)	2,012	5,487
Roadbase and subbase	696	1,147
Unprocessed aggregate	W	W
Fill	42	89
Other uses	249	454
Total	4,882	11,419

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

The Monongahela and Ohio Dredging Co. of Pittsburgh, retained by the Municipal Authority of New Kensington to dredge away silt clogging its water intakes on the Allegheny River, was dumping the silt into a trench 100 feet long, 40 feet wide, and 25 feet deep causing turbidity in the river and was ordered to stop operations by DER officials.

A Federal-State study concluded that dredging for sand and gravel in the upper Allegheny River is harming fish life. Four firms employing approximately 60 people are currently dredging. In early May, the State Environmental Hearing Board ruled that dredging permits for 1974–75 be issued to the Oil City Sand and Gravel Co. and Warren Sand and Gravel Co. and a permit be issued to the Davison Sand and Gravel Co. for the remaining part of 1974. Several conservation organizations are seeking an end to dredging and the inclusion of the upper Allegheny in the Wild and Scenic Rivers system.

Hummelstown residents located near Harrisburg are concerned with blasting vibrations from the nearby Pennsy Supply Companies quarries. The National Crushed Stone Association's noise and vibration committee is studying more effective ways to control blasting damage vibrations.

Stone.—Pennsylvania was the country's leading stone producer. Adams, Berks, Bucks, Chester, Lancaster, Lebanon, Montgomery, Northampton, and York Counties each produced over 3 million tons. Collec-

tively, these nine counties accounted for 57.6% of the total quantity and 57.0% of the total value. The total output of the 52 producing counties was 6.9% less, but its total value was 6.1% greater than that in 1973. The average value in 1973 was $1.91 per ton as compared to $2.18 in 1974.

Dimension stone produced at 31 quarries in 11 counties accounted for 0.11% of the total tonnage and 3.2% of the total value of all stone produced. The average value of all dimension stone increased to $62.29 per short ton from $45.77 in 1973. The type of dimension stone and the number of producing quarries were as follows: Sandstone 19, slate 7, other stone 3, quartzite 1, and granite 1.

Dimension quartzite, sandstone, and other stone were used primarily for irregular shapes and sawed stone. Slate was primarily used for blackboard and flagging. Slate accounted for 38.4% of the total production of dimension stone and 75.0% of its total value.

Crushed and broken limestone accounted for 73.46% of the tonnage and 72.71% of the total value of crushed and broken stone. The percentage distribution by use of the crushed and broken limestone was as follows: Road aggregates and road-base stone 65.53%, cement manufacture 13.88%, flux stone 5.6%, lime manufacture 6.05%, agricultural uses 2.08%, and all other uses 6.93%. Crushed and broken stone was transported as follows: Truck 83.8%, railroads 7.9%, waterways 2.4%, and other methods 5.9%.

Table 23.—Pennsylvania: Stone sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974			Kind of stone produced in 1974
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Allegheny	3	W	1,122	2	W	351	Sandstone.
Armstrong	5	174	478	4	165	461	Limestone.
Berks	16	5,352	7,983	14	4,180	7,908	Limestone, sandstone, traprock.
Blair	7	1,368	2,559	6	W	3,469	Limestone, dolomite, quartzite.
Bucks	15	5,026	9,902	16	5,174	11,463	Limestone, sandstone, traprock, other stone.
Butler	7	2,004	5,111	7	2,001	5,972	Limestone, sandstone.
Centre	9	2,830	6,226	8	2,910	6,213	Limestone.
Chester	8	4,137	7,311	9	3,803	7,435	Limestone, granite, quartzite, sandstone.
Clarion	4	302	789	4	286	W	Limestone, sandstone.
Cumberland	7	1,947	3,465	7	1,725	3,520	Do.
Dauphin	7	2,630	3,957	3	1,611	3,136	Do.
Fayette	6	W	W	7	1,246	3,284	Limestone, quartzite.
Huntingdon	5	764	1,510	7	W	1,557	Do.
Jefferson	--	--	--	1	35	70	Sandstone.
Juniata	1	275	432	--	--	--	
Lancaster	17	5,696	10,883	17	5,308	11,681	Limestone, dolomite, other stone.
Lawrence	5	1,505	2,622	4	1,442	3,413	Limestone.
Lehigh	9	2,631	4,106	9	2,821	4,815	Limestone, slate.
Luzerne	4	1,039	1,713	4	1,253	2,926	Sandstone.
Monroe	3	W	W	3	769	1,574	Limestone, other stone, sandstone.
Montgomery	14	7,156	13,728	13	6,608	14,105	Limestone, dolomite, granite, other stone, traprock.
Northampton	18	5,757	10,912	17	5,005	10,873	Limestone, dolomite, slate.
Northumberland	3	480	1,029	3	481	922	Limestone, sandstone.
Potter	3	1	30	3	1	W	Sandstone.
Somerset	5	690	W	5	W	W	Limestone, sandstone.
Susquehanna	7	W	724	8	W	916	Sandstone.
Wayne	2	W	W	2	393	843	Do.
Westmoreland	8	2,178	4,951	8	2,046	5,051	Limestone, sandstone.
York	10	4,461	10,339	10	4,670	11,647	Limestone, dolomite, sandstone.
Undistributed [1]	47	20,162	38,461	50	19,158	36,008	Limestone, quartzite, sandstone, traprock, other stone.
Total [2]	255	78,564	150,346	251	73,092	159,615	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes Adams, Bedford, Cambria, Carbon, Clinton, Columbia, Delaware, Elk, Franklin, Fulton, Greene (1973), Indiana (1974), Lackawanna, Lebanon, Lycoming, McKean, Mercer, Mifflin, Montour, Perry, Pike (1974), Schuylkill, Snyder, Tioga (1974), Union, and Washington (1973) Counties, and production for which no county breakdown is available.

[2] Data may not add to totals shown because of independent rounding.

Table 24.—Pennsylvania: Stone sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone:				
Building stone [1]	59	895	39	962
Curbing and flagging	22	634	21	782
Other uses [2]	23	3,277	23	3,469
Total [3]	105	4,806	84	5,213
Crushed and broken stone:				
Bituminous aggregate	7,561	15,301	7,019	15,170
Concrete aggregate	7,363	13,331	5,933	12,086
Dense graded roadbase stone	20,731	34,897	20,026	39,813
Macadam aggregate	1,624	2,960	1,370	2,720
Surface treatment aggregate	3,460	5,284	3,411	6,344
Unspecified construction aggregate and roadstone	11,540	21,759	10,088	19,538
Agricultural purposes [4]	1,499	5,104	2,080	7,366
Cement manufacture	12,045	16,685	10,136	16,633
Lime manufacture	3,634	8,443	4,422	9,862
Filter stone	236	W	264	W
Flux stone [5]	4,087	9,357	4,117	10,521
Glass	90	W	W	W
Manufactured fine aggregate (stone sand)	427	1,167	901	2,611
Mineral fillers, extenders, whiting	728	3,092	267	2,388
Railroad ballast	1,738	2,944	1,033	2,369
Refractory stone	W	W	78	1,045
Riprap and jetty stone	956	1,813	709	1,553
Special uses and products [6]	141	754	113	846
Other uses [7]	601	2,648	1,042	3,536
Total [3]	78,459	145,540	73,008	154,402
Grand total	78,564	150,346	73,092	159,615

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Includes rough blocks (1973), rough construction stone, cut stone, house stone veneer, and dressed construction stone.

[2] Includes roofing slate, millstock, flooring slate, and other uses not specified.

[3] Data may not add to totals shown because of independent rounding.

[4] Includes agricultural limestone and poultry grit and mineral food. 1973 data also include other soil conditioners.

[5] Data include dead-burned dolomite.

[6] Includes mine dusting and abrasives.

[7] Includes stone used in acid neutralization and uses not specified. 1974 data also include chemical stone for alkali works, building products, fill, and waste material.

Sulfur (Recovered).—Four petroleum refineries operated by four companies in Delaware and Philadelphia Counties produced 25,703 long tons of sulfur. Shipments totaling 25,536 long tons averaged $25 per long ton. There was no hydrogen sulfide or sulfur dioxide produced in Pennsylvania during the year.

Tripoli (Rottenstone).—Crude tripoli was produced at one mine in Lycoming County and prepared material sold as filler.

Vermiculite (Exfoliated).—Vermiculite was shipped into the State and exfoliated by Hyzer & Lewellen at Southampton, Bucks County; by W. R. Grace & Co. at New Castle; and by J. P. Austin Associated Inc. in Beaver Falls. The vermiculite was used in horticulture, block fill insulation, pool base, soil conditioner, castable, cryogenic, fertilizer carrier, and plaster aggregate.

METALS

Aluminum.—At the Aluminum Co. of America (Alcoa) Logans Ferry works, 18 employees of the atomizing plant that converts aluminum to a fine powder for paint pigment may be moved to another location because of difficulties in meeting Allegheny County particulate limits. Alcoa also announced in October that an additional 136 employees would be laid off at its Cressona plant near Pottsville bringing the total of laid off employees for the year to 265 due to declining demand for aluminum extrusions.

Beryllium.—After a 2-week strike of 39 technicians in early July, supported by approximately 400 hourly employees of Local 2317 United Steel Workers of America who refused to cross the picket line, operations resumed at the Kawecki-Berylco Industries plant in Reading.

Cadmium.—Smelter production of cadmium decreased 11% in 1974 and value decreased 0.5% as compared with that of 1973 owing to higher product prices. Nationally, Pennsylvania ranked third behind Oklahoma and Colorado in production.

Carbide.—*Silicon Carbide.*—One company in Allegheny County produced artificial abrasives and silicon carbide. Satellite Alloy Corp., Springdale Borough, a producer of silicon carbide was assessed $1,000 under the County Air Pollution Code for failing to have baghouses installed by April 1974 to control air pollution.

Tungsten Carbide.—Kennametal Inc., a hard carbide alloys producer located near Latrobe, expects to spend about $15 million for plant and equipment additions during the year, more than twice the $6 million spent last fiscal year. Additions in Pennsylvania include 10,250 square feet of floor space at the Chestnut Ridge plant for new furnaces; 12,000 square feet at the Kingston plant for new furnaces and powerplant facilities; and new additions to the Bedford plant in fiscal year 1975 to increase output of mining tools.

Ferroalloys.—Nationally Pennsylvania ranked second in the production of ferroalloys. During the year Pennsylvania produced 271,128 tons valued at $96,673,000 as compared with 454,143 tons valued at $96,967,000 in 1973.

Iron Oxide Pigments.—Three plants produced iron oxide pigments in Pennsylvania during 1974. One plant located in Allegheny County produced crude red iron oxide while two plants in the eastern part of the State produced both natural and manufactured iron oxide pigments consisting of brown, red, yellow, and black grades.

Iron Ore.—Bethlehem Mines Corp.'s Cornwall mine No. 3 and No. 4 were permanently closed as a result of flooding caused by Hurricane Agnes in June 1972. Bethlehem is currently operating the Grace underground mine located near Morgantown, Berks County.

Early in September, Bethlehem Steel Corp. announced that the Cornwall plant, located in Lebanon County, that had been closed in 1973 would be reopened to pelletize an estimated 750,000 tons of ore per year for the Steelton and Bethlehem plants.

Production in 1974 at Bethlehem's Grace mine totaled 1,312,896 net tons of pellets and 1,284 net tons of low-grade chalcopyrite. Approximately 494,650 pounds of dynamite and 164,300 pounds of Nylite #303 were used during the year.

Iron and Steel.—Shipments of pig iron in Pennsylvania in 1974 totaled 21.77 million tons valued at $2,577,311,000. At the beginning of 1974, 36 blast furnaces were operating and 17 were out of blast for a total of 53 furnaces as compared to 34

operating furnaces and 16 idle at the end of December. Types of pig iron produced were basic, bessemer, malleable, and direct castings having an average value per short ton of from $116.14 to $125.24 as shown in table 25.

Table 25.—Pennsylvania: Pig iron production, shipments, and stocks in 1974

Type	Production (short tons)	Shipments (short tons)	Value	Average value
Basic	20,569,506	20,650,081	$2,442,304,397	$118.27
Bessemer	673,733	672,377	78,090,000	116.14
Malleable	451,515	454,125	56,875,300	125.24
Direct castings	332	332	41,294	124.38
Total	21,695,086	21,776,915	2,577,310,991	118.35

During the first week in May steelmakers in the Pittsburgh district set an alltime weekly record high of 475,000 tons of raw steel or 123% of the 1967 average, which is within 1% or 2% of theoretical capacity in the area. Production is expected to drop slightly owing to relining of furnaces in the coming months.

Financing for pollution control projects by United States Steel is through tax-free bonds approved by the Industrial Development Authority (IDA) of Allegheny County. On February 7, IDA had approved an $850,000 wet electrostatic precipitator at the United States Steel Duquesne works while the County Air Pollution Variance Board had granted an extension on emission controls until June 8, 1974, for two basic oxygen furnaces, one at Duquesne and the other at Edgar Thomson. At United States Steel's Clairton works, a $3 million enclosure for "coke wharves" on the discharge side of the No. 17 coke battery will be installed to control emissions. The exhaust gas cleaning project at the Homestead works will involve installation of 19 new dust collection hoppers on the electric precipitators and new equipment to increase the fan capacity. United States Steel's $27 million waste water treatment plant at the Clairton works capable of cleaning 2.5 million gallons of process water daily will be completed in 1975. The Environmental Protection Agency has requested information from both United States Steel and Bethlehem on steel production waste water treatment processes and costs in connection with future effluent guidelines for the industry.

Environmental experts from four of the major steel producing companies have indicated difficulties in complying with the Clean Air Act and suggest compliance be extended for a 3-year period. In September the Commonwealth Court issued an order to United States Steel to prove that it cannot meet key provisions of the air pollution agreement signed with county and State officials 2 years ago. In early October, United States Steel was fined a total of $4,088 after losing an argument in an air pollution case that technical equipment is more reliable than the human eye.

At Bethlehem's Johnstown plant, officials predict a phasing out of the operation, but relaxed State pollution control requirements with a company investment of $100 million in pollution control equipment could keep the plant operating until 1983, with some facilities shutting down at an earlier date. Meanwhile EPA and DER have ordered Bethlehem to reduce by about 90% the pollution discharged into the Conemaugh River. Bethlehem announced plans for a $3.75 million water pollution control system on the blast furnace making ferromanganese and the installation by 1978 of two modern, efficient basic oxygen furnaces (BOF) enabling the Johnstown plant to maintain its capacity at about 2.3 million tons of raw steel per year; the cost of the BOF furnaces were not made available by Bethlehem.

At the Steelton plant a second baghouse dust control system is being installed at the plant's electric furnace melt shop. The new baghouse is 206 feet long, 80 feet wide, and 123 feet high and operates much like a home vacuum cleaner. In December, 750 of the 17,000 employees of the Bethlehem plant were idled due to a shortage of coal resulting from contract negotiations between the coal producers and the UMWA.

Jones & Laughlin's (J&L) Hazelwood plant was fined $100,000 by the County Health Department's Air Pollution Control Bureau for violation of pollution standards and failing to begin construction of desulfurization control equipment by March 1, 1974. J&L plans to appeal the fine. In November, J&L pleaded guilty to two air pollution charges involving excessive smoke discharges from the plant and was fined a total of $700 by a justice of the peace. In another pollution case J&L's Hazelwood plant was found not responsible for naphthalene entering the water intakes of Western Pennsylvania Water Co.'s Becks Run plant, but J&L was found guilty of a 90-minute leak of naphthalene from a crack in the service trench on October 30 resulting in violation of the State's Clean Stream law.

Crucible Steel plans to limit the amount of cyanide discharged into the Ohio River from its Midland plant, to build a treatment plant to handle all waste discharges from the hot and cold strip mills, and to limit its discharge of phenols into the river to less than 100 pounds per day.

Wheeling-Pittsburgh Steel Corp. has agreed to limit discharges of cyanide and phenols into the Monongahela River from its Monessen plant and to construct a partially closed water pollution control system to prevent discharges from coke ovens and blast furnaces into the river.

Allegheny Ludlum Steel Corp. completed a $1.7 million water reclamation system at its Brackenridge plant that returns the used water to the Allegheny in a pollution-free condition.

Lukens Steel Co., Coatesville, started operation in early February of a new 150-ton-capacity electric furnace equipped with a direct evacuation dust control system, a secondary canopy system, a new baghouse, and a closed-loop water system costing $20 million.

J&L Steel Corp., the Nation's sixth largest steel producer, announced in March a new method of shrouding the liquid steel being poured into a continuous casting machine that prevents harmful oxidation of the steel. The "Pollard shroud" is being used at the Aliquippa works. In early May J&L announced a $200 million program for the Aliquippa works to be completed in 2 to 4 years, which would add 1 million tons to the plant's present 4-million-ton capacity by adding equipment to increase output of the BOF furnace, installing a second blooming mill, adding tubular products finishing facilities, and improving coke ovens and blast furnaces. Other J&L improvements include a contract to Wean United for a plant to process and regenerate pickle liquor at an out-of-State operation, a contract with Eichleary Corp. for demolition of an open hearth at the Aliquippa works, and the dismantling of an existing soaking pit by Swindell-Dressler Co.

J&L will discontinue production of "general line" cold-rolled steel sheet at the Pittsburgh works by December 1, but this line will be continued at other more modern company plants.

One of the United States Steel's Duquesne blast furnaces built in 1890 is being dismantled and remelted at a nearby BOF. Other changes included phasing out of the seamless tube mills at Ellwood City with consolidation at the Gary, Ind., plant, and banking a blast furnace at the National Tube Works located in McKeesport because of the coal strike.

United States Steel will have relining complete on its "Dorothy" furnace by late September while emergency repairs to furnace bells were made at one furnace located at the Homestead works. Relining of another furnace at the Edgar Thomson works took place in November, and the company also announced a second furnace to be banked at Edgar Thomson and two others at the Clairton works devoted to making ferromanganese. By late November, United States Steel had banked 17 blast furnaces with coke production reduced by over 50%.

Steel production in the Pittsburgh district continued to drop during the latter part of the year because of the coal strike. Wheeling-Pittsburgh Steel will shut down the largest blast furnace at the Monessen works for 2 months for relining.

Bethlehem Steel Corp. announced relining of a furnace located in Bethlehem, Pa.

Bethlehem announced in early July plans for installation of two electroslag remelt (ESR) furnaces at its Bethlehem plant. The furnaces will produce steel ingots in various alloys, up to 60 inches in diameter and weighing a maximum of 150,000 pounds, for the electrical industry, which requires improved quality material.

Universal Cyclops Specialty Steel Div.,

Cyclops Corp., has also purchased an ESR furnace to be installed at its Bridgeville plant, that will double output of electroslag refined specialty alloys; production is scheduled for late 1975.

Lukens Steel's Coatesville, Pa., plant has recently installed an ESR furnace producing over 140 heats without requiring any maintenance or repairs.

In Reading, Pa., Carpenter Technology Corp. has awarded Dravo Corp. a contract for the design and fabrication of an ESR furnace, which will give Carpenter three such furnaces. Dravo is the exclusive licensee in the United States and Canada for Behr Boehler and Co., Vienna, Austria, developer of the ESR furnaces.

In October, Armco Steel Corp. announced plans to increase iron and steel production at its Ashland, Ky., plant by one-half million tons per year with a substantial portion to be shipped to its Butler and Ambridge, Pa., plants. The Ambridge plant will increase tubular products for oil and gas drilling by 40,000 tons a year.

Babcock and Wilcox's Tubular Products Div. located at Beaver Falls has a new 25-ton-per-cycle argon-oxygen refining unit used to refine stainless steels plus other high-chromium and chrome-containing alloys vital to production of steel tubular products. An electroslag remelting furnace is also being installed as part of the modernization program. Late in the year the DER ordered the Tubular Products Div. to convert 3 of the plant's 11 boilers that used 2% sulfur coal for the past 26 years to oil or gas. The other eight boilers are currently fueled by either oil or gas.

In August, Lukens announced an improvement and expansion program to meet customers' requirements for heavy, heat-treated, alloy plate steel costing $14 million.

The Washington Steel Corp. located at Washington has contracted for $18 million a construction project for a new hot rolling mill and related equipment. In Pittsburgh the Pittsburgh Forgings Co. purchased the Janney Cylinder Co. of Philadelphia, a major producer of metals castings by a centrifugal process, for approximately $2.5 million.

The Alan Woods Steel Co. Conshohocken plant producing about 1.2 million tons of steel plate a year was shut down between May 1 and May 25 while a new labor contract was being negotiated. In early July, Alan Woods began to convert or roll semi-finished steel for several other mills because of additional plant rolling capacity. A $7 million project to boost the plant's ironmaking capacity from 2,038 tons to 2,248 tons, or a 11% increase, by replacing three air heating stoves and installing a new car damper was announced in late July of 1974 and in August. Creusot-Loire, a French steel producer, obtained a 10% interest in the Conshohocken plant, which is the first such investment in an American steel company according to steel industry sources.

To meet future needs of the steel industry, Chemetron Corp.'s Sharon, Pa., plant is being expanded to add 250 tons of liquid oxygen, nitrogen, and argon and 215 tons of gaseous oxygen and nitrogen per day to bring the plant's total daily capacity to over 1,200 tons.

NVF Co., which currently owns about 85% of Sharon Steel Co. stock, is considering acquisition of the remaining 15% resulting in the merger of a NVF subsidiary with Sharon Steel and the issuance of a new series of subordinated debentures in exchange of outstanding Sharon common stock.

The beginnings of the steel industry can be traced to the 500 iron furnaces scattered throughout the eastern half of the United States. Over 200 years ago the Cornwall and Hopewell Furnaces were the early iron producers in Pennsylvania. The Cornwall Furnace is now operated by the Pennsylvania Historical and Museum Commission while the Hopewell Furnace, located south of Birdsboro, Pa., is being restored by the National Park Service and it will play an important role in the Nation's 200th birthday celebration in 1976. Recently Bethlehem Steel Corp. donated to the Hopewell Furnace 250 tons of iron ore from the nearby abandoned Cornwall Mine which introduces more realism into the restoration of early iron industry in Pennsylvania.

In western Pennsylvania, the Laurel Hill Furnace built in 1845 and located in Westmoreland County was given to the Western Pennsylvania Conservancy by the Charles L. Reidenour family of New York State to be used as a historical monument when transferred to the Pennsylvania Historical and Museum Commission.

Lead.—St. Joe Minerals Corp. will test

the Queneau-Schuhman (Q-S) process for direct production of lead bullion from sulfide concentrates at its research center in Monaca. The Q-S process eliminates sintering and blast furnace operations by continuously converting galena mineral to lead bullion in a single bottom blown reactor.

Nickel.—The Westinghouse Specialty Metals Div., employing about 400 people at Blairsville, will spend $8.5 million to double the size of the special nickel alloy tube mill that manufactures tubing (Westro) used in nuclear steam generators. Last year an expansion took place in the Zircolay seamless tubing division that manufactures tubing or fuel rods containing pellets of uranium dioxide for nuclear reactor core fuel assemblies.

Silver–Copper.—The Hussey Metals Div. of Copper Range Co., Leetsdale, plans to sell a new super silver-copper alloy, No. 155, comprised of 99.8% copper, 0.04% silver, 0.05% phosphorus, and 0.11% magnesium, which possesses strength and thermal, electrical, and mechanical properties not previously available.

Uranium.—Exxon Corp. is considering exploration for uranium on State Game Lands in Luzerne and Carbon Counties, but sportsmen in that area are opposed to exploration, which may open the land to extensive mining and reduce hunting areas.

Zinc.—New Jersey Zinc Div. of Gulf & Western Industries plans to modernize its Palmerton zinc plant which includes improved mix houses, changes in the roasting and acid plants, mechanization of bagroom oxide handling, revisions of materials handling systems, and new dust control facilities in addition to increases in production capacity for the French process and American process zinc oxide operations.

At the other end of the State, the St. Joe Minerals Corp. Monaca zinc smelter had difficulties meeting the State's air pollution standards and has appealed DER's regulations.

The State's production of primary zinc came from the New Jersey Zinc underground Friedensville mine near Bethlehem where a zinc sulfide replacement ore body in dolomitic limestone was mined by the open slope and room-and-pillar methods. This mine is ranked eighth in the Nation in order of output.

Pennsylvania ranks seventh in the Nation producing 20,288 short tons of zinc valued at $14,567,000, a production increase of 7.5% over 1973. The unit price for zinc in 1974 was $0.3590 per pound or $718.00 per ton.

Pennsylvania Geological Survey data shows a limonite sample taken in an abandoned iron mine in the Beekmantown Group of Blair County to contain 1.6% zinc. Trace element analyses of limonite occurrences in approximately 50 abandoned iron mines of central and southeastern Pennsylvania suggest the presence of zinc.

Table 26.—Pennsylvania: Principal producers

Commodity and company	Address	Type of activity	County
Abrasives: Satellite Alloy Corp.	9800 McKnight Rd. Pittsburgh, Pa. 15237	Plant	Allegheny.
Cement:			
Amcord, Inc.[1]	610 Newport Center Dr. Newport Beach, Calif. 92660	do	Northampton.
Coplay Cement Manufacturing Co.[1]	Nazareth, Pa. 18064	do	Lehigh and Northampton.
Keystone Portland Cement Co.[2]	Box 1785 Allentown, Pa. 18105	do	Northampton.
Louisville Cement Co	501 South Second St. Louisville, Ky. 40202	do	Lawrence.
Medusa Corp.[1 2]	Box 5668 Cleveland, Ohio 44101	do	Lawrence and York.
Penn-Dixie Industries, Inc.[1 2]	60 East 42d St. New York, N.Y. 10017	do	Butler and Northampton.
United States Steel Corp.[1 3]	600 Grant St. Pittsburgh, Pa. 15230	do	Allegheny and Northampton.
Clays:			
Dresser Industries, Inc	P.O. Box 6504 Houston, Tex. 77005	Pit	Clearfield and Somerset.
Glen-Gery Corp	227 North 5th St. Reading, Pa. 19601	Pit	Adams, Berks, Northumberland, Union, York.
Hanley Co	28 Kennedy St. Bradford, Pa. 16701	Pit	Jefferson and McKean.
Resco Products	Box 108 Morristown, Pa. 19404	Pit	Clearfield and Huntingdon.
Coal, anthracite:			
Greenwood Stripping Corp	1 Venice St. Nesquehoning, Pa. 18240	Strip	Carbon and Schuylkill.
Jeddo-Highland Coal Co	800 Exeter Ave. West Pittston, Pa. 18643	Strip and culm bank.	Luzerne.
Leon E. Kocher Coal Co	Box 127 Valley View, Pa. 17983	Underground	Schuylkill.
Reading Anthracite Co	200 Mahantongo St. Pottsville, Pa. 17901	Culm bank and strip.	Northumberland and Schuylkill.
Coal, bituminous:			
Barnes & Tucker Co	357 Lancaster Ave. Haverford, Pa. 19041	Underground	Cambria.
Bethlehem Mines Corp.[4]	701 East 3rd St. Bethlehem, Pa. 18016	do	Cambria and Washington.
C&K Coal Co	Box 69 Clarion, Pa. 16214	Strip	Clarion.
Pittsburgh Coal Co	Box 500 Library, Pa. 15129	Underground	Washington.
Graphite, synthetic:			
Air Reduction Co., Inc	Theresia St. St. Marys, Pa. 15857	Plant	Elk.
Charles Pfizer & Co., Inc.[1]	235 East 42d St. New York, N.Y. 10017	do	Northampton.
Stackpole Carbon Co	St. Marys, Pa. 15857	do	Elk.
Gypsum, calcined: United States Gypsum Co.[5]	101 South Wacker Dr. Chicago, Ill. 60606	do	Philadelphia.
Iron oxide pigments:			
The Prince Manufacturing Co.	Bowmanstown, Pa. 18030	do	Carbon.
Reichard-Coulston, Inc	15 East 26th St. New York, N.Y. 10010	do	Northampton.
Lime:			
Bethlehem Mines Corp	701 East 3rd St. Bethlehem, Pa. 18016	do	Adams and Lebanon.
Marblehead Lime Co	300 W. Washington Chicago, Ill. 60606	do	Centre.
Warner Co	1721 Arch St. Philadelphia, Pa. 19103	do	Centre and Chester.
Peat:			
Gouldsboro-Wayne Peat Co	Box 68 Gouldsboro, Pa. 18424	Moss	Wayne.
Lake Benton Peat Moss	1418 North Main St. Scranton, Pa. 18508	Bog	Lackawanna.
Perlite, expanded:			
Armstrong Cork Co	Lancaster, Pa. 17603	Plant	Lancaster.
Atlantic Perlite	Box 345 Primose, Pa. 19018	do	Delaware.
Pennsylvania Perlite Corp	Box 2002 Lehigh Valley, Pa. 18001	do	Lehigh and York.

See footnotes at end of table.

Table 26.—Pennsylvania: Principal producers—Continued

Commodity and company	Address	Type of activity	County
Perlite, expanded —Continued			
Perlite Manufacturing Co	Box 478 Carnegie, Pa. 15106	Plant	Allegheny.
Petroleum refineries [6]			
Sand and gravel:			
Davison Sand & Gravel Co	34th Ave. and 4th St. New Kensington, Pa. 15068	Dredge	Westmoreland.
Dravo Corp	One Oliver Plaza Pittsburgh, Pa. 15222	---- do	Beaver.
Erie Sand Steamship Co	Erie, Pa 16500	---- do	Erie.
Lycoming Silica Sand Co.[1]	401 Broad St., Box 159 Montoursville, Pa. 17754	Pit	Lycoming.
Shippingport Sand & Gravel Co.	1200 Slambaugh Bldg. Youngstown, Ohio 44501	Pit	Armstrong.
Warner Co.[1]	1721 Arch St. Philadelphia, Pa. 19103	Pit	Bucks.
Stone:			
G. & W. H. Corson, Inc.[7]	Plymouth Meeting, Pa. 19462	Quarry	Montgomery.
The General Crushed Stone Co.	712 Drake Bldg. Easton, Pa. 18042	---- do	Bucks, Chester, Delaware, Lancaster, Luzerne, Perry.
Glasgow Quarry, Inc	Route 2, Box 121 Glasgow, Mo. 65254	---- do	Montgomery.
Martin-Marietta Corp	11300 Rockville Pike Rockville, Md. 20852	---- do	Centre, Chester, Fayette, Northampton.
New Enterprise Stone & Lime.	New Enterprise, Pa. 16664	---- do	Bedford, Blair, Cumberland, Franklin, Huntingdon, Somerset.
Sulfur:			
Atlantic Richfield Co	3144 Passyunk Ave. Philadelphia, Pa. 19145	Plant	Philadelphia.
British Petroleum Corp., Ltd.	Box 428 Marcus Hook, Pa. 19061	---- do	Delaware.
Gulf Oil Corp	Box 7408 Philadelphia, Pa. 19101	---- do	Philadelphia.
Sun Oil Co	1608 Walnut St. Philadelphia, Pa. 19103	---- do	Delaware.
Tripoli, rottenstone:			
Keystone Filler & Manufacturing Co.	Muncy, Pa. 17756	Pit	Lycoming.
Vermiculite, exfoliated:			
Hyzer & Lewellen	Box 155 Southampton, Pa. 18966	Plant	Bucks.
W.R. Grace & Co	62 Whittemore Ave. Cambridge, Mass. 02140	---- do	Lawrence.

[1] Also stone.
[2] Also clays.
[3] Also coal.
[4] Also iron ore.
[5] Also expanded perlite.
[6] Many major oil companies operate oil refineries in Pennsylvania and several commercial directories contain lists of them.
[7] Also lime.

The Mineral Industry of Puerto Rico

The Puerto Rico section of this chapter has been prepared through cooperation among the Bureau of Mines and the Geological Survey, U.S. Department of the Interior, and the following Commonwealth of Puerto Rico agencies: Department of Natural Resources, Economic Development Administration (Fomento), and Office of Petroleum Fuels Affairs.

By Charles D. Hoyt [1]

PUERTO RICO

Most segments of the Puerto Rican economy suffered decreased activity as a result of inflation, tight money supply, and the general impact of recession. In Puerto Rico the construction industry, which consumes most of the minerals produced, was particularly affected by these factors as well as by unusually unfavorable weather.

[1] Assistant Chief, State Liaison Program.

Table 1.—Mineral production in Puerto Rico [1]

Mineral	1973		1974	
	Quantity (thousand short tons)	Value (thousands)	Quantity (thousand short tons)	Value (thousands)
Cement, portland	2,062	$41,203	1,881	$70,277
Clays	464	473	291	382
Lime	42	2,215	39	2,923
Salt	29	580	29	624
Sand and gravel	7,480	21,243	NA	NA
Stone	15,647	r 41,857	14,362	41,640
Total	XX	r 107,571	XX	115,796
Total 1967 constant dollars	XX	78,860	XX	p 55,374

p Preliminary. r Revised. NA Not available. XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of mineral production in Puerto Rico, by District
(Thousands)

Senatorial District	1973	1974 [1]	Minerals produced in1974 in order of value
Aguadilla	W	$271	Stone.
Arecibo	$851	35	Do.
Guayama	244	--	
Humacao	118	--	
Mayaguez	3,347	2,701	Stone, salt.
Ponce	23,054	41,259	Cement, lime.
San Juan	29,330	38,360	Cement, stone, clays.
Undistributed [2]	50,626	33,167	
Total [3]	r 107,571	115,796	

W Withheld to avoid disclosing individual company confidential data included with "Various."
[1] Sand and gravel production values are not available.
[2] Stone values which cannot be assigned to specific districts.
[3] Data may not add to totals shown because of independent rounding.

Since the island exists almost totally on imports of all products, including fuels, the sudden Organization of Petroleum Exporting Countries (OPEC) price increases had an unusually serious impact on the economy. At yearend island official unemployment rates were approaching one-fifth of the labor force.

The single most important event in 1974 concerning the mineral resource area was implementation of the mandatory allocation program for most petroleum products under the Emergency Petroleum Allocation Act of 1973. While this legislation clearly covered Puerto Rico, it did not provide any specific details as to how Puerto Rico subsidiaries of major U.S. oil firms were to be treated. Under this law allocation and price controls of most petroleum products went into effect on January 15, 1974.

During the first year of Federal controls over petroleum products, there were no shortages in Puerto Rico. Distribution problems were encountered from April–July 1974 when a Texaco Puerto Rico Inc. strike reduced normal transportation capability by 25%. However, major difficulties occurred in applying and enforcing Federal pricing regulations. Federal Energy Administration (FEA) pricing decisions forced island major distributors to be treated as "refiners" hence, Puerto Rican costs were merged with total U.S. corporate costs resulting in an annual estimated saving to Puerto Rican consumers of $150–$155 million. On November 1, 1974, under a special order issued by FEA, the Commonwealth of Puerto Rico assumed control over allocation of petroleum product requirements for the island, except for aviation gasoline. Pricing controls remained under Federal jurisdiction at yearend.

Controversy continued to surround the possible exploitation of the porphyry copper deposits in central Puerto Rico. In mid-1974 recommendations were submitted to the Governor by the Secretary of Natural Resources for a variety of options concerning their development. Shortly thereafter, the Secretary of Natural Resources was replaced and at yearend the new Secretary was reorganizing the Department and the copper situation remained at an impasse.

In November 1974, the Department of Natural Resources received a proposal from Universal Oil Products Co. for the development of nickel laterite ores in southwestern Puerto Rico. The Department is working on the further development of this proposal.

At the end of 1974 the Department of Natural Resources reported six exploration permits in effect. Details concerning the permits are shown in table 3.

Table 3.—Exclusive prospecting permits in Puerto Rico
(December 31, 1974)

Permit holder	Date	Parent Co.	Minerals
Puerto Rico Petroleum Exploration Corp.	July 14, 1968	----------	Gas and oil.
Oceanic Exploration Co ----------	Sept. 24, 1971	Eastman Dillon Union Securities & Co., Inc.	Do.
Corbe Caribe S.A.[1] ----------	Aug. 5, 1958	Kennecott Copper Corp ----------	Copper.
Ponce Mining Co.[1] ----------	May 15, 1961	American Metal Climax Inc ----	Do.
Oceanic Exploration Co ----------	Oct. 27, 1970	Eastman Dillon Union Securities & Co., Inc.	Do.
Parnasse Delaware Co ----------	Oct. 27, 1971	Parnasse Delaware Co ----------	Do.

[1] Application has been made for a mining lease.

Government Programs.—U.S. Geological scientists from the Environmental Geology group continued their cooperative mapping program in 1974 with the Department of Natural Resources. During the year revised large-scale (1:20,000), general purpose geologic maps were published for nine quadrangles: Coamo, Corozal, Penuelas, Rio Descalabrado, Utuado, Cayey, Patillas, Camuy, and Quebradillas. In addition, one open file report on Mona Island,[2] a new geologic map,[3] and a contribution to stratigraphy[4] were published.

The Caribbean District of the Water Resources Division of the U.S. Geological Survey issued one open file report[5] and three published reports.[6] Surface-water, ground water, and water quality data-collection networks were continued. Hydrologic studies were underway in seven areas: (1) The south coast of Puerto Rico; (2) the Maunabo Basin; (3) the San Juan Lagoons; (4) Lago Loiza; (5) the proposed copper-mining area of Utuado-Lares; (6) the Lajas Valley; and (7) the north-coast limestone area. Also flood inundation mapping was being performed at a number of sites, a flood-frequency study of Puerto Rico was started, and a water-resources planning model was completed.

NONMETALS

Cement.—Production and shipments of cement in 1974 declined 4% to 9% respectively due to decreased business activity, strikes, power outages, and unfavorable weather. The output of the major producer, Puerto Rican Cement Co., Inc., with plants at San Juan and Ponce, provided 78% of the gray cement output (over 34 million bags). The firm's sales of cement in the Caribbean area and continental United States increased to 11% and 6%, respectively, of total sales. Despite modest price increases in January, April, and July granted by the Puerto Rican Department of Consumer Affairs, Puerto Rican Cement reported a loss of over $877,000 in 1974.[7] At yearend the price of bagged cement was $2.239 per bag and bulk cement $1.979 per bag. In Puerto Rico about 47% of the sales in 1974 were in bagged form. In August Puerto Rican Cement reached an agreement with the Environmental Protection Agency to install $15 million in air pollution abatement equipment over the next 2 years. A loan for the project was being negotiated from the Government Development Bank of Puerto Rico. The loan would be repaid over a 15-year period from an escrow account obtained from price increases granted to the firm. The firm also produced slightly over 79,000 tons of ready-mix mortar in 1974, down from 88,540 tons in 1973.

San Juan Cement Company, the newest producer, completed installation of its third kiln which expanded its capacity about 1,200 tons per day. The new kiln and associated equipment went on stream in August.

[2] Briggs, R. P. Economic Geology of the Isla de Mona Quadrangle. U.S. Geol. Survey, Open File Rept., 1974, 116 pp.

[3] Glover, Lynn, III, and P. H. Mattson. Geologic Map of the Rio Descalabrado Quadrangle, Puerto Rico, U.S. Geol. Survey, Misc. Geol. Inv. Map No. I-735, 1974.

[4] McIntyre, D. H. Concepcion and Palma Escrita Formations, Western Puerto Rico. U.S. Geol. Survey Bull. 1394-D, 1974, p. D1—D9, (contributions to stratigraphy).

[5] Diaz, J. R. Coastal Salinity Reconnaissance and Monitoring System—South Coast of Puerto Rico 1974. U.S. Geol. Survey Open File Rept., 1974, 28 pp.

[6] U.S. Geological Survey. Water Resources Data for Puerto Rico. Pt. 1, Surface Water Records for 1969, 1970, and 1971-74.

[7] Puerto Rican Cement Co., Inc. Annual Report, 1974, p. 2.

Table 4.—Puerto Rico: Portland cement salient statistics

		1973	1974
Number of active plants		3	3
Production	short tons	2,059,956	1,971,448
Shipments from mills:			
Quantity	short tons	2,062,204	1,881,284
Value		$41,202,918	$70,276,653
Stocks at mills, Dec. 31	short tons	44,866	43,089

Table 5.—Puerto Rico: Stone sold or used by producers

(Thousand short tons and thousand dollars)

Year	Dimension limestone		Crushed limestone	
	Quantity	Value	Quantity	Value
1970	101	292	5,549	9,777
1971	142	441	9,662	15,856
1972	139	426	10,194	17,033
1973	162	859	11,631	22,153
1974	223	1,023	10,546	21,682
	Miscellaneous stone [1]		Total [2]	
	Quantity	Value	Quantity	Value
1970	1,646	3,878	7,296	13,947
1971	2,326	13,550	12,130	29,847
1972	3,171	15,333	13,504	32,793
1973	3,854	18,844	15,647	41,586
1974	3,593	18,933	14,362	41,640

[1] Includes granite (1970), marble, traprock (1971–74), and other stone.
[2] Data may not add to totals shown because of independent rounding.

Table 6.—Construction activity in Puerto Rico

(Million dollars)

Type of construction	Fiscal Year [1]		
	1972 [r]	1973 [r]	1974
Dwellings:			
Private	353.1	358.9	332.0
Public	97.8	75.5	118.3
Total	450.9	434.4	450.3
Industrial and commercial:			
Private	332.1	207.4	247.7
Public	268.7	228.0	307.2
Total	600.8	435.4	554.9
Roads, schools, other public works:			
Puerto Rican Government	214.1	216.7	209.0
Municipalities	21.9	24.6	37.7
Total	236.0	241.3	246.7
Grand total	1,287.7	1,111.1	1,251.9

[r] Revised.
[1] Fiscal year July 1 to June 30.

Source: Puerto Rico Planning Board.

General construction activity in Puerto Rico declined considerably in 1974, despite dollar expenditures that increased almost 13%, as shown in table 6. The most notable declines were in the private housing sector and in Puerto Rican Government expenditures.

METALS

Copper.—Negotiations that could lead to a 48,000 ton-per-year copper industry based on central Puerto Rican deposits were continued during 1974 with no conclusive agreement.

Nickel.—During the last quarter of the year the Department of Natural Resources received a proposal by the Universal Oil Products Company (UOP) to complete an evaluation of the nickel laterite ores of Guanajibo in southwestern Puerto Rico and to carry out a mining development utilizing a new process of extracting nickel patented by UOP.

MINERAL FUELS

Imports of crude and unfinished oil as feedstock to refiners and petrochemical producers increased 2% from those in 1973 and averaged 338,852 barrels per day. Residual fuel oil and and finished products amounting to 22,737[8] barrels per day were also imported during the year for direct consumption. During fiscal year 1974 imports of petroleum, natural gas, and related products from foreign countries and the Virgin Islands were valued at $927.1 million. Various petroleum and related organic chemical products valued at $77.6 million were shipped to Puerto Rico from the United States during the same period. The United States was the destination for $750.3 million worth of various products shipped from Puerto Rico, including $251.5 million in natural gasoline and blending agents, $163.4 million in distillate fuel oils, $210.6 million in organic chemicals, $97.1 million in mineral tar and crude chemicals from petroleum, and $0.02 million in ethyl alcohol. Shipments to other destinations were valued at $131.2 million, over half inorganic chemicals. Export values in fiscal year 1974 were up 106% from those in 1973.

Commonwealth Oil Refining Co., Inc. (CORCO), the island's largest refiner and petrochemical processor, reported the processing of a total of 59.8 million barrels of crude and other feedstocks valued at $743.3 million in 1974 compared with 62.2 million barrels valued at $268.4 million in 1973. CORCO in 1974 obtained approximately 49% of the crude oil processed in its plants from Venezuela; approximately 16% from Algeria; and the remaining quantities from other African and Mideast sources. Towards the end of 1974, the company discontinued lifting Algerian crude oil and condensate because of pricing policies of the Algerian Government.[9]

Puerto Rico Sun Oil Company imported for processing at its Yabucoa refinery a total of 21.5 million barrels of crude oil during 1974. By source, Sun obtained approximately 46% from Venezuela, 34% from Persian Gulf countries, 15% from North Africa, and 5% from other sources, mainly Mexico and Equador. Caribbean Gulf imported 12.3 million barrels of crude oil during 1974 for processing at its Catano refinery near San Juan. Of this total 46% came from Venezuela and 54% from Ecuador. During 1974 total capacity of Puerto Rican refineries increased to 285,000 barrels per day, divided as follows: CORCO 160,000 barrels per day; Gulf 40,000 barrels per day, and Sun 85,000 barrels per day. Based on total crude oil imports of 72.5 million barrels, local refineries operated at approximately 70% of capacity during 1974.

Table 7 shows involvement of major companies in the Puerto Rican petrochemical industry. Besides basic refining, CORCO maintained a 50% interest in three joint petrochemical ventures: Hercor Chemical Corp., Oxochem Enterprise, and Puerto Rico Olefins Co. Late in 1974 CORCO and W. R. Grace & Co. announced a 50% expansion of Oxochem Enterprise which will increase production of oxoalcohols to 425 million pounds per year by 1976. Also during 1974 construction proceeded on a $41 million isoprene plant, a joint venture between CORCO, Nippon Zeon Co., and Mitsubishi. The plant is scheduled for completion in the fall of 1975. Also scheduled for completion in 1975 is the 160-million-pound-per-year polyvinyl chloride (PVC) plant being con-

[8] Preliminary figures due to estimation in the item "others" which forms part of the unfinished oil and finished products categories.
[9] Commonwealth Oil Refining Company, Inc. 1974 Annual Report, 36 pp.

structed at Guayanilla by Rico Chemical Corp.

Union Carbide Caribe, Inc., completed an olefins plant and units for making butadiene, ethylene oxide, and polyethylene at Penuelas in December 1971 and later in 1972 began operations of units at the same location for making cumene, glycol ethers, and phenol, acetone, and bisphenol products. Union Carbide's estimated $400 million Puerto Rican petrochemical facility reportedly had the following capacities, in million pounds: Ethylene, 775; ethylene oxide, 450; ethylene and triethylene glycols, 630; LD polyethylene, 300; propylene, 360; cumene, 640; phenol, 200; acetone, 120; bisphenol-A, 70; and butadiene, 60. Union Carbide Caribe, Inc., is presently expanding its olefins facilities to approximately 1 billion pounds per year of ethylene. The company is also expanding the oxoalcohols facilities to 220 million pounds per year. Incremental expansions are underway in ethylene oxide and glycol. An acetylene black plant of approximately 10 million pounds per year is scheduled for early 1976 completion.

Table 7.—Refining and petrochemical industry in Puerto Rico [1]

Basic Producers:	
Petroleum refiners	Commonwealth Oil Refining Co., Inc. (CORCO).
	Puerto Rico Sun Oil Co. (Sun Oil Co.).
	Caribbean Gulf Refining Corp. (Gulf Oil Corp.).
Basic petrochemical producers	Commonwealth Petrochemicals, Inc. (CORCO).
	Puerto Rico Olefins Co. (CORCO–PPG Industries, Inc.).
	Phillips Core, Inc.
	Union Carbide Caribe, Inc.
	Peerless Petrochemicals (P.R.) Inc. (Peerless Oil & Chemical Corp.).
	Hercor Chemical Corp. (CORCO–Hercules, Inc.).
Basic chlor-alkali producer	PPG Industries, Inc. (PPG).
Principal intermediate producers:	
Petrochemical processors	Union Carbide Caribe, Inc.
	Phillips Core, Inc.
	Oxochem Enterprise (CORCO–W. R. Grace & Co.).
	PPG Industries.
	CORCO Cyclohexane.
	Puerto Rico Chemical Co., (Hooker Chemical Corp.).
	Styrochem Corp. (CORCO).
Chlor-alkali processors	PPG Industries.
Producers of semifinished products	Reichhold Chemical del Caribe, Inc.
	International Corry Foam.
	Products (Firestone Foam & Rubber Products Div.).
	Fibers International Corp. (Phillips Petroleum Co.).
	Union Carbide Caribe, Inc.

[1] Based on report of Commonwealth of Puerto Rico, Economic Development Administration, May 1974.

VIRGIN ISLANDS

The U.S. Virgin Islands, located in the Caribbean, are about 40 miles east of Puerto Rico. They consist of some 50 islands and cays which are a part of the Antilles which form the border between the Caribbean Sea and the Atlantic Ocean. The three main islands, St. Croix, St. Thomas, and St. John, contain an estimated 100,000 inhabitants and dominate the commercial activity of the group.

Mineral production is mainly basalt traprock, crushed for use as concrete and asphalt aggregate and roadstone. Three firms on St. Croix and one on St. Thomas, provide the total output. For the first half of 1974 public works expenditures increased from $22 million to $24 million, but inflation probably represented most of this increase. Estimated value of construction permits for the first half of 1974 declined sharply from almost $57 million to nearly $46 million.

On July 30, 1974, because of continuing losses of its subsidiary, the Puerto Rican Cement Company sold its 91.3% ownership in the Caribbean Material Supply Company (CAMSCO), a producer of ready-mix concrete and concrete block operating on St. Croix. Despite the sale CAMSCO continued to buy all its cement from its former parent company.

Table 8.—Production of traprock in the Virgin Islands [1]

1973:		
Quantity	short tons	664,323
Value		$2,859,545
1974:		
Quantity	short tons	637,677
Value		$3,869,282

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

Amerada Hess in its 1974 annual report described the continuation of a major expansion program at its Caribbean refinery located on St. Croix. Throughput of crude oil averaged 449,000 barrels per day in 1974, compared with 415,000 in 1973. In June 1974, a new 200,000-barrel-per-day crude distillation unit was commissioned. In December 1974 four additional units went into service: An 80,000-barrel-per-day vacuum unit; a 40,000-barrel-per-day platformer, and two 50,000-barrel-per-day distillate desulfurizers. Two additional units will come on stream in mid-1975. At yearend the facility had a refining capacity of almost 700,000 barrels per stream-day, and principal products were residual fuel oil, heating oil, jet fuel, gasoline, and aromatic petrochemicals.

PACIFIC ISLAND POSSESSIONS

American Samoa.—Practically all of Samoan mineral production is on Tutuila, the main island which contains most of the population. Total output of volcanic cinder and limestone for aggregate declined an estimated 20% to 25% in 1974 compared with that of 1973. The Department of Public Works operated quarries which provided traprock for concrete and asphalt plants. In fiscal year 1974 these operations produced 5,210 cubic yards of ready-mix concrete, 16,000 cubic yards of crushed rock, and 3,672 tons of hot-mixed asphalt. New access roads were nearly completed to three villages in northern Tutuila. The runway at the international airport at Pago Pago is being widened under a $2 million grant from the Federal Aviation Agency. When finished larger transoceanic jets will be able to land at the airport.

Guam.—The island located in the Western Pacific at the southernmost end of the chain of the Mariana Islands covers about 210 square miles and has an estimated 100,000 inhabitants. Since 1967 the island has experienced unprecedented growth which began to slow down during 1974 because of the island's size and limited infrastructure combined with worldwide reduced economic activity. Total output of crushed limestone mined mainly for aggregate reportedly declined by almost 36% compared with that of 1973, reflecting the decline in construction activity.

Table 9.—Mineral production in the Pacific Island Possessions [1]

Area and mineral	1973		1974	
	Quantity (short tons)	Value	Quantity (short tons)	Value
American Samoa:				
Volcanic cinder	36,634	$214,000	27,000	$183,000
Limestone	63,444	152,374	50,000	122,200
Total	XX	366,374	XX	305,200
Guam: Limestone	1,245,746	3,139,367	797,776	1,444,230

XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

TRUST TERRITORY OF THE PACIFIC ISLANDS

In the Trust Territory of the Pacific Islands, commonly called Micronesia, the only mineral presently produced is volcanic rock for aggregate in concrete. Small reserves of phosphate exist in three districts of the Territory but are not considered significant to warrant mining. Reserves of proved and possible bauxite ore sufficient to yield over 5 million short tons of washed ore containing 50% alumina are found on Babelthuap in the Palau District. Micronesia's mineral resources have been investigated and reported on fairly extensively. A bibliography containing 20 reports and titled "Micronesian Minerals—An Abstract" is cited in the United States 27th Annual Report to the United Nations.[10] It states that the U.S. Geological Survey has concluded in its summary review that ". . . deposits of all minerals are too small, or of inferior grade, and too removed from industrial centers to permit profitable exploitation at the present time."

[10] Department of State. 27th Annual Report to the United Nations on the Administration of the Trust Territory of the Pacific Islands, Trust Territory of the Pacific Islands 1974—July 1, 1973, to June 30, 1974. U.S. Dept. of State publ. 8820; 1975, pp. 46–46.

The Mineral Industry of Rhode Island

By Richard H. Singleton [1]

Production by the mineral industry of Rhode Island in 1974 was valued at $6.0 million, an increase of 39.5% over 1973. The value of sand and gravel comprised 77% of the total value. Crushed stone accounted for nearly all the remainder. A small quantity of gem stones was gathered by hobbyists.

Sand and gravel production increased 15% in tonnage and 49% in value. Stone output decreased 8% in tonnage but increased 11% in value.

Among the States, Rhode Island ranked 49th in value of mineral production.

[1] Physical scientist, Division of Nonmetallic Minerals.

Table 1.—Value of mineral production in Rhode Island, by county [1]
(Thousands)

	1973	1974	Minerals produced in 1974 in order of value
Kent	W	$2,109	Sand and gravel.
Newport	$48	W	Stone, sand and gravel.
Providence	W	W	Do.
Washington	W	W	Sand and gravel.
Undistributed [2]	4,292	3,873	
Total	4,340	5,982	
Total 1967 constant dollars	3,182	p 2,862	

p Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Bristol County is not shown because no production was reported.
[2] Includes gem stones and values indicated by symbol W.

Table 2.—Indicators of Rhode Island business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	NA	NA	--
Unemployment	do	NA	NA	--
Employment:				
Construction	do	14.7	13.5	−8.2
Manufacturing	do	124.3	125.8	+1.2
Services [1]	do	63.1	66.3	+5.1
Government	do	55.5	54.6	−1.6
Other [2]	do	108.3	107.5	−0.7
Personal income:				
Total	millions	$4,710	$5,038	+7.0
Per capita		$4,869	$5,376	+10.4
Construction activity:				
Cement shipments to Rhode Island	thousand short tons	193	180	−6.7
Mineral production value	thousands	$4.3	$6.0	+39.5

p Preliminary. NA Not available.
[1] Includes mining.
[2] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate.

Sources: Survey of Current Business; Employment and Earnings; Area Trends in Employment and Unemployment; and the U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Consumption of portland cement and masonry cement in 1974 was 175,000 tons and 5,000 tons, respectively, equal to a 7% decrease from 1973. There are no cement plants in Rhode Island.

Gem Stones.—The value of gem stones and mineral specimens collected was estimated at $2,000.

Sand and Gravel.—Production of sand and gravel increased 15% in tonnage and 49% in value. Average value per ton increased from $1.27 in 1973 to $1.65 in 1974. Average value had been $1.60 in 1972. The use pattern was concrete, 30%; roads, 42%; unprocessed aggregate, 21%; and fill, industrial sand, and other uses, 7%. Leading producers were A. Cardi Construction Co., Inc., Exeter Sand & Gravel Co., Forte Brothers, Inc., and Rhode Island Sand & Gravel Co., Inc.; these producers accounted for 71% of the total output.

Table 3.—Rhode Island: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	2,429	3,095	1,115	2,175
Gravel			1,072	1,890
Unprocessed: Sand and gravel			597	417
Industrial:				
Sand	W	W	W	W
Gravel				
Total	2,429	3,095	2,784	4,482

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data in this table may not be directly comparable to that in table 4 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 4.—Rhode Island: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction	1,774	2,378	345	515
Highway and bridge construction			37	97
Other uses such as dams, waterworks, airports, etc			19	45
Concrete products (cement blocks, bricks, pipe, etc.)			422	627
Bituminous paving (asphalt and tar paving)			497	1,075
Roadbase and subbase			131	288
Unprocessed aggregate			597	417
Fill	56	64	107	187
Other uses	599	654	79	479
Industrial sand and gravel	W	W	W	W
Total	2,429	[2]3,095	2,234	3,730

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Data do not add to total shown because of independent rounding.

Stone.—Output of stone decreased 8% in quantity but increased 11% in value. Conklin Limestone Co., Inc., quarried and crushed limestone at Ashton. The limestone was sold for agriculture, terrazzo, roofing, filler, and flux. M. A. Gammino Construction Co. produced granite at Cranston for use as bituminous and concrete aggregate, roadbase stone, riprap, and stone sand. P.C.A. Construction Co. crushed granite for riprap near Fall River. Peckham Brothers Co., Inc., crushed miscellaneous stone near Middletown for macadam aggregate and road base use.

The black granite quarrying operation that had begun in 1973 at Foster by Rock of Ages Corp. produced a small quantity of granite in 1974.

MINERAL FUELS

Petroleum.—At its East Providence petroleum refinery, Mobil Oil Corp. processed unfinished oils from the gulf coast and foreign countries to produce asphalt and fuel oil. Capacity of the small refinery was approximately 10,000 barrels per day. Mobil announced the planned closing of this plant in 1975. The plant had opened in 1919.

Table 5.—Rhode Island: Construction aggregate sold or used for publicly funded projects, by producers
(Thousand short tons and thousand dollars)

	1974	
	Quantity	Value[1]
Construction aggregate:		
Highway and bridge construction	W	W
Bituminous paving (asphalt and tar paving)	445	711
Roadbase and subbase	105	164
Fill	W	W
Other	W	W
Total	550	875

W Withheld to avoid disclosing individual company confidential data; included with "Bituminous paving."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 6.—Principal producers

Commodity and company	Address	Type of activity	County
Petroleum:			
Mobil Oil Corporation	1001 Wampanoag Trail E. Providence, R.I. 02915	Refinery	Providence.
Sand and gravel:			
A. Cardi Construction Co., Inc	451 Arnold Road Coventry, R.I. 02816	Pit	Kent.
Exeter Sand & Gravel Co	38 Celia St. Johnston, R.I. 02919	Pit	Washington.
Forte Brothers, Inc	14 Whipple St. Berkeley, R.I. 02900	Pit	Providence.
Holliston Sand Co., Inc	Slatersville, R.I. 02876	Pit	Do.
Rhode Island Sand & Gravel Co., Inc.	Kilverk St. Warwick, R.I. 02886	Pit	Kent.
South County Sand & Gravel Co., Inc.	North Road Peace Dale, R.I. 02878	Pit	Washington.
Tasca Sand & Gravel Co	Box 113, R.F.D. 4 Esmond, R.I. 02917	Pit	Providence.
Westerly Trucking Co	35 High St. Westerly, R.I. 02891	Pit	Washington.
Stone:			
Limestone, crushed:			
The Conklin Limestone Co., Inc.	R.F.D. 1 Lincoln, R.I. 02860	Quarry	Providence.
Other stone, crushed and broken:			
M.A. Gammino Construction Co.	875 Phenix Ave. Cranston, R.I. 02920	---- do	Do.
P.C.A. Construction Co	67 Riverside Drive Tiverton, R.I. 02878	---- do	Newport.
Peckham Brothers Co., Inc	P. O. Box 193 Newport, R.I. 02840	---- do	Do.

The Mineral Industry of South Carolina

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the South Carolina Division of Geology, State Development Board, for collecting information on all minerals except fuels.

By Herman W. Sheffer[1]

The value of mineral production in South Carolina in 1974 continued the steady increase begun in 1963 and for the first time surpassed the $100 million mark, reaching $105.2 million. Startup of a third cement plant principally caused shipments of portland and masonry cements combined to increase 20% in quantity. The value of output increased 39% and cement continued, in terms of value, as the principal mineral commodity produced in the State. Although production of stone decreased in quantity, value of stone production increased, and stone continued to rank second in value to cement production. Following stone in order of rank were clays, which increased in both production and value, and sand and gravel, which decreased in production and increased in value.

The production of kaolin and vermiculite in South Carolina continued to rank second nationally in quantity and value. Production of flake mica (sericite) ranked fourth nationally in quantity and value.

As a result of the enforcement of the South Carolina Mining Act beginning in July 1974, numerous additional mining companies, not formerly canvassed for mineral production, have been identified. Mineral production and value statistics for South Carolina therefore should be substantially greater than those reported in the 1974 canvass. Beginning in 1975 the increase will appear not as an increase in production of 1975 versus 1974 but rather as an increase in industry coverage.

In 1974 mineral commodities were produced by 109 separate companies operating 259 mines located in 29 of the 46 counties of the State (table 2). Sand was the leading commodity ranked by the number of operating mines (101), followed by miscellaneous clays (74), crushed stone (34), and kaolin (19). Aiken County led in the number of operating mines (32), followed by Cherokee (17), Lexington (16), and Richland (15).

Legislation and Government Programs.—Enforcement of the South Carolina Mining Act began on July 1, 1974, under the administration of the Mining and Reclamation Department of the South Carolina Land Resources Commission. Each mining company producing in South Carolina must obtain an operating permit from the Mining and Reclamation Department. To obtain a permit, the company must submit with the permit application a reclamation plan for approval, and upon approval the company must post adequate bond to insure proper reclamation of acreage utilized during mining. The technical staff of the Mining Department includes six professionals and two support personnel. Additionally, a 32-member Technical Advisory Committee composed of various staff members from State and Federal agencies lends support to the Mining Department.

[1]State Liaison Officer, Bureau of Mines, Columbia, S.C.

The Division of Geology of the South Carolina State Development Board continued its ongoing collection and evaluation of basic geologic data in order to advise firms on geologic conditions for designing structural foundations and subsurface storage. Mining-oriented firms were advised by the division on exploration potential for various mineral commodities such as clays, crushed stone, gold, gravel, lightweight aggregate, limestone, manganese, sericite, silica sand, uranium, vermiculite, and sulfide ores of copper and zinc.[2] The first Mineral Resources Map of South Carolina was prepared in 1974 for publication in 1975. The map combines geology with known zones, areas, and locations of potentially economic minerals and rocks. During October 1974, the division hosted the Carolina Geologic Society annual field trip held at Cheraw. The division supported preparation of the first gravity map of South Carolina on new 7 1/2 minute topographic maps by P. Talwani, University of South Carolina. New projects begun in 1974 by the division included a geochemical investigation of the Carolina Barite Belt, a Carolina Sand Hills sand evaluation, seismic profiles of rocks underlying coastal plain rivers, and examination of sericite-rich ores. The division expanded its staff and now consists of the State Geologist, a Chief of Geologic Mapping and Research, three staff geologists, a geologic technician, and three secretaries.

[2]Olson, N.K. Geologic Activities in South Carolina During 1974. Geologic Notes, (Division of Geology, South Carolina State Development Board), v. 19, No. 1, Spring 1975, pp. 2-13.

Table 1.—Mineral production in South Carolina[1]

Mineral	1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays[2] thousand short tons	2,250	$12,877	2,297	$13,765
Gem stones	NA	5	NA	5
Mica (scrap)	W	W	W	252
Peat thousand short tons	14	W	18	W
Sand and gravel do.	8,179	12,628	7,380	13,054
Stone do.	14,985	24,280	[3]12	[3]579
Value of items that cannot be disclosed: Cement, clays (fuller's earth), mica (scrap), stone (crushed and broken), vermiculite, and values indicated by symbol W	XX	38,571	XX	77,516
Total	XX	88,361	XX	105,171
Total 1967 constant dollars	XX	64,777	XX	[P]50,293

[P]Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2]Excludes fuller's earth; included with "Value of items that cannot be disclosed."

[3]Excludes crushed and broken stone; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in South Carolina, by county[1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Aiken	$9,568	$9,689	Clays, sand and gravel.
Anderson	--	2	Stone.
Berkeley	W	W	Stone, clays.
Cherokee	2,772	1,243	Stone, clays, sand and gravel.
Chesterfield	W	W	Sand and gravel, stone, clays.
Colleton	W	W	Peat, sand and gravel.
Dorchester	19,249	26,802	Cement, stone, sand and gravel.
Edgefield	44	W	Clays, stone.
Fairfield	W	2,479	Stone, clays.
Florence	W	W	Sand and gravel.
Greenville	W	W	Stone, sand and gravel.
Greenwood	1,325	W	Do.
Horry	W	W	Sand and gravel, clays.
Jasper	W	W	Sand and gravel.
Kershaw	1,211	W	Sand and gravel, clays, stone.
Lancaster	W	390	Mica, clays.
Laurens	W	W	Vermiculite, stone.
Lexington	W	W	Stone, sand and gravel, clays.
Marion	W	W	Sand and gravel, clays.
Marlboro	W	3,951	Do.
Newberry	W	W	Stone, clays.
Oconee	--	541	Stone, sand and gravel.
Orangeburg	18,003	W	Cement, stone, clays, sand and gravel.
Pickens	2,460	2,551	Stone.
Richland	W	5,391	Stone, clays, sand and gravel.
Saluda	W	86	Clays.
Spartanburg	W	W	Stone, sand and gravel.
Sumter	W	W	Sand and gravel, clays.
York	W	W	Stone.
Undistributed[2]	33,728	52,045	
Total[3]	88,361	105,171	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1]The following counties are not listed because no production was reported: Abbeville, Allendale, Bamberg, Barnwell, Beaufort, Calhoun, Charleston, Chester, Clarendon, Darlington, Dillon, Georgetown, Hampton, Lee, McCormick, Union, and Williamsburg.

[2]Includes gem stones and values indicated by symbol W.

[3]Data may not add to totals show because of independent rounding.

Table 3.—Indicators of South Carolina business activity

		1973	1974[P]	Change, percent
Employment and labor force, annual average:				
Total work force	thousands	1,197.9	NA	NA
Unemployment	do.	43.4	NA	NA
Wage and salary employment:				
Mining	do.	1.8	2.0	+11.1
Contract construction	do.	70.8	78.2	+10.5
Transportation, communication, and public utilities	do.	42.4	43.1	+1.7
Manufacturing	do.	375.2	375.2	--
Trade	do.	171.5	177.8	+3.7
Finance, insurance, and real estate	do.	36.8	39.5	+7.3
Services	do.	113.7	124.4	+9.4
Government	do.	171.7	179.3	+4.4
Personal income:				
Total	millions	$10,582	$11,855	+12.0
Per capita		$3,885	$4,258	+9.6
Construction activity:				
Value of nonresidential construction	millions	$123.4	$110.9	-10.1
Number of housing units authorized		25,878	14,259	-44.9
Farm marketing receipts	millions	$755.7	NA	NA
Mineral production value	do.	$88.4	$105.2	+19.1

[P]Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

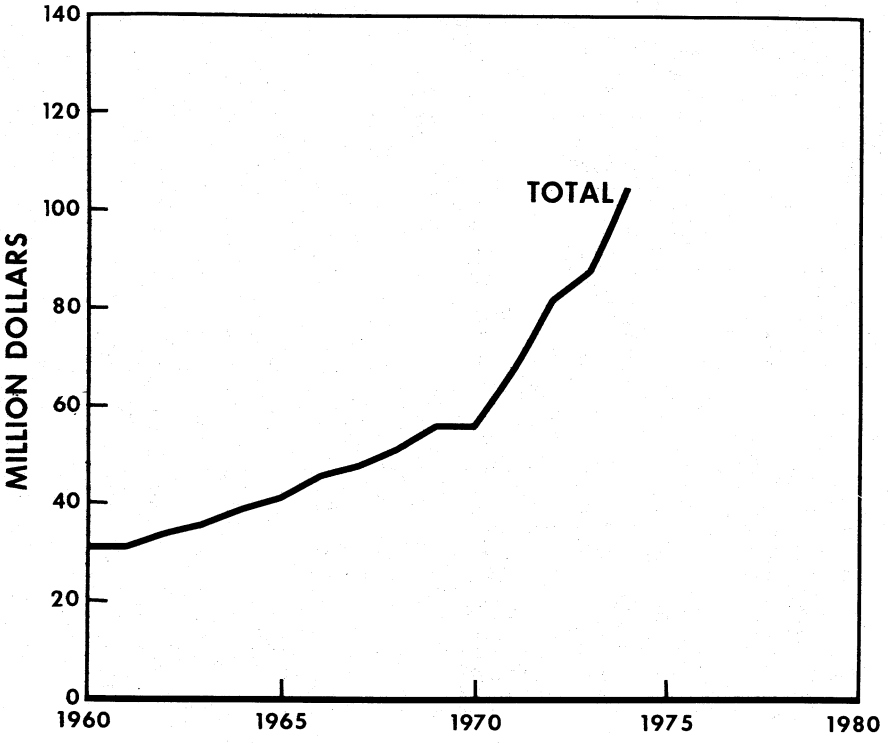

Figure 1.—Total value of mineral production in South Carolina.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Portland and masonry cements were produced by Giant Portland Cement Co. and Gifford-Hill Portland Cement Co. in Dorchester County and Santee Portland Cement Co. in Orangeburg County. Cement production continued to rank first in value of mineral production. Each company, in addition to producing cement, mined marl (limestone), miscellaneous clays, and sand for use as raw materials in the manufacture of the cement. Shipments of portland cement increased 28%, but shipments of masonry cement decreased 21%. More than 92% of the portland cement shipped was types I and II and was used principally for ready-mix concrete products and concrete products manufacturers. Smaller amounts were sold for use in highway construction by building material dealers and other contractors. More than 93% of the cement shipments were in bulk.

Clays.—Clay production in South Carolina is represented by output of processed kaolin, miscellaneous clays used for the manufacture of brick and cement, and fuller's earth used as an absorbent.

Processed kaolin is produced only in Aiken County by 5 separate producers operating a total of 19 mines. South Carolina continued to rank second to Georgia nationally in the production of kaolin in both quantity and value. Air-floated kaolin was used principally in rubber, fertilizers, pesticides, fungicides, and adhesives.

Included under miscellaneous clays are numerous clay materials such as manganiferous clay, sericite, kaolin, and shale. Miscellaneous clay was used almost entirely in the manufacture of brick. Some of the unprocessed kaolin was used in refractories and sanitary ware, and some other clay was used in the manufacture of cement. Miscellaneous clay was produced at 74 mines in 17 counties.

Fuller's earth was produced at one mine in Sumter County and was sold chiefly for use in absorbing "kitty litter."

Feldspar.—Spartan Minerals Co. (a division of Lithium Corp. of America) produced a feldspar-silica mixture from waste material shipped to Pacolet, S.C., from the Lithium Corp. spodumene operation in North Carolina. The feldspar-silica mixture was sold for use as a latex filler.

Sand and Gravel.—Producers of sand and gravel in South Carolina include those companies that produce sand and gravel, those that produce only gravel, and those that produce only sand. The latter group also includes producers of fill material, a product that contains sand and/or clay dirt. Whether or not gravel is produced depends upon the location of the mining operation in the State, since most sand deposits do not contain any gravel-size components.

Table 4.—South Carolina: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	7,573	9,544	3,719	3,840
Gravel			1,880	4,752
Unprocessed:				
Sand and gravel			1,008	575
Industrial:				
Sand			773	3,884
Gravel	606	3,084	--	--
Total	8,179	12,628	7,380	13,051

[1]Value data may not be directly comparable to that in table 1, 5, and 6 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Total production of sand and gravel amounted to 7.4 million tons valued at $13.1 million. Most of this production was from sand only operations and was commercial production for use as industrial sand in construction.

Pennsylvania Glass Sand Corp. in Lexington County mined and processed a high-quality silica sand for use in the glass, fiberglass, ceramic, and chemical industries in the Southeast.

Lexington County had the most operating mines (10), followed by Aiken (9), Horry and Chesterfield (7). However, according to total quantity of production, Lexington was the leading county, followed by Sumter, Marlboro, and Chesterfield.

Sericite.—The Minerals Mining Corp. in Lancaster mined and dry-milled sericite-rich ores and produced a micaceous product which was sold mainly for use in paint, joint cement, and electronics. During 1974, samples of the sericite-rich ore were analyzed at the Bureau of Mines Tuscaloosa Metallurgy Research Laboratory. Results of testing indicated that the sericite-rich ores are actually a mixture of sericite, cryptocrystalline quartz, and kaolin. Although Minerals Mining Corp. is the only processor of the sericite-rich ores, numerous other deposits are mined for use in the manufacture of brick. Production of sericite decreased 19% in quantity and 23% in value from that of 1973.

Stone.—The value of stone production continued to rank second behind cement and accounted for 23% of the total value of mineral production in the State. Stone production decreased in quantity but increased in value, chiefly as a result of a slowdown in the construction industry and an increase in production costs. Crushed stone was produced at 34 mines in 18 counties. Most of the stone produced was granite, but one company in Cherokee County produced limestone and several companies in Berkeley, Dorchester, and Orangebury Counties mined marl (shell limestone). Several new quarries began production.

Crushed granite was used for road-base stone, concrete bituminous and macadam aggregate, railroad ballast, and riprap. Most of the crushed granite was shipped by truck; the remainder moved by rail.

Dimension stone was produced from six quarries in three counties and was used as monumental stone.

Crushed limestone and marl was used as road-base stone, agricultural limestone, concrete and bituminous aggregate, riprap, and railroad ballast.

Crushed marl produced by three cement companies was used in the manufacture of cement.

Vermiculite.—Production of crude vermiculite increased 4% in quantity and nearly 17% in value. Crude vermiculite was mined by W. R. Grace & Co. from three mines in Laurens County and from five mines in Spartanburg County. The ore was exfoliated at two plants, one each in Greenville and Laurens Counties. Patterson Vermiculite Co. mined crude vermiculite from three mines in Laurens County and exfoliated the ore in a plant in the same county. Principal uses of exfoliated vermiculite are for soil additives, for manufacturing lightweight aggregates (concrete, plaster, and fireproofing), and in loose and block insulation. Crude vermiculite production in South Carolina is second to that of Montana, the only other producing state.

Table 5.—South Carolina: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregates:				
Nonresidential and residential construction			4,617	7,535
Highway and bridge construction			143	150
Other uses (dams, waterworks, airports, etc.)			40	40
Concrete products (cement blocks, bricks, pipe, etc.)	5,218	4,295	466	587
Bituminous paving (asphalt and tar paving)			198	171
Road base and sub-base			W	W
Unprocessed aggregate	--	--	989	563
Fill	272	130	64	58
Other uses	2,083	5,119	W	W
Industrial sand and gravel	606	3,084	773	3,884
Total	8,179	12,628	7,290	12,988

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."

[1]Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 6.—South Carolina: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1974	
	Quantity	Value[1]
Construction aggregate:		
Nonresidential and residential construction	W	41
Highway and bridge construction	--	--
Other uses (dams, waterworks, airports, etc.)	--	--
Concrete products (cement blocks, bricks, pipe, etc.)	--	--
Bituminous paving (asphalt and tar paving)	W	26
Road base and subbase	W	W
Unprocessed aggregate	W	W
Fill	--	--
Other	--	--
Total	90	67

W Withheld to avoid disclosing individual company confidential data; the value of unprocessed is included with "Nonresidential and residential construction."

[1]Unit value of construction aggregate may be higher than unit value of sand or gravel.

METALS

No metals were mined in South Carolina in 1974; however, several metals were processed from ores obtained from out-of-state sources.

Special ferroalloys were produced by Airco Alloys Division of Airco, Inc. in Charleston.

Renewed interest in gold mining was evident as core drilling programs were conducted adjacent to abandoned gold mines in several counties.

Steel was produced in Georgetown by the Georgetown Steel Co., a subsidiary of Korf Industries of West Germany. Raw material for the steel manufacture was in the form of prereduced pellets made by the Midrex process. This steel plant is one of two U.S. plants that currently use the prereduced pellets produced by the Midrex process.

Milled zircon was produced by M & T Chemicals, Inc., near Andrews for use in foundries, refractories, ceramics, and glass manufacture.

MINERAL FUELS

Peat.—Crude peat was mined from a bog near Green Pond, Colleton County, by United States Peat Corp. and hauled to the company's processing and shipping plant at Green Pond. The company changed its mining method from one of cultivating and drying of the peat to one of dredging and decanting the peat. New economics in production were realized from the change in method. The crude peat is mixed with special additives at the processing plant, bagged, and shipped to consumers for use in general soil improvement.

Table 7.—Principal producers

Commodity and company	Address	Type of activity	County
Cement:			
Giant Portland Cement Co.[1]	P.O. Box 218 Harleyville, S.C. 29448	Plant	Dorchester.
Gifford-Hill Portland Cement Co.[2]	P.O. Box 326 Harleyville, S.C. 29448	---do	Do.
Santee Portland Cement Co.[3]	P.O. Box 698 Holly Hill, S.C. 29059	---do	Orangeburg.
Clays:			
Common clay and shale:			
Carolina Ceramics, Inc.[4]	RFD 3, Box 266 Columbia, S.C.	Mine	Kershaw and Richland.
Guignard Brick Works[4]	P.O. Box 568 Cayce, S.C. 29033	---do	Lexington.
Richtex Corp.[4]	P.O. Box 3307 Columbia, S.C. 29230	---do	Fairfield, Lexington, Richland.
Fuller's earth:			
Bennett Mineral Co	P.O. Box 158 Pinewood, S.C. 29125	---do	Sumter.
Kaolin:			
J. M. Huber Corp	P.O. Box 306 Langley, S.C. 29834	---do	Aiken.
Mica, scrap:			
Minerals Mining Corp	P.O. Box 458 Kershaw, S.C. 29067	Mine and plant	Lancaster.
Peat:			
United States Peat Corp	P.O. Box 245 Green Pond, S.C. 29446	Plant and bog	Colleton.
Sand and gravel:			
Columbia Silica Sand Co	P.O. Box 1519 Columbia, S.C. 29202	Pit	Greenwood and Lexington.
Deerfield Sand & Mining Co	P.O. Box 580 Ridgeland, S.C. 29936	Pit	Jasper and Orangeburg.
Foster-Dixiana Sand Co	P.O. Box 5447 Columbia, S.C.29205	Pit	Lexington.
Pennsylvania Glass Sand Corp	P.O. Box 84 Cayce, S.C. 29033	Pit	Do.
Whitehead Bros. Co	P.O. Box 8 Lugoff, S.C. 29078	Pit	Kershaw.
Williams, F.T. Co	3009 Rozzells Ferry Rd. Charlotte, N.C. 28208	Pit	Chesterfield.
Wilson Bros. Sand Co	P.O. Box 945 Greenwood, S.C. 29646	Pit	Abbeville and Lexington.
Stone:			
Granite (crushed and broken):			
Dickerson, Inc.[5]	P.O. Box 400 Monroe, N.C. 28110	Quarry	York.
Interstate Materials, Inc	P.O. Box 57 Jenkensville, S.C. 29065	---do	Fairfield.
Lone Star Industries[5]	P.O. Box 268 Columbia, S.C. 29205	---do	Fairfield, Greenwood, Laurens, Richland.
Martin-Marietta Aggregates[6]	P.O. Box 3486 Cayce, S.C. 29033	---do	Fairfield, Lexington, Richland, York.
Vulcan Materials Co.[6]	P.O. Drawer 8834, Station A Greenville, S.C. 29604	---do	Greenville, Laurens, Pickens, Spartanburg.
Vermiculite, crude and exfoliated:			
W. R. Grace & Co	Route 1 Enoree, S.C. 29335	Mines and plants	Greenville, Laurens, Spartanburg.
Patterson Vermiculite Co	Route 1 Enoree, S.C. 29335	---do	Laurens.

[1] Also common clay and shale, and stone.
[2] Also sand and gravel, and stone.
[3] Also common clay and shale, sand and gravel, and stone.
[4] Also kaolin.
[5] Also sand and gravel.
[6] Also stone.

The Mineral Industry of South Dakota

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the South Dakota Geological Survey for collecting information on all minerals except fuels.

By J. H. Aase [1]

The value of mineral production in South Dakota rose to an alltime high of $102.8 million in 1974, 27% more than the previous high record value set in 1973. Nonmetals accounted for 43%, metals 54%, and fuels 3% of the total mineral output value in 1974. Gold continued as the State's leading mineral commodity in terms of value, followed by cement, stone, and sand and gravel.

Nationally, South Dakota ranked first in gold production, with the Homestake mine at Lead accounting for the total State production output of 343,723 troy ounces valued at nearly $55 million. Although the quantity of gold produced dropped 3.9% from the 1973 level, the value of 1974 production was 57% higher as a result of major advances in gold prices; the average value increased about $62 from $97.81 to $160 per troy ounce.

A bill to reinstate a State ore tax, which was repealed 4 years ago, was narrowly defeated in the State legislature. The bill would have levied an 8½% tax on the net income of mining operations having a production of 10,000 tons or more annually.

[1] State Liaison Officer, Bureau of Mines, Rapid City, S. Dak.

Table 1.—Mineral production in South Dakota [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays [2] thousand short tons	201	$181	190	$202
Gem stones	NA	42	NA	42
Gold (recoverable content of ores, etc.) troy ounces	357,575	34,974	343,723	54,906
Gypsum thousand short tons	W	W	32	135
Lime do	63	1,206	94	2,059
Mica (scrap) do	--	--	W	W
Petroleum (crude) thousand 42-gallon barrels	275	988	494	3,283
Sand and gravel thousand short tons	13,963	16,587	9,028	9,720
Silver (recoverable content of ores, etc.) thousand troy ounces	72	184	62	294
Stone thousand short tons	2,745	11,607	2,968	14,231
Value of items that cannot be disclosed: Cement, clays (bentonite), feldspar, iron ore, natural gas liquids, and values indicated by symbol W	XX	15,370	XX	17,938
Total	XX	81,139	XX	102,810
Total 1967 constant dollars	XX	59,483	XX	p 49,164

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes bentonite; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in South Dakota, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Aurora	$42	$45	Sand and gravel.
Beadle	W	W	Do.
Bon Homme	45	17	Do.
Brookings	W	W	Sand and gravel, stone.
Brown	420	385	Sand and gravel.
Brule	28	--	
Buffalo	W	W	Sand and gravel.
Butte	W	2,950	Clays, natural gas liquids, sand and gravel.
Campbell	151	98	Sand and gravel.
Charles Mix	69	87	Do.
Clark	14	47	Do.
Clay	17	25	Do.
Codington	W	555	Do.
Corson	16	51	Do.
Custer	W	857	Stone, feldspar, sand and gravel, mica.
Davison	19	56	Sand and gravel.
Day	W	118	Do.
Deuel	30	554	Do.
Dewey	45	13	Do.
Douglas	143	122	Do.
Edmunds	W	W	Do.
Fall River	W	W	Sand and gravel, stone.
Faulk	45	55	Sand and gravel.
Gregory	W	8,981	Stone, sand and gravel.
Grant	7,608	58	Sand and gravel.
Hamlin	41	109	Do.
Hand	W	72	Do.
Hanson	W	W	Stone, sand and gravel.
Harding	1,020	35	Sand and gravel.
Hughes	17	8	Do.
Hutchinson	151	80	Do.
Hyde	W	47	Do.
Jerauld	13	8	Do.
Kingsbury	11	85	Do.
Lake	W	110	Do.
Lawrence	35,300	W	Gold, silver, sand and gravel, stone.
Lincoln	W	82	Sand and gravel.
Lyman	--	W	Do.
McCook	W	55	Do.
McPherson	W	37	Do.
Marshall	156	102	Do.
Meade	W	W	Sand and gravel, gypsum.
Mellette	--	228	Sand and gravel.
Miner	26	22	Do.
Minnehaha	W	W	Stone, sand and gravel.
Moody	W	110	Sand and gravel.
Pennington	17,026	20,714	Cement, stone, lime, sand and gravel, clays, iron ore, mica, feldspar.
Perkins	102	78	Sand and gravel.
Potter	60	42	Do.
Roberts	W	333	Do.
Sanborn	77	73	Do.
Shannon	11	--	
Spink	132	147	Sand and gravel.
Sully	31	56	Do.
Tripp	83	150	Sand and gravel, stone.
Turner	138	77	Sand and gravel.
Union	63	56	Do.
Walworth	4	8	Do.
Washabaugh	W	W	Do.
Yankton	237	W	Sand and gravel, stone.
Ziebach	25	--	
Undistributed [2]	17,723	64,803	
Total	81,139	[3]102,810	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Bennett, Haakon, Jackson, Jones, Stanley, and Todd.

[2] Includes gem stones, some sand and gravel and petroleum (1974) that cannot be assigned to specific counties, and values indicated by symbol W.

[3] Data do not add to total shown because of independent rounding.

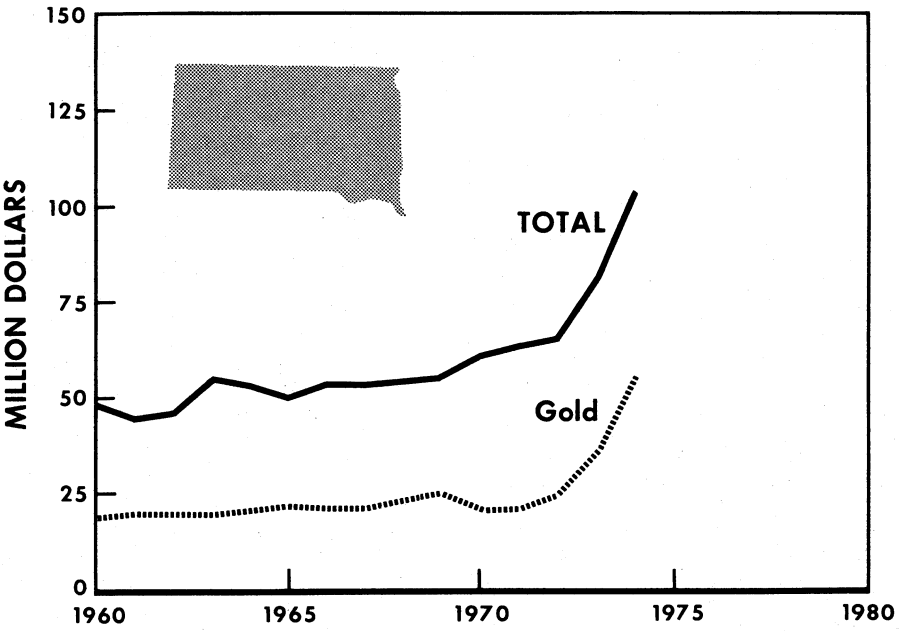

Figure 1.—Value of mine production of gold, and total value of mineral production in South Dakota.

Table 3.—Indicators of South Dakota business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---------- thousands --	297.9	NA	NA
Employment ---------- do ----	254.5	NA	NA
Unemployment ---------- do ----	43.4	NA	NA
Nonagricultral employment:			
Mining ---------- do ----	2.4	2.5	+4.2
Construction ---------- do ----	10.4	10.5	+1.0
Manufacturing ---------- do ----	19.9	20.8	+4.5
Government ---------- do ----	60.7	63.1	+4.0
Other nonagricultural employment ---------- do ----	112.8	118.6	+5.1
Personal income:			
Total ---------- millions --	$3,254	$3,534	+8.6
Per capita ----------	$4,771	$4,218	—11.6
Construction activity:			
Highway construction contracts awarded ---------- thousands --	$46.3	$44.4	—4.1
Cement shipments to and within South Dakota thousand short tons --	344	354	+2.9
Number of authorized residential units ----------	3,839	2,719	—29.2
Value of nonresidential construction ---------- millions --	$35.8	$42.7	+19.3
Mineral production value ---------- thousands --	$81.1	$102.8	+26.8

p Preliminary. NA Not available.

Source: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and U.S. Bureau of Mines.

The experimental coal-gasification pilot plant in Rapid City, built and managed by Conoco Coal Development Co. under contract to the Office of Coal Research (U.S. Department of the Interior) and the American Gas Association, has been successful in producing 400-Btu synthetic gas from North Dakota lignite on a sustained around-the-clock basis. Economic studies were initiated to determine the desirability of extending this development to a large-scale demonstration plant with a capacity of 100–250 million cubic feet per day of gas. A methanation unit was installed at the plant to raise the low-Btu gas to a high (950 Btu) pipeline-quality synthetic gas.

Susquehanna Western, Inc., and Mines Development, Inc., wholly-owned subsidiaries of the Susquehanna Corp., sold its uranium properties and milling facility in the Edgemont area to the Tennessee Valley Authority. The properties sold included approximately 94,000 acres of uranium claims and leases in addition to an ore milling and processing facility. This transaction represented substantial completion of Susquehanna's previously announced program to dispose of all of its uranium and vanadium mining and processing properties.

The South Dakota Cement Commission initiated a $20 million expansion project to double the annual cement production of the State-owned plant in Rapid City from 3 to 6 million barrels by 1976. Owing to the increased demand for cement, customers of this plant were cut at mid-year to a 75% allocation of what they used the preceding year. The plant, which operated at 98% capacity during the year, is the only cement-producing facility in the State.

The Earth Resources Observation System (EROS) Data Center in Sioux Falls has begun extensive expansion of its Computer Branch because of the magnitude of the demands on the computer system. The larger system being installed represents an investment of $2 million to $6 million over a 5-year period. In addition to the functions of the computer within the Data Center relating to research, database inquiry, and order entry, terminals from other Geological Survey offices throughout the Nation will be connected to the EROS Data Center. The expanded computer complex will also be used for digital data processing and analysis to provide more timely information to resource managers, and to increase the capability to extract information from space- and aircraft-acquired electronic data and imagery.

Among the publications dealing with the geology of South Dakota in 1974 were a U.S. Geological Survey circular describing gold deposits in the State and how new deposits might be found[2] and a South Dakota Geological Survey report on geothermal potential in the State.[3]

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Production of cement in 1974 remained at approximately the same level as in 1973. Shipments rose 1% compared with those of the previous year. All of the production came from the State-owned Rapid City plant operated by the South Dakota Cement Commission. The disposition of finished portland cement shipments was 65% to ready mix companies, 14% to highway contractors, 11% to concrete product manufacturers, 6% to building material dealers, and the remainder to other various customers. Almost two-thirds of the total shipments was consumed in South Dakota. North Dakota and Minnesota each received about 10%, and the remainder went to other neighboring States.

Raw materials consumed in 1974 cement production were as follows, in tons: limestone, 641,499; shale 133,054; sand, 38,142; gypsum, 26,863; and iron ore, 9,119.

Clays.—Total output of clays in 1974 declined 2% below that of 1973. Bentonite production accounted for the largest part of the value of clays produced in 1974. The bentonite produced was used principally in oil well drilling mud, water sealant, foundry clay, and animal feed. The American Colloid Co. continued to operate the State's only bentonite-processing

[2] Norton, J. Gold in the Black Hills, South Dakota, and How New Deposits Might Be Found. U.S. Geol. Survey Circ. 699, 1974, 21 pp.

[3] Schoon, R., and D. J. McGregor. Geothermal Potentials in South Dakota. S. Dak. Geol. Survey Rept. Inv. 110, 1974, 76 pp.

plant, at Belle Fourche, using crude material obtained from within the State and from Wyoming sources.

Common clay production for cement manufacturing, lightweight aggregate, and brickmaking declined about 5% in 1974 compared with that of 1973.

Feldspar.—Production of feldspar in 1974 was sharply lower in quantity and value than that of 1973. Seven mines in Custer County and one mine in Pennington were operated during the year, with the bulk of the output processed by Pacer Corp., operators of a grinding mill at Custer.

Gypsum.—The State's production of gypsum, totaling 32,300 tons valued at $135,000, set a new record high in 1974 and was used in cement manufacturing. The South Dakota Cement Commission was the operator of a small surface mine in Meade County that provided the entire output.

Lime.—Pete Lien & Sons, produced lime in Pennington County for soil stabilization, electric steel furnaces, sewage treatment, and other uses. Output was at a record high of 93,600 tons in 1974, 49% above that of 1973. The lime was used in Colorado, South Dakota, Nebraska, and other areas. Consumption of lime within South Dakota was 32,970 tons.

Mica.—A small tonnage of scrap and flake mica was produced by two mines, one each in Custer and Pennington Counties.

Sand and Gravel.—Production of construction and industrial sand and gravel in 1974 decreased 35% compared with that in 1973. Output totaling 9 million tons was produced at 175 mines operated in 58 counties during 1974. Counties leading in production were Pennington, Minnehaha, Codington, Brown, Brookings, and Mellette; these counties supplied 3.3 million tons, 37% of the State total.

Table 4.—South Dakota: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	13,963	16,587	1,057	1,598
Gravel			6,501	7,114
Unprocessed: Sand and gravel			1,470	1,010
Industrial:				
Sand	--	--	--	--
Gravel			--	--
Total	13,963	16,587	9,028	9,722

[1] Value data may not be directly comparable to that in tables 1, 5, and 6 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 5.—South Dakota: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction	5,209	6,269	736	1,193
Highway and bridge construction			406	652
Other uses (dams, waterworks, airports, etc.)			71	101
Concrete products (cement blocks, brick, pipe, etc.)			362	628
Bituminous paving (asphalt and tar paving)			332	462
Roadbase and subbase			1,171	990
Unprocessed aggregate	--	--	1,257	920
Fill	613	515	73	69
Other uses[2]	438	516	218	293
Industrial sand and gravel	--	--	--	--
Total	6,260	7,300	4,626	5,308

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes miscellaneous (1973).

Table 6.—South Dakota: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate:				
Nonresidential and residential construction	7,335	9,064	2	W
Highway and bridge construction			691	1,002
Other uses (dams, waterworks, airports, etc.)			--	--
Concrete products (cement blocks, brick, pipe, etc.)			14	31
Bituminous paving (asphalt and tar paving)			981	941
Roadbase and subbase			2,211	2,032
Unprocessed aggregate	--	--	213	90
Fill	113	57	82	78
Other	254	166	209	238
Total	7,702	9,287	4,403	4,412

W Withheld to avoid disclosing individual company confidential data; included with "Highway and bridge construction."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Stone production consisting of granite, quartzite, limestone, and quartz was produced in 10 counties. Output in 1974 amounted to 2.97 million tons valued at $14.2 million which represents an 8% increase in tonnage and a 23% increase in value compared to 1973.

Granite was quarried by six companies in Grant County, mostly for monumental and architectural purposes.

Crushed and broken stone accounted for 99% of the total output. Approximately 33% was used as concrete aggregate, 17% in railroad ballast, and the remainder in other miscellaneous uses.

Table 7.—South Dakota: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total[1]	40	7,474	36	8,881
Crushed and broken:				
Limestone	1,661	1,843	2,019	3,262
Other stone[2]	1,048	2,290	914	2,087
Total[3]	2,745	11,607	2,968	14,231

[1] Data represent granite.
[2] Data include quartzite, quartz (1974), and granite (1974).
[3] Data may not add to totals shown because of independent rounding.

Table 8.—South Dakota: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars, unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone:				
Rough monumental[1] ---- thousand cubic feet	281	W	146	2,295
Dressed monumental ---- do	128	W	218	6,442
Total (thousand short tons)[2]	40	7,474	36	[3]8,881
Crushed and broken stone:				
Bituminous aggregate	236	472	263	566
Concrete aggregate	1,027	2,015	971	2,120
Macadam aggregate	1	1	1	1
Surface treatment aggregate	107	149	119	255
Railroad ballast	(4)	(4)	512	1,007
Riprap and jetty stone	33	63	34	62
Other uses[5]	1,299	1,433	1,033	1,337
Total[3]	2,704	4,133	2,933	5,349
Grand total[3]	2,745	11,607	2,968	14,231

W Withheld to avoid disclosing individual company confidential data; included in "Dimension stone total."
[1] Includes dressed architectural stone.
[2] Data include stone for rough construction (1973), and architectural work.
[3] Data may not add to totals shown because of independent rounding.
[4] Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[5] Includes stone used for agricultural limestone, dense graded roadbase stone, and uses not specified. Data also include stone used in unspecified construction aggregate and roadstone, other filler (1973), cement, and lime manufacture.

METALS

Gold and Silver.—The Homestake mine at Lead, South Dakota, the State's sole producer of gold and silver, processed 1.56 million tons of ore in 1974, from which 343,723 ounces of gold and 62,474 ounces of silver were recovered. Although production was down 3.9% for gold and 13.2% for silver compared with 1973 figures, total values rose 57% and 60% for gold and silver, respectively, owing to higher metal prices.

During 1974, the grade of ore decreased slightly at the Homestake mine as a result of a reduction in the cutoff grade and high production from the lower grade Nine and Eleven ledge ore bodies. The metallurgical recovery improved from 93.6% in 1973 to 95.1% in 1974. Deepening of the No. 6 winze was started and had been advanced 517 feet to a depth of 7,729 feet by yearend. On the 6800 level, preparations were begun for sinking the No. 7 winze. Both winzes will provide access to the 8000 level. To provide access to the western part of the mine, major exploration crosscuts are being driven on the 5300 and 5900 levels.[4]

[4] Skillings' Mining Review. Homestake Mining Co. Experiences Favorable Year in 1974. V. 64, No. 20, May 17, 1975, p. 12.

Table 9.—South Dakota: Mine production (recoverable) of gold and silver

	1972	1973	1974
Mines producing: Lode	1	1	1
Material sold or treated: Gold ore ---- thousand short tons	1,467	1,574	1,560
Production (recoverable):			
Quantity:			
Gold ---- troy ounces	407,430	357,575	343,723
Silver ---- do	99,992	71,989	62,474
Value:			
Gold ---- thousands	$23,875	$34,974	$54,906
Silver ---- do	168	184	294
Total ---- do	24,043	35,158	[1]55,201

[1] Data do not add to total shown because of independent rounding.

Table 10.—South Dakota: Homestake mine ore milled and receipts for gold produced

Year	Ore milled (thousand short tons)	Receipts for gold produced	
		Total (thousands)	Per ton
1970	1,954	$21,059	$10.78
1971	1,800	21,179	11.77
1972	1,467	23,875	16.27
1973	1,574	34,974	22.22
1974	1,560	54,906	35.20

Homestake Mining Co. entered into a partnership agreement with Taiga Gold, Inc., of Denver, Colo., to explore the former Bald Mountain Mining Co. property near Lead. Taiga Gold, Inc., acquired the assets of Bald Mountain Mining Co. and contributed them to the partnership. Homestake Mining Co. will be the managing partner. Under the agreement, the partnership will determine whether there is enough gold to warrant mining and milling operations. The Bald Mountain Mining Co. conducted mining and milling operations from 1933 until closure in 1959 when production costs became excessive.[5]

Iron Ore.—A new open pit iron ore property was put into production by Pete Lien & Sons of Rapid City. The property, known as the Black Fox mine, is located in Pennington County and contains a hematite-limonite ore. The mined ore was delivered to the State-owned cement plant in Rapid City for use in cement manufacturing.

Uranium and Vanadium.—No production or processing of uranium or vanadium ore was carried on in the State during 1974. Susquehanna Western, Inc., and Mines Development, Inc., sold their uranium properties and processing facilities at Edgemont, S. Dak., to the Tennessee Valley Authority. Exploration drilling was continued on the property in an effort to extend the uranium-vanadium reserves.

MINERAL FUELS

Petroleum.—In 1974, production of crude oil increased 80% in quantity and 232% in value compared with that of 1973. Output totaling 494,000 barrels was obtained from 31 producing wells throughout 7 fields. The largest producing field was the Travers Ranch, which accounted for 33% of the crude oil production. The Buffalo and State Line fields accounted for 28% and 19%, respectively, of the State output.

A total of 20 drilling permits were issued in 1974 and 17 test holes were drilled, with a total footage of 86,046 feet. This compares with 17 permits issued and 14 holes drilled for 78,538 feet during 1973. The deepest hole drilled was 9,220 feet and the shallowest was 1,531 feet. The average depth of all wells was 5,061. Six of the test holes had as their objectives the dolomite of the Red River Formation of Ordovician age, a proven producer of oil and gas in the six oilfields of Harding County, as well as in oilfields in adjacent States. The remaining 11 tests were drilled to shallower formations such as the Muddy Sandstone Member of Cretaceous age.

Table 11.—South Dakota: Oil test completions in 1974, by county

County	Total		Status
	Wells	Footage	
Butte	1	2,342	Dry and abandoned.
Corson	1	7,650	Do.
Harding	8	58,777	One development, one discovery, six dry and abandoned.
Hughes	2	3,318	Dry and abandoned.
Jackson	2	8,809	Do.
Meade	1	1,982	Do.
Stanley	1	1,531	Do.
Sully	1	1,637	Do.
Total	17	86,046	

Source: South Dakota Geological Survey, Western Field Office, Rapid City, S. Dak.

No new oilfields were established in 1974, although there was one new discovery well. The well, Depco 22–24 Travers in SENW 24, 27N. 4E., Harding County, reached bottom in late December and had not been put on production at yearend. The discovery lies between the Buffalo and the Travers Ranch fields, and brings the

[5] Lead Daily Call-Deadwood Pioneer Times. Mining Partnership Revealed. November 8, 1974, p. 1.

number of oil discoveries to nine for the 4-year period 1971–1974.

In addition to the discovery well, a new field development well was completed in the Travers Ranch field early in May. The second well, Hanover-Luff 1–7A Travers in NWNE 3, 22N., 5E., Harding County, came into production in August with an initial daily potential pumping rate of 652 barrels of 36° API (gravity) oil, 91 barrels of water, and no gas.

New rules for the conservation of oil and gas in South Dakota were promulgated during the year by the Board of Natural Resource Development. This board assumed responsibility for oil and gas conservation from the old Oil and Gas Board. The new rules are similar to the older Rules and Regulations of the Oil and Gas Board, except those covering proration and allocation of production, if and when they are needed, can now be enforced by the Board of Natural Resource Development.[6]

[6] South Dakota Geological Survey. South Dakota Oil and Gas Future Bright. News Release, South Dakota Geol. Survey, Western Field Office, Rapid City, S. Dak., Feb. 22, 1975.

Table 12.—Principal producers

Commodity and company	Address	Type of activity	County
Cement: South Dakota Cement Commission.	P.O. Box 360 Rapid City, S. Dak. 57701	Wet-process, 3-rotary-kiln plant.	Pennington.
Clays:			
American Colloid Co	5100 Suffield Ct. Skokie, Ill. 60076	Open pit mine and plant.	Butte.
South Dakota Cement Commission.	P.O. Box 360 Rapid City, S. Dak. 57701	Open pit mine	Pennington.
Feldspar: Pacer Corp	Box 311 Custer, S. Dak. 57730	Open pit mines and dry-grinding plant.	Custer.
Gold: Homestake Mining Co	Lead, S. Dak. 57754	Underground mine, cyanidation mill, refinery.	Lawrence.
Gypsum: South Dakota Cement Commission.	P.O. Box 360 Rapid City, S. Dak. 57701	Open pit mine	Meade.
Lime: Pete Lien & Sons	Box 3124, P.O. Annex Rapid City, S. Dak. 57703	1-rotary-kiln, 1-vertical-kiln, continuous-hydrator plant.	Pennington.
Petroleum:			
Depco, Inc	1025 Petroleum Club Bldg. Denver, Colo. 80202	Crude oil wells	Harding (Yellow Hair and State Line field).
Hanover Planning Co., Inc	1236 North 28 St. Billings, Mont. 59102	---- do	Harding (Harding Springs field).
Kenneth Luff, Inc	2180 Colorado State Bank Bldg. Denver, Colo. 80202	---- do	Harding (Travers Ranch field).
Koch Exploration Co	P.O. Box 2256 Wichita, Kans. 67201	---- do	Harding (Buffalo field).
Phillips Petroleum Co	P.O. Box 2920 Casper, Wyo. 82601	---- do	Do.
Sand and gravel:			
Archie Campbell, Inc	New Rockford, N. Dak. 58356	Pit	Various.
Birdsall Sand and Gravel Co., Inc.	Box 767 Rapid City, S. Dak. 57701	Pit and plant	Fall River and Pennington.
Concrete Materials, Inc	100 South Dakota Ave. Sioux Falls, S. Dak. 57102	Pits	Minnehaha and Roberts.
E. L. Lien and Sons, Inc	P.O. Box 46 Aberdeen, S. Dak. 57401	---- do	Brown.
F. J. McLaughlin Co	Box 13 Watertown, S. Dak. 57201	Pit	Codington.
H. W. Faber & Sons Construction.	Sheldon, Iowa 51201	Pits	Various.
Hallett Construction Co	Box 78 St. Peter, Minn. 56082	Pit and plant	Codington.
Highway Construction Co	Box 511 Rapid City, S. Dak. 57701	Pit	Pennington.
L. G. Everist, Inc	302 Paulton Building Sioux Falls, S. Dak. 57102	Pit and plant	Various.
Mannerud, Inc	Box 223 Brookings, S. Dak. 57006	Plant	Brookings.
Martin L. Meyer	Box 1968 Rapid City, S. Dak. 57701	Pits	Various.
N & M Construction, Inc	Box 337 Sturgis, S. Dak. 57785	Pit	Meade.

Table 12.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel—Continued			
Reynolds Construction Co	Box 689 Sioux Falls, S. Dak. 57101	Pit	Minnehaha.
W. E. Bartholow & Sons Construction.	Box 3 Huron, S. Dak. 57350	Pit	Various.
Weelborg Brothers, Inc	Dell Rapids, S. Dak. 57022	Pits and mill	Do.
Silver: Homestake Mining Co	Lead, S. Dak. 57754	Underground mine, cyanidation mill, refinery.	Lawrence.
Stone:			
Cold Spring Granite Co	Cold Spring, Minn. 56320	2 quarries	Grant.
Concrete Materials Co	100 South Dakota Ave. Sioux Falls, S. Dak. 57102	Quarry and plant	Minnehaha.
Dakota Granite Co	Box 269 Milbank, S. Dak. 57252	2 quarries	Grant.
Hills Materials Co	Box 1392 Rapid City, S. Dak. 57701	Quarry and plant	Pennington.
Lee Construction Co	Box 348 Spearfish, S. Dak. 57783	Quarry	Lawrence.
L. G. Everist, Inc	302 Paulton Building Sioux Falls, S. Dak. 57102	Quarry and plant ---- do	Minnehaha. Pennington.
Pete Lien & Sons	Box 3124, P.O. Annex Rapid City, S. Dak. 57703	---- do	Do.
Pioneer Lime Co	Humboldt, Iowa 50548	Quarry	Yankton.
South Dakota Cement Commission.	P.O. Box 360 Rapid City, S. Dak. 57701	Quarry and plant	Pennington.
Spencer Quarries, Inc	Spencer, S. Dak. 57374	Quarry	Hanson.

The Mineral Industry of Tennessee

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Tennessee Division of Geology, for collecting information on all minerals produced in Tennessee.

By William D. Hardeman [1] and Stuart W. Maher [2]

The 1974 production of the mineral industry was valued at $396 million, an increase of 43% over that of 1973. Tennessee was the leading producing State for ball clay and pyrite, and was third in the production of phosphate rock and zinc ore.

The discovery of the prolific Indian Creek oilfield in Morgan County, the continued high-level of exploration for zinc ore in middle Tennessee, and the new emphasis on coal exploration were the most significant developments of the mineral industry during 1974.

[1] State Liaison Officer, Bureau of Mines, Nashville, Tenn.
[2] Chief geologist, Tennessee Division of Geology, Knoxville, Tenn.

Table 1.—Mineral production in Tennessee [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Portland ---- thousand short tons --	1,711	$42,402	1,525	$43,339
Masonry ---- do ----	201	7,908	154	4,706
Clays [2] ---- do ----	1,719	9,083	1,638	9,776
Coal (bituminous) ---- do ----	8,219	66,827	7,541	135,874
Copper (recoverable content of ores, etc.) short tons --	8,500	10,115	6,304	9,745
Gold (recoverable content of ores, etc.) -- troy ounces --	68	7	18	3
Lime ---- thousand short tons --	W	W	136	3,449
Natural gas ---- million cubic feet --	20	6	17	6
Petroleum (crude) ---- thousand 42-gallon barrels --	201	W	769	W
Phosphate rock ---- thousand short tons --	2,512	12,799	2,411	18,465
Pyrites ---- thousand long tons --	W	W	411	4,101
Sand and gravel ---- thousand short tons --	12,010	20,145	10,702	19,476
Silver (recoverable content of ores, etc.) thousand troy ounces --	73	187	20	94
Stone ---- thousand short tons --	42,742	71,116	41,720	75,547
Zinc (recoverable content of ores, etc.) -- short tons --	64,172	26,516	85,671	61,512
Value of items that cannot be disclosed: Barite, clay (fuller's earth), and values indicated by the symbol W ----	XX	8,579	XX	9,515
Total ----	XX	275,690	XX	395,608
Total 1967 constant dollars ----	XX	202,108	XX	p 189,180

p Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes fuller's earth; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Tennessee, by county [1 2]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Anderson	W	W	Coal, stone, sand and gravel.
Bedford	$854	W	Stone.
Benton	W	W	Sand and gravel, stone.
Bledsoe	W	W	Coal.
Blount	2,423	$2,330	Stone.
Bradley	W	W	Do.
Campbell	W	30,587	Coal, stone, sand and gravel.
Cannon	195	145	Stone.
Carroll	W	W	Clays.
Carter	W	W	Stone.
Claiborne	W	W	Coal, stone, petroleum.
Clay	265	W	Stone, petroleum.
Cocke	147	219	Stone, sand and gravel.
Coffee	W	W	Do.
Cumberland	W	3,026	Stone, sand and gravel, coal.
Davidson	W	15,851	Stone, cement, clays.
Decatur	W	W	Stone, sand and gravel.
DeKalb	243	318	Stone.
Dickson	W	W	Do.
Dyer	38	41	Sand and gravel.
Fayette	64	15	Do.
Fentress	821	705	Stone, coal, petroleum.
Franklin	8,919	W	Cement, stone, sand and gravel, clays.
Gibson	W	W	Clays.
Giles	W	W	Phosphate rock, stone.
Grainger	W	53	Stone.
Greene	W	W	Do.
Grundy	518	W	Coal, stone.
Hamblen	W	W	Stone.
Hamilton	20,181	18,649	Cement, stone, sand and gravel, clays.
Hardeman	W	217	Sand and gravel.
Hardin	W	W	Stone, sand and gravel.
Hawkins	W	W	Do.
Haywood	12	13	Sand and gravel.
Henderson	W	--	
Henry	W	4,584	Clays, sand and gravel.
Hickman	W	W	Phosphate rock.
Humphreys	W	W	Stone, sand and gravel.
Jackson	W	W	Stone.
Jefferson	23,977	49,387	Zinc, stone.
Johnson	W	W	Stone.
Knox	19,486	30,402	Zinc, cement stone, lime, sand and gravel, clays.
Lauderdale	83	W	Sand and gravel.
Lawrence	438	824	Stone, sand and gravel.
Lincoln	W	W	Stone.
Loudon	1,610	1,559	Stone, barite, sand and gravel, clays.
McMinn	W	W	Stone, lime, sand and gravel.
McNairy	129	99	Sand gravel.
Macon	W	W	Stone.
Madison	W	W	Sand and gravel.
Marion	W	W	Coal, cement, stone.
Marshall	W	W	Stone.
Maury	W	W	Phosphate rock, stone.
Meigs	W	W	Stone.
Monroe	W	1,105	Stone, barite, sand and gravel.
Montgomery	W	W	Stone.
Moore	--	45	Stone.
Morgan	3,310	W	Coal, petroleum, natural gas.
Obion	168	W	Sand and gravel.
Overton	W	W	Stone, petroleum.
Perry	W	W	Sand and gravel.
Pickett	(3)	W	Petroleum.
Polk	17,139	W	Copper, pyrites, zinc, silver, gold.
Putnam	1,973	W	Coal, stone, sand and gravel.
Rhea	W	W	Stone.
Roane	1,907	W	Stone, coal.
Robertson	W	W	Stone, petroleum, natural gas.
Rutherford	1,400	1,368	Stone.
Scott	8,009	W	Coal, petroleum.
Sequatchie	3,222	7,990	Coal.
Sevier	W	W	Stone, sand and gravel.
Shelby	6,408	6,236	Sand and gravel.
Smith	57	69	Stone.
Stewart	404	676	Do.
Sullivan	W	11,443	Cement, stone, clays.
Sumner	W	W	Stone.
Tipton	W	115	Sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Tennessee, by county [1] [2]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Unicoi	W	W	Sand and gravel, stone.
Union	W	W	Stone, sand and gravel.
Van Buren	W	W	Coal.
Warren	W	W	Stone.
Washington	W	W	Sand and gravel, stone, clays.
Wayne	W	W	Sand and gravel.
Weakley	$5,258	$5,602	Clays.
White	W	W	Coal, stone.
Williamson	6,539	W	Phosphate rock, stone.
Wilson	W	W	Stone.
Undistributed [4]	139,493	201,941	
Total [5]	275,690	395,608	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported; Cheatham, Chester, Crockett, Houston, Lake, Lewis, and Trousdale.

[2] The value of petroleum and natural gas is based on an average price per barrel and cubic foot, respectively, for the State.

[3] Less than ½ unit.

[4] Includes some sand and gravel (1973) that cannot be assigned to specific counties and values indicated by symbol W.

[5] Data may not add to totals because of independent rounding.

Table 3.—Indicators of Tennessee business activity

	1973	1974 [p]	Change, percent
Employment and labor force, annual average:			
Total work force ---- thousands	1,798.0	NA	NA
Unemployment ---- do	54.7	NA	NA
Total nonagricultural employment ---- do	1,534.8	1,574.4	+2.6
Mining ---- do	6.9	8.1	+17.4
Manufacturing ---- do	522.6	520.0	−0.5
Construction ---- do	83.0	87.5	+5.4
Transportation and public utilities ---- do	72.4	74.4	+2.8
Wholesale and retail trade ---- do	312.5	319.8	+2.3
Finance, insurance, and real estate ---- do	67.1	70.7	+5.4
Services ---- do	224.1	236.9	+5.7
Government ---- do	246.2	257.0	+4.4
Personal income:			
Total ---- millions	$16,888	$18,516	+9.6
Per capita	$4,124	$4,484	+8.7
Construction activity:			
Number of new housing units authorized	39,000	17,356	−55.5
Value of nonresidential construction ---- millions	$397.6	$402.4	+1.2
Cement shipments to and within Tennessee thousand short tons	1,953	1,820	−6.8
Mineral production value ---- millions	$275.7	$395.6	+43.5

[p] Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

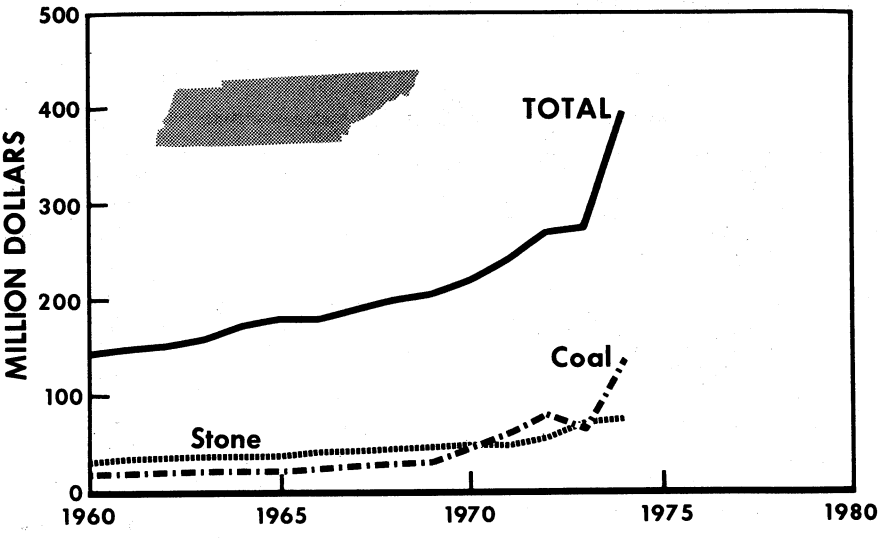

Figure 1.—Value of stone, coal, zinc and total mineral production in Tennessee.

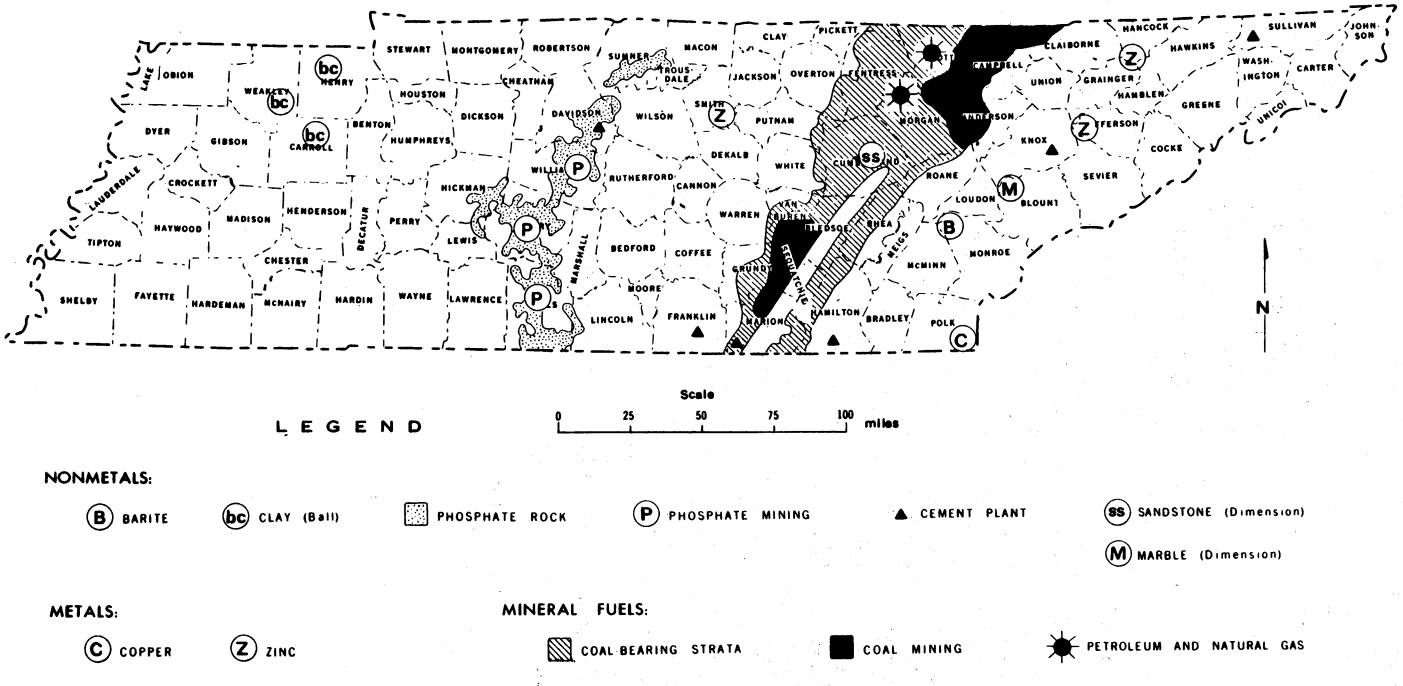

Figure 2.—Generalized map of selected mining areas and industries in Tennessee.

Legislation and Government Programs.—The Tennessee Division of Geology continued its State-wide program of quadrangle mapping of geology and mineral resources. Nine new reports were issued covering the following 7½ minute quadrangles: Clarksville, New Market, Jefferson City, Hornsby, Bolivar East, Mansfield, Palmer Shelter, Bethpage, and Whites Creek. Also, 12 total intensity magnetic quadrangle maps were published. This mapping was carried out under a continuing cooperative program with the Geologic Branch, Tennessee Valley Authority (TVA). The Division initiated a computer program covering surface mining, began various projects dealing with environmental geology, and published a detailed report on the gold deposits of the old Coker Creek district.

The Geologic Branch, TVA, continued its program of airborne magnetic surveying which resulted in additional coverage of 7,568 square miles within the State during the year. The Branch is also engaged in a major cooperative effort to catalog mineral resource data into the Computer Resources Information Bank (CRIB) system of the U. S. Geological Survey (USGS). The Branch engaged in a variety of activities relating to engineering geology in support of design and construction of all of TVA's major projects. Also at least 22 sites were investigated in conjunction with future power sites, pumped storage sites, and a breeder reactor plant site.

Construction continued on four major TVA hydroelectric plants. The Tellico Dam is slated for closure in January 1977; the Columbia Dam in January 1980; and the Normandy Dam in January 1976. The Racoon Mountain pumped storage project is scheduled for completion in August 1978. Construction was also in progress on two nuclear plants. The Sequoyah plant is scheduled for completion in May 1978 and the Watts Bar plant in August 1979.

The USGS in Tennessee was involved in independent studies on zinc and other mineral resources and a region-wide program of investigation of potential oil and gas resources. The USGS was also engaged in cooperative programs with the State on geological mapping, water resources, and topographic mapping.

The Tennessee Division of Surface Mining continued its supervision of surface mining operations and reclamation of lands disturbed by such mining. The State permitted 5,945 acres in 1974.

Taxes.—Tennessee has a coal severance tax of 20 cents per ton of coal mined with reports and payment due the 15th of each month. The State also has a production tax of 4.2 cents per barrel of crude oil and 5% of sales price of any gas sold.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Nonmetals accounted for 46% of the total mineral production value in Tennessee. The principal nonmetallic commodities in order of value were stone, cement, sand and gravel, phosphate rock, and clays.

Barite.—Two companies operated open pit mines and plants in the Sweetwater district of eastern Tennessee. NL Industries, Inc. shipped its barite concentrate from the Ballard mine in Monroe County to New Orleans to be ground for use as drilling mud. B.C. Wood Co. shipped the concentrate from its mine in Loudon County to out-of-state purchasers. The quantity of barite produced during the year decreased from that of 1973; however, value increased. Permits were issued by the State Division of Surface Mining allowing 7 acres of land to be disturbed by barite mining in 1974.

Cement.—Cement was produced by four companies operating six plants in the State—General Portland, Inc. at Chattanooga; Ideal Basic Industries, Inc. at Knoxville; Marquette Cement Manufacturing Co. at Nashville and at Cowan; and Penn-Dixie Industries, Inc. at Kingsport and Richard City. Shipments of portland cement decreased 11% in quantity but increased 2% in value compared with 1973. Masonry cement, however, decreased 23% in quantity and 40% in value.

Types of portland cement shipped included types I and II (general use and moderate heat), type III (high-early-strength), white, expansive, and waterproof. Ready-mix concrete companies purchased 66% of the shipments; concrete product manufacturers, 19%; building materials dealers, 8%; and contractors and other users, 7%. Portland cement con-

sumed in the State totaled 1,646,063 short tons and masonry cement consumed totaled 174,035 short tons.

The raw materials used in producing portland cement included; limestone, shale, sand, gypsum, iron-bearing materials, fly ash, and blast furnace slag.

Ideal Basic Industries, Inc. proceeded with a modernization program at its Knoxville plant which will improve productivity and increase the plant's capacity by 85,000 tons. The project calls for a completely new mill room and a new conveying and distribution system.[3]

Table 4.—Tennessee: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	6	6
Production	1,578,701	1,557,003
Shipments from mills:		
Quantity	1,710,839	1,524,652
Value	$42,402,240	$43,338,597
Stocks at mills, Dec. 31	80,435	115,852

Table 5.—Tennessee: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	5	5
Production	228,502	174,586
Shipments from mills:		
Quantity	200,580	153,657
Value	$7,908,393	$4,706,381
Stocks at mills, Dec. 31	12,727	12,894

Clays.—Tennessee ranked first in the Nation in production of ball clays in 1974, producing 61% of the U.S. total. Production of ball clay was 500,323 tons valued at $8.4 million, an increase of about 3% in quantity and 9% in value over 1973. Common clay and shale production decreased about 8% in quantity below 1973 tonnage, but value increased about 3%. The State issued surface mining permits covering 407 acres for all types of clay mining in 1974.

Ball clay was mined from 32 open pits in Carroll, Gibson, Henry, and Weakley Counties. The major producing companies were Kentucky-Tennessee Clay Co., Cyprus Industrial Minerals Co., and H. C. Spinks Clay Co., Inc. The principal uses for ball clay were in the manufacture of sanitary ware, pottery, floor and wall tile, asphalt tile, electrical porcelain, china dinnerware, ceramics, mortar and cement (refractory), and catalysts (oil refining). Other uses were in production of refractories, high-alumina refractories, kiln furniture, drilling mud, crockery and earthware, quarry tile, pesticides, fire brick and block, common brick, rubber, and glazes, glasses, and enamels. About 11% of the ball clay was exported for uses in ceramics, refractories, sanitary ware, and asphalt tile.

Common clay and shale was produced from 19 open pits scattered throughout the State. The major producers were General Shale Corp.; Tennlite, Inc.; R. C. O'Connor; General Portland, Inc.; and Shalite Corp. The principal uses were in the production of face and common brick, portland cement, concrete block, and structural concrete.

Fuller's earth was produced by Lowe's, Inc. from one open pit operation in Henry County. Production increased about 29% in tonnage and about 86% in value over that of 1973. The major uses of this clay were for oil and grease absorbent, pesticides, and pet absorbent.

[3] Knoxville News Sentinel. Ideal Basic Industries, Inc. 1974 Annual Report. July 1974.

Table 6.—Tennessee: Ball clay sold or used by producers, by kind and use
(Short tons)

Use	1973			1974		
	Airfloat	Unprocessed	Total	Airfloat	Unprocessed	Total
Fine china/dinnerware	4,400	7,000	11,400	20,059	1,301	21,360
Electrical porcelain	W	W	16,600	W	W	33,822
Floor and wall tile, ceramic	47,986	26,500	74,486	37,666	26,248	63,914
Glazes, glass, and enamels	500	--	500	569	--	569
Pottery	67,357	46,023	113,380	47,467	49,103	96,570
Sanitary ware	63,000	108,047	171,047	82,052	77,905	159,957
Other uses [1]	16,800	46,602	[2] 46,802	31,785	70,390	[2] 68,353
Exports	42,405	11,005	53,410	32,438	23,340	55,778
Total	242,448	245,177	487,625	252,036	248,287	500,323

W Withheld to avoid disclosing individual company confidential data; included in "Other uses."
[1] Includes asphalt emulsion; common brick; catalysts (oil refining); crockery and other earthenware; drilling mud; firebrick, block, and shapes; high alumina refractories; kiln furniture; refractory mortar and cement (1974); pesticides and related products; rubber; asphalt and quarry tile; and data indicated by symbol W.
[2] Incomplete total; remainder included in total for electrical porcelain.

Table 7.—Tennessee: Common clay sold or used by producers, by use
(Short tons)

Use	1973	1974
Brick	667,807	579,972
Portland cement	235,419	258,795
Concrete block [1]	328,000	164,436
Structural concrete [1]		134,400
Total	1,231,226	1,137,603

[1] Reported as lightweight aggregate in 1973.

Table 8.—Tennessee: Production of clay and shale

Year and type	Production (short tons)	Value	
		Total	Average per ton
1973:			
Ball clay	487,625	$7,744,794	$15.88
Common clay and shale	1,231,226	1,338,200	1.09
Total	1,718,851	9,082,994	XX
1974:			
Ball clay	500,323	8,403,994	16.80
Common clay and shale	1,137,603	1,372,210	1.21
Total	1,637,926	9,776,204	XX

XX Not applicable.

Graphite.—Synthetic graphite was produced from petroleum coke by Union Carbide Corp. at its plant near Columbia in Maury County. The chief use of the graphite was in the manufacture of electric furnace electrodes.

Lime.—Bowaters Southern Paper Corp. (Calhoun plant), Williams Lime Mfg. Co. (Knoxville plant), and Tennessee Lime Co. (Asbury plant), produced lime in McMinn and Knox Counties for paper and pulp, water purification, lithium manufacture, and other uses. Output was 136,300 tons. The lime was used principally in Tennessee, North Carolina, and South Carolina. Consumption of lime in Tennessee was 197,300 tons.

Perlite.—Chemrock Corp. continued production of expanded perlite at its Nashville plant. The product was used as filter aid, in concrete and plaster aggregates, as insulation, and in horticulture aggregate.

Phosphate Rock.—Tennessee ranked third in the Nation in tonnage and value of phosphate rock produced in 1974. The ore was recovered by surface mining in four counties in the Columbia-Mt. Pleasant district of south-central Tennessee. In order of tonnage produced and value, these counties were Maury, Williamson, Hickman and Giles. The State permitted 990 acres for surface mining, and mining operations disturbed 522 acres involving 39 different tracts. Marketable production for the year was 2,410,914 tons valued at $18,465,000. This was a decrease of 4% in tonnage, but price increases resulted in a 44% increase in value. The average grade of the ore mined was 20% P_2O_5 and, after beneficiation by washing, the average grade of the concentrate was 27.5% P_2O_5. In the washing process 23% of the P_2O_5 in the ore was lost.

All of the mine production was used in the manufacture of elemental phosphorus by the three major producers, the Monsanto Co., Hooker Chemical Co., and Stauffer Chemical Co. These companies operate 14 electric furnaces in the Columbia-Mt. Pleasant area. Other producers in the area were M.C. West, Inc., and the Tennessee Valley Authority.

The Monsanto Co. was building a large earth dam near its Mt. Pleasant plant to impound a reservoir which will be used as a settling pond and a source of recycled water for washing and other plant operations. The dam had reached a maximum height of 169 feet, was about 3,000 feet long, and impounded a reservoir of 360 acres. When completed to its maximum height of 189 feet it reportedly will be the second highest dam of this type in the eastern United States.

Table 9.—Tennessee: Production of phosphate rock
(Thousand short tons and thousand dollars)

Year	Mine production		Marketable production		Value	
	Rock	P_2O_5	Rock	P_2O_5	Total	Average per ton
1972	3,824	817	2,154	583	10,732	$4.98
1973	4,168	894	2,512	653	12,799	5.10
1974	4,135	821	2,411	648	18,465	7.66

Pyrite.—Tennessee led the Nation in pyrite output during 1974, but production tonnage and value continued to decrease from that of the preceding year. The only producer in the State was Cities Service Co. at Copperhill. Pyrite was recovered by flotation from the sulfide ore produced from the company's four underground mines in the area. Processing of these pyrite concentrates yielded industrial chemicals (mostly sulfuric acid) and iron sinter.

Sand and Gravel.—Production decreased 11% in quantity and 3% in value compared with 1973. About 9,944,000 tons (93%) of total production was used for construction purposes, with the remainder used as industrial sands. Sixty-six companies operated 72 open pits in 35 counties scattered throughout the State. Surface mining permits for 486 acres were issued by the State for these operations during the year.

Shelby County continued to be the leading producer, supplying about 36% of the sand and gravel sold or used during the year; followed by Benton County with about 12% of the total. The Benton County operations were mainly for glass and molding sands and accounted for about 50% of the industrial sands produced during the year.

Table 10.—Tennessee: Sand and gravel sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Anderson	--	--	--	1	56	126
Benton	7	1,533	2,623	6	1,331	2,652
Cocke	--	--	--	1	112	33
Coffee	1	279	W	2	451	W
Cumberland	2	W	W	3	156	420
Decatur	1	W	275	1	W	W
Dyer	1	101	38	1	92	41
Fayette	4	86	64	1	81	15
Franklin	3	199	W	4	331	1,416
Hardeman	2	W	W	3	130	217
Hardin	2	W	W	1	7	4
Haywood	1	32	12	1	29	13
Henry	2	W	W	3	189	216
Humphreys	2	548	W	1	W	W
Lauderdale	4	W	83	2	W	W
Lawrence	--	--	--	1	197	37
McNairy	2	123	129	1	112	99
Obion	4	223	168	2	W	W
Perry	2	673	W	2	W	W
Putnam	1	W	W	2	158	332
Shelby	16	4,489	6,408	15	3,900	6,236
Tipton	4	W	W	1	W	115
Union	--	--	--	1	W	99
Other counties [1]	18	3,722	10,344	16	3,367	7,357
Total [2]	79	12,010	20,145	72	10,702	19,476

W Withheld to avoid disclosing individual company confidential data; included with "Other counties."

[1] In 1973 includes Campbell, Hamilton, Hawkins, Henderson, Knox, Loudon, McMinn, Madison, Monroe, Polk, Roane, Sevier, Unicoi, Washington, and Wayne; some sand and gravel that cannot be assigned to specific counties; and counties indicated by symbol W. In 1974 includes Campbell, Hamilton, Hawkins, Knox, Loudon, McMinn, Madison, Monroe, Sevier, Unicoi, Washington, and Wayne Counties and counties indicated by symbol W.

[2] Data may not add to totals shown due to independent rounding.

Table 11.—Tennessee: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	11,121	16,702	4,236	7,703
Gravel			3,836	6,501
Unprocessed:				
Sand and gravel			1,872	1,335
Industrial:				
Sand	889	3,443	758	3,606
Gravel			--	--
Total	12,010	20,145	10,702	19,145

[1] Value data may not be directly comparable to that in tables 12, and 13 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 12.—Tennessee: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	9,459	15,147	1,850	3,503
Highway and bridge construction			426	946
Other uses (dams, waterworks, airports, etc.)			311	648
Bituminous paving (asphalt and tar paving)			609	969
Concrete products (cement blocks, bricks, pipe, etc.)			2,029	3,971
Roadbase and subbase			733	1,422
Unprocessed aggregate			1,449	1,165
Fill	719	789	172	229
Other uses [2]	390	504	116	204
Industrial sand and gravel	889	3,443	758	3,606
Total	[3] 11,456	19,883	8,453	16,663

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes railroad ballast, miscellaneous (1973).
[3] Data do not add to total shown because of independent rounding.

Table 13.—Tennessee: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	554	262	450	941
Highway and bridge construction			302	535
Other uses (dams, waterworks, airports, etc.			W	W
Concrete products (cement blocks, bricks, pipe, etc.)			W	W
Bituminous paving (asphalt and tar paving)			283	286
Roadbase and subbase			791	881
Unprocessed aggregate	--	--	422	170
Fill	--	--	W	W
Other	--	--	W	W
Total	554	262	2,248	2,813

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."
[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

Table 14.—Tennessee: Industrial sand sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Glass sand	304	1,413	276	1,472
Molding sand	217	689	108	422
Other uses [1]	368	1,341	374	1,712
Total	889	3,443	758	3,606

[1] Includes grinding and polishing, fire or furnace, blast, engine, oil (hydrofrac), chemical, filter, and other industrial sands.

Silicon Carbide.—The Carborundum Co. produced silicon carbide in 1974 at its plant at Jacksboro in Campbell County. The product was used for abrasives, refractories, and metallurgical applications.

Stone.—Production of all types of stone was 41.7 million tons valued at $75.5 million, a decrease of about 2% in tonnage and an increase of 6% in value over 1973. Stone was second in value of the mineral commodities produced in the State, supplying 19% of the total.

Stone was produced from 132 quarries scattered throughout the central and eastern portions of the State. Crushed limestone was produced from 120 quarries, dimension marble from 6, dimension sandstone (quartzite) from 3, crushed dolomite from 2, and crushed sandstone from 2.

Crushed limestone continued to be the principal product, accounting for more than 99% of the tonnage and about 96% of the value. Vulcan Materials Co. (Mid-South) was by far the largest producer (22 quarries) followed by Hoover, Inc. (3 quarries), and Mid-South Pavers, Inc. (5 quarries). Dimension marble and dimension sandstone (quartzite) accounted for most of the remaining tonnage and value.

End uses for crushed limestone were dense graded roadbase (35%), unspecified construction aggregate and roadstone (13%), concrete aggregate (13%), macadam aggregate (7%), bituminous aggregate (7%), agricultural purposes (7%), cement manufacture (5%), and numerous miscellaneous uses (13%).

Table 15.—Tennessee: Crushed limestone [1] sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value
Bedford	1	W	854	1	W	W
Cannon	1	118	195	1	77	145
Clay	1	W	261	1	W	269
Cocke	1	118	147	1	104	136
Cumberland	2	W	W	3	941	2,204
Davidson	8	5,738	8,741	8	5,468	8,485
DeKalb	1	W	243	2	W	318
Fentress	2	229	369	2	294	452
Franklin	4	W	W	4	1,125	W
Giles	1	255	424	1	261	533
Grundy	1	W	95	1	108	W
Jefferson	3	870	975	4	1,137	1,477
Knox	7	2,936	4,928	8	2,725	5,492
Lawrence	1	262	438	1	346	787
McMinn	2	W	W	2	1,000	1,957
Marion	4	1,739	2,537	4	1,737	2,946
Moore	--	--	--	1	30	45
Rutherford	3	1,032	1,400	3	848	1,368
Smith	1	41	57	1	46	69
Stewart	1	252	404	1	338	676
Unicoi	1	114	140	1	141	170
Union	2	W	W	3	190	346
Warren	2	W	453	2	W	W
Washington	5	122	229	5	147	297
Undistributed [2]	61	28,648	45,151	59	24,441	44,009
Total [3]	116	42,473	68,041	120	41,504	72,178

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Limestone used generally to include dolomite.

[2] Includes Anderson, Benton, Blount, Bradley, Campbell, Carter, Claiborne, Coffee, Decatur, Dickson, Greene, Hamblen, Hamilton, Hardin, Hawkins, Humphreys, Jackson, Johnson, Lincoln, Loudon, Macon, Marshall, Maury, Meigs, Monroe, Montgomery, Overton, Putnam, Rhea, Roane, Robertson, Sevier, Sullivan, Sumner, White, Williamson, and Wilson Counties and production for which no county breakdown is available.

[3] Data may not add to totals shown because of independent rounding.

Table 16.—Tennessee: Crushed limestone [1] sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	4,786	7,776	2,792	4,864
Concrete aggregate	5,290	8,055	5,327	8,911
Dense graded roadbase stone	15,417	23,716	14,395	24,218
Macadam aggregate	2,317	3,592	2,820	4,770
Surface treatment aggregate	1,799	2,951	2,107	3,682
Unspecified construction aggregate and roadstone	4,619	7,686	5,455	9,288
Agricultural purposes [2]	2,852	4,554	2,752	4,931
Cement manufacture	2,270	3,897	2,118	4,395
Lime manufacture	192	268	170	276
Manufactured fine aggregate (stone sand)	638	1,284	718	1,500
Railroad ballast	W	W	519	836
Riprap and jetty stone	949	1,427	583	1,142
Other uses [3]	1,343	2,835	1,748	3,366
Total [4]	42,473	68,041	41,504	72,178

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Limestone used generally to include dolomite.

[2] Data include agricultural limestone, poultry grit, and mineral food.

[3] Includes asphalt filler (1974), chemicals (1973), drain fields, filter stone, glass (1974), mine dusting (1974), other fillers, refractory stone (1973), roofing aggregates (1973), whiting (1974), a minor amount of stone used in building products (1974), and other uses not specified.

[4] Data may not add to totals shown because of independent rounding.

Sulfuric Acid.—Cities Service Co. produced sulfuric acid from the sulfur gases generated during the roasting and smelting treatment of pyrite and copper concentrates from company mines at Copperhill. Sulfuric acid was the most important chemical product of the Copperhill operations of the company.

Vermiculite.—Construction Products Div. of W. R. Grace & Co. continued production of expanded vermiculite at Nashville in 1974. The product was used in concrete and plaster aggregate, loose fill insulation, horticulture, and soil conditioning.

METALS

Metals accounted for 18% of the total value of mineral production in 1974. Zinc was 86% of the value of metal production and copper accounted for nearly all of the remaining 14%.

Aluminum.—Tennessee ranked third in the Nation in the quantity and value of aluminum produced in 1974. Production and value were up 19% and 47%, respectively, over 1973. The Aluminum Co. of America (Alcoa) in Blount County and Consolidated Aluminum Corp. (Conalco) in Humphreys County produced aluminum metal from alumina imported from outside the United States. Both companies operated at near capacity during the year.

Alcoa was in the process of constructing a can and scrap recycling unit which will have a capacity of 6 million pounds a month.

Copper.—Production of copper in 1974 was 6,304 short tons valued at $9.7 million; down 26% in tonnage and about 4% in value when compared with 1973. Cities Service Co. in Polk County was the only producer of copper in the State.

The Copperhill operations of the company operated four underground mines at depths of 1,000 to 3,000 feet (Boyd, Calloway, Cherokee, and Eureka), and the London flotation plant where the ore is separated into copper, pyrite (iron), and zinc concentrates. The zinc concentrate is sold and shipped out-of-state. The pyrite (iron) and copper concentrates are processed further by roasting and smelting operations to produce, in order of importance, sulfuric acid, copper metal, and iron sinter.

Further modifications of plants and equipment at the Copperhill industrial complex continued throughout the year. Two of the four iron roaster waste heat boiler units were returned to service after modifications. This interim redesign program is expected to be completed in mid-1975.[4]

Significant improvement was made in the operating reliability of the iron roaster system, although total production from all units continued below design levels. Sulfuric acid production improved appreciably in the final 6 months of 1974. Construction was underway on a new sulfuric acid plant designed to have acceptable emission levels. Construction of two water treatment plants to remove both chemicals and suspended solids from process water was also begun.[4]

[4] Cities Service Co. 1974 Annual Report. Pp. 10–11.

Table 17.—Tennessee: Mine production (recoverable) of gold, silver, copper, and zinc

		1972	1973	1974
Mines producing: Lode		11	9	10
Material sold or treated:				
Ore	thousand short tons	5,285	3,458	4,246
Copper-zinc	do	1,762	1,323	1,153
Zinc	do	3,523	2,135	3,093
Production:				
Quantity:				
Gold	troy ounces	176	68	18
Silver	do	83,466	73,104	20,053
Copper	short tons	11,310	8,500	6,304
Zinc	do	101,722	64,172	85,671
Value:				
Gold	thousands	$10	$7	$3
Silver	do	141	187	94
Copper	do	11,581	10,115	9,745
Zinc	do	36,111	26,516	61,512
Total	do	47,843	[1] 36,824	71,354

[1] Data do not add to total shown because of independent rounding.

Ferroalloys.—Tennessee ranked third in the Nation in tonnage and sixth in value of ferroalloys produced in 1974. Six companies produced 249,191 tons valued at $59,158,000; a decrease of 9% in tonnage but an increase of 21% in value.

The principal uses of ferroalloys are as additives and alloying elements in the manufacture of stainless steels, other alloy steels, carbon steels, cast irons, and various alloys.

Monsanto Chemical Co., Stauffer Chemical Co., and Hooker Chemical Corp., produced ferrophosphorus as a byproduct of their electric furnace phosphorus operations in Maury County. Mead Corp. produced ferrosilicon, ferromanganese, and silicomanganese in an electric furnace at Rockwood in Roane County. Tennessee Alloys Corp. produced ferrosilicon at Kimball in Marion County, and Chromium Mining and Smelting Co. produced ferrochromium, ferrosilicon, and ferrochromiumsilicon from electric furnace operations at Woodstock in Shelby County.

Gold.—A very small amount of gold was produced as a byproduct of refining copper concentrates from Cities Service Co.'s Copperhill operations. Eighteen ounces of gold at a value of about $3,000 was recovered at out-of-State refineries. Production of gold in 1973 was 68 ounces at a value of about $7,000.

Iron.—Cities Service Co. produced iron sinter as a byproduct of the processing of pyrite and copper concentrates at its Copperhill Operations in Polk County. The product was sold to the iron and steel industry.

Magnesium.—Tennessee Die Casting Co. at Ripley continued producing magnesium die castings from metal shipped in from Texas. The company also produced aluminum and zinc die castings.

Manganese.—Foote Mineral Co. continued production of electrolytic manganese metal at its New Johnsonville plant. The product was sold primarily to the steel and aluminum industries. Demand was high during most of 1974.

Rare Earths and Thorium.—Davison Chemical Div. of W. R. Grace & Co. processed imported bastnäsite and monazite concentrates for rare earths and thorium at Chattanooga. The company is the only monazite processor in the Nation. The supply of ThO_2 generated at the company's operations exceeded demand, and the 2,500 to 3,000 tons of the ThO_2 in their stockpile is probably the largest readily available supply of thorium in the United States.

Silver.—Silver was also recovered at out-of-State refineries as a byproduct of refining copper concentrates from Cities Service Co.'s Copperhill operations. Production declined from 73,104 troy ounces in 1973 valued at about $187,000 to 20,053 troy ounces valued at about $94,000 in 1974.

Titanium.—E. I duPont de Nemours and Co., Inc. continued production of titanium dioxide pigment using ilmenite and rutile concentrates from Florida, Georgia, New Jersey, and Australia. Capacity of the New Johnsonville plant in Humphreys County is 228,000 tons of pigment per year, making it the largest plant of this type in the United States. Waste from the plant consisted of an aqueous solution of ferric chloride with a specific gravity of about 1.3 which is produced at a rate of about 500 gallons per minute. This waste was disposed of by injection into two deep wells (5,000 to 6,000 feet deep). An additional well is planned for 1975.

Ethyl Corp. operated a pilot flotation plant during the year to test the feasibility of mining and recovering heavy mineral sands (ilmenite, rutile, zircon, and monazite) from the unconsolidated McNairy Sand Formation. The plant operated at a rate of 5 tons per hour. The company has about 2,000 acres under lease near Paris Landing in Henry County and is planning to mine the sand by dredging methods. Experiments were conducted with reclamation procedures and waste control.

Zinc.—Tennessee ranked third in domestic zinc mine production in 1974, production increasing to 85,671 short tons of zinc metal at a value of $61.5 million in 1974, compared with a tonnage of 64,172 short tons and a value of $26.5 million in 1973, increases of 34% and 132%, respectively.

During the year, three companies (American Smelting & Refining Co. (ASARCO), The New Jersey Zinc Co., and United States Steel Corp.) produced zinc ore from six mines in the Mascot-Jefferson City zinc district of eastern Tennessee—the Coy, New Market, Young, Jefferson City, Zinc Mine Works, and Immel mines. The Cities Service Co. also produced zinc concentrate from its four mines in the Ducktown district of Polk County (Copperhill operations).

The New Jersey Zinc Co., began de-

watering the Idol Mine in eastern Tennessee and additional undergound exploration was scheduled. Plans were to do selective high-grade mining and to install a small mill for processing 4% to 4.5% zinc ore. The Flat Gap mine will remain on standby. The Flat Gap mill was removed and parts were used at the new Elmwood mill.

At ASARCO's Tennessee zinc mines construction of the Young mill proceeded on schedule, and it was planned to have the facility operational by mid–1975. The Young mill will have the capacity to treat increased output from ASARCO's mines which, after milling and smelting, yielded 56,400 tons of zinc metal in 1974, nearly double that of 1973.[5]

The New Jersey Zinc Co. will construct an electrolytic zinc refinery near Clarksville, Tenn., with production scheduled to begin in 1977. This will be the first new zinc-producing facility to be built in the United States in over 20 years. The company first announced that the plant would have a capacity of 160,000 tons of zinc metal per year,[6] but in a later announcement revised the tonnage figure to 90,000 tons.

The New Jersey Zinc Co. continued exploration work near Carthage in central Tennessee. Mining commenced in 1974 at the Elmwood mine, although no production was reported, and the company completed construction of its new zinc mill. The mill has standard flotation cells, preceded by heavy media separation. The rated capacity of the concentrator is 3,500 tons per day of crude ore, to produce a 63% zinc concentrate, construction stone, and agricultural limestone. The concentrate will be shipped by rail to the company smelter at Palmerton, Pa., until the new zinc plant at Clarksville has been completed. The company announced that the deposit contained 20 million tons of zinc ore grading 4.5% to 5% zinc. By yearend 1974, about 25,000 feet of lateral development was completed. The company was also drilling a pilot hole for a new mine 2 miles southwest of the main shaft of the Elmwood mine.

Getty Oil Co. announced a 3-year, $2.3 million joint venture exploration project in central Tennessee with Kinsho-Matachi Corp., Dowa Mining Co., Mitsubishi Metal Corp., and Mitsubishi Corp. Getty will control and direct the project and the Japanese companies will fund 80% of the cost. Occidental Minerals Corp. (Oxymin) increased its lease holdings near Carthage in central Tennessee to 14,400 acres, and an agreement was entered into with a mining company to continue exploration and possible development of the project.[7]

Other major companies which were active in zinc exploration in the State included: American Smelting & Refining Co.; American Metal Climax, Inc.; Cominco American, Inc.; Dresser Industries, Inc.; Exxon Corp.; Gulf Minerals Co.; St. Joe Minerals Corp.; and U.S. Borax and Chemical Corp.

Table 18.—Tennessee: Tenor of zinc ore milled and concentrates produced in 1974

Total material	short tons	3,093,382
Metal content of ore: [1]		
Zinc	percent	2.66
Concentrates produced and average content:		
Zinc	short tons	137,928
Recovery ratio	percent	4.46
Average zinc content	do	63.18

[1] Figure represents metal content of crude ore as recovered in the concentrate.

MINERAL FUELS

Mineral fuels accounted for 36% of the total value of mineral production in 1974.

Coal (Bituminous).—Production of coal was 7.5 million[8] tons, down from the 8.2-million-ton 1973 figure, but up more than 100% in value owing to rapidly escalating coal prices. The average price paid for coal during the year was about $18 per ton. In terms of value, coal was the major mineral commodity produced in Tennessee during 1974. Production was from 125 mines in 15 counties of the Cumberland Plateau and Cumberland Mountain regions of east-central Tennessee. Surface and auger mines accounted for 59% of the total production, and underground mines accounted for 41%. The State issued surface mine permits for coal operations on 4,056 acres. There were 98 permits active at the end of the year, compared with 58 permits on the same date in 1973.

[5] American Smelting and Refining Co. 1974 Annual Report. Pp. 5, 18.
[6] Skillings' Mining Review. July 20, 1974.
[7] Occidental Petroleum Corp. 1974 Annual Report. P. 16.
[8] The Bureau collects production data on a voluntary basis. Many small operations did not comply with the Bureau's request for production data. Therefore, as in prior years the figure shown is somewhat less than the amount of coal actually produced in 1974.

A large percentage of the surface mined coal is sold to TVA for consumption in steam plants; however, very little of the coal mined underground is sold to TVA. All of the production of the largest operation in the State, the underground mines of Consolidation Coal Co. in Claiborne County, is shipped by unit train to the Georgia Power Co. About 61% of the coal mined in the State in 1974 was purchased by electric utilities about equally divided between TVA and utilities located in Florida, Georgia, and North Carolina. Tennessee Consolidation Coal Co. exports its entire output of metallurgical coal to Japan.[9]

There was widespread exploratory drilling activity in the coal region during the year, both in the search for new deposits and in extending proven coal reserves. Counties where exploration was most active were: Claiborne, Campbell, Scott, Fentress, Morgan, Bledsoe, Sequatchie, and Van Buren.

[9] Tennessee Energy Office. Coal in Tennessee. June 1975.

Table 19.—Tennessee: Bituminous coal production in 1974, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				
	Underground	Strip	Auger	Strip-auger	Total
Anderson	22	7	2	1	32
Bledsoe	--	1	--	--	1
Campbell	7	18	--	2	27
Claiborne	2	8	--	--	10
Cumberland	--	1	--	--	1
Fentress	--	3	--	--	3
Grundy	--	5	--	--	5
Marion	6	--	--	--	6
Morgan	--	6	--	1	7
Putnam	1	--	--	--	1
Roane	--	--	1	--	1
Scott	5	13	--	2	20
Sequatchie	6	2	--	--	8
Van Buren	1	1	--	--	2
White	--	1	--	--	1
Undistributed	--	--	--	--	--
Total[1]	50	66	3	6	125

	Production (thousand short tons)					
	Underground	Strip	Auger	Strip-auger	Total[1]	Value (thousands)
Anderson	1,179	546	(2)	58	1,783	$28,450
Bledsoe	--	W	--	--	W	W
Campbell	W	863	--	W	1,439	28,809
Claiborne	W	W	--	--	1,577	25,181
Cumberland	--	2	--	--	2	44
Fentress	--	10	--	--	10	206
Grundy	--	47	--	--	47	1,088
Marion	408	--	--	--	408	5,990
Morgan	--	433	--	58	492	9,952
Putnam	100	--	--	--	100	W
Roane	--	--	(2)	W	W	W
Scott	W	724	--	W	1,141	25,224
Sequatchie	W	W	--	--	450	7,990
Van Buren	W	W	--	--	W	W
White	--	21	--	--	21	W
Undistributed	1,420	827	(2)	844	72	2,939
Total[1]	3,106	3,475	(2)	960	7,541	135,874

W Withheld to avoid disclosing individual company confidential data; included with undistributed.
[1] Data may not add to totals shown because of independent rounding.
[2] Included with strip-auger production for county and State.

Coke.—The Chattanooga Coke and Chemical Company, Inc. produced all of the State's coke and breeze (undersize coke) at its plant at Alton Park in Hamilton County. Other commodities produced were ammonium sulfate, crude coal tar, naphthalene, crude light oil, and small quantities of benzene and toulene. The plant utilized coking coal from Pennsylvania, West Virginia, and Virginia at a rate of about 450 tons per day.

Nuclear Fuel.—The Erwin plant of Nuclear Fuel Services, a division of Getty Oil Co., continued operations as a speciality nuclear fuels fabrication and scrap recovery facility.

Petroleum and Natural Gas.—An increase in drilling activity resulted in 135 oil and gas tests, up 38% from 1973. Wells were drilled in 14 counties, but activity remained concentrated in Morgan, Scott, and Fentress Counties. These counties reported 113 wells; 64 exploratory and 49 development. The primary target in these counties was the lower Mississippian Fort Payne limestone.

Crude oil production for the year was 768,700 barrels, up from 201,000 barrels in 1973. This marked increase was largely from a new Fort Payne field, the Indian Creek field, in Morgan County.

The Oneida West field in Scott County became Tennessee's first million-barrel producer. Cumulative production was 1,076,000 barrels from the Fort Payne field since 1969. Relatively minor production was realized from the Honey Creek South and Gum Branch fields also in Scott County.

The most significant development during the year was the discovery of the Indian Creek field in Morgan County which will probably be the largest field yet discovered in the State.

The success ratio for the year was outstanding—90.0% for development wells, 32.9% for exploratory (wildcat) wells, and 54.1% overall. Successful exploratory wells included 10 new fields (5 oil, 5 gas), 4 new-pool wildcat discoveries (3 oil, 1 gas), 1 deeper pool gas discovery, and 13 extensions (9 oil, 4 gas).

All of the new gas discoveries were shut in, and sales of gas remained insignificant—17 million cubic feet valued at $6,000.

The capacity of the Memphis refinery of Earth Resources Co. was expanded in 1974 from 29,500 barrels per day to 43,900 barrels per day.

Table 20.—Tennessee: Oil and gas well drilling completions, by county

	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Campbell	--	--	--	--	--	2	2	6,125
Clay	1	--	--	1	--	1	3	3,068
DeKalb	--	--	--	--	--	1	1	6,334
Fentress	--	--	--	2	2	10	14	22,004
Grundy	--	--	--	--	2	1	3	6,538
Macon	--	--	--	--	--	1	1	676
Morgan	35	1	4	14	5	25	84	128,929
Overton	--	--	--	--	1	2	3	3,642
Pickett	--	--	--	--	--	4	4	6,080
Putnam	--	--	--	--	--	2	2	2,340
Scott	8	--	1	--	--	6	15	24,223
Smith	--	--	--	--	--	1	1	3,995
Sumner	--	--	--	--	--	1	1	400
Warren	--	--	--	--	1	--	1	523
Total	44	1	5	17	11	57	135	214,877

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 21.—Principal producers

Commodity and company	Address	Type of activity	County
Aluminum smelters:			
Aluminum Co. of America	P.O. Box 158 Alcoa, Tenn. 37701	Plant	Blount.
Consolidated Aluminum Corp.	1102 Richmond St. Jackson, Tenn. 38301	---- do	Humphreys.
Barite:			
NL Industries, Inc	Box 187 Sweetwater, Tenn. 37874	Open pit mines and plant.	Monroe.
B. C. Wood Co	Box 284 Sweetwater, Tenn. 37874	Open pit mine and plant.	Loudon.
Cement:			
General Portland, Inc	1300 American National Bank Bldg. Chattanooga, Tenn. 37402	Plant	Hamilton.
Ideal Cement Co	P.O. Box 6238 Knoxville, Tenn. 37914	---- do	Knox.
Marquette Cement Mfg. Co	First American Center Nashville, Tenn. 37238	Plants	Davidson and Franklin.
Penn-Dixie Industries, Inc	60 E. 42nd St. New York, N.Y. 10017	---- do	Marion and Sullivan.
Clays:			
Cyprus Industrial Minerals Co.	P.O. Box 111 Gleason, Tenn. 38229	Pits and plants	Weakley.
Kentucky-Tennessee Clay Co.	Box 449 Mayfield, Ky. 42066	---- do	Carroll, Gibson, Henry, Weakley.
H. C. Spinks Clay Co., Inc	Box 820 Paris, Tenn. 38242	---- do	Henry and Weakley.
Lowe's, Inc	Box 819 Paris, Tenn. 38242	---- do	Henry.
Coal, bituminous:			
Consolidation Coal Co	Box 460 Middlesboro, Ky. 40965	Underground mine and plant.	Claiborne.
Cumberland Coal Corp	P.O. Box 3187 Oak Ridge, Tenn. 37830	Strip mines	Scott and Anderson.
Grundy Mining Co., Inc	P.O. Box 878 Jasper, Tenn. 37347	Underground mine.	Marion.
Long Pit Mining Co	Box 443 Harriman, Tenn. 37748	Auger and strip mines.	Campbell.
Royal Dean Coal Co., Inc	Box 428 Oneida, Tenn. 37841	Underground mine.	Scott.
Shemco, Inc	Route 1, Box 86-A Oliver Springs, Tenn. 37840	Strip mine	Morgan.
Volunteer Mining Corp	Cody, Ky. 41808	Underground mine.	Anderson.
Coke: The Mead Corp.[1]	4800 Central Ave. Chattanooga, Tenn. 37410	Plant	Hamilton.
Copper: Cities Service Co.[2]	Copperhill, Tenn. 37317	Underground mines and plant.	Polk.
Ferroalloys:			
Chromium Mining and Smelting Co.	P.O. Box 28538 Memphis, Tenn. 38128	Plant	Shelby.
Tennessee Alloys Corp	818 Hamilton Bank Bldg. Chattanooga, Tenn. 37402	---- do	Marion.
Graphite, artificial: Union Carbide Corp.	P.O. Box 513 Columbia, Tenn. 38401	---- do	Maury.
Lime:			
Tennessee Lime Co	Route 8, Asbury Rd. Knoxville, Tenn. 37914	---- do	Knox.
Williams Lime Mfg. Co	Box 2286 Knoxville, Tenn. 37901	---- do	Do.
Perlite, expanded: Chemrock Corp.	Osage St. Nashville, Tenn. 37208	---- do	Davidson.
Petroleum refinery: Earth Resources Co.	543 West Mallory Ave. Memphis, Tenn. 38106	Refiners	Shelby.
Phosphate Rock:			
Hooker Chemical Corp.[1]	P.O. Box 591 Columbia, Tenn. 38401	Plant	Maury.
Monsanto Chemical Co.[1]	Columbia, Tenn. 38401	---- do	Do.
Stauffer Chemical Co.[1]	P.O. Box 472 Mt. Pleasant, Tenn. 38474	---- do	Do.

See footnotes at end of table.

Table 21.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and gravel:			
Camden Gravel Co	P.O. Box 207 Camden, Tenn. 38320	Pit	Benton.
Dixie Sand & Gravel Co	515 River St. Chattanooga, Tenn. 37402	Pit and dredge	Hamilton.
Fischer Concrete Co., Inc	P.O. Box 37 Memphis, Tenn. 38126	Pits	Shelby.
T. L. Herbert & Sons	1136 2nd Ave. N. Nashville, Tenn. 37208	do	Perry.
Long Construction Co	4434 E. Shelby Dr. Memphis, Tenn. 38118	Pit	Shelby.
Clyde Owen Sand and Gravel Inc.	10636 Shelton Rd. Collierville, Tenn. 38017	Pit	Do.
Standard Construction Co., Inc.	P.O. Box 38289 Germantown, Tenn. 38138	Pit	Do.
Stone:			
Hoover, Inc	Box 7201 Nashville, Tenn. 37210	Quarries	Davidson, Greene, Rutherford.
Mid-South Pavers, Inc	720 Argyle Ave. Nashville, Tenn. 37203	do	Jackson and Putnam.
The Stone Man, Inc	P.O. Box 2098 Chattanooga, Tenn. 37409	do	Bedford, Hamilton, Rutherford, Warren.
Vulcan Materials Co	Box 7 Knoxville, Tenn. 37901	do	Various.
Watauga Stone Co	Box 2389 Knoxville, Tenn. 37901	Quarry	Carter.
Webb Stone Co	Box 806 Athens, Tenn. 37303	do	McMinn.
Vermiculite, exfoliated: W. R. Grace & Co.	4061 Powell Ave. Nashville, Tenn. 37204	Plant	Davidson.
Zinc:			
American Smelting & Refining Co.	Mascot, Tenn. 37806	Underground mines and plant.	Jefferson and Knox.
United States Steel Corp	Jefferson City, Tenn. 37760	do	Jefferson.

[1] Also ferroalloys.
[2] Also gold, silver, zinc, and pyrites.

The Mineral Industry of Texas

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Bureau of Economic Geology, The University of Texas at Austin, for collecting information on all minerals except fuels.

By Murphy E. Hawkins [1] and Roselle Girard [2]

For the 40th consecutive year, Texas was the Nation's leading mineral producer, accounting for almost 25% of the Nation's total mineral output value. The value of mineral production was over $13.7 billion, 62% higher than that of 1974. Texas ranked first in output of crude petroleum, natural gas liquids, natural graphite, asphaltic rock, magnesium, sulfur (both native and recovered), and carbon black. The State ranked second in output of clay, cement, helium, salt, natural sodium sulfate and aluminum metal; third in stone, and fluorspar; fourth in lime, gypsum and talc; and fifth in uranium and sand and gravel.

Mineral resources in Texas are widely distributed, with 234 counties of the State's 254 counties yielding commercial mineral production in 1974. Mineral fuels were produced in 210 counties, nonmetallics in 145 counties, and metallics in 8 counties. Three counties produced a total mineral value in excess of $500 million; 13 counties produced between $200 million and $500 million; and 16 had a total production valued between $100 million and $200 million.

A summary of the mineral production and value for most commodities is presented in table 1. The value of mineral production by county is shown in table 2.

[1] State Liaison Officer, Bureau of Mines, Austin, Tex.
[2] Geologist, Bureau of Economic Geology, The University of Texas at Austin, Tex.

Table 1.—Mineral production in Texas [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Cement:				
Masonry ---------- thousand short tons	234	$6,606	195	$6,438
Portland ---------- do	8,320	189,368	7,739	207,706
Clays ---------- do	5,667	13,115	5,315	13,677
Coal (lignite) ---------- do	6,944	W	7,684	W
Gem stones ----------	NA	163	NA	160
Gypsum ---------- thousand short tons	1,616	6,469	1,365	5,276
Helium, crude ---------- million cubic feet	904	10,848	35	420
Lime ---------- thousand short tons	1,677	26,887	1,835	39,644
Natural gas ---------- million cubic feet	8,513,850	1,735,221	8,170,798	2,541,118
Natural gas liquids:				
Natural gasoline and cycle products thousand 42-gallon barrels	92,743	347,393	88,316	629,529
LP gases ---------- do	221,686	589,685	213,756	1,004,653
Perlite ---------- short tons	602	W	--	--
Petroleum (crude) - thousand 42-gallon barrels	1,294,671	5,157,623	1,262,126	8,773,003
Salt ---------- thousand short tons	10,354	45,350	11,379	51,296
Sand and gravel ---------- do	38,546	60,706	42,466	81,364

See footnotes at end of table.

Table 1.—Mineral Production in Texas [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Stone ---------- thousand short tons --	62,574	$91,379	[2] 63,074	[2] $109,758
Sulfur (Frasch) ---------- thousand long tons --	4,109	W	W	W
Talc and soapstone ---------- short tons --	232,514	1,246	192,492	1,310
Value of items that cannot be disclosed: Asphalt, fluorspar, graphite, iron ore, magnesium chloride, magnesium compounds, mercury (1973), sodium sulfate, stone (dimension, 1974), uranium, and values indicated by symbol W ----------	XX	r 158,487	XX	245,792
Total ----------	XX	r 8,440,546	XX	13,711,144
Total 1967 constant dollars ----------	XX	6,187,764	XX	p 6,556,669

p Preliminary. r Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes value of dimension stone; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Texas, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Anderson ----------	$49,816	$63,880	Petroleum, natural gas.
Andrews ----------	261,884	424,472	Petroleum, natural gas liquids, natural gas.
Angelina ----------	162	156	Clays, natural gas, petroleum.
Aransas ----------	12,622	13,067	Natural gas, petroleum, natural gas liquids.
Archer ----------	16,399	24,612	Petroleum, natural gas, sand and gravel, stone.
Armstrong ----------	1,040	W	Sand and gravel.
Atascosa ----------	23,477	35,903	Petroleum, natural gas, natural gas liquids, sand and gravel, stone.
Austin ----------	11,390	16,325	Petroleum, natural gas.
Bailey ----------	W	W	Stone.
Bastrop ----------	914	1,750	Petroleum, clays, stone, natural gas.
Baylor ----------	2,656	W	Petroleum, stone, natural gas.
Bee ----------	18,937	28,823	Natural gas, petroleum, natural gas liquids, stone.
Bell ----------	W	W	Sand and gravel, stone.
Bexar ----------	39,504	48,499	Cement, stone, petroleum, lime, natural gas liquids, sand and gravel, clays, natural gas.
Blanco ----------	18	6	Stone.
Borden ----------	43,269	79,282	Petroleum, natural gas, sand and gravel.
Bosque ----------	W	W	Lime, stone.
Bowie ----------	399	868	Natural gas, sand and gravel, petroleum.
Brazoria ----------	276,766	450,073	Petroleum, natural gas, natural gas liquids, magnesium chloride, salt, magnesium compounds, lime, sand and gravel.
Brazos ----------	1,544	2,607	Sand and gravel, natural gas, petroleum.
Brewster ----------	W	W	Fluorspar, sand and gravel.
Briscoe ----------	2	--	
Brooks ----------	61,845	85,667	Natural gas, natural gas liquids, petroleum.
Brown ----------	4,029	4,812	Stone, petroleum, natural gas, clays.
Burleson ----------	813	993	Petroleum, natural gas.
Burnet ----------	W	W	Stone, graphite.
Caldwell ----------	9,401	15,631	Petroleum, natural gas.
Calhoun ----------	24,701	33,344	Natural gas, natural gas liquids, petroleum, lime.
Callahan ----------	4,026	5,495	Petroleum, natural gas, natural gas liquids.
Cameron ----------	2,955	4,018	Natural gas, petroleum.
Camp ----------	3,420	6,226	Petroleum, natural gas, clays.
Carson ----------	41,808	66,354	Natural gas, natural gas liquids, petroleum.

See footnotes at end of table.

Table 2.—Value of mineral production in Texas, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Cass	$23,506	$43,961	Natural gas liquids, petroleum, natural gas, iron ore.
Chambers	139,842	201,810	Petroleum, natural gas, natural gas liquids, salt, clays.
Cherokee	14,207	23,259	Petroleum, natural gas liquids, natural gas, clays.
Childress	212	287	Petroleum, natural gas.
Clay	10,445	14,523	Petroleum, natural gas, sand and gravel.
Cochran	47,692	83,098	Petroleum, natural gas, natural gas liquids.
Coke	24,526	36,689	Petroleum, natural gas liquids, natural gas, sand and gravel.
Coleman	3,462	5,044	Petroleum, natural gas, clays, stone.
Collin	W	286	Stone.
Collingsworth	1,756	2,315	Natural gas, petroleum.
Colorado	55,092	77,716	Natural gas liquids, natural gas, sand and gravel, petroleum.
Comal	W	9,559	Stone, lime.
Comanche	297	407	Petroleum, natural gas, stone, clays.
Concho	1,861	2,554	Petroleum, natural gas, natural gas liquids.
Cooke	42,067	65,041	Petroleum, natural gas liquids, natural gas, sand and gravel, stone.
Coryell	452	153	Stone.
Cottle	54	251	Petroleum, natural gas.
Crane	227,786	363,270	Petroleum, natural gas, natural gas liquids.
Crockett	61,878	89,440	Do.
Crosby	1,789	2,138	Sand and gravel, petroleum, natural gas.
Culberson	W	W	Sulfur, petroleum, talc, natural gas, sand and gravel.
Dallam	W	W	Natural gas.
Dallas	14,982	18,407	Cement, sand and gravel, stone, clays.
Dawson	48,142	76,573	Petroleum, natural gas liquids, natural gas.
Deaf Smith	W	W	Lime, stone.
Denton	1,664	1,798	Sand and gravel, natural gas, clays, petroleum.
De Witt	14,428	19,124	Natural gas, petroleum, natural gas liquids.
Dickens	1,037	2,639	Petroleum, natural gas.
Dimmit	30,457	50,135	Petroleum, natural gas, natural gas liquids.
Donley	W	W	Stone, sand and gravel, natural gas.
Duval	40,489	67,312	Petroleum, natural gas, natural gas liquids, salt, sand and gravel.
Eastland	3,976	6,454	Natural gas liquids, petroleum, natural gas, clays, stone.
Ector	395,879	660,873	Petroleum, natural gas liquids, natural gas, cement, sand and gravel, stone.
Edwards	530	703	Natural gas, petroleum.
Ellis	51,540	51,987	Cement, stone, clays, petroleum, natural gas.
El Paso	9,683	W	Cement, stone, sand and gravel.
Erath	501	747	Natural gas, petroleum.
Falls	301	249	Do.
Fayette	2,288	3,112	Petroleum, clays, sand and gravel, natural gas.
Fisher	41,262	74,355	Petroleum, natural gas, natural gas liquids, gypsum, clays, sand and gravel.
Floyd	W	W	Stone, petroleum.
Foard	1,129	2,020	Petroleum, natural gas.
Fort Bend	91,108	152,700	Petroleum, natural gas, sulfur, natural gas liquids, salt, clays.
Franklin	19,985	30,326	Petroleum, natural gas liquids, natural gas.
Freestone	16,314	15,972	Coal, natural gas, stone, petroleum, clays.
Frio	4,901	7,872	Petroleum, natural gas, natural gas liquids, stone.

See footnotes at end of table.

Table 2.—Value of mineral production in Texas, by county [1]—Continued
(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Gaines	$259,192	$422,847	Petroleum, natural gas, natural gas liquids, sodium sulfate.
Galveston	57,723	87,690	Petroleum, natural gas, natural gas liquids, clays, sand and gravel.
Garza	21,561	67,678	Petroleum, natural gas.
Gillespie	W	1,124	Gypsum, stone, sand and gravel.
Glasscock	8,942	17,602	Petroleum, natural gas.
Goliad	11,570	15,030	Natural gas, petroleum.
Gonzales	1,409	4,038	Uranium, natural gas, clays, petroleum.
Gray	41,950	69,158	Petroleum, natural gas, natural gas liquids, sand and gravel.
Grayson	33,202	50,392	Petroleum, natural gas, natural gas liquids, sand and gravel, stone.
Gregg	236,154	398,483	Petroleum, natural gas liquids, natural gas.
Grimes	71	75	Petroleum, natural gas.
Guadalupe	10,731	16,192	Petroleum, sand and gravel, clays, natural gas.
Hale	25,533	48,140	Petroleum, natural gas liquids, natural gas.
Hamilton	206	244	Natural gas, petroleum.
Hansford	23,750	27,730	Do.
Hardeman	5,817	8,730	Petroleum, gypsum, natural gas liquids, sand and gravel, natural gas.
Hardin	26,859	40,110	Petroleum, natural gas, natural gas liquids, sand and gravel.
Harris	217,896	361,088	Petroleum, natural gas liquids, natural gas, cement, lime, salt, sand and gravel, clays.
Harrison	16,006	22,906	Petroleum, natural gas, natural gas liquids, coal, clays, sand and gravel.
Hartley	W	W	Natural gas.
Haskell	11,607	20,031	Petroleum, natural gas.
Hays	W	W	Sand and gravel.
Hemphill	46,787	72,380	Natural gas, petroleum, natural gas liquids, sand and gravel.
Henderson	64,885	108,866	Petroleum, natural gas liquids, natural gas, clays, sand and gravel.
Hidalgo	44,275	52,442	Natural gas, natural gas liquids, stone, sand and gravel, petroleum.
Hill	W	W	Lime, stone.
Hockley	211,420	380,027	Petroleum, natural gas liquids, natural gas, stone.
Hood	W	W	Natural gas, stone.
Hopkins	12,215	19,227	Petroleum, natural gas liquids, natural gas, clays.
Houston	9,427	13,866	Petroleum, natural gas, natural gas liquids.
Howard	76,377	134,241	Petroleum, natural gas liquids, natural gas, sand and gravel, stone.
Hudspeth	2,135	1,710	Talc, stone, sand and gravel, gypsum.
Hunt	170	243	Natural gas, stone.
Hutchinson	92,029	158,849	Natural gas liquids, natural gas, petroleum, sand and gravel, salt.
Irion	11,697	18,038	Petroleum, natural gas liquids, natural gas.
Jack	14,771	22,381	Petroleum, natural gas, stone, natural gas liquids.
Jackson	104,646	168,150	Petroleum, natural gas, natural gas liquids.
Jasper	1,441	1,886	Petroleum, natural gas.
Jeff Davis	W	--	
Jefferson	67,364	98,030	Natural gas, petroleum, sulfur, natural gas liquids, salt, clays, sand and gravel.
Jim Hogg	11,503	15,229	Natural gas, petroleum, stone, natural gas liquids.
Jim Wells	94,330	131,792	Natural gas, natural gas liquids, petroleum, stone.
Johnson	5,088	7,067	Lime, sand and gravel, stone.

See footnotes at end of table.

Table 2.—Value of mineral production in Texas, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Jones	$8,693	$14,121	Petroleum, sand and gravel, natural gas.
Karnes	33,712	42,303	Natural gas, uranium, petroleum, natural gas liquids.
Kaufman	3,056	4,285	Petroleum, stone, natural gas.
Kenedy	26,207	36,548	Natural gas, natural gas liquids, petroleum.
Kent	72,821	135,064	Petroleum, natural gas, sand and gravel.
Kerr	W	839	Stone, sand and gravel.
Kimble	620	899	Natural gas, sand and gravel, petroleum.
King	8,920	17,876	Petroleum, natural gas.
Kleberg	225,194	321,807	Natural gas, natural gas liquids, petroleum, stone.
Knox	3,129	5,383	Petroleum, natural gas.
Lamb	744	W	Petroleum, stone, natural gas.
Lampasas	W	310	Stone, sand and gravel.
La Salle	2,448	3,259	Natural gas, petroleum, stone.
Lavaca	12,464	22,440	Natural gas, natural gas liquids, petroleum.
Lee	191	1,051	Petroleum, natural gas.
Leon	3,253	3,946	Natural gas, petroleum.
Liberty	39,526	58,619	Petroleum, sulfur, natural gas, natural gas liquids, sand and gravel.
Limestone	5,507	7,760	Clays, sand and gravel, natural gas, petroleum.
Lipscomb	14,880	19,135	Natural gas, petroleum.
Live Oak	20,506	26,336	Natural gas, petroleum, natural gas liquids, uranium.
Llano	574	382	Stone.
Loving	5,398	13,832	Petroleum, natural gas.
Lubbock	3,200	5,979	Petroleum, stone, natural gas.
Lynn	962	1,676	Do.
McCulloch	2,813	W	Sand and gravel, natural gas, stone, petroleum.
McLennan	13,258	15,942	Cement, sand and gravel, stone, natural gas liquids, clays, petroleum, natural gas.
McMullen	12,791	18,030	Natural gas, petroleum, stone.
Madison	3,184	3,909	Natural gas, petroleum.
Marion	4,950	6,060	Petroleum, natural gas, natural gas liquids, clays.
Martin	53,817	87,249	Petroleum, natural gas.
Matagorda	66,723	96,158	Natural gas, petroleum, natural gas liquids, stone, salt.
Maverick	4,516	7,879	Petroleum, natural gas liquids, natural gas, sand and gravel.
Medina	949	1,717	Petroleum, sand and gravel, clays, natural gas, stone.
Menard	1,003	1,676	Petroleum, natural gas.
Midland	76,874	111,359	Petroleum, natural gas liquids, natural gas, stone.
Milam	6,110	W	Coal, petroleum, natural gas.
Mitchell	20,476	35,692	Petroleum, natural gas, sand and gravel.
Montague	13,983	21,440	Petroleum, natural gas, stone, natural gas liquids, sand and gravel.
Montgomery	103,973	414,388	Petroleum, natural gas liquids, natural gas.
Moore	85,003	124,477	Natural gas, natural gas liquids, petroleum.
Morris	W	9,141	Iron ore.
Motley	1,980	2,921	Petroleum, sand and gravel, natural gas.
Nacogdoches	4,698	6,366	Natural gas, iron ore, petroleum, clays.
Navarro	11,161	13,022	Natural gas, petroleum, clays, stone.
Newton	5,421	7,007	Petroleum, natural gas.
Nolan	39,946	57,224	Petroleum, cement, natural gas liquids, natural gas, gypsum, stone, sand and gravel.
Nueces	107,450	155,674	Natural gas, petroleum, natural gas liquids, lime, cement, stone.

See footnotes at end of table.

Table 2.—Value of mineral production in Texas, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Ochiltree	$34,911	$53,845	Petroleum, natural gas, natural gas liquids.
Oldham	2,554	3,622	Petroleum, sand and gravel, natural gas.
Orange	12,707	17,847	Petroleum, cement, natural gas, sand and gravel, clays.
Palo Pinto	6,996	15,150	Natural gas liquids, natural gas, sand and gravel, clays.
Panola	31,605	48,059	Natural gas, natural gas liquids, petroleum.
Parker	8,882	15,259	Natural gas liquids, stone, natural gas, sand and gravel, clays, petroleum.
Parmer	W	--	
Pecos	277,822	436,159	Natural gas, petroleum, natural gas liquids, sulfur, sand and gravel.
Polk	7,358	11,250	Petroleum, natural gas.
Potter	30,000	46,043	Natural, gas, natural gas liquids, cement, petroleum, stone, sand and gravel, clays.
Presidio	W	--	
Rains	1,884	2,141	Natural gas.
Randall	W	491	Stone.
Reagan	54,093	84,213	Petroleum, natural gas liquids, natural gas.
Red River	67	111	Petroleum, natural gas.
Reeves	48,453	72,444	Natural gas, petroleum, natural gas liquids, stone, sand and gravel.
Refugio	186,863	295,070	Petroleum, natural gas, natural gas liquids.
Roberts	13,129	18,239	Natural gas, petroleum.
Robertson	26	35	Petroleum, natural gas.
Runnels	6,534	10,492	Do.
Rusk	96,848	155,728	Petroleum, natural gas liquids, natural gas, clays.
San Jacinto	1,604	1,371	Natural gas, petroleum.
San Patricio	37,946	56,621	Petroleum, natural gas, natural gas liquids, stone, clays.
Schleicher	11,331	16,746	Petroleum, natural gas, natural gas liquids.
Scurry	447,396	809,059	Petroleum, natural gas liquids, natural gas, magnesium chloride, stone.
Shackelford	14,453	21,081	Petroleum, natural gas, natural gas liquids.
Shelby	960	1,290	Natural gas, petroleum.
Sherman	13,800	19,088	Do.
Smith	19,863	31,989	Petroleum, natural gas, natural gas liquids, clays.
Somervell	W	1,095	Sand and gravel.
Starr	49,925	71,657	Petroleum, natural gas, natural gas liquids, sand and gravel.
Stephens	13,064	24,206	Petroleum, natural gas liquids, natural gas.
Sterling	5,011	7,498	Petroleum, natural gas, stone.
Stonewall	23,405	40,733	Petroleum, natural gas liquids, natural gas, gypsum.
Sutton	10,459	18,860	Natural gas, natural gas liquids, petroleum, stone.
Tarrant	18,014	19,542	Cement, sand and gravel, stone, natural gas.
Taylor	14,081	21,244	Petroleum, stone, sand and gravel, natural gas, natural gas liquids, clays.
Terrell	7,061	12,345	Natural gas, petroleum.
Terry	48,961	91,507	Petroleum, natural gas, natural gas liquids, sodium sulfate.
Throckmorton	6,769	10,678	Petroleum, natural gas.
Titus	10,254	W	Petroleum, coal, natural gas.
Tom Green	10,742	16,876	Petroleum, natural gas liquids, natural gas, sand and gravel.
Travis	7,967	9,634	Lime, stone, sand and gravel, petroleum.
Trinity	25	46	Petroleum, natural gas.
Tyler	3,224	5,100	Petroleum, natural gas, sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Texas, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974, in order of value
Upshur	$13,665	$19,499	Petroleum, natural gas, sand and gravel.
Upton	68,418	110,850	Petroleum, natural gas, natural gas liquids.
Uvalde	11,003	15,628	Asphalt, stone, sand and gravel, natural gas.
Val Verde	760	W	Natural gas, sand and gravel, petroleum.
Van Zandt	87,147	144,221	Petroleum, natural gas liquids, salt, natural gas, clays.
Victoria	27,125	41,770	Petroleum, natural gas, sand and gravel, natural gas liquids.
Walker	140	192	Clays, natural gas, petroleum.
Waller	126,823	176,983	Natural gas, natural gas liquids, petroleum, sand and gravel.
Ward	135,338	190,070	Natural gas, petroleum, natural gas liquids, sand and gravel, salt.
Washington	741	1,275	Petroleum, natural gas, stone.
Webb	12,363	17,531	Petroleum, natural gas, natural gas liquids, sand and gravel, stone.
Wharton	60,473	96,332	Sulfur, petroleum, natural gas, natural gas liquids, clays.
Wheeler	9,846	21,650	Natural gas, petroleum, natural gas liquids.
Wichita	27,710	46,305	Petroleum, sand and gravel, natural gas liquids, natural gas, stone.
Wilbarger	16,154	25,005	Petroleum, natural gas liquids, natural gas.
Willacy	13,443	20,386	Petroleum, natural gas.
Williamson	6,037	W	Stone, lime, petroleum, natural gas.
Wilson	2,502	4,496	Petroleum, clays, natural gas.
Winkler	115,916	184,363	Natural gas, petroleum, natural gas liquids.
Wise	57,275	86,399	Natural gas, natural gas liquids, stone, petroleum, sand and gravel, clays.
Wood	206,678	358,966	Petroleum, natural gas liquids, natural gas, clays, sand and gravel.
Yoakum	300,456	606,304	Petroleum, natural gas liquids, natural gas, salt.
Young	11,839	16,721	Petroleum, natural gas liquids, natural gas, sand and gravel.
Zapata	4,616	7,053	Natural gas, petroleum.
Zavala	4,711	5,175	Petroleum, natural gas.
Undistributed [2]	r 147,671	216,585	
Total [3]	r 8,440,546	13,711,144	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Bandera, Castro, Delta, Fannin, Hall, Kendall, Kinney, Lamar, Mason, Mills, Real, Rockwall, Sabine, San Augustine, San Saba, and Swisher. Values for petroleum and natural gas (1974) is based on an average price per barrel and cubic foot, respectively, for the State.

[2] Includes some sand and gravel, petroleum (1973), natural gas liquids that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Texas business activity

	1973	1974 p	Change, percent
Annual average labor force and employment:			
Total labor force ---------- thousands --	4,952.0	NA	NA
Unemployment ---------- do ----	193.0	NA	NA
Employment:			
Construction ---------- do ----	271.7	292.3	+7.6
Mining ---------- do ----	108.8	120.3	+10.6
Manufacturing ---------- do ----	795.9	830.5	+4.3
Transportation and public utilities ---------- do ----	280.0	294.5	+5.2
Wholesale and retail trade ---------- do ----	1,017.4	1,055.3	+3.7
Finance, insurance, real estate ---------- do ----	235.1	247.5	+5.3
Services ---------- do ----	691.8	736.5	+6.5
Government ---------- do ----	745.7	775.7	+4.0
Personal income:			
Total ---------- millions --	$53,912	$57,715	+7.1
Per capita ----------	$4,558	$4,790	+5.1
Construction activity:			
Value of authorized nonresidential construction -- millions --	$1,360.3	$1,414.3	+4.0
Number of new building permits issued ----------	105,418	69,558	−34.0
Highway-construction contracts awarded ---------- millions --	$367.3	$365	−0.6
Cement shipments to and within Texas thousand short tons --	6,821	6,359	−6.8
Farm marketing receipts ---------- millions --	$6,463.2	NA	NA
Mineral production value ---------- do ----	8,440.5	$13,711.1	+62.4

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and U.S. Bureau of Mines.

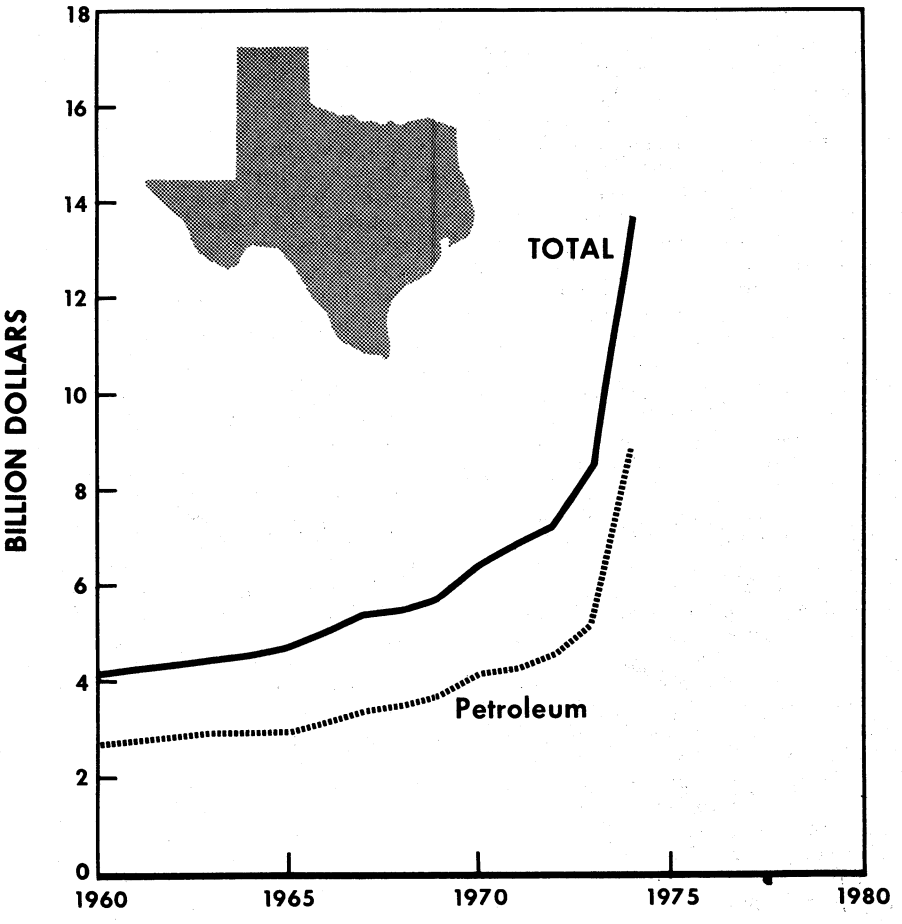

Figure 1.—Value of petroleum and total value of mineral production in Texas.

Trends and Developments.—Texas remained one of the most attractive areas in the United States for exploration and development of oil and gas reserves. According to the Hughes Tool Co. count at yearend 1974, there were 605 rigs operating in Texas out of the U.S. total of 1,611. A total of 9,529 wells was drilled in the State in 1974, up 17.7% over the number of wells drilled in 1973.

Improved oil and gas prices were chiefly responsible for the sharp increase in drilling. Higher natural gas prices, especially in the uncontrolled intra-State market, continued to attract new drilling ventures. The overall success ratio increased over 1973 figures for both exploratory and developmental drilling. A large number of less productive oil and gas wells were completed because the higher prices made them profitable; in earlier years, they would not have been drilled or would have been abandoned as dry holes. Consequently, the higher success percentages reflected the better prices of new oil and gas more than other factors such as improvments in finding and completion technology.

In 1974, rising costs and shortages of drilling rigs, tubular goods, and equipment characterized drilling operations. All of the available drilling rigs, supporting services, and trained labor were employed at near capacity because of the rapid

expansion in drilling for all kinds of energy supplies; that is, oil, gas, lignite, coal, and uranium. No doubt, a greater drilling effort would have been attained had more rigs, pipe, equipment, and trained personnel been readily available.

Leasing continued at a vigorous pace, with intense competition bringing about changes in lease bonuses, rentals, royalties, and terms. For example, at its July sale, the General Land Office upped the State's royalty on permanent school fund lands from one-sixth to one-fifth and reduced the primary terms of oil and gas leases from 5 to 3 years.

Geophysical activity increased significantly in 1974. The increase in leasing and geophysical activity portends further increases in drilling if incentives remain favorable.

The downward slide in reserves and production of crude oil, natural gas, and natural gas liquids continued. For the second consecutive year, a decline was registered in the production of crude petroleum and natural gas liquids. Natural gas continued its production decline. As natural gas output declines, an increasing percentage of the marketed production is retained for consumption in the State. According to Texas Railroad Commission (TRRC) statistics, the volume of gas marketed in Texas was 4,550 billion cubic feet in 1974 compared with 4,186 billion cubic feet in 1972. Volumes of gas exported from the State for 1974 and 1972 were 2,975 billion cubic feet and 3,508 billion cubic feet, respectively. Increases in demand and the existence of a free intra-State market are responsible for this development.

In 1974, some natural gas was sold in the intra-State market at a price more than three times the regulated price set for the inter-State market by the Federal Power Commission. Because of this price differential, almost all of the new gas is sold in the intra-State market.

In spite of this trend, supplies continued to be inadequate to meet the requirements of all Texas customers during periods of peak demand. Mineral processors that have traditionally used large volumes of natural gas have been forced to seek a more plentiful and cheaper fuel to replace natural gas during periods of disruption in service. Some of the State's cement and lime producers, for example, have shifted to oil, coal, or petroleum coke as backup fuels.

In earlier years, liquefied petroleum gas (LPG) was used as an alternative fuel during temporary interruptions of natural gas deliveries. However, in the past year or two, the interruptions have become more frequent and longer in duration. The supply of LPG has tightened and the price has skyrocketed, virtually eliminating this fuel as an emergency backup.

Decreasing oil and gas reserves have increased interest in the State's substantial lignite and bituminous coal resources. Lignite production was up 11% over that of 1973, and 90% over 1972 production. The trend in lignite output should continue upward as several large strip mines are in the development or planning stages.

The production of carbon black declined as one of the State's two channel plants was closed in 1974. The average cost of natural gas feed for the carbon black plants increased sharply last year. Because channel plants are relatively inefficient and the cost of natural gas is increasing every year, the outlook for the State's remaining channel plant is not bright.

The trend in production and value for nonmetals was mixed in 1974. Output of lime, salt, sand and gravel, and sulfur reached new highs. Gains were also registered for ball clay, fluorspar, graphite, and stone. Lower output was noted, however, for bentonite, cement, common clay, fire clay, gypsum, kaolin, sodium sulfate, and talc. Weakness in the construction industry, especially in residential buildings, contributed to the lower demand for a number of industrial minerals. In general, the unit value increased for most of the commodities owing to inflationary pressures, including considerably higher energy costs.

In the metal sector, in situ solution mining appears to have been perfected to the extent that it will be used to recover uranium from a number of ore deposits in the South Texas uranium district. Atlantic Richfield Co. began construction of a commercial-scale U_3O_8 in situ facility in Live Oak County. Six other pilot in situ tests are in various stages of development and evaluation in the area.

At Palestine, the Aluminum Company of America (Alcoa) was constructing a 15,000-ton-per-year potline to test a new

aluminum-smelting process developed by the company. Eventually, if the process is successful, the capacity of the smelter will be expanded to 300,000 tons per year. Alcoa also plans to add 575,000 kilowatts of electric generating capacity at its lignite-fired Rockdale facility.

United States Steel Corp. plans to double the raw steelmaking capacity of its Texas works at Baytown from 1 to 2 million tons per year. The expansion includes two new electric furnaces and two continuous slab casters.

NL Industries, Inc., began production of synthetic scheelite at its new tungsten mill in Laredo. Production of scheelite is estimated at about 2,000 tons per year from Guatemalan tungsten concentrates that are shipped to Laredo by rail through Mexico.

ASARCO, Inc., continued work on its new electrolytic copper refinery in Potter County near Amarillo. Startup of this new refinery, which will have a capacity of over 400,000 tons per year, is scheduled for late 1975.

Legislation and Government Programs.—The 63d Texas Legislature passed a Senate-House resolution empowering the Governor to appoint a joint Interim Surface Mining Operations Study Committee to investigate surface mining in the State. The committee is to report its findings and recommendations, if any, to the 64th session of the legislature, which was to convene in January 1975. In June, the Governor appointed a committee composed of six senators and representatives and five citizens. The committee completed its work and published its final report in December 1974. The report recommended that (1) the State of Texas adopt surface mining and reclamation legislation to insure the development of the State's natural resources in a manner consistent with adequate protection of the environment, and (2) the State of Texas adopt legislation permitting it to join the Interstate Mining Compact. The staff of the committee prepared a working draft of a bill providing for the regulation of surface mining and reclamation of all minerals. This bill was attached to the final committee report with the stipulation that the document was merely a working paper and not a recommendation to the 64th legislature.

The State of Texas sued a number of oil and gas operators, alleging violations of the royalty provisions of oil and gas leases on State lands. The State contended that the lease contracts stipulate that royalty will be paid on the current market price of gas, whereas the operating companies have continued over the years to pay the royalty based on long-term sales agreements calling for prices considerably lower than current market value. Most of the suits were settled in favor of the State.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Fossil fuels continued to be the dominant mineral commodity produced in Texas and accounted for almost 95% of the total mineral value in 1974. Crude petroleum, the State's single most valuable commodity, constituted about 64% of the total value; natural gas, 18.5%; and natural gas liquids, 11.9%.

Asphalt.—In Uvalde County, two companies continued to quarry a naturally occurring asphaltic rock. Production decreased 4%, but value jumped 52% over that in 1973.

Carbon Black.—Production was 1,435 million pounds, a decrease of 5% from 1973 production. Average price per pound of carbon black was 10.84 cents, an increase of 2.36 cents per pound over the 1973 price. Total value was $155.6 million. During 1974, 14 plants (12 furnace and 2 channel) produced 42.3% of the Nation's total carbon black. One of the channel plants, Cabot Corp.'s Shafer facility in Carson County, was closed in August. In 1974, 11,781 million cubic feet of natural gas was consumed in the production of carbon black. A total of 258 million gallons of liquid hydrocarbons was used for feedstock to produce 1,412 million pounds or 98% of the State's carbon black output. Average yield was 5.47 pounds per gallon.

Coal (Lignite).—In 1974, lignite production was 7,684,000 tons, an increase of 740,000 tons, or 10.6%, over the output in 1973. Titus became the fourth active lignite-producing county when the Texas Utilities Generating Co. opened the Monti-

cello strip mine. Lignite from this mine was used to fuel the company's steam electric generating plant about 5 miles southwest of Mount Pleasant. ICI United States, Inc. (Atlas Chemical Div.), continued to strip mine lignite in Harrison County for use in manufacturing activated carbon. The Big Brown strip mine in Freestone County and the Sandow strip mine in Milam County were operated at or near capacity during the year.

Declining oil and gas production revived interest in the substantial lignite and bituminous coal resources in the State. The Bureau of Economic Geology[3] estimated Texas lignite resources to be about 10.4 billion tons at depths of less than 200 feet. Estimates of deep-basin lignite resources at depths between 200 and 5,000 feet are more than 100 billion tons.

Extensive leasing and drilling for lignite continued along the Wilcox trends from Bowie to Maverick Counties. The Yegua and Jackson lignites also attracted leasing and drilling attention in Lee, Burleson, Brazos, Grimes, McMullen, Washington, Fayette, and other counties in the Central and Southeast areas of the State. Shell Oil Co., Phillips Petroleum Co., Tenneco, Inc., and Dow Chemical Co. were actively engaged in leasing and drilling for lignite reserves. Texas Utilities, Inc., Texas Municipal Power Pool, and South Texas Electric Co-op. were some of the electric utilities acquiring lignite reserves.

Interest in the State's bituminous coals prompted the Bureau of Economic Geology[4] to publish a handbook on these resources in Texas. The report is a compilation of existing information, both published and unpublished, supplemented by field observations. Texas bituminous coal resources are more than 6.1 billion tons in beds at least 14 inches thick and overlain by less than 3,000 feet of overburden. Some leasing, drilling and mining feasibility studies were made on selected areas of the bituminous coalfields in north-central and south Texas.

Helium.—Production of crude helium was about 35 million cubic feet compared with 904 million cubic feet in 1973. Crude helium deliveries to the Federal Bureau of Mines from Phillips Petroleum Co. helium plants ceased late in 1973, contributing to this precipitous decline in output. Unit value of crude helium remained constant and Texas production was valued at $420,000.

Construction on the helium-enriching unit at the Federal Bureau of Mines Exell plant was completed. The work included piping, instrument calibration, pressure testing, and installation of cold boxes. The enrichment unit was tested and in operation at yearend. No high-purity helium was produced in the State in 1974.

Natural Gas.—Texas remained the leading natural gas producer, supplying 37.8% of the U.S. output. Marketed production was 8,171 billion cubic feet, down 4% from 1973 production. The average unit value climbed sharply from 20.4 cents to 31.1 cents per thousand cubic feet (Mcf), yielding a record value of $2,541 million. Natural gas was produced in 208 of the State's 254 counties. The 10 leading producers were, in billions of cubic feet, Pecos, 824; Kleberg, 547; Waller, 402; Ward, 399; Winkler, 321; Moore, 269; Brazoria, 248; Hemphill, 246; Nueces, 245; and Jim Wells, 216. These counties produced 45.5% of the State's total output.

According to American Gas Association (AGA) estimates, the State's proved natural gas reserve at yearend 1974 totaled 78.5 trillion cubic feet, a decline of 7.5% from the previous year. Texas natural gas reserves were 33% of the U.S. total.

According to TRRC, there were 37,243 productive gas wells in Texas as of yearend 1974. The average daily output per gas well was 51,995 cubic feet per day, down 16.5% from 1973 output. The average daily production of natural gas (casinghead or associated) from the State's oil wells was 31,548 cubic feet per day per well, a decrease of 9.2% from the 1973 rate.

Improved wellhead prices for natural gas, especially in the uncontrolled intra-State market, gave drillers added incentive to search for gas. Consequently, a stepped-up exploratory drilling program discovered 562 new gas pools in 1974 according to American Petroleum Institute (API) records. The new pools, new fields, extensions, and revisions added 1.547 trillion cubic feet to the State's natural gas reserves during the year. In spite of the

[3] Kaiser, W. R. Texas Lignite: Near-Surface and Deep-Basin Resources. Univ. Tex. (Austin), Bureau of Econ. Geol. Rept. Inv. 79, 1974, 70 pp.

[4] Evans, T. J. Bituminous Coal in Texas. Univ. Tex. (Austin), Bureau Econ. Geol. Handbook 4, 1974, 65 pp.

increased drilling effort, withdrawals exceeded additions; consequently, the State suffered a net loss of natural gas reserves for the seventh consecutive year.

South Texas (railroad districts 1, 2, and 4) had 33% of the State's natural gas reserves at yearend 1974. The area continued to be fruitful as 257, or 45%, of the State's new gas discoveries were made there. The Wilcox Group continued to be an attractive target for exploration and development activity; about 30 drilling rigs were located in Webb and Zapata Counties at yearend 1974. Other active gas exploration and development areas were west Texas (railroad districts 7B, 8, and 8A), the Panhandle (railroad district 10), and north-central Texas (railroad districts 7C and 9).

Drilling for Devonian, Silurian, Fusselman, and Ellenburger gas reserves dominated the activity in west Texas. Significant gas reserves were added in the Panhandle in Hemphill and Wheeler Counties. The Fort Worth basin remained the most active exploration and development drilling area in north-central Texas.

Natural Gas Liquids.—In 1974, the production of natural gas liquids was 302.1 million barrels, a decrease of 12.4 million barrels, or 3.9%, below 1973 output. The value increased 74.4% to $1,634 million, an alltime high. Texas produced 49% of the U.S. total. The principal components of natural-gas-liquids production were propanes and butanes, 51.2%; natural gasoline, 24.7%; ethane, 19.6%; and others, 4.5%.

According to AGA estimates, natural gas liquids reserves at yearend 1974 were 2,797 million barrels, down 33 million barrels, or 1.2%, from 1973 reserves. The State had 44% of the Nation's reserves of natural gas liquids.

There were 358 gas-processing plants in Texas at yearend 1974 compared with 362 at yearend 1973, according to the Oil and Gas Journal's annual survey of gas plants. Daily capacity on December 31, 1974, stood at 29.45 billion cubic feet per day, down 429 million cubic feet per day from 1973 capacity. The capacity of Texas gas-processing plants has remained virtually unchanged since 1970 when the capacity was 29.4 billion cubic feet per day. The stagnation in the growth in gas-processing capacity reflects the deterioration in the reserves of both crude oil and natural gas in the State.

Petroleum.—Texas led the Nation in production of crude oil, supplying 39.4% of the national total. Crude oil production was 1,262 million barrels, down 32.5 million barrels, or 2.5%, from 1973 production. However, the unit value increased sharply from $3.98 to $6.95 per barrel, which yielded a record high income of $8,773 million. With a few exceptions, the State's oilfields were produced at 100% of the market demand factor (MDF) for the second consecutive year.

Petroleum production was obtained from 201 of the State's 254 counties. The 10 leading counties and their production were, in millions of barrels, Scurry, 94.2; Yoakum, 77.6; Ector, 71.1; Gaines, 57.8; Andrews, 56.2; Gregg, 51.5; Hockley, 51.3; Wood, 46.1; Crane, 38.9; and Refugio, 37.4. The combined output of these counties was 582.1 million barrels, or 46.1% of the State's total. According to the TRRC, there were 159,702 productive oil wells at yearend 1974, a net increase of 612 wells during the year. Average daily production per well was 21.7 barrels, a decrease from 22.3 barrels in 1973.

Table 4.—Texas: Production and value of petroleum, natural gas, and natural gas liquids

Year	Crude petroleum		Natural gas [1]	
	Thousand 42-gallon barrels	Value (thousands)	Million cubic feet	Value (thousands)
1970	1,249,697	$4,104,005	8,357,716	$1,203,511
1971	1,222,926	4,261,775	8,550,705	1,376,664
1972	1,301,685	4,536,077	8,657,840	1,419,886
1973	1,294,671	5,157,623	8,513,850	1,735,221
1974	1,262,126	8,773,003	8,170,798	2,541,118

Year	Natural gas liquids					
	Natural gasoline and cycle products		LP gases and ethane		Total	
	Thousand 42-gallon barrels	Value (thousands)	Thousand 42-gallon barrels	Value (thousands)	Thousand 42-gallon barrels	Value (thousands)
1970	97,511	$284,871	204,177	$334,850	301,688	$619,721
1971	96,286	299,981	210,435	380,887	306,721	680,868
1972	92,437	294,163	226,624	428,319	319,061	722,482
1973	92,743	347,393	221,686	589,685	314,429	937,078
1974	88,316	629,529	213,756	1,004,653	302,072	1,634,182

[1] Marketed production, gas either sold or consumed by producers (including losses in transmission), amounts added to storage, and increases in gas pipelines.

Table 5.—Texas: Comparison of crude oil, natural gas, and natural gas liquids production in Texas and the United States

(Million barrels of crude oil equivalent)

Commodity	Production as oil equivalent [1]				Change from 1973 (percent)		Distribution percentage				Texas as percent of United States	
	Texas		United States		Texas	United States	Texas		United States			
	1973	1974	1973	1974			1973 [2]	1974	1973	1974	1973	1974
Crude oil	1,295	1,262	3,361	3,203	−2.5	−4.7	42.5	42.9	42.7	42.6	38.5	39.4
Natural gas (marketed)	1,520	1,459	4,044	3,857	−4.0	−4.6	49.9	49.6	51.4	51.4	37.6	37.8
Natural gas liquids	229	220	463	449	−3.9	−3.0	7.5	7.5	5.9	6.0	49.5	49.0
Total equivalent	3,044	2,941	7,868	7,509	−3.4	−4.6	99.9	100.0	100.0	100.0	38.7	39.2

[1] One barrel of crude oil is equivalent to 5,600 cubic feet of natural gas or 57.6 gallons of natural gas liquids.

[2] Total does not add to 100 because of rounding.

Table 6.—Texas: Crude oil, natural gas, and natural gas liquids reserves to production ratio in Texas and the United States [1]
(Million barrels of crude oil equivalent)

Commodity	Reserves				Reserve percentage				Reserves-production ratio			
	Texas		United States		Texas as percent of United States		Change from 1973		Texas		United States	
	1973	1974	1973	1974	1973	1974	Texas	United States	1973	1974	1973	1974
Crude oil	11,757	11,001	35,300	34,250	33.3	32.1	−6.4	−3.0	9.3	8.7	11.1	10.7
Natural gas	15,167	14,025	44,634	42,345	34.0	33.1	−7.5	−5.1	10.3	9.6	11.1	11.0
Natural gas liquids	2,064	2,040	4,707	4,631	43.8	44.0	−1.2	−1.6	8.4	9.3	8.7	10.3
Total oil equivalent	28,988	27,066	84,641	81,226	34.2	33.3	−6.6	−4.0	9.7	9.2	10.9	10.8

[1] Estimated proved reserves and production from American Gas Association, Inc. and American Petroleum Institute. One barrel of crude oil is equivalent to 5,600 cubic feet of natural gas or 57.6 gallons of natural gas liquids.

Table 7.—Texas: Production trends of crude oil, natural gas, and natural gas liquids
(Million barrels of crude oil equivalent)

Year	Production [1]				Percent of annual total			Change from previous year (percent)			
	Oil	Gas [2]	Liquids	Total	Oil	Gas	Liquids	Oil	Gas	Liquids	Total
1970	1,250	1,492	219	2,961	42.2	50.4	7.4	8.5	6.4	3.8	7.1
1971	1,223	1,527	224	2,974	41.1	51.3	7.5	−2.2	2.3	2.3	0.4
1972	1,302	1,546	233	3,081	42.3	50.2	7.6	6.5	1.2	4.0	3.6
1973	1,295	1,520	229	3,044	42.5	49.9	7.5	−0.5	−1.7	−1.7	−1.2
1974	1,262	1,459	220	2,941	42.9	49.6	7.5	−2.5	−4.0	−3.9	−3.4

[1] One barrel of crude oil is equivalent to 5,600 cubic feet of natural gas or 57.6 gallons of natural gas liquids.
[2] Marketed gas.

Total crude oil stocks aboveground in Texas at yearend were 79.4 million barrels. Refinery stocks of crude petroleum were 16.6 million barrels, or about 20% of the U.S. total. Stocks at tank farms and in pipelines were 58 million barrels, and on leases, 4.7 million barrels. Stocks of refined products at yearend 1974 were 114.9 million, or 12.6% higher than at the yearend 1973.

The annual crude oil refinery survey of the Oil and Gas Journal shows the capacity of the State's 45 active refineries to be 4,096,965 barrels per stream day, an increase over that of 1973. Texas had 26.5% of the total U.S. refining capacity. The additional refining capacity resulted from expansions of existing refineries and the reopening of several small refineries in the State. Some of the larger additions included 35,000 barrels per day at the Coastal States Petrochemical Co., Corpus Christi; 23,270 barrels per day at the Pride Refinery, Inc., Abilene; 34,000 barrels per day at the Southwestern Refining Co., Inc., Corpus Christi; and 34,400 barrels per day at the Quintana-Howell refinery, Corpus Christi.

According to figures of API, Texas had 32% of the total crude oil reserves in the United States. As of December 31, 1974, the estimated crude oil reserves were 11,002 million barrels, down 755 million barrels from those at the end of 1973. This is the fourth consecutive year that the State's crude oil reserves have declined.

Table 8.—Texas: Stocks of crude petroleum at refineries, tank farms, and gathering systems in Texas as of the last day of each month, 1974
(Thousand 42-gallon barrels)

Month	Refineries	Tank farms and pipelines	Lease tanks	Total
January	16,354	55,221	4,606	76,181
February	17,216	53,962	4,580	75,758
March	18,594	54,445	4,767	77,806
April	19,212	58,441	4,607	82,260
May	20,500	57,467	4,613	82,580
June	18,604	59,654	4,686	82,944
July	21,293	58,744	4,649	84,686
August	19,578	57,051	4,627	81,256
September	19,949	56,086	4,778	80,813
October	20,163	59,160	4,753	84,076
November	20,118	59,420	4,796	84,334
December	16,641	58,036	4,716	79,393

Table 9.—Texas: Stocks of refined products held by refining and pipeline companies in 1974, by month
(Thousand 42-gallon barrels)

Month	Naphthas	Gasoline	Kerosine	Fuel oil		Jet fuel	Miscellaneous products	Total refined products
				Distillate	Residual			
January	1,866	32,633	1,556	22,032	4,644	5,956	37,042	105,729
February	1,819	33,248	1,778	17,146	4,359	5,238	35,483	99,071
March	2,041	32,877	1,744	14,189	4,894	5,331	37,511	98,587
April	1,919	34,084	1,576	16,500	5,547	5,416	37,457	102,499
May	2,097	34,847	1,817	19,633	6,052	5,502	37,627	107,575
June	2,080	32,314	2,237	23,147	6,602	5,738	38,342	110,460
July	2,179	34,755	2,268	24,784	5,670	4,260	35,997	109,913
August	2,198	36,125	2,743	28,231	5,358	5,308	36,486	116,449
September	2,151	38,341	2,318	27,941	6,042	5,377	34,974	117,144
October	2,144	37,739	2,295	26,636	5,798	5,117	38,076	117,805
November	2,249	35,165	2,195	26,746	6,556	4,817	36,992	114,720
December	2,412	35,100	2,208	26,763	5,712	5,226	37,441	114,862

Table 10.—Texas: Crude petroleum production, indicated demand, and stocks in 1974, by month
(Thousand 42-gallon barrels)

Month	Production	Indicated demand	End of month stocks originating within Texas
January	108,105	111,216	89,715
February	98,739	96,647	91,683
March	109,098	109,702	90,943
April	105,226	100,581	95,456
May	107,942	107,092	96,172
June	103,769	104,161	95,649
July	106,826	106,054	96,288
August	105,834	107,495	94,494
September	102,621	103,355	93,634
October	105,970	100,821	98,654
November	102,427	102,902	98,055
December	105,569	108,508	94,986
1974 total	1,262,126	1,258,534	XX
1973 total	1,294,671	1,294,792	XX

XX Not applicable.

Table 11.—Texas: Runs to stills and output of refineries in 1974, by month

(Thousand 42-gallon barrels)

	Runs		Output								
						Fuel oil					
	Crude	Products	Lubricating oil	Gasoline	Kerosine	Distillate	Residual	Jet fuel	Petrochemical feedstocks	Miscellaneous
January	90,424	8,224	2,627	44,655	1,734	23,868	4,690	6,770	5,648	12,132
February	78,530	11,819	2,224	42,900	1,871	18,464	4,769	5,395	6,150	11,670
March	95,720	4,001	2,773	51,338	1,779	17,299	4,296	7,309	5,871	13,623
April	94,451	9,396	2,704	49,675	797	22,606	6,915	6,578	5,021	13,369
May	104,827	9,401	2,820	52,074	1,480	26,338	7,572	6,554	5,678	13,400
June	103,177	6,566	2,822	51,018	1,625	24,522	7,082	6,175	6,370	13,709
July	107,026	10,471	2,648	55,089	1,229	25,573	8,551	5,748	7,896	14,216
August	103,499	9,857	2,758	54,043	1,743	21,707	8,670	6,417	7,736	13,687
September	99,649	8,149	2,633	51,995	1,674	20,515	8,509	6,624	7,119	12,191
October	103,469	6,671	2,495	51,602	2,667	22,751	8,480	6,382	7,573	12,820
November	101,372	10,226	2,584	51,575	2,262	24,917	8,697	5,894	7,170	11,559
December	105,980	9,784	2,468	53,933	2,281	26,063	9,149	6,589	7,070	11,466
Total	1,188,124	104,565	31,556	609,897	21,142	274,623	87,380	76,435	79,302	158,842

Table 12.—Texas: Estimated proved recoverable reserves of natural gas, natural gas liquids, and crude oil, by district

Railroad district	Proved reserves Dec. 31, 1973	Extensions and revisions	New fields and new pools	Proved reserves Dec. 31, 1974	Change from Dec. 31, 1973
NATURAL GAS (MILLION CUBIC FEET)					
1	1,473,201	48,946	8,424	1,419,873	—53,328
2	8,449,920	—715,932	153,629	7,386,745	—1,063,175
3	18,526,171	—131,514	152,889	17,078,244	—1,447,927
4	19,416,215	—1,128,576	494,844	17,291,294	—2,124,921
5	1,149,781	—132,267	68,622	986,821	—162,960
6	5,432,193	—173,208	54,357	5,026,683	—405,510
7B	652,076	61,043	24,478	659,615	7,539
7C	2,430,873	146,373	21,984	2,303,591	—127,282
8	14,796,454	1,015,240	140,023	13,962,887	—833,567
8A	2,121,505	43,372	11,825	1,953,860	—167,645
9	1,502,193	52,275	7,984	1,416,465	—85,728
10	8,985,920	1,278,506	43,250	9,054,639	68,719
Total	84,936,502	364,258	1,182,309	78,540,717	—6,395,785
NATURAL GAS LIQUIDS (THOUSAND BARRELS)					
1	26,510	1,739	45	25,388	—1,122
2	144,318	—4,285	2,184	131,877	—12,441
3	464,794	—20,102	1,757	396,871	—67,923
4	490,561	—1,474	5,751	441,941	—48,620
5	73,261	—9,208	15,315	74,363	1,102
6	355,689	31,413	3,439	361,334	5,645
7B	62,161	9,547	2,407	64,987	2,826
7C	120,608	34,332	18	136,572	15,964
8	453,718	132,444	1,334	524,299	70,581
8A	264,731	55,217	--	277,820	13,089
9	78,462	281	12	69,693	—8,769
10	295,330	36,299	1,403	291,843	—3,487
Total	2,880,143	266,203	33,665	2,796,988	—33,155
CRUDE OIL (THOUSAND BARRELS)					
1	144,149	6,696	816	133,389	—10,760
2	677,125	11,554	2,980	622,886	—54,239
3	1,489,428	29,024	4,167	1,352,103	—137,325
4	304,422	—32,895	8,208	237,192	—67,230
5	126,462	3,272	1,135	110,892	—15,570
6	2,049,248	18,027	1,004	1,913,658	—135,590
7B	235,870	48,469	1,694	250,387	14,517
7C	204,996	23,135	973	199,587	—5,409
8	3,205,538	117,924	6,947	3,064,516	—141,022
8A	2,785,308	149,663	2,235	2,578,203	—207,105
9	363,708	45,250	2,965	369,822	6,114
10	170,359	17,424	627	168,871	—1,488
Total	11,756,613	437,543	33,751	11,001,506	—755,107

Source: American Gas Association, Inc. and American Petroleum Institute.

Higher wellhead prices for both oil and gas stimulated a substantial increase in the number of wells drilled in the State for the second consecutive year. According to the API, a total of 9,529 wells were drilled in 1974 compared with 8,098 in 1973. Average depth of all wells drilled in 1974 and 1973 was 5,266.4 feet and 5,459.7 feet, respectively. In 1974, the overall success ratio was 28.9% for exploratory wells and 81.6% for development wells. Comparable figures for 1973 were 26.5% for exploratory wells and 78.7% for development wells.

In south Texas (railroad districts 1, 2, and 4), a total of 2,110 wells were drilled in 1974 compared with 1,733 wells in 1973. The exploratory well count was 871, an increase of 378 wells, or 76.7%, above the 1973 number. The percentage of successful exploratory wells also increased sharply from 14% in 1973 to 35.8% in 1974. The principal exploration targets in south Texas were the Frio, Wilcox, Cretaceous, and Miocene formations.

A total of 943 wells were drilled in the upper gulf coast area (railroad district 3) in 1974. Of this total, 426 were exploratory wells, which resulted in 36 oil and 104 gas discoveries. The exploration success ratio was 32.9% compared with 29% for 1973.

Table 13.—Texas: Oil and gas well drilling completions, by county

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Anderson	18	1	4	1	--	8	32	94,579
Andrews	84	--	7	4	--	2	97	657,443
Angelina	--	--	--	--	1	3	4	33,843
Aransas	--	4	1	--	1	7	13	127,177
Archer	66	--	36	5	--	14	121	236,453
Armstrong	--	--	--	--	--	1	1	6,726
Atascosa	3	--	2	--	--	10	15	98,109
Austin	7	1	1	2	9	10	30	229,562
Bastrop	--	--	--	--	--	1	1	3,850
Baylor	1	--	4	1	--	4	10	23,309
Bee	9	19	14	5	18	16	81	423,188
Bexar	6	--	1	--	--	--	7	5,293
Borden	11	--	4	5	--	6	26	199,766
Bosque	--	--	--	--	--	2	2	11,048
Bowie	--	--	--	--	--	5	5	40,321
Brazoria	45	--	11	4	7	23	90	626,802
Brazos	--	1	--	--	--	--	1	3,464
Brewster	--	--	--	--	--	2	2	3,485
Brooks	14	14	6	--	7	4	45	345,634
Brown	29	7	16	2	--	15	69	131,699
Burleson	2	--	--	--	--	5	7	30,465
Caldwell	43	--	3	--	--	3	49	118,203
Calhoun	--	2	3	--	7	11	23	173,267
Callahan	40	4	35	2	--	15	96	170,025
Cameron	--	6	2	--	--	6	14	108,635
Camp	--	--	1	--	--	3	4	25,091
Carson	27	3	4	--	--	--	34	108,526
Cass	3	--	1	1	1	7	13	124,972
Chambers	18	3	6	1	10	9	47	387,685
Cherokee	2	--	--	--	2	20	24	170,139
Childress	--	--	--	--	--	2	2	12,422
Clay	21	1	11	1	--	28	62	246,691
Cochran	19	16	10	1	--	3	49	239,565
Coke	12	1	3	3	1	9	29	173,148
Coleman	12	8	13	--	2	8	43	105,441
Colorado	1	8	5	3	15	37	69	476,141
Comanche	8	1	2	--	7	12	30	94,294
Concho	1	--	1	--	3	15	20	55,632
Cooke	44	1	9	1	--	14	69	274,915
Coryell	--	--	--	--	--	3	3	10,387
Cottle	1	2	--	2	--	3	8	37,915
Crane	98	3	7	3	1	9	121	570,848
Crockett	4	40	14	2	4	7	71	408,029
Crosby	2	--	--	--	--	1	3	14,612
Culberson	1	--	--	1	--	4	6	41,700
Dawson	30	--	6	1	--	7	44	373,602

See footnote at end of table.

Table 13.—Texas: Oil and gas well drilling completions, by county—Continued

County	Proved field wells[1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Denton	--	10	1	2	11	18	42	251,251
De Witt	3	10	5	2	7	21	48	363,312
Dickens	3	--	2	--	--	3	8	37,530
Dimmit	77	15	12	3	12	16	135	518,956
Duval	39	37	23	3	6	28	136	464,962
Eastland	4	3	10	--	3	19	39	133,393
Ector	177	2	7	2	--	6	194	1,006,702
Edwards	--	37	7	--	11	22	77	422,015
Ellis	--	--	--	--	--	1	1	1,400
Erath	--	1	2	--	3	9	15	63,401
Falls	--	--	2	--	--	4	6	20,553
Fayette	--	--	--	--	--	2	2	11,712
Fisher	18	--	5	--	--	17	40	202,585
Foard	--	--	1	--	1	4	6	20,731
Fort Bend	33	5	11	--	1	6	56	276,618
Franklin	6	--	--	--	--	1	7	31,054
Freestone	--	--	2	--	4	5	11	86,988
Frio	8	1	1	--	--	3	13	53,917
Gaines	91	1	5	2	--	7	106	658,323
Galveston	2	2	5	6	1	10	26	267,656
Garza	60	--	5	2	--	8	75	356,002
Glasscock	46	--	6	3	--	2	57	366,133
Goliad	2	19	24	1	21	25	92	432,880
Gonzales	--	--	--	--	--	6	6	31,776
Gray	24	1	9	--	--	1	35	122,859
Grayson	2	--	--	3	--	12	17	96,797
Gregg	2	3	1	--	--	1	7	51,300
Grimes	--	1	--	--	1	2	4	27,444
Guadalupe	30	--	3	--	--	3	36	87,178
Hale	9	--	--	--	--	1	10	63,765
Hall	--	--	--	--	--	3	3	17,564
Hamilton	--	--	1	--	--	7	8	31,506
Hansford	4	12	7	--	2	9	34	217,427
Hardeman	1	--	1	--	--	8	10	85,025
Hardin	74	3	18	--	3	17	115	378,649
Harris	41	4	10	--	1	6	62	344,065
Harrison	6	7	3	2	1	4	23	176,013
Hartley	--	--	2	--	--	3	5	22,682
Haskell	21	--	10	1	--	13	45	193,834
Hemphill	6	52	9	5	5	9	86	913,495
Henderson	2	3	1	1	1	5	13	141,913
Hidalgo	2	19	7	1	5	13	47	490,581
Hill	--	--	--	--	--	1	1	1,165
Hockley	121	2	7	3	--	7	140	733,247
Hood	--	9	3	--	2	7	21	90,596
Hopkins	4	--	--	1	--	7	12	78,181
Houston	2	2	3	--	--	7	14	120,935
Howard	74	--	6	3	--	7	90	374,985
Hudspeth	--	--	--	--	--	1	1	2,947
Hunt	--	--	--	--	--	3	3	23,446
Hutchinson	14	5	5	1	1	5	31	144,791
Irion	100	2	6	7	--	3	118	734,155
Jack	27	13	23	7	19	38	127	560,320
Jackson	15	32	14	4	11	32	108	651,570
Jasper	1	--	2	2	1	8	14	121,157
Jefferson	21	--	10	2	--	12	45	280,312
Jim Hogg	4	2	6	2	1	23	38	163,488
Jim Wells	30	26	19	4	5	13	97	530,495
Johnson	--	--	--	--	--	5	5	35,478
Jones	12	--	11	5	--	25	53	156,723
Karnes	7	2	1	--	4	8	22	166,721
Kaufman	--	--	--	--	--	9	9	60,494
Kenedy	3	9	5	--	2	6	25	220,390
Kent	15	--	10	2	--	21	48	279,275
Kerr	--	--	--	--	--	2	2	6,367
Kimble	--	1	2	--	3	9	15	29,924
King	17	4	9	1	--	25	56	262,438
Kinney	--	--	--	--	--	2	2	2,809
Klebreg	20	4	12	2	2	8	48	374,014
Knox	8	--	6	2	--	4	20	41,398
Lamar	--	--	--	--	--	1	1	2,571
Lamb	--	--	1	--	--	2	3	8,369
Lampasas	--	--	--	--	--	1	1	2,070
La Salle	--	4	--	--	--	13	17	95,992

See footnote at end of table.

Table 13.—Texas: Oil and gas well drilling completions, by county—Continued

County	Proved field wells [1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Lavaca	--	24	18	2	37	56	137	777,717
Lee	--	--	--	1	--	4	5	38,120
Leon	3	3	1	--	--	2	9	62,112
Liberty	48	--	18	1	1	6	74	295,660
Limestone	3	--	2	--	1	5	11	57,209
Lipscomb	4	13	7	--	1	7	32	276,494
Live Oak	2	7	4	--	8	22	43	266,061
Loving	--	4	2	--	2	1	9	180,858
Lubbock	1	--	1	--	--	1	3	23,687
Lynn	1	--	--	--	--	7	8	67,107
McCulloch	2	1	2	1	1	14	21	26,400
McLennan	--	--	--	--	--	1	1	2,800
McMullen	5	6	6	--	--	24	41	209,223
Madison	--	--	--	3	--	1	4	34,564
Marion	6	--	--	--	--	4	10	50,901
Martin	170	--	3	8	--	1	182	1,699,411
Matagorda	2	4	3	3	8	31	51	479,569
Maverick	20	1	7	3	5	6	42	91,240
Medina	24	1	1	--	--	1	27	24,526
Menard	--	--	3	1	--	2	6	23,106
Midland	45	2	1	2	--	1	51	418,151
Milam	10	--	3	1	--	7	21	63,070
Mills	--	--	--	--	--	3	3	6,935
Mitchell	80	3	2	--	2	3	90	272,622
Montague	13	--	5	8	--	16	42	247,939
Montgomery	4	--	4	--	1	9	18	139,275
Moore	19	2	6	--	3	1	31	85,172
Motley	--	--	--	--	--	1	1	3,350
Nacogdoches	1	4	2	--	3	2	12	106,046
Navarro	13	--	10	--	3	12	38	103,224
Newton	--	--	--	1	--	7	8	71,895
Nolan	32	--	9	1	--	3	45	260,184
Nueces	43	19	11	2	3	12	90	667,608
Ochiltree	34	13	5	--	--	6	58	438,311
Oldham	--	--	--	--	--	3	3	23,507
Orange	5	1	3	3	1	3	16	107,787
Palo Pinto	13	63	14	3	15	30	138	599,405
Panola	--	19	4	--	3	2	28	226,352
Parker	1	27	1	--	3	8	40	200,535
Pecos	162	43	20	6	12	26	269	1,211,734
Polk	3	1	4	1	10	15	34	350,912
Potter	49	16	17	--	--	--	82	188,540
Presidio	--	--	--	--	--	1	1	19,739
Randall	--	--	--	--	--	1	1	8,141
Reagan	128	--	2	--	--	4	134	752,870
Real	--	--	--	--	--	4	4	25,556
Red River	--	--	--	--	--	2	2	5,000
Reeves	17	10	3	--	4	7	41	381,692
Refugio	14	7	3	3	10	4	41	260,675
Roberts	3	9	5	--	2	11	30	257,482
Robertson	--	--	--	1	--	3	4	22,452
Runnels	5	3	11	9	1	37	66	277,592
Rusk	2	8	6	--	3	8	27	195,009
Sabine	--	--	--	--	--	1	1	8,275
San Jacinto	--	--	1	--	1	9	11	120,947
San Patricio	15	21	7	4	6	21	74	616,227
San Saba	--	--	--	--	--	1	1	4,745
Schleicher	6	11	5	2	4	16	44	266,772
Scurry	101	--	3	2	--	5	111	425,310
Shackleford	88	--	63	6	4	13	174	279,348
Shelby	1	--	--	--	--	4	5	27,452
Sherman	--	--	--	--	--	1	1	7,000
Smith	6	2	3	--	1	11	23	194,852
Somervell	--	--	--	--	--	2	2	12,015
Starr	12	23	8	2	--	11	56	226,327
Stephens	58	11	16	4	5	21	115	400,742
Sterling	3	3	--	4	1	12	23	160,568
Stonewall	16	--	10	--	--	19	45	206,747
Sutton	1	192	25	--	7	11	236	1,591,132
Taylor	31	2	15	4	--	27	79	288,999
Terrell	--	4	--	--	1	6	11	120,049
Terry	11	--	2	--	--	6	19	93,287
Throckmorton	32	3	18	1	--	10	64	180,082
Titus	14	--	1	--	--	--	15	64,160

See footnote at end of table.

Table 13.—Texas: Oil and gas well drilling completions, by county—Continued

County	Proved field wells[1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Tom Green	1	--	3	1	--	7	12	70,904
Travis	--	--	--	--	--	2	2	3,659
Tyler	1	1	--	1	6	9	18	184,229
Upshur	--	8	2	--	--	2	12	136,975
Upton	126	2	6	2	--	2	138	629,258
Val Verde	--	1	--	--	1	2	4	48,239
Van Zandt	5	--	4	--	--	2	11	65,388
Victoria	4	26	13	4	19	18	84	487,427
Walker	--	--	--	--	--	3	3	39,730
Waller	--	2	1	--	--	--	3	29,500
Ward	27	19	8	--	7	2	63	671,331
Washington	3	--	4	--	2	2	11	46,775
Webb	5	49	8	4	40	31	137	909,076
Wharton	22	21	9	2	25	40	119	624,739
Wheeler	1	3	2	--	2	2	10	133,319
Wichita	286	1	42	--	--	1	330	450,360
Wilbarger	21	--	16	1	--	8	46	109,634
Willacy	2	1	2	--	--	4	9	81,115
Williamson	--	--	--	--	--	4	4	5,418
Wilson	9	--	7	2	--	3	21	58,375
Winkler	37	7	3	1	2	2	52	323,102
Wise	15	25	4	8	13	12	77	479,661
Wood	14	1	3	1	1	6	26	187,395
Yoakum	103	--	9	2	--	4	118	620,257
Young	65	1	29	17	4	32	148	381,677
Zapata	17	6	6	--	8	10	47	231,420
Zavala	7	1	5	1	--	15	29	108,423
Offshore 602	--	--	--	--	1	2	3	31,223
Offshore 603	--	1	--	--	4	2	7	41,038
Offshore 604	--	--	--	--	1	2	3	27,500
Offshore 605	--	1	1	--	--	1	3	33,932
Offshore 606	--	--	--	--	--	1	1	8,568
Offshore 700	--	1	--	--	4	1	6	37,632
Offshore 701	--	--	--	--	--	3	3	32,732
Offshore 703	--	2	--	--	--	7	9	69,327
Offshore 704	--	1	--	--	--	5	6	56,150
Offshore 705	--	--	--	--	--	2	2	22,392
Offshore 706	--	3	2	--	1	3	9	81,596
Offshore 707	--	--	--	--	--	6	6	51,828
Offshore 708	1	--	--	--	1	5	7	77,105
Offshore 709	--	--	--	--	--	41	41	318,039
Offshore 710	--	--	--	--	--	2	2	22,866
Offshore 711	--	--	--	--	--	55	55	420,798
State total	4,124	1,281	1,217	278	562	2,067	9,529	50,183,496

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

In the offshore area of Texas, a total of 163 wells were drilled in 1974. This is 91 wells, or an increase of 126%, over the 1973 total of 72 wells. The percentage of successful exploratory wells was only 8%, however, which was considerably below the 30% success experience for all onshore exploratory wells. Seismic activity in the offshore area increased substantially over that in 1973. Two Federal lease sales were conducted for Texas offshore areas. The first sale was held on May 29, 1974. Oil companies paid slightly over $1.5 billion for 565,000 acres off the southeast coast of Texas. The second lease sale was held July 30, 1974. At this sale, the Federal Government offered 711,383 acres for lease; however, only 146,880 acres received bids.

In east Texas (railroad districts 5 and 6), 432 wells were drilled in 1974, a 67-well increase over the 365 wells drilled in 1973. Exploratory wells numbered 202. Of this total, 33 wells were successful in finding 8 new oil and 25 new gas pools. The success ratio of all exploratory wells was 16.3%, up from 10%. An important Smackover discovery in Wood County established production outside of the past Smackover trend. A notable Travis Peak discovery was made in southwestern Panola County. An accelerated development-drilling program continued in previously discovered fields in Harrison, Panola, Rusk, and Nacogdoches Counties.

Exploration and development drilling in west Texas (railroad districts 7C, 8, and 8A) attained a 9-year high when a total of 3,107 wells were drilled, a 5% increase over 1973. West Texas had 510 exploratory wells drilled in 1974, an increase of 75 wells, or 17%, over those of a year ago. The success ratio dropped slightly to 28.2% compared with 29% in 1973. The Delaware basin, Eastern Shelf, and Northwest Shelf were the principal oil exploratory areas. Most of the test holes were aimed at horizons in the Ellenburger, Devonian, Silurian, and Fusselman formations. Significant oil discoveries were made in the Eastern Shelf area and in the Midland basin. Development drilling was active in the large Spraberry trend where over 300 oil wells were completed.

A total of 1,412 geophysical crew weeks were logged in west Texas during 1974. This is 416 crew weeks above the 1973 level. A major portion of the geophysical activity was in the Delaware basin, Central Platform, and Midland basin.

In 1974, 2,296 wells were drilled in north-central Texas (railroad districts 7B and 9). Of this total, 606 wells were exploratory holes that resulted in the discovery of 85 oil and 92 gas pools for an overall success ratio of 29.2%. For the second consecutive year, new gas discoveries outnumbered new oil finds in the area. About one out of three of the area's exploratory wells were drilled in the Fort Worth basin, which includes Jack, Palo Pinto, Parker, Hood, Wise, Erath, and Denton Counties. Drilling in the Fort Worth basin resulted in the discovery of 66 new gas finds and 20 new oil discoveries. The most significant gas discovery in the Fort Worth basin was in Palo Pinto County. Active drilling continued along the axis of the Bend arch. Young County was the leader in this area, with 53 exploratory wells that resulted in 17 oil and 4 gas discoveries. The most significant oil discovery in north Texas was made in the Marietta basin (Grayson County). In 1974, 1,595 development wells were drilled, an increase of 401 wells over 1973. Most of the development wells were drilled in older, shallower fields.

A total of 478 wells were drilled in the Texas Panhandle (railroad district 10) in 1974 compared with 394 in 1973. Exploratory wells totaled 87, with 16 completed as gas and 6 completed as oil discoveries, for an overall success percentage of 25.3%. A total of 392 field development wells were drilled with 185 oil completions, 129 gas completions, and 78 dry holes.

Petrochemicals.—The petrochemical industry remained a major contributor to the manufacturing economy of the State. In 1974, a notable increase in production capacity was made in a number of petrochemical facilities, mainly along the gulf coast area of the State. Tenneco Chemicals, Inc., completed a new polyvinyl chloride plant in Deer Park to produce 240 million pounds per year of chemical. Texas Alkyls, Inc., completed an expansion program that doubled the capacity of its Deer Park facilities to produce a catalyst component to use in the manufacture of polypropylene and ethylene propylene

diene monomer. Celanese Plastic Co. in Bishop is boosting its acetal copolymer capacity from 60 to 72 million pounds per year. In Beaumont, E.I. du Pont de Nemours & Co., Inc., is increasing its capacity to produce Nordel hydrocarbon rubber from 120 to 180 million pounds per year.

NONMETALS

The value of nonmetals produced in Texas during 1974 was $656.2 million, an increase of 27% for the year. Nonmetals constituted 5% of the total value of mineral production in Texas during 1974.

Output of lime, salt, sand and gravel, and sulfur reached new record highs. Production increases were noted for ball clay, fluorspar, fuller's earth, graphite, and stone. Declines were registered in the output of bentonite, cement, common clay, fire clay, gypsum, kaolin, sodium sulfate, and talc. Although they are not mined in Texas, barite, mica, perlite, and vermiculite were brought into the State for processing.

Barite.—No barite mines operated in Texas, but crude barite, mined elsewhere, was processed in the State during 1974. Output at the barite-grinding plants, located in Brownsville (two plants), Corpus Christi (one plant), and Houston (three plants), was 33% greater than that of 1973. Total value increased 52%.

Over 97% of the processed barite was used as a weighting agent in oil- and gas-well drilling muds. Tonnage from the Texas plants used for that purpose was up 36% for the year. Some of the processed barite also was used as a filler or extender in various products.

Cement.—Output of portland cement in Texas in 1974 failed to match that of the previous year as shipments declined 7%. However, total value of the shipments increased 9.7% owing to inflationary pressures, including higher fuel costs. Average value of gray portland cement shipped from Texas plants in 1974 was $26.84 per short ton, compared with $22.76 in 1973 and $19.48 in 1971.

The cement was prepared at 18 plants operated by 13 companies. Fourteen of the plants—in Bexar, Dallas, Ellis, Harris, Nueces, Orange, Potter, and Tarrant Counties—used the wet process in preparing the cement. Three plants—in Ector, El Paso, and Nolan Counties—used the dry process, and the plant in McLennan County employed both wet and dry processes.

Six of the plants prepared only gray portland cement, nine of the plants prepared both gray portland and masonry cement, and three of the plants prepared gray portland, white portland, and masonry cement.

Table 14.—Texas: Portland cement salient statistics
(Short tons)

	1973	1974
Number of active plants	18	18
Production	8,312,050	7,889,147
Shipments from mills:		
Quantity	8,320,477	7,738,672
Value	$189,368,484	$207,705,706
Stocks at mills, Dec. 31	464,584	644,096

Table 15.—Texas: Masonry cement salient statistics
(Short tons)

	1973	1974
Number of active plants	12	12
Production	250,140	216,122
Shipments from mills:		
Quantity	233,679	195,337
Value	$6,606,121	$6,438,178
Stocks at mills, Dec. 31	21,163	23,793

One of the Texas cement producers, General Portland, Inc., Trinity Div., was installing a new electrostatic precipitator at its Fort Worth cement plant to remove dust particles from the plant stack discharge. The project was expected to be completed late in 1975.

Clays.—Clays produced in Texas during 1974 included ball clay, bentonite, common clay, fire clay, fuller's earth, and kaolin. Output was reported from 45 counties. Although total clay production was 6% less than the record high of the previous year, the total value was up 4%. The output of ball clay and fuller's earth increased, but that of bentonite, fire clay, common clay, and kaolin declined in 1974.

Common clay, which was obtained from surface mines in 39 counties, accounted for 95% of the total tonnage and 61% of the total value of clays produced in Texas during 1974. Reflecting a decline

in the production of construction materials, the output of common clay decreased 6%, and total value was down 7% for the year. Average price was $1.68 per short ton. Much of the common clay was used to prepare portland cement, face brick, and lightweight aggregate. It also was used to make drain tile, sewer pipe, flower pots, quarry tile, earthenware, structural tile, and other products.

Table 16.—Texas: Clays sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Year	Ball		Bentonite		Fire clay		Common clay and shale		Total [1]	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
1970	W	W	74	839	351	1,334	3,550	4,945	4,148	9,587
1971	W	W	W	W	W	W	4,374	7,098	4,615	10,432
1972	W	W	88	1,128	89	684	4,894	7,872	5,175	11,554
1973	W	W	85	802	87	689	5,330	8,951	5,667	13,115
1974	41	329	69	881	41	316	5,046	8,365	5,315	13,677

W Withheld to avoid disclosing individual company confidential data; included in "Total."
[1] Includes fuller's earth, kaolin, and data indicated by symbol W.

Ball clay was mined in Cherokee and Rusk Counties; bentonite was produced in Angelina, Fayette, Gonzales, and Walker Counties. Fire clay was mined in Bastrop, Hopkins and Wood Counties, fuller's earth was mined in Fayette County, and kaolin was produced in Limestone County.

Two clay producers in Texas announced in 1974 that they would expand their facilities. Marshall Pottery, Inc., a producer of common clay in Harrison County, made plans to construct a new automated plant in the Marshall area capable of manufacturing 50,000 red clay flowerpots daily. In Coleman County, Martin Brick Co. planned to enlarge its facility in Coleman and to install a new kiln that would increase production capacity to 200,000 square feet per month of clay tile.

A change of ownership took place when Sulphur Springs Brick Co. purchased the facilities of Crush Brick Co. at Sulphur Springs in Hopkins County. The new owners began producing fire clay in 1974 for use in the manufacture of firebrick and block.

Fluorspar.—One producer, D & F Minerals Co., obtained metallurgical-grade fluorspar from La Paisano surface mine in the Christmas Mountains of Brewster County. Output increased 6% during 1974. The crude ore from the mine was moved by truck to Marathon, Tex., where Bailey Fluorspar Co. processed it before it was shipped to steel companies.

Fluorspar mined in Mexico also was processed at Marathon. Additional plants that processed Mexican fluorspar operated in Brownsville and Eagle Pass.

A publication describing fluorspar deposits in the State was issued in 1974.[5]

Gem Stones.—No gem stone mines operated in Texas during 1974, but dealers and hobbyists collected gem stones and rock and mineral specimens valued at an estimated $160,000. Agate, calcite, celestite, jasper, cinnabar, feldspar, fluorite, fossiliferous limestone, opal, petrified wood, quartz, and topaz were included in the materials collected.

Graphite.—Southwestern Graphite Co., Div. of Joseph Dixon Crucible Co., continued to operate the Nation's only active graphite mine. Output of small-flake crystalline graphite at the open pit mine, which is located in western Burnet County, increased about 15% in 1974. The graphite was processed at the company's plant near the mine. Natural crystalline-flake graphite is used in foundry facings, crucibles, paints, polishes, pencils, lubricants, and for other purposes.

Gypsum.—Texas production of crude gypsum totaling 1,365,000 short tons declined 16% in 1974, and total value was down 18%. The drop in output was attributed to the decreased demand for gypsum wallboard resulting from a slow-

[5] McAnulty, W. N., Sr. Fluorspar in Texas. Univ. Tex. (Austin), Bureau Econ. Geol. Handbook 3, 1974, 31 pp.

down in construction of residential housing during the year. Texas ranked fourth among the States in mined output.

Seven companies reported production from eight gypsum mines in six Texas counties: Fisher County (The Celotex Corp. and National Gypsum Co.), Gillespie County (Fredericksburg Gypsum Co.), Hardeman County (Georgia Pacific Corp.), Hudspeth County (Southwestern Portland Cement Co.), Nolan County (The Flintkote Co. and United States Gypsum Co.), and Stonewall County (National Gypsum Co.). All of the production was from surface mines.

Although some of the crude gypsum was used as portland cement retarder and as soil conditioner, most was calcined before use. Seven calcining plants, located in Dallas, Fisher, Hardeman, Harris, and Nolan Counties, reported an output of 1,096,000 short tons in 1974—down 19% for the year. Texas ranked second in output. The calcined gypsum was used in the preparation of wallboard, plaster, joint compounds, and other products.

Lime.—Output of lime at Texas plants totaled 1.8 million short tons in 1974, surpassing by 9% the previous record high production of 1973. Total value was up 47%. Quicklime accounted for 61% and hydrate for 39% of the total lime output. Average price of hydrate was $17.89 per short ton, and that of quicklime was $23.96. The increased cost of fuel required to heat the kilns at the plants contributed to a rise in lime prices.

Twelve companies prepared the lime at thirteen plants in Bexar, Bosque, Brazoria, Calhoun, Comal, Deaf Smith, Harris (two plants), Hill, Johnson, Nueces, Travis, and Williamson Counties. Raw materials used to prepare the lime were limestone, dolomite, and shell. Leading producers (listed alphabetically) were Austin White Lime Co., PPG Industries, Inc., Texas Lime Co., and United States Gypsum Co.

Lime from Texas plants was consumed in Texas, Louisiana, Oklahoma, and other areas. Almost 30% of the Texas output was used for soil stabilization. Additional uses are listed in table 17. Lime consumption in Texas during 1974 totaled 1,838,000 short tons, an increase of 12% for the year.

Table 17.—Texas: Lime sold or used by producers, by use
(Short tons)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Soil stabilization	575,400	$8,230,000	545,000	$9,472,000
Aluminum and bauxite	158,500	2,013,000	158,700	3,726,000
Paper and pulp	133,900	1,848,000	149,200	3,503,000
Water purification	136,700	1,599,000	114,700	2,693,000
Steel, electric	79,130	1,162,000	111,700	2,623,000
Steel, open-hearth	35,320	377,500	W	W
Masons lime	18,250	260,900	17,170	298,400
Petroleum refining	9,779	142,000	12,820	301,000
Oil well drilling	7,620	116,500	11,080	260,000
Sewage	10,410	116,300	7,864	185,000
Other uses [1]	512,300	11,022,800	706,800	16,580,000
Total [2]	1,677,000	26,890,000	1,835,000	39,644,000

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes alkalies, petrochemicals, chrome, BOF steel furnaces (1974), sugar refining, magnesium metal, glass (1974), insecticides, rubber (1974), plastics (1973), fertilizers (1974), food, agriculture, paint, wire drawing (1974), and items indicated by symbol W.
[2] Data may not add to totals shown because of independent rounding.

Mica.—There was no mine production of mica in Texas during the year. Western Mica Co., Div. of United States Gypsum Co., processed mica from out-of-State at a grinding plant in Fort Worth. The ground mica was used as an ingredient in paint.

Perlite.—No perlite mines operated in Texas during 1974, but out-of-State perlite was expanded at five plants in Harris, Bexar, Dallas, and Nolan Counties. Plant output increased 22% for the year.

Chief use of the expanded perlite was as concrete aggregate. Other uses were as

horticultural aggregate, low-temperature insulation, filter aid, plaster aggregate, and masonry and cavity-fill insulation.

Pumicite (Volcanic Ash).—No pumicite was mined in Texas. The pumicite surface mine of Rio Clay Products near Rio Grande City in Starr County remained inactive during 1974.

Salt.—The salt industry in Texas continued its upward climb during the year with a record high output of 11,379,000 short tons. Nine companies reported production at twelve operations in eleven counties. Total salt tonnage, consisting of salt in brine, evaporated salt and rock salt, increased 10% for the year, with a 13% increase in total value. Texas was ranked second among the States in salt output during 1974.

Table 18.—Texas: Salt sold or used by producers
(Thousand short tons and thousand dollars)

Year	Quantity	Value
1970	10,184	45,000
1971	9,217	40,838
1972	9,744	36,544
1973	10,354	45,350
1974	11,379	51,296

Most of the output was as salt in brine, which was obtained by solution mining. The brine was pumped from wells drilled into Permian salt beds in Hutchinson, Ward, and Yoakum Counties and into salt domes in Brazoria, Chambers, Duval, Fort Bend, Harris, Jefferson, Matagorda, and Van Zandt Counties. Salt-in-brine output increased 10% and its total value rose almost 12% for the year.

Rock salt was mined from the Hockley salt dome in Harris County and from the Grand Saline salt dome in Van Zandt County. Evaporated salt was produced in Fort Bend and Van Zandt Counties. Output of evaporated salt increased, but that of rock salt declined during 1974.

Sand and Gravel.—A new record high was reached as total output of sand and gravel in Texas increased 10% during the year. Total value rose 34%. Production was reported at 176 operations in 81 counties. Colorado County led in output and was followed, in sequence of production, by Dallas, Victoria, Travis, and Tarrant Counties. Texas ranked fifth among the States in sand and gravel production during 1974.

Sand and gravel sold or used commercially by producers accounted for 79% of the total Texas sand and gravel output. Construction sand and gravel constituted 96% of the total commercial production, and industrial sand made up 4%.

Output of industrial sand was up 25% in 1974, with an 85% increase in total value.

Table 19.—Texas: Sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

	Commercial		Government-and-contractor		Total sand and gravel [1]	
	Quantity	Value	Quantity	Value	Quantity	Value
1970	27,464	42,252	3,973	4,110	31,438	46,362
1971	29,607	48,831	3,181	2,983	32,788	51,814
1972	33,036	54,658	2,115	1,670	35,151	56,328
1973	35,739	58,098	2,807	2,608	38,546	60,706
1974	33,467	64,920	8,999	16,445	42,466	81,364

[1] Data may not add to totals shown because of independent rounding.

Table 20.—Texas: Industrial sand sold or used by producers, by use
(Thousand short tons and thousand dollars)

	1973		1974	
	Quantity	Value	Quantity	Value
Abrasives	W	W	W	W
Blast	135	382	316	1,954
Chemicals	W	W	W	W
Enamel	W	W	--	--
Engine	W	W	10	75
Filler	W	W	W	W
Filtration	W	W	11	138
Fire or furnace	W	W	--	--
Foundry	W	W	W	W
Glass	438	W	404	1,997
Molding	119	427	201	869
Oil hydrofrac	W	W	W	W
Pottery, porcelain, and tile	W	W	8	73
Other uses	420	3,844	442	3,490
Total industrial sand[1]	1,113	4,652	1,391	8,595

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Data may not add to totals shown because of independent rounding.

Chief use of the construction sand and gravel sold or used commercially by producers was as aggregate material in nonresidential and residential construction; 17.3 million short tons (or 52%) was used for that purpose. Additional uses are listed in table 22.

Construction sand and gravel sold or used by producers for publicly funded projects accounted for 21% of the total sand and gravel production. Almost one-half (4.3 million short tons or 48%) of this output was used in highway and bridge construction. Other publicly funded projects, which are listed in table 23, accounted for the remainder.

Table 21.—Texas: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	37,433	56,054	19,009	31,075
Gravel			17,762	38,385
Unprocessed: Sand and gravel			4,304	2,618
Industrial:				
Sand	1,113	4,652	1,391	8,595
Gravel			--	--
Total	38,546	60,706	42,466	80,623

[1] Value data may not be directly comparable to that in tables 1, 19, 22, and 23 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 22.—Texas: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			17,348	34,044
Highway and bridge construction			975	2,008
Other uses (dams, waterworks, airports, etc.)			669	1,215
Concrete products (cement blocks, brick, pipe, etc.)	31,886	51,217	3,113	5,528
Bituminous paving (asphalt and tar paving)			2,482	4,817
Roadbase and subbase			2,451	4,599
Unprocessed aggregate			4,089	2,552
Fill	1,611	1,056	581	780
Other uses [2]	1,128	1,173	368	782
Industrial sand and gravel	1,113	4,652	1,391	8,595
Total	[3]35,739	58,098	33,467	64,920

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes miscellaneous (1973).
[3] Data do not add to total shown because of independent rounding.

Table 23.—Texas: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			401	670
Highway and bridge construction			4,340	8,385
Other uses (dams, waterworks, airports, etc.)			229	432
Concrete products (cement blocks, brick, pipe, etc.)	2,765	2,528	66	88
Bituminous paving (asphalt and tar paving)			2,589	4,908
Roadbase and subbase			1,121	1,816
Unprocessed aggregate			214	66
Fill	24	26	30	47
Other	18	54	9	33
Total	2,807	2,608	8,999	16,445

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.

Sodium Sulfate (Natural).—Texas ranked second among the States in production of natural sodium sulfate during 1974. Ozark-Mahoning Co., the only producer, extracted the sodium sulfate (salt cake) from subterranean brines of the Texas High Plains. The brines were obtained through shallow wells drilled into alkali-lake beds and were treated at the company's Cedar Lake plant in the Seagraves area of Gaines County and the Brownfield plant located approximately 12 miles southeast of Brownfield in Terry County. Production dropped slightly during the year.

Sodium sulfate is used in the manufacture of products such as kraft paper, detergents, glass, medicines, dyes, and textiles. Its use in detergents as a replacement for phosphates increased in 1974.

Stone.—Total stone production in Texas, consisting of crushed or broken stone and dimension stone, increased slightly in 1974. Texas ranked third among the States in stone output during the year.

Crushed or broken stone accounted for most of the Texas stone production. Output was up 1%, with an increase of 23% in total value. Almost 88% of the crushed or broken stone consisted of limestone and dolomite, and nearly 9% consisted of shell. Other crushed or broken stone produced during the year included sandstone, quartzite, granite, marble, marl, and traprock. Combined production of limestone and dolomite increased 3%, with a 24% increase in total value. Granite output was 620% greater than during the previous year, and its total value increased 59%. Shell production was down 15% in 1974,

but total value was up 38%. Combined output of sandstone and quartzite declined 41%, with a 38% decrease in total value. Combined production of other stone, including marble, marl, and traprock, increased 34%, and total value was up 50%.

Table 24.—Texas: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone ---------- total --	21	2,325	W	W
Crushed and broken stone:				
Limestone and dolomite ----------	53,733	72,816	55,483	90,108
Granite ----------	25	236	180	375
Sandstone and quartzite ----------	1,671	3,919	978	2,412
Shell ----------	6,380	11,009	5,438	15,249
Other stone[1] ----------	744	1,074	996	1,614
Total crushed stone[2] ----------	62,554	89,054	63,074	109,758

W Withheld to avoid disclosing individual company confidential data.
[1] Includes marble, marl, and traprock.
[2] Data may not add to totals shown because of independent rounding.

Table 25.—Texas: Crushed and broken stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate ----------	7,959	15,864	6,370	16,069
Concrete aggregate ----------	6,696	10,807	8,199	15,455
Dense-graded roadbase stone ----------	20,837	20,019	23,465	29,534
Macadam aggregate ----------	416	653	566	787
Surface treatment aggregate ----------	3,655	8,795	2,834	9,004
Unspecified construction aggregate and roadstone	4,487	4,959	3,434	6,217
Agricultural purposes[1] ----------	339	672	415	928
Cement manufacture ----------	11,406	14,402	11,234	18,581
Filter stone ----------	W	192	28	74
Flux stone ----------	584	1,357	560	1,598
Lime manufacture ----------	2,363	3,592	2,620	4,106
Manufactured fine aggregate (stone sand) ------	222	403	160	354
Railroad ballast ----------	591	893	863	1,695
Riprap and jetty stone ----------	805	1,375	1,005	2,075
Terrazzo and exposed aggregate ----------	19	480	W	W
Asphalt filler ----------	105	262	W	W
Other filler ----------	28	W	30	W
Other uses[2] ----------	2,042	4,328	1,292	3,280
Total[3] ----------	62,554	89,054	63,074	109,758

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Data include agricultural limestone, poultry grit, and mineral food.
[2] Includes bedding material (1974), dead-burned dolomite, ferrosilicon (1973), paper manufacture, roofing aggregates, sugar refining, waste material, whiting, and uses not specified.
[3] Data may not add to totals shown because of independent rounding.

Slightly more than 37% of the crushed stone was used as dense-graded roadbase material, 18% was used in the manufacture of cement, and 4% was used in the preparation of lime. Additional uses are listed in table 25.

A major shell and limestone producer, Parker Bros. & Co., Inc., ceased shell-dredging operations in San Antonio Bay on the Texas gulf coast during 1974 because of siltation problems. This resulted in a drastic reduction in the amount of shell available for use as raw material at two cement plants in the Houston area.

Sulfur.—For the third consecutive year, Texas was the leading producer of native sulfur from Frasch mines. The record high output, totaling 4,593,000 long tons, rose 7% for the year. Shipments from Frasch mines in Texas also registered a gain.

As in 1973, the demand for sulfur by fertilizer manufacturers contributed to price increases. According to the Wall Street Journal (Nov. 15, 1974), the delivered price of Frasch dark sulfur in November was $57 per long ton at the Tampa, Fla., terminal.

Frasch sulfur was produced in Texas by four companies at seven operations in six counties. In west Texas, it was obtained from deposits in subsurface Permian rocks in northeastern Pecos County by Atlantic Richfield Co., and in northeastern Culberson County by Duval Corp. On the gulf coast, the sulfur was obtained from salt-dome caprock. Producers were Jefferson Lake Sulphur Co., with an operation at Long Point Dome in Fort Bend County, and Texasgulf Inc., which operated Frasch mines at Fannett Dome and Spindletop Dome in Jefferson County, at Moss Bluff Dome in Liberty County, and at Boling Dome in Wharton County.

One of the gulf coast producers, Texasgulf, Inc., announced plans to open a new Frasch sulfur mine in West Texas. The mine, located on University of Texas land about 6 miles northeast of Fort Stockton in Pecos County, was expected to have a productive capacity of from 500 to 1,000 tons per day.

In addition to the native sulfur produced at the Frasch mines, elemental sulfur was recovered from sour (sulfur-bearing) natural gas and petroleum and also from smelter gases during 1974. The recovered sulfur, totaling 855,695 long tons, was produced at 51 plants in 29 counties. Sales in 1974 amounted to 861,242 long tons valued at $19,746,983.

Table 26.—Texas: Sulfur produced and shipped from Frasch mines
(Thousand long tons and thousand dollars)

Year	Production	Shipments	
		Quantity	Value [1]
1970	3,446	2,844	63,321
1971	3,408	3,092	W
1972	3,755	3,847	W
1973	4,294	4,109	W
1974	4,593	W	W

W Withheld to avoid disclosing individual company confidential data.
[1] F.o.b. mine plant.

Talc.—All of the State's 1974 talc production was from Culberson and Hudspeth Counties in west Texas. Surface mines in that area yielded 192,492 short tons of crude talc, a 17% decrease for the year. Total value of the production increased 5%. Average value was $6.81 per short ton, compared with $5.36 in 1973.

The producers—Pioneer Talc Co., Inc., Southern Clay Products, Inc., Texas Talc Co., Inc., and Westex Talc Co. (subsidiary of the Milwhite Co.)—mined the talc in the Allamoore area of Hudspeth County. Westex Talc Co. also operated a talc mine at Tumbledown Mountain in Culberson County and a talc calcining and milling plant near Van Horn.

Texas talc was used in ceramic products, paint, insecticides, roofing materials, and in the manufacture of textiles.

Vermiculite.—No vermiculite mines operated in Texas during 1974, but vermiculite was brought into the State and processed at three exfoliating plants, one each in Dallas, Houston, and San Antonio. Plant output was down less than 1% for the year. The exfoliated vermiculite was used as concrete aggregate, fertilizer carrier, plaster aggregate, loose-fill insulation, soil conditioner, and fireproofing material.

METALS

In 1974, iron, magnesium, sodium, and uranium were the only indigenous metallic minerals produced in Texas. Iron and uranium were mined from open pits, whereas sodium and magnesium were recovered from salt, brines, and seawater. A diversified metal extractive and process-

ing industry consisting of 17 primary metal smelters, refineries, and reduction plants continued to make significant contributions to the State's economy. Primary aluminum, antimony, copper, iron, lead, magnesium, manganese, tin, tungsten, zinc, sodium, and byproducts such as cadmium, gold, and silver were refined or smelted in the State. Metal scrap and other secondary materials were also processed and refined for reuse in manufacturing by 22 facilities.

Table 27.—Texas: Smelters, refineries, and reduction plants in 1974

Product, company, and plant	Location (county)	Material treated
Aluminum:		
Aluminum Company of America:		
Point Comfort (alumina)	Calhoun	Bauxite.
Point Comfort (reduction)	do	Alumina.
Rockdale (reduction)	Milam	Do.
Reynolds Metals Co.:		
Sherwin works (alumina)	San Patricio	Bauxite.
San Patricio (reduction)	do	Alumina.
Antimony:		
NL Industries, Inc.:		
Laredo smelter	Webb	Ore.
Cadmium:		
ASARCO, Inc.:		
Electrolytic	Nueces	Flue dust.
Copper:		
ASARCO, Inc.:		
El Paso smelter	El Paso	Ore and concentrates.
Phelps Dodge Refining Corp.:		
Nichols refinery	do	Blister and anode.
Iron:		
Lone Star Steel Co.:		
Daingerfield plant	Morris	Ore and scrap.
Armco Steel Corp.:		
Houston plant	Harris	Do.
United States Steel Corp.:		
Cedar Point plant	Chambers	Do.
Lead:		
ASARCO, Inc.:		
El Paso smelter	El Paso	Ore and concentrates.
Magnesium:		
The Dow Chemical Co.:		
Freeport plants, electrolytic	Brazoria	Seawater.
American Magnesium Co.:		
Snyder plant, electrolytic	Scurry	Brine.
Manganese:		
Tenn-Tex Alloy Corp	Harris	Ore.
Sodium:		
Ethyl Corp	do	Salt.
Tin-Tungsten:		
Gulf Chemical & Metallurgical Corp.:		
Texas City smelter	Galveston	Ore.
Zinc:		
ASARCO, Inc.:		
Amarillo retort smelter	Potter	Ore and concentrates.
Corpus Christi electrolytic	Nueces	Do.
El Paso fuming plant	El Paso	Dusts and residues.

Table 28.—Texas: Secondary metal recovery plants

County and company	Material	Products
Austin:		
Schindler Bros. Steel Co	Steel scrap	Reinforced steel bars.
Dallas:		
Abasco, Inc	Aluminum scrap	Aluminum ingots, dioxidizing bars, and shot.
ASARCO	Lead and zinc scrap	Lead and zinc ingots, pigs, alloys.
Dixie Industries	Lead scrap	Lead pigs, alloys, chemicals.
NL Industries, Inc., Southwestern Branch.	Battery plates	Lead products.
Southern Lead Co	do	Lead pigs, alloys.
El Paso:		
Border Steel Mills, Inc	Steel scrap	Steel shapes, reinforcing bars.
Gregg:		
R. C. LeTourneau, Inc	do	Heavy mobile equipment.
Guadalupe:		
Structural Metals, Inc	do	Structural-steel reinforcing bars.
Harris:		
A & B Metal & Smelting Co	Aluminum, lead scrap	Lead pigs, ingots, aluminum ingots, alloys.
Federated Metals	Various metals	Lead products, alloys of copper, lead, zinc, magnesium, tin.
Gulf Reduction Corp	Aluminum, zinc scrap	Aluminum and zinc ingots, alloys.
Houston Lead Co	Lead scrap	Lead pigs, ingots, alloys.
Houston Fishing Tackle Co	Soft lead scrap	Lead products.
Lead Products, Inc	Lead scrap	Lead pigs, ingots, alloys.
Magnus Metal	Various metal scrap	Lead, brass, bronze-bearing metal.
Proler International Corp	Aluminum and zinc scrap.	Aluminum and zinc ingots.
Southwest Saw Corp	Steel scrap	Steel alloys.
Sterling Type, Rule, and Metals Co.	Type metal	Type metal.
Vulcan Materials Co	Tinned scrap	Refined tin, baled detinned steel.
Tarrant:		
National Metal & Smelting Co	Battery lead and aluminum scrap.	Lead pigs, ingots, battery metal, aluminum ingots.
Texas Steel Co	Steel scrap	Carbon and alloy steel bars and shapes, reinforcing bars.

Aluminum.—Smelter output of primary aluminum increased 2.5% and value increased 22.8% in 1974. Texas ranked second nationally in production and value of primary aluminum.

Antimony.—Primary antimony metal was produced by NL Industries, Inc., at the Nation's largest antimony smelter in Laredo. Antimony ores treated at the smelter are imported principally from Mexico. Output was down about 3%, but value increased more than 150% over that in 1973.

Cadmium.—Cadmium metal was recovered as a byproduct at ASARCO, Inc.'s, electrolytic zinc smelter in Corpus Christi. Production declined about 23%; however, the value declined only 11% because of an increase in unit value.

Copper.—Primary copper was produced at the El Paso smelter of ASARCO, Inc. Ores and concentrates are imported from other States and foreign countries. Blister and anode copper is treated at the Phelps Dodge Refining Corp.'s Nichols refinery in El Paso. ASARCO continued construction of a new electrolytic copper refinery northeast of Amarillo in Potter County. Completion date is scheduled for late 1975.

Iron Ore.—Brown iron ore (limonite and siderite) was mined from open pits in Cass, Morris, and Nacogdoches Counties. The ore was used in the production of pig iron and cement. Output of iron ore decreased about 5% and total value was up over 1973 levels.

Lead.—Primary lead was recovered at the ASARCO, Inc., metallurgical complex in El Paso. Ores and concentrates were imported from other States and Mexico. Several secondary lead smelters also processed and refined lead scrap in the State.

Magnesium.—Two companies recovered magnesium chloride from seawater and from brine wells for the production of magnesium metal and compounds. Output

and value of metal and compounds were higher than in 1973. American Magnesium Co. resumed production of magnesium metal in the last quarter of 1974. The company had been closed for installation and testing of new equipment. High magnesium brine feed for the American Magnesium's Synder plant was obtained from wells in the vicinity of Gail (Borden County).

The Dow Chemical Co., the world's largest supplier of magnesium metal and magnesium compounds, continued to produce these commodities from seawater at the company's plant at Freeport (Brazoria County).

Manganese.—Imported feedstocks are used at the Tenn-Tex Alloy Corp. of Houston to produce ferrous manganese and silicomanganese.

Mercury.—No mercury production was reported in 1974. The Anchor Co.'s Whit-Roy mine in Presidio County was closed in 1973.

Sodium.—The Ethyl Corp. continued to produce metallic sodium from salt by the electrolytic process at its plant on the Houston ship channel. The output was used principally to produce tetraethyl- and tetramethyllead. These compounds are added to gasoline to increase antiknock qualities of the motor fuel.

Tin.—Gulf Chemical and Metallurgical Corp. continued to operate the only tin smelter in the United States in Texas City. Most of the feedstock for the smelter was tin ore imported from Bolivia. Substantial increases in deliveries of tin concentrates from Bolivia allowed the company to raise its output about 25% over last year's production.

Uranium.—Production of uranium (U_3O_8) was down 10.3% but a substantial increase in the unit price increased the value about 45% over that of 1973. Ore was mined from open pits in Live Oak and Karnes Counties and processed in the Conquista uranium mill, which has a rated capacity of 1,750 tons per day, or about 7% of the total U.S. milling capacity. The Conquista mill, owned jointly by the Continental Oil Co. and Pioneer Gas Co., was the only active mill in the State in 1974. Susquehanna Western, Inc., dismantled its Karnes County mill, and Exxon's Ray Point mill remained closed during the year.

According to the Energy Research and Development Administration (ERDA) Texas ranked fourth in proved uranium reserves with about 7% of the U.S. total. As of December 31, 1974, the State had 14,400 tons of U_3O_8 based on an average grade of 0.1% and a price of $8 per pound. The 14,400 tons of U_3O_8 was in 45 deposits.

The State ranked third in exploration and development drilling for uranium in the United States with 2,980,000 feet drilled, or 13.6% of the Nation's total. Acreage under lease, as of December 31, 1974, totaled 627,000 acres, down 14,000 acres from yearend 1973.

The Atlantic Richfield Co., Dalco Oil Co., Mobil Oil Corp., Union Carbide Corp., and Westinghouse Nuclear Fuels Div. continued activities aimed at recovering uranium by in situ solution mining. At the Clay West uranium deposit in Live Oak County, the Atlantic Richfield Co. began drilling development wells and constructing a uranium-recovery plant, thus converting a pilot project into a commercial-scale operation.

Zinc.—Primary zinc metal was recovered by ASARCO, Inc., at its smelters in El Paso, Nueces, and Potter Counties. Zinc concentrates and ores were imported from other States and foreign countries.

Table 29.—Texas: Principal producers

Commodity and company	Address	Type of activity	County
Asphalt (native):			
Uvalde Rock Asphalt Co	P.O. Box 531 San Antonio, Tex. 78206	Mine	Uvalde.
White's Uvalde Mines, Inc	P.O. Box 499 San Antonio, Tex. 78206	---- do	Do.
Barite:			
Dresser Minerals	P.O. Box 6504 Houston, Tex. 77005	Grinding plant	Cameron.
The Milwhite Co., Inc	P.O. Box 15038 Houston, Tex. 77020	---- do	Harris.
NL Industries, Inc	P.O. Box 1675 Houston, Tex. 77001	---- do	Nueces.
Carbon black:			
Ashland Chemical Co	P.O. Box 1503 Houston, Tex. 77005	Furnace plant	Aransas and Wheeler.
Cabot Corp	125 High St. Boston, Mass. 02110	Channel plant	Carson.
Do	---- do	Furnace plant	Gray and Howard.
Columbian Carbon Co., Div. of Cities Service Co.	3200 West Market Akron, Ohio 44313	---- do	Montgomery.
Do	---- do	Channel plant	Gaines.
Continental Carbon Co	P.O. Box 22085 Houston, Tex. 77027	Furnace plant	Moore.
J. M. Huber Corp	P.O. Box 831 Borger, Tex. 79066	---- do	Harris and Hutchinson.
Phillips Petroleum Co	Adams Bldg. Bartlesville, Okla. 74004	---- do	Hutchinson and Orange.
Sid Richardson Carbon & Gasoline Co.	1105 Fort Worth National Bank Bldg. Ft. Worth, Tex. 76102	---- do	Howard.
Cement:			
Alpha Portland Cement Co	15 South 3d St. Easton, Pa. 18042	Quarry and plant.	Orange.
Capitol Aggregates, Inc	Rte. 13, Box 412 San Antonio, Tex. 78209	Plant	Bexar.
Centex Cement Corp	P.O. Box 9294 Corpus Christi, Tex. 78408	Quarry and plant.	Nueces.
General Portland, Inc	2800 Republic Bank Tower Dallas, Tex. 75201	---- do	Dallas, Harris, Tarrant.
Gifford-Hill Portland Cement Co.	P.O. Box 520 Midlothian, Tex. 76065	---- do	Ellis.
Gulf Coast Portland Cement Co., Div. of McDonough Co.	P.O. Box 262 Houston, Tex. 77001	---- do	Harris.
Ideal Cement Co., Div. of Ideal Basic Industries, Inc.	420 Ideal Cement Bldg. Denver, Colo. 80202	---- do	Do.
Longhorn Cement Div., Kaiser Cement & Gypsum Corp.	Kaiser Center 300 Lakeside Dr. Oakland, Calif. 94612	Plant	Bexar.
Lone Star Industries Inc	P.O. Box 47327 Dallas, Tex. 75247	Quarry and plant.	Harris and Nolan.
San Antonio Portland Cement Co.	P.O. Box 6925 San Antonio, Tex. 78209	---- do	Bexar.
Southwestern Portland Cement Co.	P.O. Box 392 El Paso, Tex. 79943	---- do	Ector, El Paso, Potter.
Texas Industries, Inc	P.O. Box 146 Midlothian, Tex. 76065	---- do	Ellis.
Universal Atlas Cement Div., United States Steel Corp.	600 Grant St. U.S. Steel Bldg. Pittsburgh, Pa. 15230	---- do	McLennan.
Clay and shale:			
Acme Brick Co., Div. of Justin Industries, Inc.	P.O. Box 425 Fort Worth, Tex. 76101	Mine and plant	Denton, Nacogdoches, Parker, Wise, Van Zandt.
Balcones Mineral Corp	P.O. Box B Flatonia, Tex. 78941	---- do	Fayette.
Dresser Minerals	P.O. Box 6504 Houston, Tex. 77005	---- do	Angelina and Limestone.
Elgin Butler Brick Co	4000 East Ave. Austin, Tex. 78767	---- do	Bastrop.
Featherlite Corp	P.O. Box 141 Ranger, Tex. 76470	---- do	Bexar and Eastland.
General Portland Inc	P.O. Box 2698 Dallas, Tex. 65201	---- do	Dallas and Limestone.
General Refractories Co	1520 Locust St. Philadelphia, Pa. 19102	---- do	Cherokee.

Table 29.—Texas: Principal producers—Continued

Commodity and company	Address	Type of activity	County
Clay and shale—Continued			
Gulf Coast Portland Cement Co., Div. of McDonough Co.	P.O. Box 262 Houston, Tex. 77001	Mine and plant	Chambers.
Henderson Clay Products Co.	P.O. Box 1251 Henderson, Tex. 75652	---- do ----	Rusk.
Lone Star Industries, Inc	P.O. Box 47327 Dallas, Tex. 75247	---- do ----	Fisher and Harris.
The Milwhite Co., Inc	P.O. Box 15038 Houston, Tex. 77020	---- do ----	Fayette and Walker.
Southern Clay Products Inc	P.O. Box 44 Gonzales, Tex. 78629	---- do ----	Angelina, Cherokee, Gonzales.
Texas Clay Products, Inc	P.O. Box T Malakoff, Tex. 75148	---- do ----	Henderson.
Texas Industries, Inc	8100 Carpenter Freeway Dallas, Tex. 75247	---- do ----	Dallas, Marion, Comanche, Ellis, Fort Bend, Henderson, Van Zandt.
Coal (lignite):			
ICI United States, Inc	P.O. Box 790 Marshall, Tex. 75670	Strip mine	Harrison.
Industrial Generating Co	P.O. Box 1111 Rockdale, Tex. 76567	---- do ----	Milam.
Texas Utilities Generating Co.	P.O. Box 948 Fairfield, Tex. 75840	---- do ----	Freestone.
Do	P.O. Box 1266 Mt. Pleasant, Tex. 75455	---- do ----	Titus.
Fluorspar:			
D & F Minerals Co	P.O. Box 75 Terlingua, Tex. 79852	Mine	Brewster.
Graphite:			
Southwestern Graphite Co	Burnet, Tex. 78611	---- do ----	Burnet.
Gypsum:			
The Celotex Corp	1500 North Dale Mabry Tampa, Fla. 33607	Open pit mine and calcining plant.	Fisher.
The Flinkote Co	480 Central Ave. East Rutherford, N.J. 07073	---- do ----	Nolan.
Georgia-Pacific Corp	P.O. Box 311 Portland, Oreg. 97207	---- do ----	Hardeman.
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	---- do ----	Fisher.
United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	---- do ----	Nolan.
Do	---- do ----	Plant	Harris.
Iron ore:			
Lone Star Steel Co	P.O. Box 12226 Dallas, Tex. 75225	Open pit	Cass and Morris.
Tex-Iron, Inc	Cushing, Tex. 75760	---- do ----	Nacogdoches.
Lime:			
Aluminum Co. of America	1028 Alcoa Bldg. Pittsburgh, Pa. 15219	Plant	Calhoun.
Armco Steel Corp	P.O. Box 1367 Houston, Tex. 77001	---- do ----	Harris.
Austin White Lime Co	General Delivery McNeil, Tex. 78651	---- do ----	Travis.
Champion Papers, Inc	P.O. Box 872 Pasadena, Tex. 77501	---- do ----	Harris.
Dow Chemical Co	2020 Dow Center Midland, Mich. 48640	---- do ----	Brazoria.
Eastex, Inc	P.O. Box 816 Silsbee, Tex. 77656	---- do ----	Jasper.
McDonough Bros., Inc	Fredericksburg Rd. Rt. 8, Box 222 San Antonio, Tex. 78228	---- do ----	Bexar.
PPG Industries, Inc	P.O. Box 4026 Corpus Christi, Tex. 78408	---- do ----	Nueces.
Round Rock Lime Co	P.O. Box 218 Round Rock, Tex. 78664	---- do ----	Hill and Williamson.
Texas Lime Co	P.O. Box 851 Cleburne, Tex. 76031	---- do ----	Johnson.
United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	---- do ----	Comal and Harris.
Magnesium compounds:			
The Dow Chemical Co	2020 Dow Center Midland, Mich. 48640	---- do ----	Brazoria.

Table 29.—Texas: Principal producers—Continued

Commodity and company	Address	Type of activity	County
Magnesium compounds—Continued			
A. P. Green Refractories Co.	Freeport, Tex. 77541	Plant	Brazoria.
E. J. Lavino & Co	3 Penn Center Plaza Philadelphia, Pa. 19102	do	Do.
Magnesium:			
American Magnesium Co	Snyder, Tex. 79549	do	Scurry.
The Dow Chemical Co	2020 Dow Center Midland, Mich. 48640	do	Brazoria.
Mica:			
Western Mica Co., Div. of United States Gypsum Co.	101 South Wacker Dr. Chicago, Ill. 60606	do	Tarrant.
Perlite:			
Filter Media, Inc	P.O. Box 19156 Houston, Tex. 77024	Expanding plant	Harris.
Perlite of Houston, Inc	P.O. Box 8386 Houston, Tex. 77004	do	Do.
Perlite Products Co	2651 Manila Dallas, Tex. 75212	do	Dallas.
Sil-Flo Corp	3405 North Sylvania Ave. P.O. Box 7086 Ft. Worth, Tex. 76111	do	Tarrant.
Texas Lightweight Products Co.	117 North Britain Rd. Irving, Tex. 75060	do	Dallas.
United States Gypsum Co	101 South Wacker Dr. Chicago, Ill. 60606	do	Nolan.
Roofing granules:			
H. B. Reed & Co., Inc	8149 Kennedy Ave. Highland, Ind. 46322	Plant	Milam.
Salt:			
Diamond Shamrock Corp	300 Union Commerce Bldg. Cleveland, Ohio 44115	Brine wells	Chambers.
The Dow Chemical Co	Midland, Mich. 48640	do	Brazoria.
Montex Chemical Co	104 East 3d Monahans, Tex. 79756	do	Ward.
Morton Salt Co	110 North Wacker Dr. Chicago, Ill. 60606	Underground mine and brine wells.	Van Zandt.
PPG Industries, Inc	P.O. Box 4026 Corpus Christi, Tex. 77704	Brine wells	Duval. Hutchinson.
Phillips Petroleum Co	Bartlesville, Okla. 74003	do	Harris, Jefferson,
Texas Brine Corp	4614 Montrose Blvd. Houston, Tex. 77006	do	Matagorda.
United Salt Corp	do	Underground mine and brine wells.	Fort Bend and Harris.
Vulcan Materials Co	P.O. Box 1060 Denver City, Tex. 79323	Brine wells	Yoakum.
Sand and gravel:			
Capitol Aggregates, Inc	Rt. 13, Box 412 San Antonio, Tex. 78209	Stationary	Guadalupe and Travis.
Dresser Minerals	Kosse, Tex. 76653	do	Limestone.
The Fordyce Co	P.O. Box 1981 San Antonio, Tex. 78206	do	Hidalgo, San Patricio, Victoria.
Fort Worth Sand & Gravel Co.	P.O. Box 400 Arlington, Tex. 76010	do	Dallas, Denton, Tarrant.
Gifford-Hill & Co., Inc	P.O. Box 47127 Dallas, Tex. 75247	do	Brazos, Colorado, Dallas, McLennan, Tarrant, Wichita.
Horton & Horton	P.O. Box 1669 Houston, Tex. 77001	Portable and dredge.	Colorado, Harris, Victoria.
Janes-Prentice, Inc	P.O. Box 2155 Austin, Tex. 78767	Stationary	Crosby.
Lone Star Industries, Inc	P.O. Box 47327 Dallas, Tex. 75247	do	Colorado, Denton, Nolan.
Parker Bros. & Co., Inc	P.O. Box 107 Houston, Tex. 77001	Stationary and dredges.	Colorado and Harris.
Thorstenberg Materials Co	1435 Bank of the Southwest Bldg. Houston, Tex. 77002	do	Do.
Shell:			
Lone Star Industries, Inc	P.O. Box 86 Houston, Tex. 77001	Dredge	Calhoun.
Parker Bros. & Co., Inc	5303 Navigation Bldg. P.O. Box 107 Houston, Tex. 77001	do	Do.

Table 29.—Texas: Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sodium (metallic):			
Ethyl Corp	P.O. Box 472 Pasadena, Tex. 77501	Plant	Harris.
Sodium sulfate (natural):			
Ozark-Mahoning Co	1870 South Boulder Tulsa, Okla. 74119	---- do	Gaines and Terry.
Stone:			
Barrett Industries	2718 SW. Military Dr. P.O. Box 21070 San Antonio, Tex. 78221	Quarry	Bexar.
General Portland Inc	2800 Republic Bank Tower Dallas, Tex. 75201	---- do	Dallas and Tarrant.
Gifford-Hill & Co., Inc	P.O. Box 47127 Dallas, Tex. 75247	---- do	Wise and Hudspeth.
Lone Star Industries, Inc	P.O. Box 47327 Dallas, Tex. 75247	---- do	Burnet, Calhoun, Ellis, Noland, Wise.
Parker Bros. & Co., Inc	P.O. Box 107 Houston, Tex. 77001	---- do	Comal and Matagorda.
Texas Crushed Stone Co	P.O. Box 9345 Austin, Tex. 78717	---- do	Llano and Williamson.
Texas Industries, Inc	P.O. Box 146 Midlothian, Tex. 76065	---- do	Ellis and Wise.
Trinity Concrete Products Co.	P.O. Box 47524 Dallas, Tex. 75247	---- do	Johnson and Wise.
White's Mines, Inc	P.O. Box 500 Brownwood, Tex. 76801	---- do	Brown, Taylor, Uvalde.
Sulfur (native):			
Atlantic Richfield Co	P.O. Box 2819 Dallas, Tex. 75221	Frasch process	Pecos.
Duval Corp	1906 First City National Bank Bldg. Houston, Tex. 77002	---- do	Culberson.
Jefferson Lake Sulphur Co	P.O. Box 1185 Houston, Tex. 77001	---- do	Fort Bend.
Texasgulf, Inc	200 Park Ave. New York, N.Y. 10017	---- do	Jefferson, Liberty, Wharton.
Sulfur (byproduct):			
Amoco Production Co	P.O. Box 591 Tulsa, Okla. 74102	Secondary recovery.	Andrews, Ector, Hockley, Van Zandt, Wood.
Cities Service Oil Co	P.O. Box 300 Tulsa, Okla. 74102	---- do	Cochran, Dawson, Gaines, Van Zandt.
Getty Oil Co	P.O. Box 8 Scroggins, Tex. 75480	---- do	Franklin and Freestone.
Gulf Oil Corp	P.O. Box 701 Port Arthur, Tex. 77640	Secondary recovery.	Jefferson.
Phillips Petroleum Co	Bartlesville, Okla. 74003	---- do	Brazoria, Crane, Ector, Hutchinson.
Shell Oil Co	P.O. Box 2099 Houston, Tex. 77001	---- do	Cass, Karnes, Harris.
Warren Petroleum Corp	P.O. Box 1589 Tulsa, Okla. 74101	---- do	Crane, Hopkins, Karnes.
Talc and soapstone:			
Pioneer Talc Co., Inc	Chatsworth, Ga. 30705	Mine and plant	Hudspeth.
Southern Clay Products, Inc.	Box 44 Gonzales, Tex. 78629	Mine	Do.
Texas Talc Co., Inc	Allamoore, Tex. 79829	---- do	Do.
United Sierra, Div. of Cyprus Mines Corp.	P.O. Box 1201 Trenton, N.J. 08606	---- do	Do.
Westex Talc Co	P.O. Box 15038 Houston, Tex. 77020	Mine and plant	Hudspeth and Culberson.
Uranium:			
Conoco-Pioneer	P.O. Box 300 Falls City, Tex. 78113	Mines and mill	Live Oak and Karnes.
Vermiculite:			
Texas Vermiculite Co	2651 Manila Rd. Dallas, Tex. 75200	Exfoliating plant	Bexar and Dallas.
Vermiculite Products, Inc	P.O. Box 7327 Houston, Tex. 77008	---- do	Harris.

The Mineral Industry of Utah

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Utah Geological and Mineral Survey, for collecting information on all minerals.

By Stephen R. Wilson [1]

Mineral production in Utah during 1974 was valued at $952 million, a record high. This total was 41% higher than production in 1973, the previous record year. Increases were noted in all three commodity groups—mineral fuels, metals, and nonmetals. The largest gain was recorded in the mineral fuels group.

In the metals group, total value of 11 commodities increased 17% above that of 1973. Nine of the commodities registered greater values, while only one commodity had decreased value and one was unchanged.

Total value of mineral fuels production increased dramatically—100% over that of 1973. Substantial gains were noted in all commodities in this group with the exception of carbon dioxide. The value of this commodity was unchanged although the volume produced increased 16%.

Increased production values were recorded for nine commodities in the nonmetals group. Clays, fluorspar, pumice, sand and gravel, gypsum, and magnesium compounds showed decreases. Total value of the commodity group increased 17%.

A total of 174.9 million tons of material was handled in the metals and nonmetals industries. This total included 56.4 million tons of ore, 116.1 million tons of waste, and 2.4 million tons of ore and waste from development activities. Underground waste handled totaled 1.1 million tons.

Kennecott Copper Corp. (Kennecott) announced plans for expending approximately $175 million for an overall modification project to combat air pollution at the Garfield smelter and meet air quality standards established by the State and the Federal Government by July 1977. Construction of a 1,200-foot stack and modification of smelter furnaces to the Noranda system are included in the plans. Work was started during the year.

Utah Power & Light Co. completed construction of the first 430-megawatt unit of the Huntington coal-burning powerplant in Emery County. The unit was placed in operation during midyear and meets ambient air quality standards without special air pollution control equipment.

Lease sales by the U.S. Department of the Interior of two prototype tracts of oil shale lands in Utah were completed during the year. A joint venture of Phillips Petroleum Co. and Sun Oil Co. acquired the first tract with a bid of $75,596,800. The lease on the second tract was taken by White River Shale Oil Corp. with a bid of $45,107,200.

Utah Power & Light Co. and Geothermal Kinetics, Inc., of Phoenix, Ariz., formed a joint venture to conduct geothermal exploration in Utah. During the year one hole was completed in Box Elder County, a short distance northwest of Brigham City. Considerable high-temperature water and steam were encountered in the hole and tests are underway to determine the commercial potential of the area.

Legislation and Government Programs.—The Bureau of Mines and Sohio Petroleum Co. (Sohio) signed a cooperative agree-

[1] State Liaison Officer, Bureau of Mines, Salt Lake City, Utah.

ment to permit research on extraction of petroleum from bituminous sandstone deposits near Vernal, Uintah County. The area known as Asphalt Ridge is held under lease by Sohio. Operating costs of the project will be furnished by the Government.

Work under the agreement will determine the technical feasibility of an in-situ combustion process for recovering oil from the sand at a depth of 200 feet, by burning part of the bitumen. Holes will be drilled in the deposit and then fired by lowering a propane torch into the holes. Vapors will be recovered through established holes. Drilling began during the last quarter of 1974.

The Bureau awarded a research contract to the Salt Lake City office of Ford, Bacon & Davis of New York to study 2,600 surface coal mines in the United States. The study was expected to yield information to be used in future planning for exploration and design of surface and underground mines, transportation of coal, air and water pollution control, and land reclamation. Improvement in mining methods and equipment is expected from the study as well as faster development of the Nation's coal reserves.

Another Bureau of Mines contract was awarded to the Eimco Corp., Salt Lake City, to develop a special type drill for drilling roof bolt holes in coal mines. The principal problem involves drilling an 8-foot vertical hole in areas of limited space where the coalbed may be only 2½ feet in thickness.

The National Science Foundation awarded a $174,000 grant to the Department of Mining, Metallurgy, and Fuels Engineering of the University of Utah. The grant is for the purpose of continuing a project to develop and evaluate alternatives to conventional smelting processes for recovery of copper from copper concentrates.

Table 1.—Mineral production in Utah [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Carbon dioxide, natural ---- thousand cubic feet --	80,490	$6	93,751	$6
Clays ---- thousand short tons --	[2] 243	[2] 771	232	953
Coal (bituminous) ---- do ----	5,500	61,566	5,858	71,699
Copper (recoverable content of ores, etc.) ---- short tons --	256,589	305,341	230,593	356,497
Fluorspar ---- do ----	4,778	144	2,967	98
Gem stones ----	NA	95	NA	100
Gold (recoverable content of ores, etc.) ---- troy ounces --	307,080	30,035	254,909	40,719
Gypsum ---- thousand short tons --	231	1,134	248	1,076
Iron ore (usable) ---- thousand long tons, gross weight --	1,986	13,581	1,808	14,016
Lead (recoverable content of ores, etc.) ---- short tons --	13,733	4,474	10,510	4,729
Lime ---- thousand short tons --	185	3,804	176	4,911
Natural gas ---- million cubic feet --	42,715	8,159	50,522	20,815
Petroleum (crude) ---- thousand 42-gallon barrels --	32,656	117,743	39,363	279,858
Pumice ---- thousand short tons --	42	57	15	19
Salt ---- do ----	717	6,913	771	7,321
Sand and gravel ---- do ----	15,410	15,986	11,578	12,985
Silver (recoverable content of ores, etc.) thousand troy ounces --	3,619	9,257	3,208	15,109
Stone ---- thousand short tons --	2,848	6,318	2,869	6,410
Uranium (recoverable content (U_3O_8) --- thousand pounds --	[r] 1,961	[r] 12,745	W	W
Vanadium ---- short tons --	142	W	W	W
Zinc (recoverable content of ores, etc.) ---- do ----	16,800	6,942	12,619	9,060
Value of items that cannot be disclosed: Asphalt, beryllium, cement, clays (kaolin, 1971), magnesium chloride, magnesium compounds, molybdenum, natural gas liquids, phosphate rock, potassium salts, sodium sulfate, tungsten concentrate, and values indicated by symbol W ----	XX	69,274	XX	105,664
Total ----	XX	[r] 674,345	XX	952,045
Total 1967 constant dollars ----	XX	494,263	XX	[p] 455,268

[p] Preliminary. [r] Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes kaolin; included with "Value of items that cannot be disclosed."

Table 2.—Value of mineral production in Utah, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Beaver	W	W	Copper, silver, sand and gravel, gold.
Box Elder	$1,840	$1,975	Stone, lime, sand and gravel, salt, tungsten.
Cache	W	W	Sand and gravel, stone.
Carbon	W	W	Coal, natural gas, petroleum, carbon dioxide, sand and gravel.
Daggett	W	W	Natural gas, petroleum.
Davis	1,325	1,412	Sand and gravel, stone.
Duchesne	W	164,985	Petroleum, natural gas, natural gas liquids, sand and gravel.
Emery	24,754	W	Coal, uranium, natural gas, sand and gravel, petroleum.
Garfield	7,810	12,154	Petroleum, sand and gravel, copper, silver, uranium.
Grand	6,737	12,194	Potassium salts, natural gas, petroleum, uranium, sand and gravel.
Iron	14,265	14,727	Iron ore, sand and gravel, pumice.
Juab	362	411	Clays, fluorspar, gypsum, sand and gravel, stone, silver, zinc, lead, gold, copper.
Kane	114	300	Sand and gravel.
Millard	W	W	Gypsum, pumice, beryllium, sand and gravel.
Morgan	9,163	W	Cement, stone, sand and gravel.
Piute	W	2	Sand and gravel.
Rich	W	W	Phosphate rock.
Salt Lake	377,845	434,108	Copper, gold, molybdenum, silver, cement, sand and gravel, salt, lime, stone.
San Juan	62,033	112,755	Petroleum, uranium, natural gas liquids, natural gas, vanadium, copper.
Sanpete	616	W	Sand and gravel, gypsum, salt, clays.
Sevier	3,890	4,372	Coal, gypsum, clays, salt, sand and gravel.
Summit	5,970	6,748	Petroleum, natural gas, clays, sand and gravel, stone.
Tooele	9,716	12,262	Lime, potassium salts, salt, stone, sand and gravel, magnesium compounds, clays, tungsten.
Uintah	23,522	48,097	Petroleum, phosphate rock, asphalt, natural gas, sand and gravel, natural gas liquids, stone, copper.
Utah	18,037	22,099	Zinc, lead, silver, stone, sand and gravel, gold, copper, clays, lime.
Wasatch	W	W	Sand and gravel, stone.
Washington	W	W	Do.
Wayne	W	W	Sand and gravel.
Weber	5,836	9,140	Potassium salts, asphalt, salt, sodium sulfate, sand and gravel, magnesium compounds, stone, clays.
Undistributed [2]	101,015	94,304	
Total [3]	r 674,345	952,045	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Values of petroleum and natural gas (1974) are based on an average price per barrel and cubic foot, respectively, for the State. County data for uranium is estimated for 1973.

[2] Includes some sand and gravel that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Utah business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	471.5	NA	NA
Unemployment	do	26.8	NA	NA
Nonagricultural employment	do	417.6	438.1	+4.9
Mining	do	12.3	13.4	+8.9
Construction	do	23.6	24.0	+1.7
Manufacturing	do	64.1	69.5	+8.4
Government	do	105.7	108.2	+2.4
Other nonagricultural employment [1]	do	211.8	223.0	+5.3
Personal income:				
Total	millions	$4,711	$5,222	+10.9
Per capita		$4,096	$4,452	+8.7
Construction activity:				
Total construction valuation	millions	$596.0	NA	NA
Residential housing units		13,738	12,147	−11.6
Nonresidential construction	millions	$105.3	$145.5	+38.2
Highway construction contracts awarded	do	$45.0	$42.5	−5.6
Cement shipments to and within the State	thousand short tons	687	685	−0.3
Farm marketing receipts	millions	$332.3	NA	NA
Mineral production value	do	$674.3	$952.0	+41.2
Electrical energy utilized	million kilowatt hours	9,073.7	NA	NA

p Preliminary. NA Not available.
[1] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services.

Sources: Bureau of Economic and Business Review, University of Utah; Survey of Current Business; Employment and Earnings; Farm Income Situation; Area Trends in Employment and Unemployment; Roads and Streets; and U.S. Bureau of Mines.

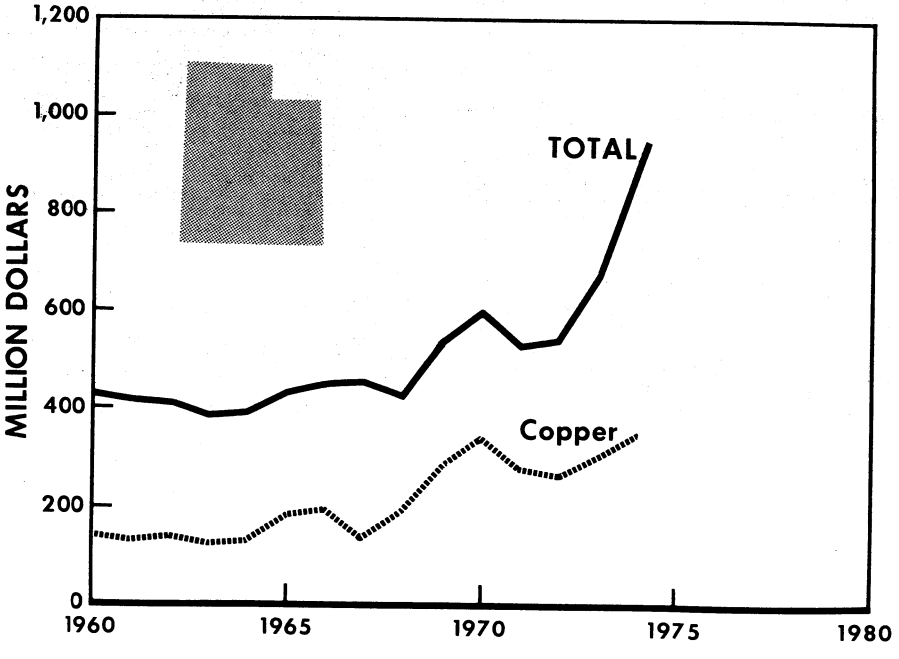

Figure 1.—Value of mine production of copper, and total value of mineral production in Utah.

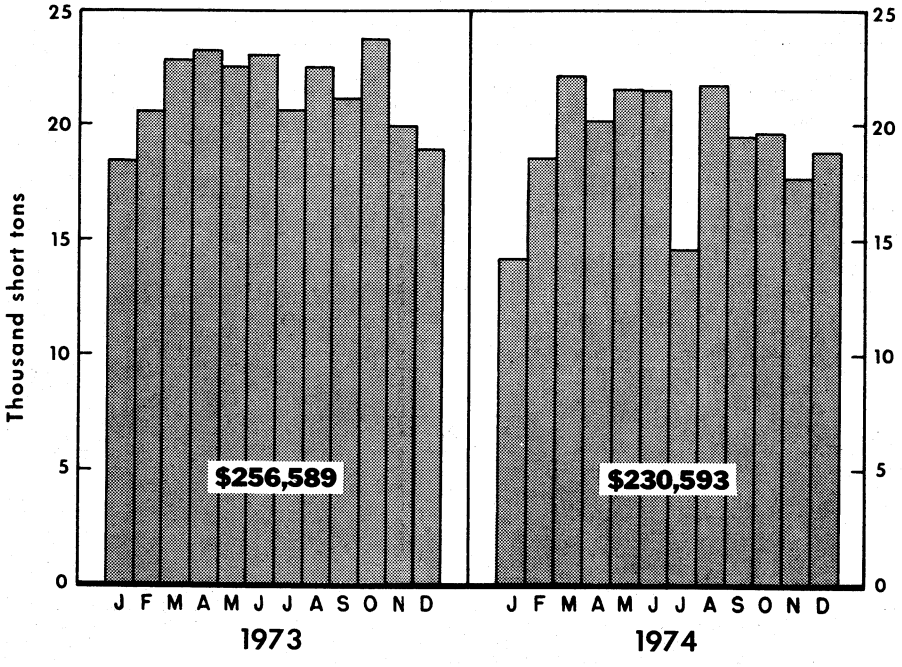

Figure 2.—Mine production of copper in Utah, by month in terms of recoverable metals.

REVIEW BY MINERAL COMMODITIES

METALS

Beryllium.—Mining operations of Brush Wellman, Inc., at its Spor Mountain bertrandite mine continued at essentially the same rate during 1974. Production and value of product were unchanged. Mining and stockpiling of a 2-year ore supply was maintained during the period. Actual mining activities were conducted only during a brief period under the most favorable weather and temperature conditions. Ores were trucked to the company processing plant, 48 miles east of the mine and 10 miles north of Delta in Millard County. The Brush Wellman operation is the largest beryllium ore producer in the United States.

Copper.—Production of copper during 1974 dropped 10% but the total value increased 17%. The open pit mine at Bingham, operated by Kennecott Copper Corp., was the largest copper producer in the United States. Other leading copper producers in Utah included the Milford properties of Essex International, and the GTO and Blue Jay mines operated by Keystone-Wallace Resources Co. Copper was produced from nine mines in seven counties.

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

County	Mines producing [1] lode	Material sold or treated (short tons)	Gold		Silver	
			Troy ounces	Value	Troy ounces	Value
1972, total	6	36,063,001	362,413	$21,237,401	4,299,604	$7,244,834
1973, total	6	39,207,402	307,080	30,035,495	3,619,038	9,257,499
1974:						
Salt Lake	1	35,440,414	W	W	W	W
San Juan	1	--	--	--	--	--
Uintah	1	20	--	--	--	--
Utah	2	178,989	W	W	W	W
Undistributed [2]	3	205,305	254,909	40,719,164	3,207,923	15,109,317
Total [3]	8	35,824,728	254,909	40,719,164	3,207,923	15,109,317

County	Copper		Lead		Zinc		Total value
	Short tons	Value	Short tons	Value	Short tons	Value	
1972, total	259,507	$265,735,427	20,706	$6,224,345	21,853	$7,757,941	$308,199,948
1973, total	256,589	305,340,886	13,733	4,474,325	16,800	6,941,787	356,049,992
1974:							
Salt Lake	227,235	351,305,199	--	--	--	--	W
San Juan	547	845,305	--	--	--	--	845,305
Uintah	1	900	--	--	--	--	900
Utah	129	198,796	10,509	4,728,958	12,617	9,059,256	W
Undistributed [2]	2,682	4,146,395	1	499	1	1,051	425,268,635
Total [3]	230,593	356,496,595	10,510	4,729,457	12,619	9,060,307	426,114,840

W Withheld to avoid disclosing individual company confidential data; included in "Undistributed."
[1] Operations at old mill or miscellaneous cleanups not counted as producing mines, nor are various uranium mines counted from which byproducts were recovered.
[2] Includes Beaver, Garfield, and Juab Counties combined to avoid dsiclosing individual company confidential data, and items indicated by symbol W.
[3] Data may not add to totals shown because of independent rounding.

Table 5.—Utah: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by class of ore or other source material

Source	Number of mines [1]	Material sold or treated (short tons)	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode ore:							
Dry gold	1	114,453	1,793	9,752	368	--	--
Dry gold-silver	1	15,967	2,697	194,633	86	--	--
Total [2]	2	130,420	4,490	204,385	453	--	--
Copper	5	35,482,596	250,235	2,325,360	190,974	--	--
Lead-zinc	1	163,022	181	676,400	43	10,509	12,617
Total	6	35,645,618	250,416	3,001,760	191,017	10,509	12,617
Other lode material:							
Copper precipitates	1	48,661	--	--	39,122	--	--
Zinc cleanup	1	29	[3]	1,778	([3])	1	1
Total	2	48,690	[3]	1,778	39,122	1	1
Grand total [2]	8	35,824,728	254,909	3,207,923	230,593	10,510	12,619

[1] Detail will not add to total because some mines produce more than one class of material.
[2] Data may not add to totals shown because of independent rounding.
[3] Less than ½ unit.

Table 6.—Utah: Mine production (recoverable) of gold, silver, copper, lead, and zinc in 1974, by type of material processed and method of recovery

Type of material processed and method of recovery	Gold (troy ounces)	Silver (troy ounces)	Copper (short tons)	Lead (short tons)	Zinc (short tons)
Lode:					
Smelting of concentrates	250,416	2,892,303	188,066	8,689	11,717
Leaching	--	--	2,944	--	--
Direct smelting of:					
Ore	4,490	313,842	460	1,819	901
Copper precipitates	--	--	39,122	--	--
Zinc cleanup	3	1,778	(1)	1	1
Total [2]	254,909	3,207,923	230,593	10,510	12,619

[1] Less than ½ unit.
[2] Data may not add to totals shown because of independent rounding.

The Anaconda Co., during midyear, announced plans for a new underground copper mining operation in the Carr Fork area, Bingham district, Salt Lake and Tooele Counties. Exploration since 1970 resulted in discovery of substantial ore bodies in limestone beds at depths of 2,000 to 5,000 feet below the surface. Shaft sinking and mine plant preparation were started in September. Plans call for mining and milling 10,000 tons of ore daily, beginning in 1979. Total expenditure for the mining and milling plants is estimated at $135 million.

Gold.—Virtually all gold produced in Utah was a byproduct of base metal ores. Gold production declined 17% but the value of production rose 36% as a result of a higher average price for gold during the year. Five mines in four counties accounted for all the gold output. Kennecott Copper Corp. at Bingham was the major gold producer. The Trixie mine in Utah County, also operated by Kennecott, was second in gold production.

Getty Oil Co. acquired leases on major groups of patented mining claims in the Mercur district in Tooele County and began a program of exploratory drilling and other investigations of gold occurrences in the area. If sufficient ore reserves are developed, mining and processing plants will be constructed.

Iron Ore.—Three companies, CF&I Steel Corp., United States Steel Corp., and Utah International, Inc., mined iron ores from the Iron Springs area in Iron County. Principal mines operated included the Comstock, Mountain Lion, Thompson, and Eclipse. Utah International, Inc., continued to mine the low-grade alluvial material in the Thompson area, with upgrading at the mine site. Total output declined 9%, but value increased 3%.

Ores and concentrates shipped during 1974 averaged 55.68% iron. The products were used primarily in the iron and steel industry. A small tonnage was consumed for miscellaneous uses.

Lead.—Two mines, one in Utah County and the other in Juab County, produced lead during 1974. The Burgin mine in Utah County was the major producer in the State. Output of lead declined 23%, but because of greater average price, total value increased by 6%.

Park City Ventures continued development of lead-zinc-silver properties in the Park City area, owned by United Park City Mines Co. Construction of a 750-ton flotation concentrator was on schedule at yearend, with expected operation by April 1975.

Magnesium Compounds.—Production of magnesium compounds, all from lake brines, was reported by Great Salt Lake Minerals & Chemicals Corp. at Ogden and by Kaiser Aluminum & Chemical Corp. at Wendover. Output decreased 15% in quantity and 10% in value from production in 1973. Magnesium operations of NL Industries, Inc., on Great Salt Lake were conducted at low level during most of 1974 but increased toward the end of the year.

Molybdenum.—All molybdenum produced in the State was recovered as a byproduct from the concentration of copper ore mined in the Bingham district by Kennecott Copper Corp. Total molybdenum produced decreased 52%.

Selenium.—All selenium output was recovered as a byproduct from the Kennecott Copper Corp. electrolytic refinery at Gar-

field. Production declined 17% during 1974.

Silver.—Five mines in five counties yielded silver during 1974. Production dropped 11%, but because of increased average prices for silver, total value of production was 63% greater. The leading silver producer was Kennecott Copper Corp. at the Bingham open pit mine. The Burgin mine in Utah County, also operated by Kennecott, was the second largest producer in the State.

Tungsten.—Production of tungsten ores was reported during 1974 from two properties in Tooele County, and one in Box Elder County—Timm Tungsten Co., C&P Leasing, and the Blair Sorenson property. The first two properties lie on Dutch Mountain in the Gold Hill district. Blair Sorenson mined ore in the Newfoundland Range in Box Elder County. Total production was 14% less, but value increased 53% as a result of a greater average price per unit of WO_3.

Uranium.—Although production of uranium decreased in 1974, value of output rose, as a result of increased average unit price. The average price rose from $6.50 per pound U_3O_8 in 1973 to $10.50 per pound in 1974.

Vanadium.—Production and value of vanadium increased notably during 1974. Nearly all vanadium-bearing ores were mined in San Juan County, with a minor amount coming from Garfield County. All ores were processed at mills in Colorado.

Zinc.—Two mines reported zinc production during 1974, one in Utah County and one in Juab County. The Burgin mine in Utah County was the major zinc producer. Tonnage dropped 25%, but because of increased average price the total value was 31% higher.

MINERAL FUELS

Asphalt and Related Bitumens.—Output from two gilsonite-producing companies rose 23% in quantity and, as a result of increased unit price, value was more than triple that of 1973.

Carbon Dioxide.—All production of carbon dioxide continued to come from the one-well Farnham Dome field, Carbon County. The value of production was unchanged from that in 1973, but output rose 16%.

Coal (Bituminous).—Coal production from properties in three counties increased 7% in quantity and 16% in value. Carbon and Emery Counties accounted for most of the total output.

The first 430-megawatt unit at the Huntington plant of Utah Power & Light Co. became operational during midyear. Plans announced by the company for future construction of coal-burning powerplants include an additional 430-megawatt unit at Huntington by 1977, a 430-megawatt unit at another site in Emery County by 1978, and another 430-megawatt unit at this site by 1980. Coal for all units will be provided by Peabody Coal Co. or will be mined by Utah Power & Light Co. from company mines.

Table 7.—Utah: Bituminous coal production in 1974, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines				Production (thousand short tons)				Value (thousands)
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total	
Carbon	9	--	--	9	2,958	--	--	2,958	$46,335
Emery	5	--	--	5	2,534	--	--	2,534	W
Sevier	1	--	--	1	366	--	--	366	W
Undistributed	--	--	--	--	--	--	--	--	25,364
Total	15	--	--	15	5,858	--	--	5,858	71,699

W Withheld to avoid disclosing company confidential data and included with undistributed.

A contract was reached by McCulloch Oil Co. and American Electric Power Co. on a letter of intent signed in 1973 for supplying coal to the power company. McCulloch earlier acquired coal mines at Helper, Carbon County, including mines formerly controlled by American Coal Co. The contract between the two companies stipulates that McCulloch will provide at least 140 million tons of coal to American Electric Power over the next 25 years. The coal will be transported by unit trains to

the power company operations in several states in the midwest.

Natural Gas.—Marketed natural gas rose 18% from the 42.7 billion cubic feet marketed in 1973, and the value was more than double that of 1973. The increase was due principally to a gain in the average wellhead price from 19.1 cents per thousand cubic feet in 1973 to 41.2 cents per thousand in 1974. The State Division of Oil and Gas Conservation[2] reported production of 78.4 billion cubic feet, of which 29.5 billion cubic feet was injected into reservoirs for storage. San Juan County was the largest producer of natural gas, followed by Duchesne and Uintah Counties. These counties accounted for 82% of the total output.

Natural gas reserves as estimated by the American Petroleum Institute (API) and the American Gas Association, Inc. (AGA), totaled 1.031 trillion cubic feet. Reserves increased 6.7 billion cubic feet during 1974.

Twelve gas wells were completed in 1974—four each in Grand and Uintah Counties, two in Carbon County, and one each in Duchesne and San Juan Counties.

Natural Gas Liquids.—Production of natural gas liquids increased 11% in quantity but the value was more than double that in 1973. According to estimates by API and AGA, reserves of gas liquids totaled 52.4 million barrels at yearend, slightly less than those at the end of 1973.

Petroleum.—Activity on the Uinta Basin's Tertiary trend continued at a high rate in 1974, and crude petroleum production rose 21%. Value increased 138% over that in 1973. Duchesne County was the leading producing county with 56% of the total output and 54% increase over production in 1973. San Juan County was in second place with 26% of the total, followed by Uintah County with 12%, and Garfield County with 4%.

The Bluebell and Altamont fields both in Duchesne County, ranked first and second in oil production with 10.7 million and 10.6 million barrels, respectively, surpassing the Greater Aneth field in San Juan County, which produced 8.2 million barrels. The Red Wash unit, Uintah County, was fourth, producing 1.8 million barrels, and the Upper Valley field in Garfield County was in fifth place with 1.7 million barrels. Wonsits Valley, Uintah County, and the Lisbon field in San Juan County were sixth and seventh with 1.5 million and 1.4 million barrels, respectively. These seven fields accounted for 91% of the total output compared with 87% in 1973.

Proved crude oil reserves in the State at yearend 1974 were 250.6 million barrels, a decrease of 13.9 million barrels. In addition, 40.5 million barrels are considered available by fluid injection. New fields and extensions added 33.3 million barrels to reserves but revisions deducted 8.0 million barrels.

Eight oil refineries in the State processed 43.2 million barrels of crude oil. Utah fields provided 17.5 million barrels; 25.7 million barrels was received from other states. Colorado provided 21.4 million and Wyoming 4.3 million barrels. Out-of-State shipments of Utah crude oil totaled 21.4 million barrels, of which 12.0 million went to California, 3.4 million to Texas, and 2.4 million to Colorado.

Drilling activity totaled 195 completed wells, unchanged from 1973. Sixty seven percent were producers—118 oil and 12 gas wells. Drilling was conducted in 11 counties, but exploration in Duchesne County resulted in the greatest number of productive wells. In this county 63 oil wells and 1 gas well drilled were producers. In San Juan County, drilling resulted in 45 producing oil wells and 1 gas well. Wildcat drilling increased during 1974. Amerada Hess Corp. was preparing to drill a hole to test Mississippian rocks in Box Elder County, 52 miles northeast of Wendover. Other wildcat drilling included an 11,000-foot test in western Millard County; American Oil Co. plans two wells in Great Salt Lake in a search for oil in Tertiary sediments beneath the lake; and Clinton Oil Co. (Wichita, Kans.) plans to drill a well for oil and gas in the Madison Formation in Emery County, 42 miles southeast of Price and 12 miles northwest of Green River.

American Quasar Petroleum Co., Houston, Tex., which began drilling an exploratory well in Summit County in 1973, was producing at the rate of 500 barrels of oil daily. The well, Newton Sheep Co. No. 1, is 16 miles east of Coalville. The productive formation is the Nugget Sandstone of Jurassic Age. Considerable activity de-

[2] Utah Department of Natural Resources, Division of Oil and Gas Conservation. Monthly Oil and Gas Production Report. December 1974.

veloped in the area as a result of the discovery. American Quasar is drilling a second well one-half mile northeast of the Newton Sheep Co. No. 1 well. Drilling at yearend was below 5,000 feet, and it is expected that the Nugget Formation will be encountered near 10,000 feet. Colorado Energetics Co. and Fuel Resources Co., both Colorado companies, announced plans to drill a well at a site 3 miles east of Coalville. This well will test the Nugget Sandstone at an approximate depth of 13,000 feet.

Table 8.—Utah: Crude oil production, by county
(Thousand 42-gallon barrels)

County	1973	1974	Principal fields in 1974, in order of production
Carbon	--	1	Peters Point.
Daggett	7	7	Clay Basin.
Duchesne	14,217	21,861	Bluebell, Altamont, Cedar Rim.
Emery	1	1	Ferron.
Garfield	2,152	1,700	Upper Valley.
Grand	73	87	Salt Wash, Long Canyon.
San Juan	10,677	10,306	Greater Aneth Area, Lisbon, Boundary Butte.
Summit	922	736	Bridger Lake.
Uintah	4,607	4,664	Red Wash Area, Wonsits Valley.
Total	32,656	39,363	

Source: Utah Oil & Gas Conservation Commission.

Table 9.—Utah: Oil and gas well drilling completions in 1974, by county

County	Proved field wells [1]			Exploratory			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Wells	Footage
Box Elder	--	--	--	--	--	1	1	8,077
Carbon	--	1	1	--	1	5	8	39,047
Daggett	1	--	--	--	--	--	1	6,940
Duchesne	61	1	--	2	--	2	66	886,336
Emery	--	--	--	--	--	7	7	37,423
Garfield	--	--	1	--	--	3	4	24,220
Grand	2	3	10	1	1	8	25	85,990
Kane	--	--	--	--	--	2	2	13,590
Millard	--	--	--	--	--	1	1	380
San Juan	44	1	4	1	--	14	64	370,505
Uintah	6	2	1	--	2	5	16	144,323
Total	114	8	17	4	4	48	195	1,616,831

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

NONMETALS

Barite.—Crude barite was not produced in Utah in 1974. Barite prepared for well drilling mud by Custom Milling & Supply Co., Circle Mines, Inc., Rocky Mountain Refractories, Westemco, Inc., and All Minerals Corp. originated from out-of-State properties.

Cement.—Output of portland cement decreased 4% in quantity, but rose 13% in value. Increases in quantity and value were recorded for masonry cement. The entire output was produced by Ideal Cement Co., Division of Ideal Basic Industries, Inc., and Portland Cement Co. of Utah. Portland and masonry cement consumed in the State totaled 684,100 and 1,400 tons, respectively. Seventy eight percent of the portland cement was purchased by ready-mix concrete companies, 9% by concrete product manufacturers, 7% by building materials dealers, and 6% by contractors and other users. Raw materials used in making portland cement included limestone and cement rock, sandstone, and gypsum.

Clays.—Production of clays fell 14% in quantity and 8% in value from output in 1973. Fifteen operations in seven counties contributed to total output. The major producing companies were Utelite Corp., Mountain Fuel Supply Co., Filtrol Corp., and Interpace Corp. The materials listed

as clays included shale, common clay, bentonite, fire clay, fuller's earth, and kaolin. Most of the clays were used as expanded material in making lightweight aggregates, in manufacturing building brick, and as catalysts in oil refining.

Fluorspar.—Shipments of fluorspar, all metallurgical grade, decreased 38% in quantity and 32% in value from that in 1973. Three companies in Juab County, Willden Fluorspar Co., U.S. Energy Corp., and Spor Bros., accounted for the total shipments

Gypsum.—Five companies, Cox Enterprises, Inc., Georgia-Pacific Corp., Thomas J. Peck & Sons, Inc., United States Gypsum Co., and White Mountain Gypsum Co., mined gypsum during the year. Properties were in Juab, Millard, Sanpete, and Sevier Counties. Production increased 7% to 248,100 tons, which is 4% above the record year 1972. Georgia-Pacific Corp. and United States Gypsum calcined gypsum mined in Sevier County. Output decreased by 1%.

Lime.—Five companies produced lime during the year from plants in Box Elder, Salt Lake, Tooele, and Utah Counties. The producing companies included The Flintkote Co.; Kennecott Copper Corp.; Mountain States Lime, Inc.; Utah-Idaho Sugar Co.; and Utah-Marblehead Lime Co. The lime was used principally for refractories, mason's lime and in flotation of sulfide copper ores. Total output decreased 5% to 176,000 tons, which is 12% below 1966, the record year. The lime was consumed in Utah, as well as in California, Oregon, Washington, and other States. A total of 110,100 tons was used in Utah.

Perlite.—Georgia-Pacific Corp. at Sigurd, Sevier County, expanded perlite from out-of-State sources for use as a plaster aggregate.

Phosphate Rock.—Stauffer Chemical Co. was the only producer of phosphate rock during 1974. The company operated two mines, the underground mine in the Crawford Mountains, Rich County, and the open pit mine, 10 miles north of Vernal in Uintah County. Production increased 4% and total value rose 83% because of increased prices for the commodity.

Potash.—Production of potash salts was reported by Texasgulf, Inc., near Moab, Grand County; Kaiser Aluminum & Chemical Corp., Bonneville, Ltd. Division, at Wendover, Tooele County; and Great Salt Lake Minerals & Chemicals Corp., Weber County. Output was 6% greater than that in 1973 and value rose 52%.

Pumice.—Production of pumice and related volcanic materials in the State decreased substantially, and the number of active mines dropped from five to two. The Utah State Road Commission mined material in Iron County and Utah State Department of Highways produced from a deposit in Millard County. Materials mined were utilized primarily in road construction. Total production decreased 64% and value dropped 67% during 1974.

Salt.—Eight operations in six counties accounted for the entire output of salt. Quantity and value increased 8 and 6%, respectively, over those in 1973. Evaporated salt was produced by six companies in four counties, and one mine each in Sanpete and Sevier Counties accounted for the total rock salt production. The salt was sold for use in many industries, including the chemical and animal feed processing industries, but most of the salt was sold for road salt.

Sand and Gravel.—Sand and gravel, which had led the nonmetallic group in total value of commodity production, fell to third place in 1974 after potassium salts and portland cement. Output of sand and gravel decreased 25% in tonnage and 19% in value from that in 1973. The average value of sand and gravel produced, however, increased from $1.04 per ton to $1.12 per ton. One hundred mining operations were active during 1974, the same number that were productive during 1973. Salt Lake County with 17 operations and Utah County with 13, were the leaders in numbers of mines.

Table 10.—Utah: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	15,410	15,986	2,219	3,160
Gravel			6,669	8,206
Unprocessed: Sand and gravel			2,690	1,503
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	15,410	15,986	11,578	12,869

W Withheld to avoid disclosing individual company confidential data; included with "Construction."

[1] Value data may not be directly comparable to that in tables 1, 11, and 12 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 11.—Utah: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	9,878	11,198	2,300	2,914
Highway and bridge construction			204	307
Other uses (dams, water-works, airports, etc.)			148	211
Concrete products (cement blocks, bricks, pipe, etc.)			817	1,071
Bituminous paving (asphalt and tar paving)			1,161	1,576
Roadbase and subbase			1,452	1,835
Unprocessed aggregate			2,427	1,273
Fill	1,397	555	119	180
Other uses [2]	1,012	1,050	285	327
Industrial sand and gravel	W	W	W	W
Total	[3] 12,286	12,803	8,913	9,694

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction" (1974), and "Other uses' (1973).

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes railroad ballast, miscellaneous (1973).

[3] Data do not add to total shown because of independent rounding.

Table 12.—Utah: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	1,706	2,324	31	36
Highway and bridge construction			437	724
Other uses (dams, water-works, airports, etc.)			22	31
Concrete products (cement blocks, bricks, pipe, etc.)			32	44
Bituminous paving (asphalt and tar paving)			651	828
Roadbase and subbase			1,030	1,244
Unprocessed aggregate			263	230
Fill	1,342	751	189	143
Other	75	108	11	12
Total	[2] 3,124	3,183	2,666	3,292

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Data do not add to total shown because of independent rounding.

Sodium Sulfate.—Great Salt Lake Minerals & Chemicals Corp. produced sodium sulfate in the company plant on Great Salt Lake, west of Ogden, Weber County. Tonnage increased 7% and total value rose 50%, as a result of greater average unit price during the year.

Stone.—Production of stone from 27 quarries was only 1% more in quantity and value over that in 1973. Three counties—Box Elder, Morgan, and Utah—accounted for 77% of the total output. Principal producing companies were United States Steel Corp., Southern Pacific Railroad Co., Ideal Cement Co. Division of Ideal Basic Industries, Inc., and Portland Cement Co. of Utah.

Table 13.—Utah: Stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974			Kind of stone produced in 1974 [1]
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Box Elder	3	W	W	4	751	W	Limestone, quartzite, other stone.
Cache	4	W	W	3	W	299	Limestone, sandstone.
Davis	1	13	12	1	4	4	Granite.
Juab	1	W	W	1	W	W	Quartzite.
Morgan	1	W	W	1	W	W	Limestone, sandstone.
Rich	1	10	8	--	--	--	
Salt Lake	3	W	W	2	W	W	Limestone.
Summit	2	W	W	2	W	W	Sandstone, other stone.
Tooele	3	W	807	3	W	733	Limestone, marble.
Uintah	--	--	--	1	(2)	2	Quartzite.
Utah	3	W	W	3	W	W	Limestone.
Wasatch	2	(2)	6	3	2	19	Sandstone.
Washington	1	W	W	1	W	W	Do.
Weber	1	13	12	2	4	5	Granite.
Undistributed	--	2,813	5,471	--	2,108	5,349	
Total [3]	26	2,848	6,318	27	2,869	6,410	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Limestone used generally to include dolomite.
[2] Less than ½ unit.
[3] Data may not add to totals shown because of independent rounding.

Table 14.—Utah: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total	5	259	5	292
Crushed and broken stone:				
Bituminous aggregate	--	--	(1)	2
Cement and lime manufacture	903	1,883	833	1,724
Mine dusting	W	W	14	91
Riprap and jetty stone	W	W	777	1,080
Other uses [2]	1,941	4,177	1,239	3,221
Total [3]	2,844	6,059	2,864	6,118
Grand total [3]	2,848	6,318	2,869	6,410

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Less than ½ unit.
[2] Data includes stone used in agricultural limestone, poultry grit and mineral food, terrazzo and exposed aggregate, flux stone, refractory stone, dense graded roadbase stone, manufactured fine aggregate (stone sand) and dead burned dolomite. 1974 data also include surface treatment aggregate, and other uses not specified. 1973 data also include stone used in acid neutralization.
[3] Data may not add to totals shown because of independent rounding.

Table 15.—Utah: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total: [1]	5	259	5	292
Crushed and broken:				
Limestone [2]	2,049	4,731	2,001	4,681
Granite	W	W	9	9
Sandstone, quartz, and quartzite	111	139	W	W
Undistributed [3]	685	1,189	854	1,428
Crushed total	[4] 2,844	6,059	2,864	6,118
Grand total	[4] 2,848	6,318	2,869	6,410

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes marble, sandstone, and quartzite.
[2] Limestone used generally to include dolomite.
[3] Includes marble, and other stone.
[4] Data may not add to totals shown because of independent rounding.

Vermiculite.—No crude vermiculite was produced in Utah in 1974. However Vermiculite Intermountain, Inc., Salt Lake City, exfoliated vermiculite shipped to Utah from surrounding states. The exfoliated product was sold and used principally as loose insulation and concrete aggregate. Other uses included plaster aggregate, roofing aggregate, pipe covering insulation, and soil conditioning.

Table 16.—Principal producers

Commodity and company	Address	Type of activity	County
Asphalt: American Gilsonite Co.	Suite 1150, Kennecott Bldg. Salt Lake City, Utah 84110	Underground mines and plants.	Uintah.
Beryllium: Brush Wellman, Inc.	67 W. 2950 S. Salt Lake City, Utah 84115	Open pit mines and plant.	Juab and Millard.
Carbon dioxide, natural:			
Equity Oil Co	806 American Oil Bldg. Salt Lake City, Utah 84101	Well and plant	Carbon.
Cement:			
Ideal Basic Industries, Inc.[1]	420 Ideal Cement Bldg. Denver, Colo. 80202	Plant	Morgan.
Portland Cement Co. of Utah [1]	Box 1469 Salt Lake City, Utah 84110	---- do	Salt Lake.
Clays:			
Filtrol Corp	3250 E. Washington Blvd. Los Angeles, Calif. 90023	Open pit and underground mine.	Juab.
Utelite Corp	RFD Coalville, Utah 84017	Open pit mine and plant.	Summit.
Coal:			
American Coal Co	190 N. Main Huntington, Utah 84528	Underground mine.	Emery.
Kaiser Steel Corp	Sunnyside Coal Mines Sunnyside, Utah 84539	Underground mines and plant.	Carbon.
Peabody Coal Co	301 N. Memorial Drive St. Louis, Mo. 36102	Underground mine.	Emery.
Copper: Kennecott Copper Corp.[1 2]	Box 11299 Salt Lake City, Utah 84111	Open pit mine, mills, smelter, refinery.	Salt Lake.
Fluorspar:			
Spor Brothers	Box 276 Delta, Utah 84624	Open pit and underground mines.	Juab.
U.S. Energy Corp	625 East Madison Suite 1 Riverton, Wyo. 82501	Open pit mine	Do.
Willden Fluorspar Co	Box 536 Delta, Utah 84624	Underground mine.	Do.

See footnotes at end of table.

Table 16.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Gypsum:			
Georgia-Pacific Corp	P.O. Box 311 Portland, Oreg. 97204	Open pit mine and plant.	Sevier.
United States Gypsum Co	101 S. Wacker Dr. Chicago, Ill. 60606	---- do	Do.
Iron ore:			
CF&I Steel Corp	Box 1920 Pueblo, Colo. 80201	Open pit mines	Iron.
United States Steel Corp.[1 3]	600 Grant St. Pittsburgh, Pa. 15230	Open pit mine	Do.
Utah International, Inc	Box 649 Cedar City, Utah 84720	Open pit mines and plants.	Do.
Lime:			
The Flintkote Co	2244 Beverly Blvd. Los Angeles, Calif. 90057	Plant	Utah.
Utah-Marblehead Lime Co.[1]	300 W. Washington St. Chicago, Ill. 60606	---- do	Tooele.
Phosphate rock: Stauffer Chemical Co.	636 California St. San Francisco, Calif. 94419	Open pit and underground mine.	Rich and Uintah.
Potassium salts:			
Great Salt Lake Minerals & Chemicals Corp.[4 5]	Box 1190 Ogden, Utah 84402	Plant	Weber.
Kaiser Aluminum & Chemical Corp.[4]	300 Lakeside Dr. Oakland, Calif. 94604	---- do	Tooele.
Texasgulf, Inc	200 Park Ave. New York, N.Y. 10017	Underground mine and refinery.	Grand.
Pumice: Thompson Brick Co	620 N. 400W. Cedar City, Utah 84720	Open pit mines and plant.	Iron.
Salt:			
American Salt Co	3142 Broadway Kansas City, Mo. 64111	Plant	Tooele.
Morton International Inc	110 N. Wacker Drive Chicago, Ill. 60606	---- do	Salt Lake.
Sand and gravel:			
Breitling Brothers Construction Co.	3645 S. 500 West Salt Lake City, Utah 84119	Pit	Do.
W. W. Clyde & Co	Box 232 Springville, Utah 84663	Plant	Various.
Cox Construction Co., Inc	270 North First E. Manti, Utah 84642	---- do	Sanpete
Gibbons & Reed Co	41 W. Central Ave. Murray, Utah 84107	Pits and plants	Davis, Salt Lake, Weber.
Pioneer Sand and Gravel Co.	P.O. Box 18457 Salt Lake City, Utah 84110	Pits	Salt Lake.
Thorn Construction Co	1425 E 900 South Provo, Utah 84601	Pits	Sanpete.
Utah Sand and Gravel Products Corp.	Box 537 Salt Lake City, Utah 84110	Pits and plants	Salt Lake.
Stone:			
General Dynamics	300 West Washington St. Chicago, Ill. 60606	Quarry	Tooele.
Southern Pacific Railroad Co.	65 Market St. San Francisco, Calif. 94105	---- do	Box Elder.
Utah Calcium Co., Inc	2150 S 2 DW Salt Lake City, Utah 84115	---- do	Sanpete.
Uranium:			
Atlas Corp.[6]	Box 1207 Moab, Utah 84532	Underground mines.	San Juan.
Rio Algom Corp.[6]	Box 610 Moab, Utah 84532	Underground mine.	Do.

[1] Also stone.
[2] Also gold, silver, lead, zinc, molybdenum, selenium, and lime.
[3] Also coal.
[4] Also magnesium compounds.
[5] Also salt.
[6] Also vanadium.

The Mineral Industry of Vermont

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Geological Survey of Vermont, for collecting information on all minerals except fuels.

By William R. Barton [1] and Charles G. Doll [2]

Mineral production in Vermont in 1974 increased 21% in value to $35.5 million. Stone was the principal mineral commodity in value, followed by asbestos, sand and gravel, talc, and a small production of peat and gem stones. The Vermont mineral industry is significant nationally as a producer of dimension granite, dimension marble, dimension slate, asbestos, talc, and ground marble. Some of the Vermont dimension stones are exported and recognized worldwide. The Vermont mineral industry is of critical importance to Vermont railroads—the St. Johnsbury and Lamoille County Railroad normally generates about one-half of its revenue from mineral products, 20% of the total traffic over Vermont Railway is minerals, and Green Mountain Railroad depends upon minerals for about 75% of its traffic.[3]

The Bureau of Mines published the results of a survey of land use and reclamation by the mining industry. Of the 5.9 million acres in Vermont, 0.12% had been utilized by mining during the 1930–71 period. That was less than the national average of 0.16%. Of the disturbed land in Vermont, only 16.3% had been reclaimed, far less than the national figure of 40.0%. This was due to the large portion of Vermont mined land represented by dimension stone quarries and asbestos open pit mines which do not lend themselves to being reclaimed in part unless operations are irrevocably completed.[4]

Two areas on the western slope of the Green Mountains, Bristol Cliffs and Lye Brook, were proposed as wilderness areas. Under the legislation pending before Congress, as wilderness, the areas would not be open to mineral exploitation.

The Vermont "Land Use Planning Bill of 1974" failed to pass in the State Legislature. The bill would have allotted massive land use powers to State environmental officials at the expense of local controls and options. A new land use plan was being drafted for introduction in the 1975 legislature. Melvin Mandigo of Glover, Vt., summarized opposition to such legislation in a statement at a public hearing: "Among the things that I regard as sacred is the environment of freedom by which Vermonters have maintained the use of their land. If this Vermont is beautiful, it is because of what free men have done to it."

The Vermont Geological Survey published two reports in its Environmental Geology Series, No. 4: "Geology for Environmental Planning in the Johnson-Hardwick Region, Vermont" by Frank N. Wright, III; and No. 5: "Geology for Environmental Planning in the Milton-St. Albans Region, Vermont" by David P. Stewart. The series is extremely important since it provides environmental planners with scientific guidelines by which their decisions can be objectively formulated instead of by the subjective techniques so commonly encountered in the field.

[1] State liaison officer, Bureau of Mines, Newmarket, N.H.
[2] State geologist, Burlington, Vt.
[3] Tillman, D. A. Mining in Vermont. Tower Pub. Co., Portland, Me., 1974, 102 pp.
[4] Paone, J., J. L. Morning, and L. Giorgetti. Land Utilization and Reclamation in the Mining Industry, 1930–71. BuMines IC 8642, 1974, 61 pp.

The Vermont Agency of Environmental Conservation and the New England River Basins Commission prepared an inventory and analysis of water and related land resources of Vermont.[5]

[5] State of Vermont and New England River Basins Commission. Water and Related Land Resources of Vermont, Inventory and Analysis. A Guide Plan Report. June 1974, 97 pp.

Table 1.—Mineral production in Vermont[1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Peat ---------- thousand short tons	(2)	$2	(2)	$4
Sand and gravel ---------- do	4,041	3,581	2,394	3,588
Stone ---------- do	1,871	19,523	1,932	21,630
Talc ---------- short tons	251,087	1,497	W	W
Value of items that cannot be disclosed: Asbestos, gem stones, talc (1974), and values indicated by symbol W ----------	XX	4,763	XX	10,231
Total ----------	XX	29,366	XX	35,453
Total 1967 constant dollars ----------	XX	21,528	XX	p 16,954

p Preliminary. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Less than ½ unit.

Table 2.—Value of mineral production in Vermont, by county

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Addison ----------	$2,609	W	Stone, sand and gravel.
Bennington ----------	W	$473	Sand and gravel, stone.
Caledonia ----------	W	W	Stone, sand and gravel.
Chittenden ----------	W	W	Sand and gravel, stone.
Essex ----------	W	W	Do.
Franklin ----------	W	W	Stone, sand and gravel.
Grand Isle ----------	W	W	Stone.
Lamoille ----------	W	W	Talc, sand and gravel, stone.
Orange ----------	W	W	Stone, sand and gravel.
Orleans ----------	W	W	Asbestos, sand and gravel, stone.
Rutland ----------	9,432	8,857	Stone, sand and gravel.
Washington ----------	W	W	Do.
Windham ----------	W	256	Talc, sand and gravel.
Windsor ----------	1,407	W	Talc, sand and gravel, stone, peat.
Undistributed[1] ----------	15,919	25,868	
Total[2] ----------	29,366	35,453	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Includes gem stones, some sand and gravel (1973) that cannot be assigned to specific counties, and values indicated by symbol W.
[2] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Vermont business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	200.5	203.6	+1.6
Unemployment	do	11.1	14.3	+28.8
Employment:				
Mining	do	0.8	0.8	--
Construction	do	10.4	7.8	−25.0
Manufacturing	do	41.6	42.6	+2.4
Government	do	28.7	29.2	+1.7
Other [1]	do	79.8	80.0	+0.3
Personal income:				
Total	millions	$1,949	$2,157	+10.7
Per capita		$4,185	$4,588	+9.6
Construction activity:				
Number of housing units authorized		2,544	1,396	−45.1
Value of nonresidential building construction	millions	$15.1	$9.8	−35.1
Portland cement shipments to and within Vermont	thousand short tons	143	120	−16.1
Mineral production value	millions	$29.4	$35.5	+20.7

p Preliminary.
[1] Includes transportation and public utilities; wholesale and retail trade; finance, insurance, and real estate; and services.

Sources: Survey of Current Business; Employment and Earnings; Construction Review; Area Trends in Employment and Unemployment; New England Economic Indicators; U.S. Bureau of Mines.

Table 4.—Employment and injuries in the Vermont mineral industry, 1974 [1 2]

	Men employed	Man-hours worked	Fatal injuries	Fatal frequency rate [3]	Nonfatal disabling injuries [2]	Nonfatal disabling frequency rate
Underground	136	195,805	1	5.11	15	76.61
Surface	575	962,562	2	2.08	23	22.86
Mill	701	1,444,470	--	--	33	22.85
Total	1,412	2,602,837	3	1.15	71	26.89

[1] Data are preliminary.
[2] Data supplied by Mining Enforcement & Safety Administration.
[3] Per million man-hours.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Asbestos.—An employee group was trying to raise funds to purchase the Lowell asbestos mine and mill from GAF Corp. The U.S. Environmental Protection Agency announced it would extend the March 15, 1975 deadline for meeting air pollution control requirements until the end of 1975. The extension was intended to give the employees' association (the Vermont Asbestos Group) time to raise capital for the purchase and for pollution control equipment. The purchase and continued operation of the property would save 178 jobs, and would require an estimated $2.4 million for the purchase from GAF and $1 million for new pollution control equipment. Production increased 22% in quantity and 47% in value in 1974.

The Bureau of Mines published results of research on making brick from some of the Vermont asbestos waste fines.[6]

Cement.—Vermont has no cement producing plants, importing all of the commodity it needs. Preliminary Bureau of Mines data indicated that 120,000 short tons of portland cement and 7,000 short tons of prepared masonry cement were shipped to Vermont destinations in 1974. These compared, respectively, with 143,000 short tons and 6,000 short tons in 1973.

Gem Stones.—Gem stones and mineral specimens were recovered in all counties by collectors. The most popular collecting localities were listed in Vermont Geological Survey Special Publication No. 2 "Mineral Collecting in Vermont" by R. W. Grant. The report could be purchased for $5 from

[6] Pigott, P. G., E. G. Valdez, and K. C. Dean. Steam-cured Bricks From Industrial Mineral Wastes. BuMines RI 7856, 1974, 13 pp.

the Vermont Department of Libraries, Montpelier, Vt.

Mica, Reconstituted.—At Rutland, Samica Corp. processed delaminated scrap mica in the manufacture of reconstituted sheet mica for use in electrical insulation.

Sand and Gravel.—Sand and gravel producton decreased 41% in quantity and was essentially unchanged in value. Average value per ton was $1.50 ($0.89 in 1973). Commercially used aggregate was produced by 40 sand and gravel companies and totaled 1.9 million tons valued at $3.1 million. An additional 484,000 tons of aggregates were sold or used for publicly funded projects. Leading counties were Chittenden, Rutland, Addison, Bennington, and Windham. Leading commercial producers were Hinesburg Sand & Gravel, J. P. Carrara & Sons, Inc., S. T. Griswold, Inc., and Albert Nadeau.

By end use, most sand and gravel was sold unprocessed primarily for fill, followed in decreasing order by processed aggregates for use in building construction, bituminous paving, roadbase, subbase, and unspecified highway and bridge construction applications.

Table 5.—Vermont: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	4,041	3,581	775	1,421
Gravel			825	1,564
Unprocessed:				
Sand and gravel			794	597
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	4,041	3,581	2,394	3,582

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Value data may not be directly comparable to that in tables 1, 6, and 7 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 6.—Vermont: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	2,212	2,908	552	1,034
Highway and bridge construction			56	197
Other uses such as dams, waterworks, airports, etc.			44	153
Concrete products (cement blocks, bricks, pipe, etc.)			146	324
Bituminous paving (asphalt and tar paving)			232	454
Roadbase and subbase			156	316
Unprocessed aggregate	256	140	706	566
Fill	--	--	18	18
Other uses	W	W	W	W
Industrial sand and gravel	W	W	W	W
Total	2,468	3,048	1,910	3,062

W Withheld to avoid disclosing individual company confidential data; included with "Construction aggregate."
[1] Unit value of construction aggregate may be lower than unit value of sand or gravel.

Table 7.—Vermont: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	1,554	517	W	W
Highway and bridge construction			90	114
Other uses such as dams, waterworks, airports, etc			8	16
Concrete products (cement blocks, bricks, pipe, etc.)			16	34
Bituminous paving (asphalt and tar paving)			137	170
Roadbase and subbase			101	99
Unprocessed aggregate	--	--	88	31
Fill	--	--	--	--
Other	19	16	44	62
Total	1,573	533	484	526

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—Compared with 1973, tonnage and value of stone production increased 3% and 11%, respectively.

Production of dimension stone decreased from 158,910 tons to 145,107 tons, and value increased from $10.9 million to $12.3 million. Average value per ton increased from $68.47 in 1973 to $84.77 in 1974.

Production of crushed stone increased from 1.7 million tons in quantity and $8.6 million in 1973 to 1.8 million tons and $9.3 million in 1974. Average value per ton increased from $5.05 in 1973 to $5.17 in 1974.

Leading stone producers were White Pigment Corp. (partly-owned by Vermont Marble Co.); Rock of Ages Corp.; Vermont Marble Co.; Wells-Lamson Quarry Co., Inc.; and Vermont Structural Slate Co., Inc. Dimension stone was produced at 30 quarries. Crushed stone was mined at 47 operations. Leading counties were Rutland, Washington, and Addison. Principal kinds of stone were marble (most of it marketed under the terminology of crushed or ground limestone or dolomite), granite, and slate.

Vermont Marble Co. reported that shipments of both dimension stone and ground products increased moderately in 1974. The firm operated three dimension stone quarries at full capacity during the year: Danby (white), Isle La Motte (black), and Roxbury (verde antique). The Main No. 2 quarry in West Rutland was closed permanently owing to excessive property taxes coupled with high mining costs.

Ground marble (including limestone) production also increased moderately. The New Haven, Vt. mill of the White Pigment Corp. was expanded in capacity by about 50%. The plant product was principally for filler in items such as plastics, synthetic rubber, and chewing gum.

Rock of Ages Corp. operated four quarries (in gray granite), a finishing plant at Barre, and a fifth quarry (in white granite), intermittently, at Bethel. A new operation, the Adams quarry, was being developed at Barre during 1974. This quarry reportedly will feature inclined haulage entries so trucks can be loaded directly in the pit. Areas of waste rock will not be quarried; instead the waste rock will be mined by drilling and blasting and sent to a crusher. The result will be a salable crushed stone product instead of new grout piles. Dimension granite shipments increased in 1974, and for the first time significant quantities of rough blocks and sawn slabs were shipped to Europe and Japan.

Rock of Ages Corp. and the town of Barre were about $4 million apart in their appraisal of the value of the corporation's granite reserves. James Dunn, hired by Rock of Ages, estimated $1,131,457, while William Carlson, hired by the town arrived at $5,060,760. Disputed taxes for 1972–74 could vary by as much as $550,000 depending upon which figure is used.

Wells-Lamson Quarry Co., Inc. operated a quarry and finishing plant at Barre producing both rough and dressed stone.

An old granite quarry on Cobble Hill in Barre, Vt. planned to reopen. An Act 250 permit was granted to the B&S Quarrying Corp. of North Arlington, N.J. Under the Vermont environmental permit the quarry will have to maintain a 200-foot buffer zone and dispose of waste granite on the site.

Despite the objections of contiguous residents, the Barre, Vt. Town Planning Commission approved rezoning of a piece of property from residential to industrial to permit two firms to build new granite saw-

ing and finishing facilities. The firms that will operate the new plants are Northeast Granite Co. and C & G (Conrad Gadbois) Granite Co. The planned operations still had to obtain permits from the State environmental authorities.

The Stevens Branch of the Winooski River was reported to be clear of new granite sludge. John Ponsetto, a lawyer for the Vermont Agency for Environmental Conservation said that the 70 or 80 Barre granite firms were "doing what they are supposed to." The branch was stocked with trout and there was talk of building a park along its banks in Barre. The 20,000 tons of stone dust, carborundum, and zinc oxide that used to go into the river annually is now settled out at the plants and transported to sludge dumps away from the stream. Attempts were being made by the Barre Granite Association to find use for the sludge in abrasive products, metallurgical plants, or in bricks.

Dolomite (marble), quartzite, and traprock were quarried for road surface treatment, roadbase stone, and construction aggregate.

Dimension slate production, exclusive to Rutland County, totaled 19,957 tons worth $1.8 million, compared with 21,350 tons with a value of $1.6 million in 1973. Eighteen quarries were active. Mill stock for flagging, the principal product, was worth an average of $33.33 per ton in 1974. Other products included mill stock for structural and sanitary uses ($309.67 per ton), roofing slate ($185.89 per ton), and flooring slate ($157.96 per ton).

A quantity of crushed slate was expanded in a rotary kiln near Castleton by Vermont Light Aggregate Corp. to produce lightweight concrete aggregate.

Talc.—The talc industry was being expanded in 1974. Windsor Minerals, Inc. (subsidiary of Johnson and Johnson, Inc.) which operated a mine at Hammondsville and mills at West Windsor and Gassetts, developed two new mines near Ludlow. The new mines were to supply a new $3 million mill under construction at Ludlow. Pending completion of the mill, their 1974 production, along with that from Hammondsville, went to West Windsor and Gassetts.

Three companies mined and ground talc in 1974. Quantity decreased, but value of production increased over that of 1973. The ground talc was sold and used for toilet preparations, plastics, rubber, paper, paint, insecticides, asphalt filler, refractories, foundry facings, and for export. Vermont Soapstone Co., Inc. fabricated soapstone stoves, griddles, and other products in its Perkinsville plant.

METALS

Copper.—Dartmouth College signed an agreement giving a Canadian firm exclusive exploration and mining rights on a 512-acre tract in West Corinth. Conwest Exploration Co., Ltd. of Toronto, reported that exploration of the tract will take about 3 years, with preliminary phases to be performed by Prospecting Geophysics, Ltd. The agreement included a firm prohibition against any eventual open pit mining, and restricting any eventual development to shaft mining. Conwest was already active in the Vermont copper belt, with an active exploration project in Topsham.

Gold.—Inflation coupled with higher gold prices resulted in the ALA Auto and Travel Club issuing an advisory on where to pan for gold in Vermont. It particularly recommended: The Ottauqueechee River near Killington, Jail Brook near Chelsea, Shady Rill Brook north of Montpelier, Minister Brook in Worcester, Gold Brook in Stowe, and Lewis Creek and Baldwin Creek in Bristol. Other localities where gold has been reportedly panned recently included Plymouth and Bridgewater. Vermont hardware stores were having trouble keeping gold pans in stock as Green Mountain prospectors headed for their favorite creeks.

MINERAL FUELS

Statistics on Vermont fuel consumption are published annually in the New England Fuel Institute (NEFI) Statistical Fact Book. The book appears as the March issue of "Yankee Oilman" magazine published by NEFI, Boston, Mass. Data for 1972 were published in March 1974.

Coal.—There are no coal mines or resources in Vermont. The cost of imported coal climbed dramatically in 1974. One large coal user, Steamtown, Inc. of Bellows Falls, paid $56 per ton plus freight for coal in 1974, compared with $14 per ton plus freight in 1973.

Peat.—A small quantity of humus peat was produced from a bog near Barnard. The material was sold both in bulk and in bags for general soil improvement.

Petroleum and Natural Gas.—Natural gas has been known to exist in the Champlain Valley of Vermont for many years. It is present in some water wells and has been encountered in drilling for water. Some gas-producing wells with reportedly commercial possibilities have been located to the north in the St. Lawrence Lowlands of Canada.

Several attempts have been made to locate gas or oil in the Champlain Valley since the mid-1950's. Several holes were drilled from 3,500 to 5,000 feet and pockets of gas were encountered, but the wells were abandoned. Some geologists feel the drilling was not deep enough, and the energy crisis has resulted in a revival of interest in the area. The thickness, extent, and variety of rocks beneath the Champlain thrust is not known, nor have they been adequately tested for oil and gas potential in Vermont.

Uranium.—During 1974, Dexter Mining Co. continued exploring for uranium and possible associated residual hydrocarbons near Highgate Springs and Milton. The Atomic Energy Commission (now Energy Research and Development Administration) commenced airborne scintillation surveys of the State.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Asbestos: GAF Corp.[1]	140 W. 51st St. New York, N.Y. 10020	Pit and mill	Orleans.
Peat: Kirks Green Mountain Peat	P.O. Box 456 Woodstock, Vt. 05091	Bog	Windsor.
Sand and gravel:			
Burgess Bros., Inc	RFD Burgess Rd., Bennington, Vt. 05201	Pit	Bennington.
Caledonia, Inc	Box 428 St. Johnsburg, Vt. 05819	Pit	Caledonia.
Calkins Construction, Inc	Lyndonville, Vt. 05851	Pit	Orleans.
J. P. Carrara & Sons, Inc	Rutland, Vt. 05701	Pit	Rutland.
S. T. Griswold, Inc	P.O. Box 8 Williston, Vt. 05495	Pit	Chittenden.
Hinesburg Sand & Gravel	Hinesburg, Vt. 05461	Pit	Do.
Albert Nadeau	Johnston, Vt. 05656	Pit	Lamoille.
Stone:			
Granite (dimension):			
Rock of Ages Corp	Barre, Vt. 05641	Quarries and plant.	Orange, Washington, Windsor.
Wells-Lamson Quarry Co., Inc.[2]	700 N. Main St. Barre, Vt. 05641	Quarry and plant.	Washington.
Limestone (crushed and broken):			
White Pigment Corp	Proctor, Vt. 05765	Quarries and plant.	Addison and Rutland.
Marble (dimension): Vermont Marble Co.[3]	---- do	Quarries	Grand Isle, Rutland, Windsor.
Slate (dimension):			
John G. Hadeka	25 College St. Poultney, Vt. 05764	Quarry	Rutland.
Hilltop Slate Co	Middle Granville, N.Y. 12849	---- do	Do.
Tatko Brothers Slate Co	---- do	---- do	Do.
Vermont Structural Slate Co., Inc.	Prospect St. Fair Haven, Vt. 05743	---- do	Do.
Talc:			
Eastern Magnesia Talc Co	Johnston, Vt. 05656	Underground mines.	Lamoille.
Windsor Minerals, Inc	P.O. Box 680 Windsor, Vt. 05089	Underground mines and mills.	Windsor.

[1] Also miscellaneous stone.
[2] Also crushed and broken granite.
[3] Also crushed and broken limestone and dolomite.

The Mineral Industry of Virginia

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Virginia Division of Mineral Resources for collecting information on all minerals except fuels.

Charles E. Vannoy [1]

The value of mineral production in Virginia in 1974 was $1,058.2 million, an increase of $512.8 million, or 94% above that of the previous year. This was the 12th consecutive year that mineral values have increased. Every commodity except masonry cement registered an increase in output value. Of the total mineral value, approximately 81% was contributed by fuels; 18%, by nonmetals; and 1%, by metals.

[1] Mining engineer, Division of Coal.

Table 1.—Mineral production in Virginia [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons --	1,646	$1,886	1,957	$2,614
Coal (bituminous) ---- do ----	33,961	377,679	34,326	856,099
Gem stones	NA	13	NA	13
Lead (recoverable content of ores, etc.) short tons --	2,637	859	3,106	1,398
Lime ---- thousand short tons --	782	12,205	895	18,929
Natural gas ---- million cubic feet --	5,101	1,688	7,096	3,619
Petroleum (crude) - thousand 42-gallon barrels --	--	--	8	W
Sand and gravel ---- thousand short tons --	14,511	26,246	14,314	29,270
Soapstone ---- short tons --	4,600	12	W	W
Stone ---- thousand short tons --	43,895	82,719	44,176	95,988
Zinc (recoverable content of ores, etc.) short tons --	16,683	6,894	17,195	12,346
Value of items that cannot be disclosed: Aplite, cement, gypsum, kyanite, and values indicated by symbol W ----	XX	r 35,201	XX	37,931
Total ----	XX	r 545,401	XX	1,058,207
Total 1967 constant dollars ----	XX	399,834	XX	p 506,035

p Preliminary. r Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

Table 2.—Value of mineral production in Virginia, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Accomack	$116	$135	Sand and gravel.
Albemarle	W	W	Stone, sand and gravel.
Amherst	W	W	Do.
Appomattox	W	W	Stone.
Augusta	W	W	Stone, sand and gravel.
Bedford	W	W	Do.
Bland	482	1,610	Stone.
Botetourt	W	20,997	Cement, stone, clays.
Brunswick	W	W	Stone, clays.
Buchanan	174,611	385,552	Coal, natural gas, stone, sand and gravel.
Buckingham	W	W	Kyanite, stone, clays.
Campbell	W	W	Stone, sand and gravel.
Caroline	W	950	Sand and gravel.
Charles City	W	W	Do.
Charlottesville (city)	114	W	Do.
Chesapeake (city)	W	W	Cement, sand and gravel.
Chesterfield	5,642	8,450	Sand and gravel, stone, clays.
Clarke	W	W	Stone.
Colonial Heights (city)	--	W	Sand and gravel.
Craig	150	185	Do.
Culpeper	W	W	Stone.
Dickenson	W	W	Coal, natural gas.
Dinwiddie	W	W	Stone.
Essex	W	W	Sand and gravel.
Fairfax	8,719	5,424	Stone, sand and gravel.
Fauquier	W	W	Do.
Floyd	10	14	Stone.
Franklin	12	W	Stone, soapstone.
Frederick	7,890	9,983	Stone, lime, sand and gravel, clays.
Giles	W	W	Lime, stone.
Gloucester	W	W	Sand and gravel.
Goochland	4,430	5,043	Stone, sand and gravel.
Grayson	467	W	Do.
Greensville	W	W	Stone, clays.
Halifax	W	W	Stone, sand and gravel.
Hampton (city)	W	W	Sand and gravel, stone.
Hanover	W	4,731	Stone, aplite, sand and gravel.
Henrico	3,993	6,074	Sand and gravel, stone.
Henry	W	W	Stone.
Highland	(2)	--	
Isle of Wight	W	W	Sand and gravel, lime, stone.
James City	55	36	Sand and gravel.
King and Queen	W	8	Do.
King George	W	W	Do.
King William	W	64	Do.
Lancaster	W	W	Do.
Lee	10,363	W	Coal, stone, petroleum.
Loudoun	7,140	6,980	Stone.
Madison	W	W	Sand and gravel.
Middlesex	W	4	Do.
Montgomery	W	1,006	Stone, clays.
Nansemond	W	W	Clays, sand and gravel.
Nelson	W	W	Aplite, stone.
New Kent	W	W	Sand and gravel.
Newport News (city)	W	W	Do.
Norfolk (city)	W	--	
Northampton	32	17	Sand and gravel.
Northumberland	43	19	Do.
Nottoway	W	W	Stone.
Orange	W	W	Clays.
Page	W	W	Stone, sand and gravel.
Pittsylvania	W	W	Do.
Portsmouth	--	242	Sand and gravel.
Powhatan	W	W	Stone.
Prince Edward	W	W	Kyanite, stone.
Prince George	W	1,938	Sand and gravel.
Prince William	W	W	Stone, clays.
Pulaski	W	W	Stone.
Rappahannock	W	W	Do.
Richmond	19	--	
Richmond (city)	W	W	Stone, clays.
Roanoke	W	W	Stone, sand and gravel, clays.
Rockbridge	W	873	Do.
Rockingham	W	2,950	Sand and gravel, stone.

See footnotes at end of table.

Table 2.—Value of mineral production in Virginia, by county [1]—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Russell	$30,009	W	Coal, stone, clays, natural gas.
Scott	1,475	W	Stone, coal.
Shenandoah	W	W	Lime, stone.
Smyth	469	W	Stone, clays, sand and gravel.
Spotsylvania	1,462	$1,950	Stone, sand and gravel.
Stafford	W	W	Sand and gravel.
Surry	W	W	Do.
Sussex	W	W	Do.
Tazewell	20,220	47,099	Coal, stone, natural gas, clays.
Virginia Beach (city)	478	1,983	Sand and gravel.
Warren	W	4,430	Cement, stone, sand and gravel.
Washington	W	W	Stone, gypsum.
Westmoreland	W	68	Sand and gravel.
Wise	95,393	W	Coal, stone, sand and gravel, natural gas.
Wythe	9,177	15,890	Zinc, stone, lead.
York	W	W	Sand and gravel.
Undistributed [3]	r 162,426	523,509	
Total [4]	r 545,401	1,058,207	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] The following counties are not listed because no production was reported: Alleghany, Amelia, Arlington, Bath, Carroll, Charlotte, Cumberland, Fluvanna, Greene, Louisa, Lunenberg, Lynchburg (city), Mathews, Mecklenburg, Patrick, and Southampton.

[2] Less than ½ unit.

[3] Includes sand and gravel (1973) that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[4] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Virginia business activity

	1973	1974 p	Percent, Change
Employment and labor force, annual average:			
Total labor force ---- thousands	2,081	NA	NA
Unemployment ---- do	75.0	NA	NA
Employment (nonagricultural):			
Manufacturing ---- do	401.4	401.0	−0.1
Mining ---- do	16.2	17.5	+8.0
Construction ---- do	125.4	129.4	+3.2
Transportation and public utilities ---- do	105.1	107.2	+2.0
Wholesale and retail trade ---- do	358.6	362.8	+1.2
Finance, insurance, real estate ---- do	84.0	87.3	+3.9
Services ---- do	266.5	283.6	+6.4
Government ---- do	390.2	403.9	+3.5
Personal income:			
Total ---- millions	$23,579	$25,842	+9.6
Per capita	$4,868	$5,265	+8.2
Construction activity:			
Value of nonresidental construction ---- millions	$644.9	$594.7	−7.8
New housing units authorized	73,008	41,857	−42.7
Portland cement shipments to and within Virginia ---- thousand short tons	2,281	2,176	−4.6
Farm marketing receipts ---- millions	$923.4	NA	NA
Mineral production value ---- do	$545	$1,058	+94.0

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

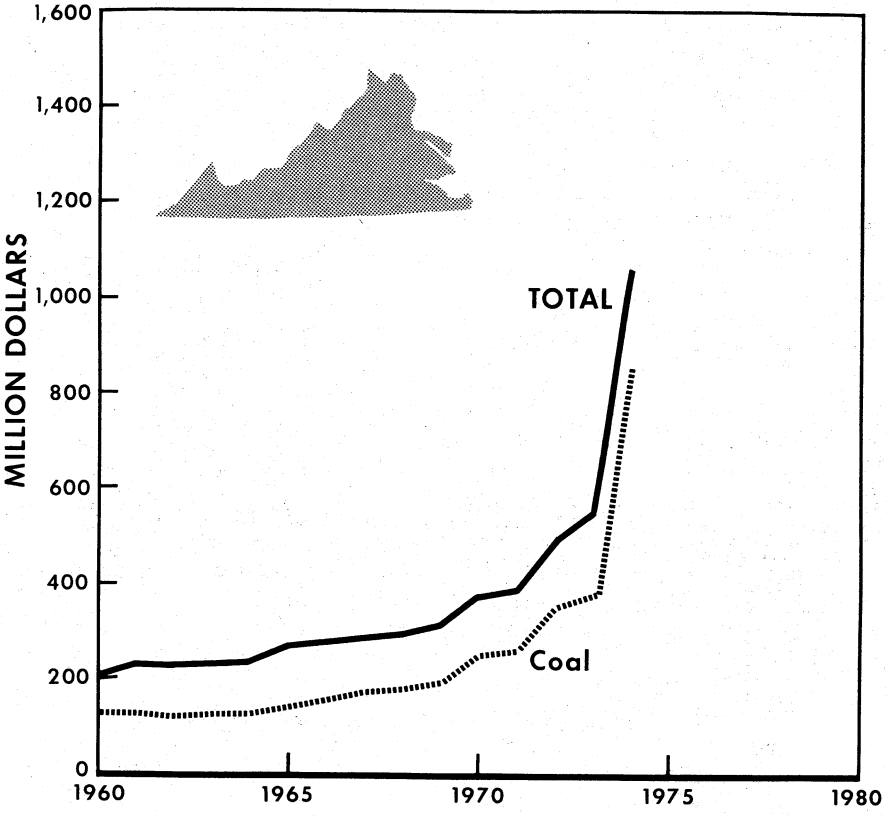

Figure 1.—Value of coal and total value of all mineral production in Virginia.

Legislation and Government Programs.—Creation of a State Energy Office was announced in June by the Governor. The new office will have charge of State efforts to conserve all energy resources; coal, gas, electric power, and petroleum products. The office will assume the functions now performed by the State Fuel Allocation Office. Its establishment adds Virginia to the growing list of States having one central office for handling programs delegated by the Federal Energy Administration.

Virginia became the seventh State to enter an agreement for Federal-State cooperation in the health and safety inspection of its metal and nonmetal mines. Federal law requires the Mining Enforcement and Safety Administration to inspect mines at least once each year, and each inspection will be conducted concurrently with an inspection by the Commonwealth's mine safety agency. In addition to coordination of inspections, a full exchange of information between the two inspection groups and uniformity of enforcement is expected from the agreement.

A Federal grant of $251,000 to aid in the first year of the State's efforts to develop a coastal zone management program was awarded by the National Oceanic and Atmospheric Administration. Design of an approvable program will require 3 years. The first year will be devoted to defining the coastal zones and problem areas within those zones.

A 3-year contract was awarded to Virginia Polytechnic Institute and State University (VPI) by the Office of Coal Research (OCR) to further develop computerized data and techniques for evaluating engineering and safety factors involved in underground mining. The contract is

valued at $537,600, of which VPI is to contribute $81,000. VPI is to develop data that will allow computerized evaluation of the comparative health, safety, productivity, and environmental underground mining problems by conventional methods, including longwalling. The work will also include laboratory and in situ tests on coal specimens from a wide variety of bed conditions. Research results will be incorporated in the mine planning program currently being developed by VPI under OCR sponsorship.

Studies of the geology and mineral resources of Virginia include a three-part geologic study of the coastal plain of Virginia,[2] reports on the geology of several Virginia quadrangles,[3] and an index of geographic and place names in Virginia.[4]

A directory of the mineral industry in Virginia is issued annually by the Virginia Division of Mineral Resources.[5] The 1974 edition of this publication lists 286 companies and individuals, exclusive of coal producers, on record as of February 1, 1974. The listing includes portable crushing plants, some captive and intermittent operations, and some processors of out-of-State or imported materials. The names of producers and processors are arranged by county or city under the appropriate raw material or commodity. The locations of the various operations are given with respect to a nearby city or town. An alphabetical listing of the names of companies and individuals is provided as a reference index.

Trends and Developments.—An area in Westmoreland County, near the King George County line, is the possible site for a diatomite mining operation. Chief interest in the mineral has come from cement companies. The mine is near the Rappahannock River and the mined material could be barged to industrial centers for processing if dock facilities were constructed.

Deepsea Ventures, Inc., a Tenneco subsidiary based in Newport News, will undertake steps toward making underwater mining of manganese nodule deposits a commercial reality. The firm plans to test its mining process at depths of 12,000 to 16,000 feet. In addition, the firm will construct a processing plant with a capacity of 40 tons per day. Deepsea's pilot plant, located at Gloucester Point, can handle 1 ton per day. Following the 40-ton-per-day plant, a larger commercial plant would be planned. According to company officials, the commercial operation would have to mine and process about 1 million tons of nodules per year.

Test drilling was conducted in an area north of Mineral, Louisa County, by Piedmont Minerals Associates, a corporate partnership of New Jersey Zinc Co. and Callahan Mining Co. The object of the drilling program was the copper, lead, gold, silver, and zinc deposits in the area.

Employment and Injuries.—The 1974 annual report of the Virginia Department of Labor and Industry reported 15 fatalities in the coal industry, compared with 18 fatalities the previous year. The cause of the 15 fatalities were as follows: Eight by fall of face or roof, three by machinery, one by a coal bump, one by explosives, one by falling materials, and one by haulage. Of the fatalities, 13 occurred at underground mines and 2 at surface mines. The fatality rate was 0.44 per million tons of coal produced, compared with 0.53 per million tons in 1973. The number of workers employed by coal mines averaged 12,858 for the year, an increase over the 11,334 employed in 1973. The 1974 employment included 9,311 underground employees, 2,991 surface workers, and 556 office personnel.

[2] Teifke, R. H., and E. Onuschak, Jr. Geologic Studies, Coastal Plain of Virginia. Va. Div. Miner. Res. (Charlottesville, Va.), Bull. 83, 1974, 153 pp.

[3] Edmundson, R. S., and W. E. Nunan. Geology of the Berryville, Stephenson, and Boyce Quadrangles, Virginia. Va. Div. Miner. Res. (Charlottesville, Va.), RI 34, 1974, 112 pp.

Young, R. S., and E. K. Rader. Geology of the Woodstock, Wolf Gap, Conicville, and Edinburg Quadrangles, Virginia. Va. Div. Miner. Res. (Charlottesville, Va.), RI 35, 1974, 69 pp.

Gathright, T. M., and P. G. Nystrom, Jr. Geology of the Ashby Gap Quadrangle, Virginia. Va. Div. Miner. Res. (Charlottesville, Va.), RI 36, 1974, 55 pp.

Amato, R. V. Geology of the Salem Quadrangle, Virginia. Va. Div. Miner. Res. (Charlottesville, Va.), RI 37, 1974, 40 pp.

[4] Biggs, T. H. Geographic and Place Names in Virginia. Va. Div. Miner. Res. (Charlottesville, Va.), IC 20, 1974, 374 pp.

[5] Le Van, D. C. Directory of the Mineral Industry in Virginia. Va. Div. Miner. Res. (Charlottesville, Va.), 1974, 56 pp.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal (Bituminous).—Coal, the State's leading mineral commodity in terms of output value, accounted for 81% of the value of the Commonwealth's mineral production in 1974. Although coal tonnage increased only 1%, the value rose 127%. The average value per ton was $24.94, compared with $11.12 in 1973. Production data include coal produced from deposits within Virginia, whether the mine opening is or is not inside the State boundary, and exclude operations producing less than 1,000 tons per year. Consequently, production data published by the Federal Bureau of Mines differ somewhat from data published by the State.

Both high- and low-volatile bituminous coals were produced for coke manufacture, electric power generation, export, industrial and domestic heating, and other industrial uses. Coalbeds mined included the Blair, Clintwood, Eagle, Hagy, High Splint, Imboden, Jawbone, Jewell, Kelly, Lyons, Parsons, Pocahontas No. 3, Splash Dam, Taggart, Tiller, Upper and Lower Banner, and Widow Kennedy.

Table 4.—Virginia: Bituminous coal production, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines					Production (thousand short tons)					Value total (thousands)
	Underground	Strip	Auger	Strip-auger	Total	Underground	Strip	Auger	Strip-auger	Total	
Buchanan	219	78	26	9	332	10,253	2,351	687	976	14,268	$383,108
Dickenson	35	34	1	4	74	3,989	1,164	13	358	5,524	136,434
Lee	17	8	--	6	31	702	44	--	206	952	23,871
Russell	9	15	--	3	27	1,327	W	--	W	1,822	47,791
Scott	2	--	--	--	2	8	--	--	--	8	211
Tazewell	22	6	--	2	30	1,604	W	--	W	1,947	44,082
Wise	46	117	7	16	186	4,883	3,707	67	1,147	9,805	220,602
Undistributed	--	--	--	--	--	--	608	--	230	XX	XX
Total[1]	350	258	34	40	682	22,767	7,874	767	2,918	34,326	856,099

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed." XX Not applicable.
[1] Data may not add to totals shown because of independent rounding.

Of the total coal produced, 66% was from underground mines; 23%, from strip mines; 2%, from auger mines; and 9%, from combined strip-auger mines. Coal production was reported from seven southwestern counties. Three counties accounted for 86% of the total output. These counties were Buchanan (42%), Wise (28%), and Dickenson (16%). Buchanan County was the leading producer from underground mines, while Wise County led in surface mine production.

The total underground output from 350 mines was 22.8 million tons compared with 23.4 million tons produced by 300 mines in 1973. The average value received was $25.87 per ton, an increase of $13.17 over the $12.70 per ton average value in 1973.

A total of 202 continuous miners produced 12.4 million tons, or 54% of the underground output. Mobile loading machines numbered 233 and produced 7.4 million tons for 33%. Ten plow-type longwall installations produced 1.6 million tons or 7%. Ninety-seven scoops produced 1.2 million tons, or less than 1%.

The total surface mine output from 332 mines was 11.6 million tons compared with 10.5 million tons produced by 350 mines in 1973. Strip mines produced 7.8 million tons from 258 mines with an average value of $25.87 per ton compared with 8.7 million tons from 242 mines at $7.66 per ton in 1973. Auger mine output was 0.8 million tons with a value of $17.85 per ton compared with 1.8 million tons valued at $7.33 per ton in 1973. Forty mines produced 2.9 million tons with an average value of $18.46 per ton by a combination of strip and auger mining.

Equipment used in the 332 surface mines included 93 power shovels and draglines, 550 bulldozers, 457 front-end loaders, 70 augers, 48 motor graders, and 30 carryall scrapers.

Nineteen mechanical cleaning plants

received 21.15 million tons of raw coal from which 7.28 million tons of refuse were removed and 13.87 million tons of salable coal (40% of the State's total production) were recovered. The coal cleaning methods employed were dense media, 51%; tables, 32%; flotation, 14%; and jigs, 3%.

Sixteen thermal drying units in seven cleaning plants produced 5.01 million tons of dried coal, or 63% of the mechanically clean coal.

Transportation of coal to market was 30.43 million tons by rail (including 4.27 million tons by unit-train) and 3.88 million tons by truck.

Coke.—Coal was converted to coke at a plant in Buchanan County that uses nonrecovery Mitchell-type ovens. Total coke production increased 6%, and average coke yield was 65%.

Natural Gas and Petroleum.—Natural gas production increased 39% to 7,096 million cubic feet and value rose 114% as the average wellhead value rose to 51 cents per million cubic feet compared with 33.1 cents per million cubic feet in 1973. According to the Virginia Department of Labor and Industry, Div. of Mines and Quarries, the total amount of natural gas produced in five southwestern counties was as follows: Buchanan (4,656 million cubic feet), Dickenson (1,356 million cubic feet), Tazewell (1,076 million cubic feet), Wise (4 million cubic feet), and Russell (4 million cubic feet). Reserves of natural gas at yearend were 44,707 million cubic feet, or 7,434 million cubic feet more than that in 1973.

Virginia had a total of 39 wells drilled in 1974, 17 more than the previous year's total. Total footage drilled amounted to 195,797 feet, or 91,573 feet more than the 1973 total, with an average footage per well of 5,020.4 feet. Of the 39 wells drilled, 36 were completed as producers and only 3 were plugged and abandoned as dry holes. Eight of the 39 wells drilled were exploratory tests, which indicated an increased interest by gas and oil companies in the development of new areas.

Dickenson County was the site of most of the drilling activity during 1974 with 27 wells drilled, followed by Buchanan County with 5 wells, Wise County with 4 wells, and Lee, Rockingham, and Tazewell Counties with 1 well each.

There were 25 wells drilled by Philadelphia Oil Co. during 1974, with a total footage of 127,439 feet. Columbia Gas Transmission Corp. drilled 11 wells, with a total footage of 54,081 feet. Of the remaining three wells, one was drilled by Tamik Oil Co. to a total depth of 2,135 feet in Lee County, one was drilled by Crab Run Gas Co. to a depth of 6,972 feet in Rockingham County, and one was drilled by Consolidated Gas Supply Corp. to a depth of 5,170 feet in Tazewell County. The Rockingham and Tazewell County wells were plugged and abandoned as dry holes, and the Lee County well has yet to be acidized and completed.

The majority of the productive gas wells were completed in the Berea Sandstone and Greenbrier Limestone of Lower Mississippian age; however, there was some production from the Upper and Middle Mississippian Ravencliffe and Maxon Sandstones, the Lower Mississippian Weir Sand, and the Devonian Shale. The one oil well exhibited possibilities of oil production from the Trenton, Eggleston, and Moccasin Limestones of the Middle Ordovician age.

Washington Gas Light Co. has postponed construction of a $20 million synthetic natural gas plant in Prince William County. The company said it suspended plans to build the unit because firm supplies of naphtha were not available.

Oil production resumed in Virginia during 1974 following a period of more than a year in which no oil was produced. Tamik Oil Co. resumed production from three previously drilled wells in Lee County, one in the Ben Hur Field and two in the Rose Hill Field, for a total production of 2,790 barrels. A refinery was operated by Amoco Oil Co. at Yorktown, York County, with an operating capacity of 52,900 barrels per day.

NONMETALS

Aplite.—Output of aplite increased 10% in 1974 and the value increased 30% above that of 1973. Production of this commodity, chiefly for use in glassmaking with a minor amount used as brick flux, was from two operations, The Feldspar Corp. in Hanover County and Sobin Chemical Corp. in Nelson County.

Cement.—Shipments of portland cement decreased 11% but value increased 9%; masonry cement shipments declined 23% and value decreased 9%. Of the portland

cement shipments, 86% was Type I and II (general use and moderate heat), and the remainder was Type III (high early strength). Distribution of shipments by type of transportation was 53% by rail in bulk and 3% by rail in containers, 41% by truck in bulk and 3% by truck in containers. Disposition of cement by type of customer was ready mix concrete companies (73%), highway contractors (13%), concrete product manufacturers (9%), and building material dealers (5%).

Three cement plants were active in 1974. One plant in Botetourt County produced both types of cement, while one plant in Warren County produced masonry cement only. The third plant in the City of Chesapeake ground cement from imported clinker.

Citadel Cement Corp. was proceeding with work to double the capacity of its Roanoke plant to 1.2 million tons per day. The expansion involved expenditures of $36 million and is to be completed in 1975. Major components of the system included a pelletizer pan, traveling grate preheater, rotary kiln, and stoker cooler. Lone Star Industries, Inc., and Canada Cement Lafarge each have a 50% equity interest in Citadel Cement Corp.

Clays.—Clay production increased 19% and the value increased 39% compared with that of 1973. The average value per ton rose to $1.34. The principal use was in manufacturing face brick. Other major uses were lightweight aggregate and cement. Minor uses were for clay dummies (shothole tampers) and miscellaneous products.

Clay production was reported by 12 companies operating 33 mines in 15 counties and 1 independent city. In order of output, the chief producing counties were Botetourt, Buckingham, Orange, Russell, and Prince William. The aforementioned five counties accounted for 72% of the State output and 75% of the output value. Four firms, Webster Brick Co., Inc., Solite Corp., General Shale Products Co., and Citadel Cement Corp., accounted for 69% of the output and 68% of the output value.

Gem Stones.—Mineral collectors and hobbyists collected a variety of semiprecious gems and mineral specimens in various areas in the State.

Gypsum.—The output of crude gypsum decreased 14%, and value increased 6% in 1974. The raw gypsum, mined at Plasterco, Washington County, was calcined or otherwise processed and manufactured into plasterboard and other gypsum products by United States Gypsum Co. at its Plasterco plant. The company also calcined imported gypsum at its Berkeley plant in Norfolk. Output of calcined gypsum by the company decreased 9%.

Table 5.—Virginia: Clays sold or used by producers
(Thousand short tons and thousand dollars)

Year	Quantity	Value
1970	1,633	1,672
1971	1,710	1,800
1972	1,684	1,783
1973	1,646	1,886
1974	1,957	2,614

Kyanite.—Shipments and value of kyanite increased 11% over that of 1973. Shipments were principally to refractory and ceramic product manufacturers. The Kyanite Mining Corp. operated two mines and four processing plants in adjacent Buckingham and Prince Edward Counties.

Only a small portion of the beneficiated kyanite (Al_2SiO_5) is used in the raw state; the bulk of production is calcined to mullite, one of the most imporant refractory materials used in the ceramic industry. Quartzite sand, recovered during the milling of kyanite, was marketed for industrial and construction uses. Virginia is North America's leading producer of kyanite.

Lime.—Total lime production (quick and hydrated) increased 14% over the previous year but was 17% below the 1969 record. The principal use for Virginia lime production was as a metallurgical flux in the basic oxygen steelmaking process. Other major uses were in pulp and paper, in electric furnaces for steel, and for water purification.

Primary lime production was reported by six companies operating six plants in four counties. Giles and Shenandoah Counties accounted for 83% of the output and 81% of the output value. The major producing companies were Chemstone Corp., National Gypsum Co., and Virginia Lime Co.

Lime consumption in Virginia was 204,700 tons, equal to 23% of the State's production. The remaining output was shipped to Pennsylvania, Ohio, Maryland,

and other States. The average value of all lime increased to $21.15 per ton from $15.61 per ton in 1973.

Processing equipment used in limemaking included pot, shaft, and rotary kilns and batch and continuous hydrators. Raw materials included high-calcium limestone (predominantly), dolomitic limestone, and oystershell. Fuel used included bituminous coal, coke, and natural gas.

Table 6.—Virginia: Lime sold or used by producers, by use
(Short tons)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Steel, BOF	383,100	$5,893,000	432,000	$8,920,000
Paper and pulp	72,570	1,116,000	107,000	2,218,000
Water purification	82,370	993,000	98,970	2,043,000
Steel, electric	67,500	1,038,000	71,440	1,474,000
Steel, open-hearth	45,180	694,000	61,040	1,260,000
Sewage treatment	37,760	580,000	48,780	1,007,000
Construction	17,650	306,000	14,190	759,000
Agriculture	14,880	248,000	12,000	211,000
Other [1]	61,300	1,337,000	49,830	1,037,000
Total [2]	782,300	12,205,000	895,200	18,929,000

[1] Includes metallurgy (other), miscellaneous chemicals, refractory dolomite, tanning, sugar refining, and acid mine water neutralization (1973).
[2] Data may not add to totals shown because of independent rounding.

Mica.—Mica was processed in two Newport News plants. Ashville Mica Co. operated a mica fabricating plant, and Mica Co. of Canada, Inc., operated a plate mica plant.

Nitrogen Compounds.—Allied Chemical Corp., Nitrogen Div., Hopewell, Prince George County, using reformed natural gas, produced ammonia, urea, ammonium nitrate, and ammonium sulfate for use chiefly as fertilizer ingredients. The capacity of the plant at Hopewell is rated at 350,000 short tons annually of ammonia.

Sand and Gravel.—Production of sand and gravel remained stable in 1974 while value increased 12%. Of the total output, 80% was used commercially and 20% was used for publicly funded projects. Processed aggregates accounted for 87% of the total output and 88% of the total value, unprocessed aggregates accounted for 10% of total output and 5% of total value, and industrial sand accounted for 3% of total output and 7% of total value. The industrial sand was marketed for glass, engine, foundry, filter, fire or furnace, chemical, and other industrial uses.

Production of sand and gravel was reported from 48 counties and 6 independent cities. In order of output the principal sand and gravel producers were Chesterfield County, Henrico County, City of Virginia Beach, King George County, and Prince George County. Transportation of commercial production to market was 88% by truck, 11% by railroad, and 1% by other methods.

Eighty-three of the 125 commercial sand and gravel operations had an annual output range of up to 50,000 tons and accounted for 8% of the total tonnage; 33 operations had an output range of from 50,000 to 500,000 tons and accounted for 36%; 6 had an output range from 500,000 to 1,000,000 tons and accounted for 30%; and 3 had an output range over 1,000,000 tons and accounted for 26%. The bulk of the sand and gravel recovery was by open pit mining and dredging, a sizable tonnage of industrial silica sand was produced from crushed sandstone and quartzite, and a limited amount was obtained in the processing of kyanite.

Table 7.—Virginia: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	14,214	24,760	8,425	15,842
Gravel			3,974	9,588
Unprocessed: Sand and gravel			1,510	1,446
Industrial:				
Sand	297	1,486	405	2,072
Gravel			--	--
Total	14,511	26,246	14,814	28,948

[1] Value data may not be directly comparable to that in tables 1, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 8.—Virginia: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregates:				
Nonresidential and residential construction	11,182	22,263	3,902	8,374
Highway and bridge construction			866	1,623
Other uses (dams, waterworks, airports, etc.)			100	282
Concrete products (cement blocks, bricks, pipe, etc.)			1,755	4,555
Bituminous paving (asphalt and tar paving)			520	984
Roadbase and subbase			1,064	1,995
Unprocessed aggregate	--	--	1,510	1,446
Fill	2,493	1,839	1,263	1,075
Other uses [2]	387	599	28	38
Industrial sand and gravel	297	1,486	405	2,072
Total	14,359	26,187	11,413	22,394

[1] Unit value of construction aggregate may be higher than the unit value of sand or gravel.
[2] Includes railroad ballast, miscellaneous (1973).

Table 9.—Virginia: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	43	23	1,018	2,035
Highway and bridge construction			622	1,718
Other uses (dams, waterworks, airports, etc.)			W	W
Concrete products (cement blocks, bricks, pipe, etc.)			547	1,526
Bituminous paving (asphalt and tar paving)			159	281
Roadbase and subbase			555	1,321
Unprocessed aggregate	--	--	--	--
Fill	108	35	--	--
Other	1	1	W	W
Total	152	59	2,901	6,876

W Withheld to avoid disclosing individual company confidential data; included with "Nonresidential and residential construction."
[1] Unit value of construction aggregate may be higher than the value of sand or gravel.

Soapstone.—Crushed and ground soapstone was produced by Blue Ridge Talc Co., principally for use in insecticides and foundry facings. Output and value increased over that of the previous year.

Dimension soapstone was produced by Alberene Stone Div., Georgia Marble Co., and is included in the Stone section of this chapter.

Stone.—Virginia's stone production in 1974 broke all previous Sate records in both output and value. Stone, the second most important mineral commodity produced in the Commonwealth, accounted for 9% of the State's total value of mineral production in 1974. Production totaled 44.2 million tons valued at $96 million, a gain of 1% in output and 16% in value over that of 1973.

Various types of stone were quarried in the State; in order of output value they were limestone, granite, traprock, slate, sandstone, miscellaneous stone, quartzite, marble, shell, and marl. Both dimension stone and crushed or broken stone were produced.

Dimension stone was produced at 12 operations in 6 counties, and although it was a low-output commodity in terms of tonnage (less than 0.1% of total stone production), dimension stone accounted for 2.2% of the total stone output value. The use of dimension stone in decreasing order of quantities produced were structural, roof slate, rough blocks, irregular shapes, and flagging.

Table 10.—Virginia: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total	25	2,229	24	2,149
Crushed and broken stone:				
Bituminous aggregate	3,028	5,827	3,408	7,342
Concrete aggregate	7,832	14,715	5,954	11,904
Dense graded roadbase stone	12,610	21,541	14,917	28,644
Macadam aggregate	1,285	2,344	861	1,655
Surface treatment aggregate	2,847	5,446	2,151	4,460
Unspecified construction aggregate and roadstone	7,670	12,940	8,543	17,961
Agricultural purposes [1]	1,167	2,359	1,347	3,109
Cement and lime manufacture	3,247	4,860	2,779	5,553
Flux stone	363	626	462	829
Manufactured fine aggregate (stone sand)	601	1,235	842	1,835
Mine dusting	307	702	384	2,224
Railroad ballast	533	786	763	1,277
Riprap and jetty stone	212	464	275	665
Terrazzo and exposed aggregate	W	117	W	W
Other uses [2]	2,168	6,528	1,467	6,882
Crushed total [3]	43,869	80,490	44,152	93,889
Grand total [3]	43,895	82,719	44,176	95,988

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Data include stone used in agricultural limestone, and poultry grit and mineral food.
[2] Includes stone used in asphalt and other fillers, chemicals, drain fields (1973), fill, filter stone, glass, lightweight aggregate, paper manufacture, roofing aggregates, abrasives (1973), and other uses not specified.
[3] Data may not add to totals shown because of independent rounding.

Table 11.—Virginia: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973		1974	
	Quantity	Value	Quantity	Value
Limestone [1]	19,985	W	20,099	W
Granite	16,186	30,170	17,193	35,253
Marble	W	220	W	W
Sandstone, quartz, quartzite	W	W	W	W
Shell	(2)	W	(2)	W
Slate	958	5,698	W	6,167
Traprock	4,872	10,460	4,610	10,683
Undistributed [3]	1,894	36,172	2,274	43,885
Total [4]	43,895	82,719	44,176	95,988

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Limestone used generally to include dolomite.
[2] Less than ½ unit.
[3] Includes marl and other stone.
[4] Data may not add to totals shown because of independent rounding.

Crushed stone was produced from all the stone types and contributed over 99.9% of the total stone output and 97.8% of the total stone value. Of the total crushed stone output, 81% was used for building purposes (aggregate and roadstone), 4% for lime, 3% for agricultural use, 2% for cement, and the remainder for stone sand, railroad ballast, flux, mine dusting, riprap and jetty stone, and miscellaneous and unspecified applications. Crushed stone increased 1% in output and 17% in value over that reported in 1973. The average value per ton for crushed stone rose to $2.13 from $1.83 in 1973.

Commercial stone was produced at 139 operations in 53 counties and 2 independent cities. In terms of tonnage, the principal stone producing counties were Loudoun (traprock and granite), Goochland (granite), Frederick (limestone), Brunswick (granite), and Fairfax (granite and traprock). In terms of value the most important counties were Loudoun, Goochland, Frederick, Fairfax, and Brunswick. The aforementioned counties accounted for 27% of both the total stone output and value. Nineteen counties produced more than 1 million tons each, and 32 counties and 1 independent city had output valued in excess of $1 million each.

Shipments of crushed stone products in million short tons by methods of transportation were distributed as follows: 34.7 by truck, 8.8 by railroad, and 0.7 by other and unspecified methods.

Sulfur.—Hydrogen sulfide, recovered from fuel gas, was converted to elemental sulfur by American Oil Co. and its Yorktown refinery. Compared with those of 1973, sulfur production increased 12%, but the sales value increased 29%. Production and sales were approximately equal.

METALS

Iron Ore (Pigment Material).—Natural iron oxide pigments were produced by Blue Ridge Talc Co., Inc., in Henry County, utilizing purchased iron oxides. Natural iron oxide pigments were also produced by Hoover Color Corp. at Hiwassee, Pulaski County, from local deposits of earthy forms of hydrous and anhydrous iron oxides, including ocher, sienna, and umber. Manufactured iron oxides were also produced at the company's Pulaski facilities. The finished iron oxide pigments are used in paint manufacture, printing inks, cement, and other products.

Lead and Zinc.—Lead and zinc were recovered from two mines in Wythe County operated by the same company. The ratio of zinc recovery to that of lead was about 5.5 to 1. Lead production increased 18% and value increased 63%. Zinc output rose 3% and the output value rose 79%.

Magnetite.—Foote Mineral Co. operated a grinding plant at Kimballton, Giles County, to process out-of-State magnetite for use in coal preparation.

Manganese.—Union Carbide Corp., Consumer Products Div., Newport News, operated a processing plant for imported ore used in company products.

Table 12.—Virginia: Mine production of recoverable lead and zinc

Year	Lead		Zinc	
	Short tons	Value (thousands)	Short tons	Value (thousands) [1]
1970	3,356	$1,048	18,063	$5,634
1971	3,386	935	16,829	5,419
1972	3,441	1,034	16,789	5,960
1973	2,637	859	16,683	6,894
1974	3,106	1,398	17,195	12,346

[1] Recoverable zinc valued at the yearly average price of prime western-slab zinc, East St. Louis market. Value established after transportation, smelting, and manufacturing charges have been added to the value of the ore at the mine.

Table 13.—Principal producers

Commodity and company	Address	Type of activity	County
Aplite (Crude):			
Sobin Chemical Corp	Piney River, Va. 22964	Quarry	Nelson.
The Feldspar Corp	Box 23 Montpelier, Va. 23192	do	Hanover.
Cement:			
Lone Star Industries, Inc.[1]	3315 W. Broad St. Richmond, Va. 23230	Plants and quarry.	Botetourt and Chesapeake (City).
Riverton Corp	Riverton, Va. 22651	do	Warren.
Clays:			
Solite Corp.[2]	P.O. Box 27211 Richmond, Va. 23261	Pit	Buckingham.
Webster Brick Co., Inc	P.O. Box 12887 Roanoke, Va. 24029	Pit	Botetourt, Nansemond, and Orange.
Coal (Bituminous):			
Clinchfield Coal Co.[3]	Dante, Va. 24237	Underground mine.	Buchanan, Dickenson, and Russell.
Coal Processing Corp	Box 497 Norton, Va. 24273	do	Wise.
General Trucking Corp	Box 389 Appalachia, Va. 24216	Strip and auger mines.	Do.
Sterling Mining Co	Box 1187 Wise, Va. 24293	do	Do.
Harman Mining Corp	Harman, Va. 24618	do	Buchanan.
Island Creek Coal Co	Box 113 Keen Mountain, Va. 24624	do	Do.
Contracting Enterprises, Inc.	Box 430 Clintwood, Va. 24228	do	Dickenson.
Westmoreland Coal Co	P.O. Box 229 Big Stone Gap, Va. 24219	do	Wise.
Coke:			
Christie Coal and Coke Co., Inc.	P.O. Box 409 Norton, Va. 24273	Plant	Do.
Jewell Smokeless Coal Corp	Jewell Valley, Va. 24623	do	Buchanan.
Gypsum: United States Gypsum Co.	101 S. Wacker Dr. Chicago, Ill. 60606	Mine and plant	Chesapeake (City) and Washington.
Iron oxide pigments (crude):			
Hercules, Inc	Hiwassee, Va. 24347	do	Pulaski.
Lime:			
Battery Park Fish & Oyster Co.	Battery Park, Va. 23304	Plant	Isle of Wight.
Chemstone Corp	Menlo Park Edison, N.J. 08817	do	Shenandoah.
The Flintkote Co	Lime Kiln, Md. 21768	do	Frederick.
W. S. Frey Co., Inc	257 E. Market St. York, Pa. 17403	do	Do.
National Gypsum Co	325 Delaware Ave. Buffalo, N.Y. 14202	do	Giles.
Virginia Lime Co	Star Route Ripplemead, Va. 24150	do	Do.

See footnotes at end of table.

Table 13.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Sand and Gravel:			
Friend Sand and Gravel Co	209 River St. Petersburg, Va. 23801	Pit	Chesterfield.
Massaponax Sand & Gravel Corp.	P.O. Box 270 Fredericksburg, Va. 22401	Pit	Spotsylvania.
West Sand and Gravel Co	Box 6008 Richmond, Va. 23222	Pits	Henrico and Rockingham.
E. V. Williams Co., Inc	P.O. Box 938 Norfolk, Va. 23501	Pit	Virginia Beach (City).
Talc (Soapstone):			
Blue Ridge Talc Co., Inc.[4]	P.O. Box 8 Henry, Va. 24102	Mine and plant	Franklin.
Stone:			
Blue Ridge Stone Corp	Box 2459 Roanoke, Va. 24010	Quarry	Botetourt.
Chantilly Crushed Stone Co	Box 12 Chantilly, Va. 22021	---- do	Loudoun.
General Crushed Stone Co	712 Drake Bldg. Easton, Pa. 18042	---- do	Hanover.
Luck Quarries, Inc	Box 4682 Richmond, Va. 23229	---- do	Augusta.
Pounding Mill Quarry Corp	Box 2459 Roanoke, Va. 24010	---- do	Tazewell.
Trego Stone Corp	P.O. Box 2459 Roanoke, Va. 24010	---- do	Greensville.
Vulcan Materials Co	P.O. Box 7506 Reynolds Station Winston-Salem, N.C. 27109	Quarries	Brunswick, Fairfax, Goochland, Halifax, Pittsylvania, Prince William, Rockbridge, Washington.

[1] Also clay, sand and gravel, and stone.
[2] Also sand and gravel.
[3] Also clay.
[4] Also finished iron oxide pigments.

The Mineral Industry of Washington

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the Washington Division of Geology and Earth Resources for collecting information on all minerals.

By John R. Welch [1]

The value of mineral production in Washington rose to a high of almost $144 million in 1974, 25.5% more than in 1973. Nonmetals, including coal, accounted for about 88% of the value and metals for most of the balance. Decreased production of lead, gold, and silver was offset by increase in output of other minerals such as coal, portland cement, and stone. Total value of mineral commodity output increased substantially because of an increase in the average price per unit for most minerals. The value of nonmetals was about $104.5 million, up approximately 26% compared with that of 1973.

An experimental coal liquefaction plant at Fort Lewis, Wash., was dedicated during the year and preliminary tests were run. The pilot plant, the result of a contract between the Office of Coal Research and Pittsburgh and Midway Coal Mining Company, is designed for a 50-ton-per-day input of coal to produce 30 tons per day of solvent refined coal. The beginning trials were with coal from Kentucky, after which the process will be tried on western coals.

After foreign crude oil went up in price, the formation of other commodity cartels seemed to be of concern, with aluminum high on the list. So far, this has had little effect on the Pacific Northwest's big aluminum industry, which produces about 30% of the nation's supply, since about half of the Northwest's raw materials supply is alumina made from Australian bauxite. This situation however, has stirred new interest in alternative sources such as the laterite deposits in Washington and Oregon.

[1] State Liaison Officer, Bureau of Mines, Olympia, Washington.

Table 1.—Mineral production in Washington [1]

Mineral		1973		1974	
		Quantity	Value (thousands)	Quantity	Value (thousands)
Cement:					
Masonry	thousand short tons	6	$169	6	$193
Portland	do	1,194	26,651	1,377	36,347
Clays [2]	do	287	664	269	698
Coal (bituminous)	do	3,270	21,440	3,913	W
Gem stones		NA	160	NA	160
Lead (recoverable content of ores, etc.)	short tons	2,217	722	1,299	585
Peat	thousand short tons	21	110	14	85
Pumice	do	1	1	(3)	1
Sand and gravel	do	27,935	30,132	22,842	35,030
Stone	do	11,384	19,284	15,095	24,483

See footnotes at end of table.

Table 1.—Mineral production in Washington [1]—Continued

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Zinc (recoverable content of ores, etc.) short tons	6,378	$2,635	6,909	$4,960
Value of items that cannot be disclosed: Fire clay, copper, diatomite, gold, gypsum, lime, olivine, silver, talc, tungsten, uranium, and values indicated by symbol W	XX	r 12,695	XX	41,388
Total	XX	r 114,663	XX	143,930
Total 1967 constant dollars	XX	84,059	XX	p 32,910

p Preliminary. r Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes fire clay; included with "Value of items that cannot be disclosed."

[3] Less than ½ unit.

Table 2.—Value of mineral production in Washington, by county

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	W	W	Stone, sand and gravel.
Asotin	$58	$5,997	Do.
Benton	W	W	Do.
Chelan	W	W	Sand and gravel, stone, gold, silver, copper, lead.
Clallam	W	W	Clays, stone, sand and gravel.
Clark	2,278	W	Stone, sand and gravel, clays.
Columbia	96	111	Stone.
Cowlitz	1,219	W	Stone, sand and gravel.
Douglas	62	173	Sand and gravel, clays.
Ferry	3,247	W	Gold, silver, stone, zinc, sand and gravel, copper, lead.
Franklin	W	524	Sand and gravel, stone.
Garfield	138	115	Stone.
Grant	3,682	W	Diatomite, lime, stone, sand and gravel.
Grays Harbor	978	1,546	Sand and gravel, stone.
Island	305	622	Do.
Jefferson	W	W	Stone, sand and gravel.
King	24,502	31,840	Cement, sand and gravel, stone, coal, clays, peat.
Kitsap	W	W	Sand and gravel, peat, pumice.
Kittitas	272	W	Stone, sand and gravel, clays.
Klickitat	299	710	Stone, sand and gravel.
Lewis	22,047	W	Coal, sand and gravel, stone, clays.
Lincoln	90	539	Stone, sand and gravel.
Mason	W	130	Sand and gravel.
Okanogan	W	112	Sand and gravel, stone, gypsum.
Pacific	520	598	Stone.
Pend Oreille	7,207	10,166	Zinc, cement, lead, stone, sand and gravel, silver.
Pierce	8,696	11,420	Sand and gravel, lime, stone, clays.
San Juan	W	W	Sand and gravel, stone.
Skagit	2,912	2,553	Olivine, stone, sand and gravel, talc.
Skamania	359	224	Stone, sand and gravel, gold, silver.
Snohomish	W	W	Sand and gravel, stone, clays, peat.
Spokane	3,532	3,911	Do.
Stevens	r 5,552	10,178	Uranium, stone, sand and gravel, zinc, tungsten, silver, gold, copper.
Thurston	983	W	Coal, sand and gravel, stone, peat.
Wahkiakum	W	W	Stone.
Walla Walla	W	W	Sand and gravel, stone.
Whatcom	W	10,070	Cement, stone, sand and gravel, clays.
Whitman	W	W	Stone, sand and gravel.
Yakima	1,449	W	Sand and gravel, stone, lime.
Undistributed [1]	24,180	52,383	
Total [2]	r 114,663	143,930	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes value of mineral production that cannot be assigned to specific counties, gem stones, and values indicated by symbol W.

[2] Data may not add to totals shown because of independent rounding.

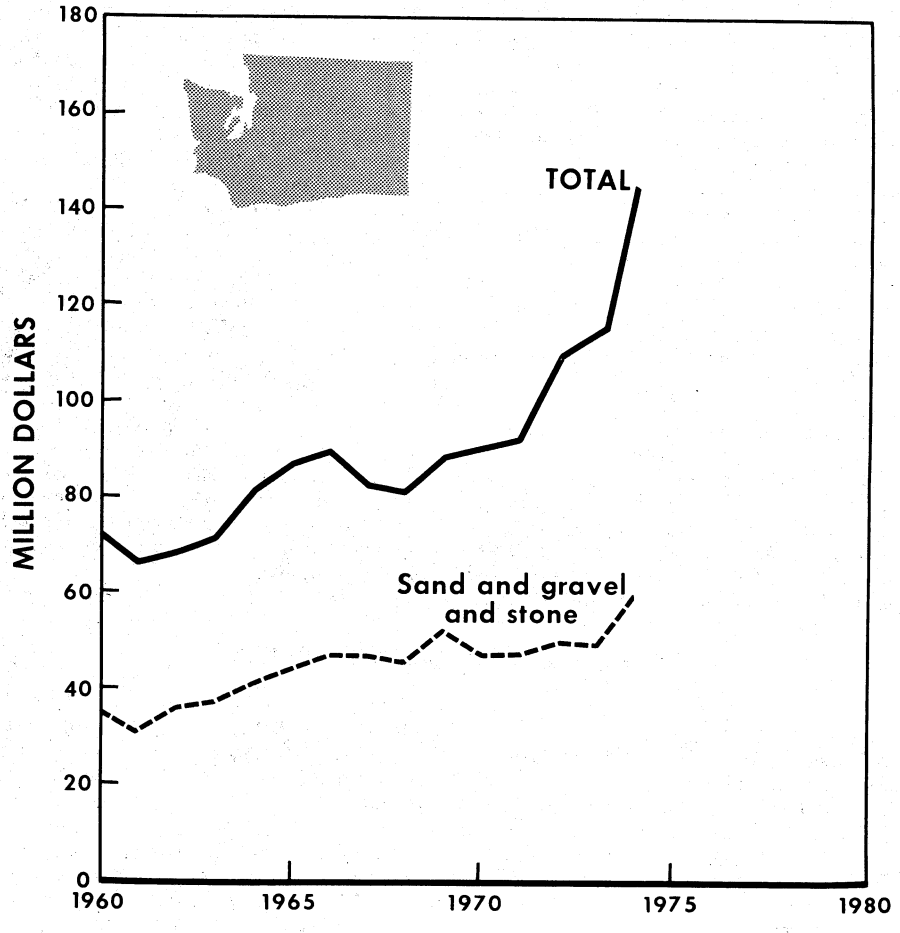

Figure 1.—Value of sand and gravel and stone, and total value of mineral production in Washington.

Table 3.—Indicators of Washington business activity

		1973	1974 p	Change, percent
Annual average labor force and employment:				
Total labor force	thousands	1,463.0	1,502.0	+2.7
Unemployment	do	115.0	108.0	−6.1
Employment:				
Construction	do	55.8	52.6	−5.7
Aerospace	do	50.5	54.4	+7.7
Lumber and wood products	do	50.1	48.7	−2.8
Food processing	do	28.4	28.3	−0.4
All manufacturing	do	244.3	252.4	+3.3
All industries	do	906.5	1,194.4	+31.8
Personal income:				
Total	millions	$17,674	$19,642	+11.1
Per capita		$5,151	$5,651	+9.7
Construction activity:				
Value of nonresidential construction	millions	$363.8	$385.5	+6.0
State highway commission: Value of contracts awarded	do	$116	$100	−13.8
Cement shipments to and within Washington	thousand short tons	1,111	1,174	+5.7
Farm marketing receipts	millions	$1,537.4	NA	NA
Mineral production value	do	$114.7	$143.9	+25.5

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Labor Force and Employment in Washington State, and the U.S. Bureau of Mines.

Legislation and Government Programs.—H. B. 135, designated as the Geothermal Resources Act, passed the State legislature during the year. This will give the State control over geothermal activities on State and private lands but not Federal lands. The controversial question of ownership of the geothermal resource was not answered nor questioned in the bill.

Environment.—Air pollution was of constant concern throughout the year. Kaiser Aluminum & Chemical Corp. requested the Washington State Department of Ecology to extend for three months the date for installation of air pollution control facilities at its Mead Works. The reason given was the difficulty in getting the equipment manufactured and installed. This request was approved.

The American Smelting and Refining Company (ASARCO) smelter in Tacoma was granted a 3-month variance from air pollution regulations to allow corrections in the new SO_2 collection and liquefaction plant. The Puget Sound Air Pollution Control Agency granted the variance. This plant to liquefy sulfur dioxide was completed at a cost of $18.5 million and it, along with a modernized sulfur dioxide plant, will recover 51 percent of the sulfur contained in the materials processed at the smelter. However, the variance gave the smelter the two following choices: (1) to announce how it plans to remove 90 percent of the smelter's sulfur dioxide emissions or (2) to close the smelter down. Apparently the final decision has not been made as to the outcome. During the year the United Steelworker's nationwide strike against three major copper producers idled about 1,000 employees at the Tacoma plant.

The Clay City brick plant, owned by Mutual Materials Company of Seattle, was granted a 1-year extension on a variance from visible particulate and SO_2 emission standards. This variance was based on fuel shortages, high prices, and the cost of control equipment.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Cement.—Production and shipments of portland cement exceeded those of 1973 by about 15.3%. The value was about $36.3 million, up 36.4% compared with that in 1973. Masonry cement shipments declined slightly. Output originated at four plants, each producing both portland and masonry cement.

Ready-mix concrete, and concrete product manufacturers, building material dealers and contractors were the major consumers.

Clays.—Output of common clay decreased 6% in quantity but increased in value 5% over that in 1973. Clay was produced in 10 counties, but five counties accounted for 93% of total production. Fire clay was produced by two companies in two counties.

Gypsum.—Agro Minerals, Inc., mined crude gypsum at the Poison Lake mine in Okanogan County. Output declined 50% below 1973 production and 79% below that of 1972. Kaiser Gypsum Co., Inc., calcined gypsum in King County. Output increased 6 percent over that of 1973.

Lime.—Domtar Chemicals, Inc., and Utah-Idaho Sugar Co. produced lime in Grant, Pierce, and Yakima Counties for sugar refining, paper and pulp, sewage treatment, and other uses. The lime was used in Washington, Oregon, other closeby States, and Canada. Consumption of lime in Washington was 199,300 tons, about 40% more than that consumed in 1973.

Sand and Gravel.—The total quantity of sand and gravel produced in 1974 was 18.2% less than was produced in 1973. The value of production increased about 16.3%. Thirty-five counties reported production, but King, Pierce, Snohomish, Spokane, and Yakima Counties produced 65% of the total.

Table 4.—Washington: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	27,935	30,132	4,453	7,259
Gravel			11,743	19,712
Unprocessed: Sand and gravel			6,407	5,669
Industrial:				
Sand	W	W	239	1,966
Gravel			--	--
Total	27,935	30,132	22,842	34,606

W Withheld to avoid disclosing individual company confidential data; included with "Construction."

[1] Value data may not be directly comparable to that in tables 1, 5, and 6 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 5.—Washington: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	15,351	20,143	5,265	8,366
Highway and bridge construction			399	732
Other uses (dams, waterworks, airports, etc.)			647	896
Concrete products (cement blocks, bricks, pipe, etc.)			1,305	2,505
Bituminous paving (asphalt and tar paving)			1,682	2,837
Roadbase and subbase			2,253	3,994
Unprocessed aggregate			6,322	5,634
Fill	5,472	3,632	482	655
Other uses [2]	1,838	2,891	284	565
Industrial sand and gravel	W	W	238	1,966
Total	22,661	26,666	18,877	28,150

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes railroad ballast and miscellaneous (1973).

Table 6.—Washington: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	3,754	3,091	185	323
Highway and bridge construction			320	707
Other uses (dams, waterworks, airports, etc.)			194	473
Concrete products (cement blocks, bricks, pipe, etc.)			114	168
Bituminous paving (asphalt and tar paving)			1,669	2,905
Roadbase and subbase			1,284	2,122
Unprocessed aggregate			84	34
Fill	1,335	272	115	148
Other	185	103	W	W
Total	5,274	3,466	3,965	6,880

W Withheld to avoid disclosing individual company confidential data; included with "Fill."

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Stone.—The quantity of crushed and broken stone sold or used by producers increased by 32.6% over that of 1973. The value increased by 27%. There were 260 quarries in 36 counties, but 56 quarries in five counties produced 31% of the stone deported. There were five counties whose production was valued in excess of $1 million.

Table 7.—Washington: Stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension stone total	6	346	5	295
Crushed and broken:				
Bituminous aggregate	580	1,123	730	1,374
Concrete aggregate	292	572	275	W
Dense graded roadbase stone	1,357	2,126	1,212	1,934
Macadam aggregate	114	200	256	546
Surface treatment aggregate	1,800	2,635	1,723	2,720
Unspecified construction aggregate and roadstone	2,135	2,598	2,048	3,717
Agricultural purposes [1]	14	67	22	143
Asphalt filler	69	W	W	W
Cement manufacture [2]	833	1,295	W	W
Fill	746	W	5,488	5,587
Manufactured fine aggregate (stone sand)	24	50	31	206
Metallurgical purposes [3]	49	120	35	108
Railroad ballast	559	872	364	625
Riprap and jetty stone	2,240	3,955	1,729	3,159
Other uses [4]	565	3,327	1,177	4,070
Crushed total [5]	11,377	18,938	15,091	24,188
Grand total [5]	11,384	19,284	15,095	24,483

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Data include agricultural limestone, poultry grit and mineral food (1974).
[2] Data include lime manufacture (1973).
[3] Data include ferrosilicon and flux stone.
[4] Data include acid neutralization (1973), abrasives, bedding material (1974), drain fields, filter stone (1974), glass, paper manufacture, porcelain (1974), roofing aggregates, sugar refining, terrazzo, uses not specified, and waste material.
[5] Data may not add to totals shown because of independent rounding.

METALS

Aluminum.—The production of primary aluminum in the State of Washington increased by 12% in 1974, compared with that of 1973, and value increased by 39%. Washington State's share of national production was 24%, a slight increase over that of 1973. Output came from seven plants, producing aluminum from semi-refined alumina imported primarily from Australia. The aluminum industry's scurry for self-sufficiency has stirred new interest in alternative sources such as the laterite deposits in Washington and Oregon.

Gold-Silver.—Production of gold and silver declined during the year but the value of both commodities increased substantially, following the upward trend in world prices for these metals. The average value of gold and silver produced in 1974 was $159.74 and $4.71 per troy ounce, respectively. This compared with 1973 price of $97.81 and $2.56 per troy ounce.

Day Mines had continued income from gold-silver mining operations at Republic, Wash., from the Gold Dollar Lease and the Joint Operation, both under the management of Knob Hill Mines, Inc.

In 1974, production from the Gold Dollar Lease was 8,180 tons with an average grade of 1.08 ounces of gold per ton and 3.77 ounces of silver per ton. In 1973, production was 11,562 tons of ore with an average grade of 0.85 ounce of gold and 2.68 ounces of silver per ton.

Day Mines share of the No. 3 Joint Operation in 1974, was 8,048 tons of ore with an average grade of 0.32 ounce of gold per ton and 2.08 ounces of silver per ton. In 1973, the company's share was 11,201 tons averaging 0.44 ounce of gold and 2.67 ounces of silver per ton. Ore reserves are adequate for three years operation in both of these areas.

Lead-Zinc.—Exploration activity continued in the lead-zinc district of the State.

The Bunker Hill Company was prospecting at the old Lead Hill property near Metalline Falls. Two adits were being driven and plans are to crosscut frequently to sample the disseminated lead-zinc deposit.

The Coronado Mining Company, Colville, will be joined by New Wellington Resources Ltd., Seattle, in the development of the Schumaker mine. The 400-ton-per-day mill, located at the old Goldfield Consolidated property, has been rehabilitated over the past year to process the ore from the Schumaker property. Initial production is expected to be about 150 tons per day.

In March 1974, Pend Oreille Mines & Metals Co. merged into The Bunker Hill Company, a wholly owned subsidiary of Gulf Resources and Chemical Company. Pend Oreille has been a major lead-zinc producer in the State for the past 40 years. The company management announced that a raise will be driven to ventilate additional exploration of deeper ore bodies in the Lower Dolomite and Yellowhead Formations. During the past 2 years, a decline was driven for 3,300 feet to provide access to the lower ore bodies.

Production of lead amounted to 1,299 tons, a decrease of 41% below that of 1973. Value decreased to $585,000, 19% below that of 1973.

Production of zinc increased to 6,909 tons, about 8% over 1973 production, while value increased by 88%.

Magnesium.—About 800 people are on construction crews completing the $50 million magnesium and silicon plant for Northwest Alloys, Inc., near Addy, 55 miles northwest of Spokane. Ferrosilicon, instrumental in the manufacture of aluminum, will start being produced in 1975, with full plant operation scheduled for early 1976. Northwest Alloys, Inc., a subsidiary of Aluminum Co. of America (Alcoa) will use the magnesium and silicon as alloying materials for aluminum.

This is the first major state industry since the passage of the 1971 Environmental Protection Act, and all environmental protection facilities are being built in from the start, thus eliminating many of the headaches older plants have had trying to adapt.

The plant was built on a 240-acre site near Addy, primarily because of the existence of a massive bed of dolomite and a good supply of quartzite. It will be the sole supplier of magnesium and ferrosilicon for all Alcoa primary production plants in the United States.

MINERAL FUELS

Coal.—Bituminous coal production increased 19.7% from that of 1973. Value also increased. Pratically all production came from Washington Irrigation and Development Company's huge strip mine near Centralia, in Lewis County.

A record 537,999 tons of clean coal was mined at this operation in August 1974. The old 1-month record was 421,237 tons, set in May. The coal is used to fire two 700-megawatt steam-generating plants, jointly owned by Washington Water Power Company of Spokane, and Pacific Power and Light Company in Portland, Oreg. Several other utility companies are also financially involved.

A small amount of coal was produced from Palmer Coking Coal Company's underground coal mine in King County, but the mine was in the process of closing down.

Geothermal Energy.—Applications for geothermal leasing in Washington, covering 344,062 acres, were submitted by 41 companies and individuals. The applications were the result of lease offerings by the Bureau of Land Management, which were opened February 1, 1974. Skamania County led the number of acres applied for, totaling 263,778. Other popular geothermal locations were in Whatcom, Cowlitz, King, and Snohomish Counties. Applications for lesser tracts were made in Yakima, Okanogan, and Lewis Counties. Phillips Petroleum and Union Oil Company of California have applied for tracts within the proposed Alpine Lakes Wilderness and the Glacier Peak Wilderness areas.

Nuclear.—Two nuclear steam supply systems, expected to be constructed at Hanford, in Benton County, and Satsop, near Aberdeen, are scheduled to go into operation in 1982 and 1983. Washington Public Power Supply Systems will spend $121.5 million for the nuclear steam supply system for two large power plants, each capable of producing 1,250 megawatts of power when completed. Total cost of both will be about $1.5 billion.

The concept of building two nuclear electric generating plants on a single site is surfacing in applications for new facilities. The advantages are an estimated 10%

savings in construction costs and minimization of environmental delays. Current plans are to build 51 nuclear plants in Washington by the year 2026.

Peat.—Production of peat declined 33% in quantity and 23% in value from that in 1973. The average value was $5.87 per ton, about 15% higher than in 1973.

Peat production was reported in five counties during the year. Kildow Brothers, Inc., produced 4,005 tons during 1974 making Thurston County the largest producing county. Spokane County was second highest in production. The material was sold in bulk for use in soil improvement.

Total production for the year was 14,492 tons compared with 21,467 in 1973.

Petroleum and Natural Gas.—The Shell Oil Company is seeking to explore for oil and gas on 77,000 acres of Federal land in eastern Washington counties including Grant, Kittitas, Yakima, and Benton Counties. Washington Water Power Company, Cascade Natural Gas Company, and Washington Natural Gas Company are investigating the possibility that oil and gas might be located in Wenatchee Heights in Chelan County.

Oil exploration was done in Grant County about 20 years ago and in Chelan County about 45 years ago, but nothing of interest was found.

Uranium.—The outlook for developing additional uranium reserves at the Midnite mine on the Spokane Indian Reservation seems to be fairly good. Diamond drilling by Dawn Mining Co. (49% owned by Midnite Mines and 51% by Newmont Mining Company) has found extensions of open pit ore bodies. The U.S. Geological Survey recently started an extensive study of the Midnite property and adjacent properties, including that leased by Midnite from Evergreen Minerals.

Dawn Mining Co. also operates the uranium ore processing mill at Ford, and processes the ore mined from the Midnite property. In 1974, Dawn mined 128,300 tons of ore that averaged 0.24% uranium oxide.

Likewise in Stevens County, Western Nuclear, Inc., continued to explore the mineralization at the Sherwood uranium property which is also located on the Spokane Indian Reservation. The company has drilled 600 bore holes in determining ore reserves estimated to be about 8 million tons of uranium ore. It is estimated that 14 million pounds of uranium oxide will be recovered during the 8-year life of the project. The final go-ahead still hinges on close scrutiny of utility demand for this nuclear fuel and upon environmental considerations.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Aluminum:			
Aluminum Co. of America	Vancouver, Wash. 98600	Plant	Chelan and Clark.
Intalco Aluminum Corp	Wenatchee, Wash. 98801	---- do	Whatcom.
Kaiser Aluminum & Chemical Corp.	Spokane, Wash. 99200	---- do	Pierce and Spokane.
Martin Marietta Corp	11300 Rockville Pike Rockville, Md. 20852	---- do	Klickitat.
Reynolds Metals Co	Longview, Wash. 98620	---- do	Cowlitz.
Cement:			
Filtrol Corp.[1]	Marietta Rd., P.O. Box 37 Bellingham, Wash. 98225	---- do	Whatcom.
Ideal Basic Industries Inc.[2]	420 Ideal Cement Bldg. Denver, Colo. 80202	---- do	King.
Lehigh Portland Cement Co.[1]	718 Hamilton St. Allentown, Pa. 18105	---- do	Pend Oreille.
Lone Star Industries, Inc.[3]	One Greenwich Plaza Greenwich, Conn. 06830	---- do	King.
Clays:			
Interpace Corp	2901 Los Feliz Blvd. Los Angeles, Calif. 90039	Pits and plants	King and Spokane.
Mutual Materials Co	P.O. Box 3547 Seattle, Wash. 98124	Pit and plant	King and Pierce.
Coal: Washington Irrigation and Development Co.	RR. 2, Box 41 Centralia, Wash. 98531	Strip mine	Lewis.
Diatomite: Witco Chemical Corp.	277 Park Ave. New York, N.Y. 10017	Mine and plant	Grant.
Ferroalloys:			
Foote Mineral Co	Wenatchee, Wash. 98801	Plant	Douglas.
Ohio Ferro-Alloys Corp	Tacoma, Wash. 98400	---- do	Pierce.

See footnotes at end of table.

Table 8.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Gold: Knob Hill Mines, Inc.[4]	160 Sansome St. San Francisco, Calif. 94104	Mine and mill	Ferry.
Gypsum: Agro Minerals, Inc	P.O. Box Call Tonasket, Wash. 98855	Mine	Okanogan.
Lime: Domtar Chemicals Inc	1220 Alexander Ave. Tacoma, Wash. 98431	Plant	Pierce.
Olivine: Northwest International.	329 Kincaid Mount Vernon, Wash. 98273	Mine and plant	Skagit.
Peat:			
Maple Valley Humus	18805 SE 17th St. Renton, Wash. 98055	Bog	King.
Plant Food Co	14515 35th Ave. Bothell, Wash. 98011	Bog	Snohomish.
Petroleum refineries:			
Atlantic Richfield Co	Ferndale, Wash. 98248	Plant	Whatcom.
Mobile Oil Corp	do	do	Do.
Shell Oil Co	Anacortes, Wash. 98221	do	Skagit.
Sound Refining, Inc	Tacoma, Wash. 98400	do	Pierce.
Texaco, Inc	Anacortes, Wash. 98221	do	Skagit.
U.S. Oil & Refining Co	Tacoma, Wash. 98400	do	Pierce.
Pumice: W. L. Marenakos Co	Route 1, Box 921 Issaquah, Wash. 98027	do	Kittitas.
Sand and gravel:			
Associated Sand & Gravel Co., Inc.	P.O. Box 2037 Everett, Wash. 98201	Pit and plant	Snohomish.
B&L Trucking & Construction Co.	1621 Marineview Dr. Tacoma, Wash. 98422	do	Pierce.
Central Pre-Mix Concrete	805 North Division St. Spokane, Wash. 99202	do	Adams, Franklin, Spokane.
Glacier Sand & Gravel Co	5975 E. Marginal Way Seattle, Wash. 98134	do	King and Pierce.
Lakeside Gravel Co	Box 46 Issaquah, Wash. 98027	do	King.
Stoneway Concrete, Inc	Box 509 Renton, Wash. 98055	do	Do.
Woodworth & Co., Inc	1200 East D St. Tacoma, Wash. 98421	do	Pierce.
Silicon carbide: The Carborundum Co.	P.O. Box 423 Niagara Falls, N.Y. 14302	Plant	Clark.
Steel:			
Bethlehem Steel Co	Bethlehem, Pa. 18016	do	King.
Northwest Steel Rolling Mills, Inc.	Seattle, Wash. 98107	do	Do.
Stone:			
Black River Quarry, Inc	6808 South 140th Seattle, Wash. 98178	Quarry	Do.
Friend & Rikals, Inc	Box 3 Aberdeen, Wash. 98520	do	Grays Harbor.
General Construction Co	Box 3845 Seattle, Wash. 98124	Quarry and plant.	Jefferson.
Lane Mountain Silica, Inc	Rt. 1 Valley, Wash. 99181	Quarry	Stevens.
Stoen Construction Co	P.O. Box 488 Monroe, Wash. 98272	do	Snohomish.
Woodworth & Co., Inc	1200 East D St. Tacoma, Wash. 98421	do	Pierce.
Sulfuric acid, smelter:			
American Smelting and Refining Co.	Box 1605 Tacoma, Wash. 98401	Plant	Do.
Talc and soapstone:			
Skaget Talc Co	220 Reed St. Sedro Wooley, Wash. 98284	Quarry	Skagit.
Western Minerals Inc	3314 Harbor Ave. S.E. Seattle, Wash. 98126	do	Do.
Uranium: Dawn Mining Co	Box 25 Ford, Wash. 99013	Mine and mill	Stevens.
Vermiculite, exfoliated:			
Vermiculite-Northwestern, Inc.	P.O. Box A Auburn, Wash. 98002	Plant	Spokane.
Zinc: Pend Oreille Mines & Metals Co.[5]	923 Old National Bank Bldg. Spokane, Wash. 99201	do	Pend Oreille.

[1] Also stone.
[2] Also clays.
[3] Also sand and gravel.
[4] Also silver, copper, lead, and zinc.
[5] Also silver and lead.

The Mineral Industry of West Virginia

This chapter has been prepared under a cooperative agreement between the Bureau of Mines, U.S. Department of the Interior, and the West Virginia Geological and Economic Survey for collecting information on all minerals except fuels.

By James E. Gilley [1]

During 1974, the total value of mineral production in West Virginia increased 59.9% in spite of a 11.2% decline in coal production. The value of coal production increased $878 million even though production dropped 13 million tons below the 1973 level. The total value of mineral production rose $900 million with coal accounting for 92.3% of the total mineral output. West Virginia was the second leading producer of bituminous coal in the Nation.

[1] State Liaison Officer, Bureau of Mines, Charleston, W. Va.

Table 1.—Mineral production in West Virginia [1]

Mineral	1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays [2] ---- thousand short tons	348	$516	339	$520
Coal (bituminous) ---- do	115,448	1,340,338	102,462	2,218,418
Gem stones	NA	2	NA	2
Lime ---- thousand short tons	W	W	128	2,315
Natural gas ---- million cubic feet	208,676	64,481	202,306	66,356
Petroleum (crude) -- thousand 42-gallon barrels	2,385	11,965	2,665	27,058
Salt ---- thousand short tons	1,217	6,082	1,201	6,296
Sand and gravel ---- do	5,893	16,257	5,382	16,018
Stone ---- do	[3] 11,732	[3] 22,821	10,954	22,308
Value of items that cannot be disclosed: Cement, clays (fire), natural gas liquids, stone (dimension, 1973), and values indicated by symbol W	XX	40,583	XX	43,886
Total	XX	1,503,045	XX	2,403,177
Total 1967 constant dollars	XX	1,101,882	XX	[p] 1,148,092

[p] Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
[2] Excludes fire clay; included with "Value of items that cannot be disclosed."
[3] Excludes dimension stone; included with "Value of items that cannot be disclosed."

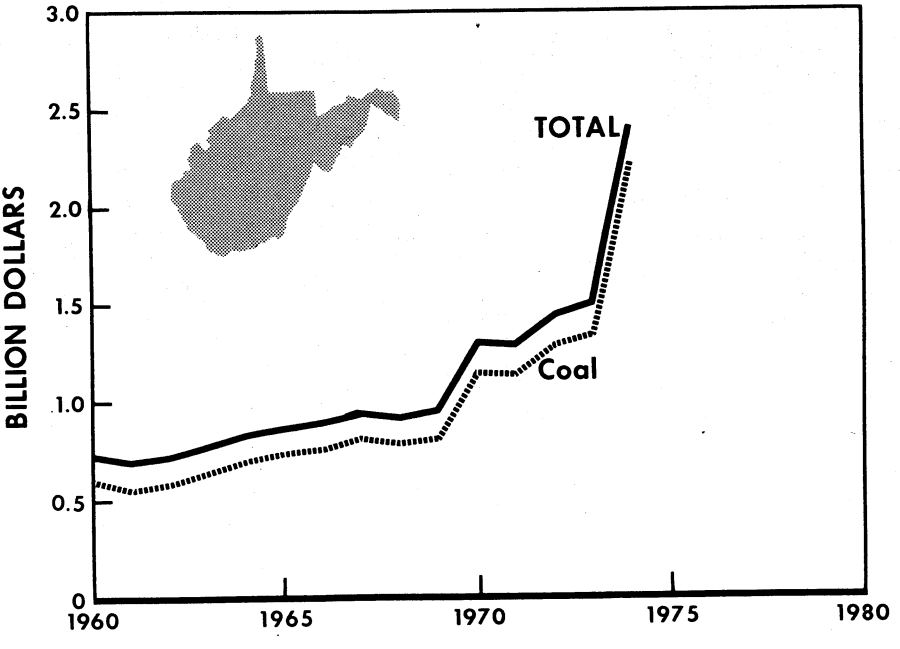

Figure 1.—Value of coal and total value of mineral production in West Virginia.

Table 2.—Value of mineral production in West Virginia, by county [1]

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Barbour	$40,771	$65,971	Coal.
Berkeley	W	W	Cement, stone, lime, clays.
Boone	W	W	Coal, stone, sand and gravel, natural gas liquids.
Braxton	W	W	Coal, stone.
Brooke	W	W	Coal, sand and gravel.
Cabell	W	W	Clays.
Clay	300	1,707	Coal, sand and gravel.
Fayette	50,812	W	Coal, stone.
Gilmer	--	W	Coal.
Grant	W	W	Coal, stone.
Greenbrier	9,530	21,935	Do.
Hancock	8,224	W	Clays, sand and gravel.
Hardy	27	W	Stone.
Harrison	32,952	50,760	Coal, stone.
Jefferson	W	W	Stone.
Kanawha	W	W	Coal, natural gas liquids, stone.
Lewis	W	W	Coal, stone.
Lincoln	4	W	Coal, clays.
Logan	105,815	W	Coal, sand and gravel.
McDowell	212,596	300,944	Coal.
Marion	W	W	Coal, stone.
Marshall	W	W	Coal, salt.
Mason	3,386	W	Coal.
Mercer	W	W	Coal, stone.
Mineral	W	W	Do.
Mingo	W	76,536	Coal.
Monongalia	W	142,878	Coal, stone.
Morgan	W	W	Sand and gravel.
Nicholas	78,573	126,036	Coal.
Ohio	W	W	Coal, sand and gravel.
Pendleton	W	W	Stone, lime.
Pleasants	W	--	
Pocahontas	W	181	Stone.
Preston	W	48,970	Coal.
Raleigh	W	W	Coal, stone.
Randolph	9,557	34,870	Do.
Roane	19	--	
Summers	--	942	Coal.
Taylor	1,475	1,398	Do.
Tucker	W	W	Coal, stone.
Tyler	W	W	Salt, sand and gravel.
Upshur	9,997	38,366	Coal.
Wayne	10,435	W	Coal, natural gas liquids.
Webster	2,717	7,258	Coal, sand and gravel.
Wetzel	W	W	Natural gas liquids, sand and gravel.
Wyoming	W	219,902	Coal, sand and gravel.
Undistributed [2]	925,855	1,264,525	
Total [3]	1,503,045	2,403,177	

W Withheld to avoid disclosing individual company data; included with "Undistributed."

[1] Calhoun, Doddridge, Hampshire, Jackson, Monroe, Putnam, Ritchie, Wirt, and Wood Counties are not listed because no production was reported.

[2] Includes natural gas, petroleum, gem stones, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Trends and Developments.—Diamond Shamrock Corp. announced plans to double the capacity of its Chemetals Div. plant at Kingwood, W. Va., from 8,500 tons per year to 17,000 tons per year of massive manganese. Completion of the $6 million expansion program was projected to be completed by the end of 1975. Approximately $1 million of the cost would be for antipollution control equipment.

The first commercial recovery of pipeline-quality gas produced by degasification of a coalbed commenced when methane from a borehole at Eastern Associated Coal Corp.'s Federal No. 2 mine was connected to a Consolidated Gas Supply Corp. line in Monongalia County. Between 600,000 and 700,000 cubic feet of gas per day, enough to meet the daily needs of 1,000 average homes, had been emitting from the borehole for 2 years.

The shortwall mining method was used successfully for the first time by the Valley Camp Coal Co. to extract pillars. Almost complete extraction of coal is possible with this method where previously used methods achieved less than 50% recovery of reserves.

A new system of hydraulically transporting coal from the mine work face to the preparation plant was demonstrated at Consolidated Coal Co.'s test installation at the Robinson Run mine in Harrison County. Successful completion of the first phase of testing marked a step forward toward developing a truly continuous haulage system that also eliminates safety hazards associated with present-day mine haulage systems.

Ashland Oil, Inc., announced plans to construct a $25 to $30 million chemical plant in Wayne County. Construction of the plant, which reportedly is to commence in 1976, will employ about 200 workers with 45 to 50 workers to be employed permanently when production begins. The Ashland Chemical Co. division of Ashland Oil will consume about 50% of the new plant's output to produce polyesters.

The gasoline strike in protest against a State order governing gasoline sales during the petroleum shortage period, the 5-day memorial period walkout declared by the United Mine Workers of America (UMWA), and the strike during the UMWA-Bituminous Coal Operators Association (BCOA) contract negotiations combined to drastically reduce coal production in the State. These stoppages combined with all other local mine walkouts during the year reduced production by 20 million tons and lowered the number of man-days worked by about 2 million, according to estimates by the West Virginia Coal Association.

Explosives sold for use in West Virginia during 1974 totaled 149.4 million pounds. This was a 4.8-million-pound decline, or 3.1% drop from the level of apparent consumption in 1973. Of the total amount of explosives used, 63.3% was used in mining coal, 2.9% was used in quarrying, 26.4% was used in construction work, and 7.4% was used for all other undifferentiated purposes.

Employment, Wages, and Injuries.—Coal mine employment totaled 46,024 persons, according to the West Virginia Department

of Mines annual report. This was an increase of 983 persons above employment in 1973. A total of 41,596 persons were employed at underground coal mines, while 4,428 persons were employed at surface mines. According to the West Virginia Coal Association, average weekly wages for coal miners for the year in 1974 were $222.87, compared with $217.95 in 1973.

The number of fatal coal mine injuries declined from 41 in 1973 to 36 in 1974. The fatal accident frequency rate continued to decline, dropping from 0.52 fatal accidents per million man-hours to 0.46 per million man-hours.

Of the 36 fatal injuries in 1974, 16 or 44.4% were due to roof falls, while 13.9% were due to haulage accidents. The balance were fairly evenly distributed among other causes. Only one fatal injury occurred at a surface mine. Only two accidents occurred during the year in which three or more persons were fatally injured, and they both involved construction company personnel.

Legislation and Government Programs.—Several measures passed by the 1974 Legislature directly affected the coal industry in West Virginia. The West Virginia Miner Training, Education and Certification Act requires applicants for underground mine jobs to complete 80 hours of preemployment training. Applicants for surface mine jobs would be required to complete 40 hours of training. The Board of Miner Training, Education and Certification, which was also authorized by this Act, commenced drafting criteria for prospective underground miner training by the close of the year. These criteria set forth the course content and the standards that must be met by training programs, public or private, before they can be approved by the Board. Once the criteria for underground training are completed, surface miner training criteria will be developed for implementation.

Another bill authorized the Department of Natural Resources to reclaim abandoned coal refuse piles. The bill also provided for the inspection of coal refuse piles and associated water impoundments for determining their adequacy to prevent hazards to life and property, and for alleviating any hazardous conditions discovered during these inspections. A third bill expanded the role of the Bureau of Coal Research at West Virginia University in the field of coal utilization research.

The 22-county surface mine moratorium, which was passed in 1971 and renewed in 1973, was tested by an application for a surface coal mine permit in Lincoln County. The application was turned down by the Department of Natural Resources and the denial was sustained by the State Reclamation Board of Review.

The West Virginia Geological and Economic Survey continued the Coal Resources and Pollution Potential Study initiated in 1973 to determine the characteristics of the remaining coal reserves and to delineate mined-out areas. Additional coal studies include the long-range petrologic study of the 62 minable coalbeds in the State and a description of coal resources by magisterial districts. Structural geologic maps of two formations important to deep oil and gas producers were being prepared. A study was started to delineate each formation within each oil and gas field for a future atlas of pool maps for each pay sand. Development of a State program in remote sensing involved investigating present and potential uses of remote-sensing techniques, assessing the needs of State agencies for remote sensing, and determining the steps to be taken in designing a remote-sensing program. Investigations continued on various aspects of hydrology and water resources both independently and in cooperation with the U.S. Geological Survey. Two cooperative studies with the Bureau of Mines continued with the pilot study to assess the desirability and feasibility of subsurface injection of industrial waste being completed and evaluation of clay and shale nearing completion. Under the cooperative program with the U.S. Geological Survey, 15 new 7.5 minute topographic quadrangle maps were published and 29 previously issued 7.5 minute topographic quadrangle maps were revised.

The Department of Natural Resources issued drainage control guidelines for construction of sediment control structures, valley fills, drainways, and haulageways used in surface mining. An inventory of dams under the National Dam Safety Program under the authority of the Corps of Engineers was conducted. The Department was granted authority by the 1974 Legislature for requiring backfilling and regrading of surface acreages affected in excess of 400 lineal feet in conjunction with underground mining. The Department was notified that a pilot abandoned mine refuse pile reclamation project in Marion County

had been approved by the Appalachian Regional Commission. Approval was pending on another such site situated in Taylor County. A total of 20,618 acres of surface-mined land was reclaimed during the year by the coal operators to meet State reclamation requirements, by Soil Conservation Districts, and by the State using special reclamation and bond forfeiture funds. Permits to prospect or surface mine on 18,917 acres were issued during the year, down from the 20,587-acre total in 1973. The reduction in permit acreage resulted from a policy decision adopted in 1973 to encourage controlled placement of spoil in all coal-producing regions of the State with elimination of highwalls and outside fill slopes.

Shortly after the close of 1974, administration of the Morgantown Energy Research Center transferred from the Bureau of Mines to the newly formed Energy Research and Development Administration. Planned construction of the Hydrane process pilot plant at the Morgantown facility was announced during the year. The process development unit will provide the economic and technical information necessary to determine the commercial potential of the Hydrane system for producing high-Btu gas from coal. Research on direct low-pressure hydrogenation of coal to oil was initiated to develop a substitute for petroleum. Laboratory-scale research on production of low-Btu gas from coal was conducted to develop fuel suitable for industrial heating and electric utilities. Tests on fireside corrosion and deposition in boilers continued so that boiler availability might be increased and power generating costs reduced.

Improvement of oil and gas extraction through analysis of earth fracture systems, directional drilling of wells, and stimulation of oil and gas reservoirs continued to be investigated. Assistance in plugging and mining through abandoned oil and gas wells was provided Mining Enforcement and Safety Administration personnel and coal companies in West Virginia, Ohio, and Illinois. Progress continued in developing an underground coal gasification site in the Pittsburgh coalbed in Wetzel County.

A subsidence project was approved by the Appalachian Regional Commission to control surface movements above an abandoned mine at Farmington in Marion County. Contract specifications for drilling exploratory and injection boreholes were being developed by the West Virginia Department of Mines at the close of the year.

The McDowell County Board of Education started construction of a simulated mine at its Vivian vocational education site to meet training requirements of the new State miner training law. The program at the Vivian Center is designed to provide hands-on training for vocational education students during their senior year in mine equipment operation, maintenance, and health and safety.

Table 3.—Indicators of West Virginia business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---------- thousands --	668	NA	NA
Unemployment ---------- do ----	39.3	NA	NA
Employment:			
Manufacturing ---------- do ----	129.1	130.6	+1.2
Transportation and public utilities ---------- do ----	40.6	40.7	+.2
Wholesale and retail trade ---------- do ----	107.9	110.2	+2.1
Finance, insurance, and real estate ---------- do ----	17.7	17.9	+1.1
Mining ---------- do ----	52.2	54.4	+4.2
Services ---------- do ----	75.1	78.4	+4.4
Contract construction ---------- do ----	34.2	31.0	−9.4
Government ---------- do ----	104.2	106.8	+2.5
Payroll average weekly earnings:			
Manufacturing ----------	$165.60	$179.39	+8.3
Personal income:			
Total ---------- millions --	$7,107	$7,862	+10.6
Per capita ----------	$3,974	$4,390	+10.5
Construction activity:			
Cement shipments to and within West Virginia thousand short tons --	750	710	−5.3
Mineral production value ---------- millions --	$1,503	$2,403	+59.9

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Area Trends in Employment and Unemployment; U.S. Bureau of Mines.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Carbon Black.—Two furnace process plants, one in Marshall County and the other in Pleasants County, produced carbon black during 1974. Production increased 4.3% in comparison with the 1973 level. The total value for 1974 production increased 47.4%. The major consumers of carbon black were the rubber industry and ink manufacturers.

Coal (Bituminous).—For the second consecutive year, West Virginia coal production trailed that of Kentucky, the leading coal producing State. In 1974, production was approximately 102 million short tons, a decline of almost 13 million tons or 11.2% from the 115-million ton production level of 1973. The decline in coal production continued on the downward trend that started after 1967 and was interrupted only by minor upward fluctuations in 1970 and 1972. The total value of this coal production leaped upward by more than $878 million, or 65.5%, above that of 1973. The average value per short ton increased by $10.04, or 86.5%, from $11.61 per short ton in 1973 to $21.65 per short ton in 1974.

The downward production trend was reflected also at the county level for only two counties produced more than 10 million tons whereas four counties produced more than that amount during 1973. The leading producing county in 1974 was Monongalia followed closely by McDowell which had been traditionally the leading county in the past. These two counties were followed by Boone, Logan, Wyoming and Kanawha, in descending order of output.

The leading county in underground mine production was McDowell followed by Monongalia, Boone, Wyoming, and Logan. Kanawha was the leading surface-mined coal-producing county and was followed by Barbour, Preston, Boone, and Nicholas.

While 19 mines, 18 underground and 1 surface mine, individually produced more than 1 million tons in 1973, only 9 surpassed that level of production in 1974. All of these were underground mines. Of these nine mines, two produced more than 2 million tons. The Robinson Run mine in Harrison County led all other mines in production. Consolidation Coal Co. was the top producing company followed by Eastern Associated Coal Corp., Island Creek Coal Co., the Pittston Co., and United States Steel Corp.[2]

The value of coal produced was more than $100 million in only four counties in 1973; eight counties had production valued at more than that amount in 1974. These counties, listed in descending order of total value of production, were McDowell, Wyoming, Boone, Logan, Raleigh, Kanawha, Monongalia, and Nicholas.

Although production of open-market coal declined, the value of such production increased markedly. Open-market coal production amounted to 89.8 million tons, 13.4 million tons, or 13.0% below the open-market production level of 1973. The total value of this open-market production, however, increased by $716 million, or 62.3%, to a level of $1,866 million. The average value per short ton of this production increased from $11.13 in 1973 to $20.77 in 1974, a 86.6% increase. In contrast with the decline in open-market production in 1974, captive coal production increased by 0.4 million tons, or 3.3%, to a level of 12.6 million tons. The total value of production increased by $162 million, or 84.8% when compared with the 1973 value, to $353 million. The average value per short ton of captive production increased by $12.32 per short ton, or by 79.3%, from $15.62 per short ton in 1973 to $27.94 per short ton.

Active mines that produced at least 1,000 short tons totaled 891. This was a decrease of 41 mines, or 4.4%, from the active mine count of 932 in 1973. Of the total number of mines active in 1974, 584, or 65.5%, were underground operations and 307, or 34.5%, were surface operations. The number of underground mines increased by 62, or 11.9% above the 1973 level of 522, while the number of surface mines declined by 103, or 25.1% below the 1973 level of 410.

Total coal produced from underground mines decreased while that produced from surface mines increased when compared with 1973 output by types of mines. Underground production decreased by 13.9%, from 95.5 million short tons to 82.2 million short tons. Surface mine production in-

[2] State of West Virginia Department of Mines Annual Report, 1974.

creased slightly by 1.6%, from 19.9 million short tons to 20.2 million short tons. Comparing contributions to total production by types of mines, 80.2% was produced by underground mines and 19.8% was produced by surface mines in 1974, while 82.7% and 17.3% of the total production were produced by underground and surface mines, respectively, in 1973. The value of underground production increased by 53.0% from the 1973 value of $1,169 million to reach slightly more than $1,789 million. The value of surface-mined coal increased 150.9% above the 1973 level of $171 million to slightly more than $429 million.

The shares of total value of coal production contributed by types of mines in 1974 were 80.7% for underground mines and 19.3% for surface mines. Similar shares of total value of production in 1973 were 87.2% and 12.8%, respectively, for underground and surface mines.

The average values per ton of production by types of mines displayed marked increases over 1973 average values. The average value per ton of underground-mined coal climbed $9.52 to $21.76 per short ton, an increase of 77.8%. Surface-mined coal demonstrated an even greater increase, $12.63 per ton above the 1973 level to reach an average value of $21.21 per short ton, a 147.2% increase.

Equipment used at underground mines in 1974 included the following: 481 cutting machines, 19 more than in 1973; 266 hand-held and/or post-mounted coal drills, 41 more than in 1973; 269 mobile coal drills, 3 less than in 1973; 1,046 rotary rock drills, 329 more than in 1973; 119 percussion rock drills, 16 more than in 1973; and 90 rotary-percussion rock drills, 8 less than in 1973. These 481 cutting machines cut over 22 million short tons while over 128,000 short tons were cut by hand or shot from the solid. Mobile drills were used to drill slightly more than 17 million short tons while more than 5 million short tons were drilled by hand-held and/or post-mounted drills.

Equipment used at surface mines included the following: 83 augers, 10 less than in 1973; 178 power shovels, 21 less than in 1973; 88 draglines; 67 more than in 1973; 47 carryall scrapers, 22 more than in 1973; 803 bulldozers, 246 more than in 1973; 284 power drills, 98 more than in 1973; 595 front-end loaders, 243 more than in 1973; 23 power brooms, 7 more than in 1973; 174 motor graders, 87 more than in 1973; and 57 coal drills, 32 more than in 1973.

Almost all of the underground production, 99.9%, was mechanically loaded in 1974. A decrease in handloading in the State accounted for the slight increase in mechanical loading from the 99.5% level of 1973. The total amount of coal mechanically loaded, however, dropped from 95 million tons in 1973 to 82.1 million tons reflecting the drop in underground mine production. Continuous-mining machines loaded 56.3 million tons, or 68.5%, of the mechanically loaded coal. Although less coal was loaded by continuous-mining machines than the 1973 level of 63 million tons, the percentage of the total mechanically loaded coal by such machines increased above the 66.4% level of 1973. The amount of coal loaded by mobile-loading machines dropped from 28.5 million tons in 1973 to 22.1 million tons for a decline of 22.4%. The percentage of coal mechanically loaded by mobile-loading machines dropped from 30% to 26.9%. There was an increase, however, in the percentage of coal mechanically loaded by longwall machines from 3.7% in 1973 to 4.0%. The amount of coal loaded by longwall machines declined from 3.5 million tons to 3.3 million tons, or a 5.5% decline. In response to the growing trend in methods of coal loading in underground mines, a new category of loading was added to the Bureau of Mines coal statistics analysis. Scoops were used to load 0.5 million tons, or 0.6%, of the coal mechanically loaded underground.

During 1974, 88.3 million tons of coal was cleaned at 126 cleaning plants to produce 62.8 million tons of cleaned product and 25.5 million tons of refuse. Two more plants were operated than were operating in 1973, while the amount of cleaned product declined by 12.8 million tons, a 17% decrease. The cleaned coal amounted to 61.3% of the total production. At the cleaning plants operated during 1974, 26.6% of the cleaned coal was dried thermally in 35 of these plants where a total of 50 thermal drying units were operated. During 1973, 68 thermal drying units were operated at 45 cleaning plants, where 28.4% of the cleaned product was thermally dried. Of the total coal production, 35.6% received no mechanical

cleaning other than crushing or screening while 3.1% received no processing at all.

Coal shipped by railroads amounted to 78.5 million tons, or 76.6% of total production. Some 23.1 million tons, or 29.4% of total rail shipments was shipped by unit trains. Waterway shipments totaled 14.3 million tons, or 14% of total production. The balance of total production was transported by truck or used at the mine mouth.

Table 4.—West Virginia: Bituminous coal production
(Thousand short tons and thousand dollars)

Year	Quantity	Value
1970	144,072	1,142,245
1971	118,258	1,128,282
1972	123,743	1,275,813
1973	115,448	1,340,338
1974	102,462	2,218,418

Table 5.—West Virginia: Bituminous coal production by type of mine and county, 1974
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines			Production (thousand short tons)			Value (thousands)
	Underground	Surface	Total	Underground	Surface	Total [1]	
Barbour	11	23	34	1,218	2,477	3,695	$65,971
Boone	49	18	67	7,661	1,762	9,423	214,368
Braxton	2	--	2	11	--	11	170
Brooke	2	3	5	603	98	701	11,605
Clay	6	1	7	57	22	79	1,699
Fayette	26	16	42	2,208	523	2,731	68,102
Gilmer	1	1	2	1	65	66	W
Grant	3	11	14	1,231	308	1,539	23,006
Greenbrier	13	11	24	215	366	581	18,751
Harrison	6	20	26	3,100	865	3,965	50,200
Kanawha	40	30	70	5,243	2,592	7,834	164,830
Lewis	1	16	17	1	588	589	9,340
Lincoln	2	--	2	5	--	5	W
Logan	62	9	71	6,942	1,025	7,967	212,657
McDowell	84	10	94	9,814	365	10,179	300,944
Marion	8	--	8	4,524	--	4,524	80,203
Marshall	4	--	4	4,935	--	4,935	50,227
Mason	2	--	2	146	--	146	W
Mercer	3	4	7	991	55	1,046	31,950
Mineral	1	7	8	110	312	422	5,391
Mingo	43	5	48	3,218	555	3,773	76,536
Monongalia	17	8	25	9,678	1,073	10,752	137,553
Nicholas	45	21	66	4,343	1,447	5,790	126,036
Ohio	2	--	2	1,581	--	1,581	W
Preston	12	32	44	836	2,056	2,893	48,970
Raleigh	39	13	52	4,672	626	5,298	166,926
Randolph	7	12	19	183	867	1,050	33,232
Summers	4	--	4	51	--	51	942
Taylor	--	3	3	--	96	96	1,398
Tucker	--	3	3	--	318	318	10,486
Upshur	3	15	18	584	1,208	1,792	38,366
Wayne	2	--	2	449	--	449	W
Webster	7	5	12	99	229	329	7,233
Wyoming	77	10	87	7,508	345	7,853	219,870
Undistributed	--	--	--	--	--	--	41,455
Total [1]	584	307	891	82,220	20,243	102,462	2,218,418

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Data may not add to totals shown because of independent rounding.

Coke and Coal Chemicals.—Coke production at 3 oven-coke plants, 1 each in Brooke, Hancock, and Marion Counties, totaled 3.6 million tons—7.2% less than the 3.8 million tons produced in 1973. Coal carbonized at these coke plants amounted to 5.3 million tons valued at $160.2 million. The coke yield was 67.6%, slightly lower than the 1973 yield of 69.9%. Coal supplied to these plants totaled 5 million tons with 2.2 million tons or 44% from Pennsylvania, 1.9 million tons or 38% from West Virginia, and the balance of 0.9 million tons or 18% from Kentucky, Virginia, Alabama, and Tennessee.

Coal-chemical materials produced at these oven-coke plants included tar, gas, ammonium sulfate, and crude light oil. Coke-oven tar production amounted to 42.7 million gallons, a 4.7% decline from the 1973 level. Production of coke-oven

gas totaled 59.4 billion cubic feet, a decrease of 6.3%. Production of ammonium sulfate, however, increased by 48.8% to reach a level of 61,000 tons. Coke breeze and crude light oil were also produced at these plants during the year. The crude light oil was used in the production of benzene, toluene, xylene, and naphtha.

Natural Gas Liquids.—Production of natural gas liquids increased slightly. The total value of this production experienced a more dramatic 27.4% increase because of the increasing demand caused by the energy shortage. Production occurred in four counties during the year with Wetzel County leading. Proven reserves of natural gas liquids at yearend totaled 81.8 million barrels, a 1-million-barrel decline from the reserve estimate for yearend 1973.[3]

Petroleum and Natural Gas.—Crude oil production in 1974 totaled 2.7 million barrels, an increase of 0.3 million barrels, or 11.7% above the 1973 level of production. The total value of this production, however, climbed to more than $27.1 million, an increase of 126% above the 1973 value. The average price paid for this crude was $10.15 per barrel. In comparison with the $5.02 per barrel average price in 1973, this amounts to an increase of $5.13, or 102% per barrel.

Production of natural gas amounted to 202,306 million cubic feet. This represents a decline of 6,370 million cubic feet, 3.1% below the 1973 production level. Total value of natural gas production, however, rose to $66.4 million. In comparison with the value of production in 1973, this amounts to an increase of almost $1.9 million, or 2.9%. The average wellhead value for natural gas in West Virginia amounted to 30.9 cents per thousand cubic feet in 1973, whereas the value in 1974 amounted to 32.8 cents per thousand cubic feet. This is a 1.9 cent, or 6.1%, increase per thousand cubic feet.

The estimated number of producing wells in West Virginia at the close of 1974 totaled 35,100. Some 13,650 oil wells and 21,450 gas wells made up this total estimate for a 0.4% increase in the number of oil wells and a 0.2% increase in the number of gas wells above comparable 1973 figures.

Drilling activities resulted in the completion of a total of 779 wells in the State during 1974, according to the American Petroleum Institute. This was an increase of 78 completions above 1973. Of these 779 wells, 677 were development wells while 102 were exploratory wells. Compared with 1973 well completion data, 56 more development wells were completed while 22 more exploratory wells were drilled. Of the development wells drilled, 91.4% were successful while 56.9% of the exploratory wells were successful. Comparable success percentages for 1973 were 87.4% for development drilling and 53.8% for exploratory drilling. Of the development wells, there were 116 oil wells, 503 gas well, and 58 dry wells. Of the exploratory wells drilled, there were 5 oil wells, 53 gas wells and 44 dry wells.

The total footage drilled amounted to 2,319,938 feet, an increase of 144,118 feet more than was drilled in 1973 for a 6.6% increase. The three leading counties according to footage drilled were Gilmer, Harrison, and Upshur in descending order. On the basis of total wells completed, the three leading counties in descending order were Gilmer, Lincoln, and Harrison. The largest number of successful oil wells was completed in Lincoln County while the largest number of successful gas wells was completed in Gilmer County.

The Oil and Gas Div. of the West Virginia Department of Mines issued 860 permits to drill new wells or deepen old wells during 1974. This was 213 fewer permits than were issued in 1973 for a decline of 19.9%. New wells were drilled at 749 locations while the balance of the permits were issued for deepening existing wells. Fracturing permits were issued for 101 wells compared with 130 in 1973. Lincoln County led in the number of permits to drill issued, while Roane County led in the number of fracturing permits issued. The number of permits issued to partial plug or abandon wells exceeded the number of new drilling permits by 28. Doddridge County led in the number of permits issued to partial plug or abandon wells.

According to the West Virginia Geological and Economic Survey, the most active oilfield was the Griffithsville field where 66 wells were successfully completed in the Lower Mississippian Berea Sandstone.

[3] American Gas Association, American Petroleum Institute and Canadian Petroleum Association. Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada and United States Productive Capacity as of December 31, 1974.

Glenville was the most active gas field where 33 wells were successfully completed in the Mississippian Big Injun Sand. Completed exploratory wells included 2 oil wells, 53 gas wells, 9 combination wells, and 42 dry holes for a total footage of 425,148 feet. This was a 20.8% increase over the 1973 exploratory footage of 351,900 feet. Of the 106 exploratory wells, 30 were wildcats, 21 were deeper-pool tests, and 55 were outposts. Exploratory successes totaled 59 for a success ratio of 55.7% compared with a 91.0% success ratio for development wells. Fifty-five of the 59 exploratory successes were drilled in shallow formations with the Benson and Weir Formations being the largest formations in most cases. Two new fields were discovered in shallow formations and 2 new fields and a new pool were discovered in deep formations. The Pocono Sands (Squaw, Weir, and Berea) with 278 completions replaced the Big Injun with 260 completions as the main drilling target in shallow drilling in West Virginia. Deep drilling targets were the Onondaga and Oriskany, with 16 completions; the Newburg, with 6 completions; and the Tuscarora, with 2 completions. Deep well activity continued to decline with only 24 wells completed.

Three deep-well tests were completed in 1974 by Exxon Corp. All three wells were dry holes and were plugged. One of the holes in Calhoun County reached a depth of 20,222 feet for a new West Virginia record and, for a brief period, a new Northeastern United States record. A fourth deep-well test by Exxon was drilled in Jackson County at the close of 1974.[4]

Secondary recovery operations continued at about the same level as in 1973 with the Big Injun waterflood in the Granny Creek - Stockly Field in Clay County remaining as the only full-scale project in the State. According to the West Virginia Geological and Economic Survey, four pilot waterfloods were in operation and a number of gas injection pressure maintenance systems was reduced to about half the 42 that were in operation a few years ago.[5]

Estimated proved crude oil reserves at yearend amounted to 32.2 million barrels, an increase of slightly less than 0.1 million barrels, or 0.3% above the 1973 yearend estimate. The estimated proved reserves of natural gas were 2,266 billion cubic feet at yearend, a decrease of slightly more than 54 billion cubic feet below the yearend 1973 estimate. This amounts to a decline in estimated natural gas reserves of 2.3%.[6]

NONMETALS

Cement.—Shipments of portland cement during 1974 declined 16.2% while the total value increased 1.5% when compared with the amount and value of shipments in 1973. The average value per short ton, however, increased 21.1%. The total amount of portland cement produced declined 16.4% with stocks on hand at the end of the year increasing by 4.4% over the yearend level in 1973. Masonry cement shipments in 1974 declined 20.6% with total production declining 21.7%. Stocks on hand at the end of the year were 17.5% lower than the 1973 yearend stock. The total value of shipments of masonry cement declined 6.9%, while the average value per short ton increased 17.3% over the 1973 figure. Portland cement consumed by ready-mix concrete producers declined 11.1% in 1974, the percentage of total shipments consumed by this sector increased from 57.5% in 1973 to 61.0% in 1974. The balance of shipments was used in concrete product manufacturing and construction of buildings and highways. Martin Marietta Cement Div., the only producer of cement in the State, operates three coal-fired rotary kilns at Martinsburg, Berkeley County.

Clays.—During 1974, total production of clay increased slightly above the 1973 production level, whereas the total value of clay production increased more significantly as the average value per short ton increased 16.6% over 1973 levels. Production of fire clays increased by 6.8% over the amount produced in 1973. The total value of fire clay production increased 20.9%, as the average value per short ton increased 13.3%. Miscellaneous clay production declined 2.6% below the 1973 level, while the total value of such pro-

[4] Patchen, D. G. Oil and Gas Developments in Mideastern States 1974—West Virginia. Am. Assoc. Petrol. Geol. Bull., v. 59, pp. 1443–1446.

[5] Interstate Oil Compact Commission. The Oil and Gas Compact Bulletin. V. XXXIV, No. 1, June, 1975, p. 48–49.

[6] American Gas Association, American Petroleum Institute, & Canadian Petroleum Association. Reserves of Crude Oil, Natural Gas Liquids, and Natural Gas in the United States and Canada and United States Productive Capacity as of December 31, 1974. V. 29, May 1975, pp. 22–23, 114.

duction rose 0.8%. The average value per short ton of miscellaneous clay production rose 3.4% over the 1973 average value. A total of six companies mined clay for face brick, fire brick, cement, block, and mine dummy production. Berkeley County was again the leading producer of miscellaneous clays while Hancock County continued to be the only producer of fire clay.

Lime.—Two companies, one in Berkeley County and the other in Pendleton County, produced lime for basic oxygen furnace (BOF) steel, open hearth steel furnaces, acid mine water neutralization, agriculture, and other uses. Production during 1974 was below that of 1973, although value increased. The lime was used primarily in Ohio, Pennsylvania, and West Virginia. Consumption of lime within the State totaled 390,400 tons, a 19.4% increase above the 1973 usage.

Salt.—Three companies produced salt from brines derived from deep well solution mining operations in Marshall and Tyler Counties. Salt production declined 16,000 tons, a 1.3% drop, below the 1973 level to 1,201,000 tons. The total value of production increased, however, by 3.5% with the average value per ton increasing by 24 cents or about 5%. The producers used the salt in the manufacture of chlorine and caustic soda.

Sand and Gravel.—Production of sand and gravel during 1974 totaled 5,382,000 tons, declining 511,000 tons from the 1973 level for a 8.7% decrease. The value of total production declined by 1.5%. However, the average value per short ton increased by 8% in comparison with that of 1973.

A total of 14 operations located in 11 counties produced sand and gravel during the year. Construction sand and gravel was produced at 12 operations while industrial sand was produced at 2 operations. Five of the operations were dredges while the balance were stationary and portable plants. The top three producing counties were Hancock, Morgan, and Tyler in descending order of output.

Table 6.—West Virginia: Sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed:				
Sand	5,893	16,257	3,354	12,340
Gravel			2,003	3,631
Unprocessed:				
Sand and gravel			25	47
Industrial:				
Sand	W	W	W	W
Gravel			--	--
Total	5,893	16,257	5,382	16,018

W Withheld to avoid disclosing individual company confidential data; included with "Construction."
[1] Unit value of sand or gravel may be lower than the unit value of construction aggregate.

Slag.—Two companies produced slag for aggregate use in 1974.

Stone.—Production of crushed stone (limestone and sandstone) amounted to 10,954,000 tons in 1974, a decline of 6.6% below that of 1973. Value of production totaled $22.3 million, a 2.2% decline from that of 1973. Average value per ton, however, increased. Output of crushed limestone decreased 7.9% while that of crushed sandstone increased 14.9%.

Production of limestone was reported from 13 counties and 30 quarries. In descending order by quantity of production, the four leading limestone producing counties were Jefferson, Monongalia, Berkeley, and Greenbrier. Major uses of limestone were various aggregates, roadbase stone, cement manufacturing, flux for iron and steel production, railroad ballast, mine rock dusting, and lime manufacturing.

Production of sandstone was reported from 9 counties and 15 quarries. The four leading sandstone producing counties, in descending order of production were Boone, Raleigh, Tucker, and Kanawha.

Major uses of sandstone were various aggregates and roadbase stone.

No production of dimension stone was reported during 1974 in the State.

Trucks transported 55.6% of the total stone production while railroads carried 28.6% and waterways carried 4.2%. Other transportation means were used or the method of transportation was not reported for the balance of the total production.

Table 7.—West Virginia: Crushed and broken stone sold or used by producers, by use
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Bituminous aggregate	200	453	451	772
Concrete aggregate	604	1,381	1,525	2,814
Dense graded roadbase stone	2,799	5,293	2,163	4,990
Macadam aggregate	161	400	167	438
Surface treatment aggregate	W	555	499	802
Unspecified aggregate and roadstone	3,325	6,244	2,237	4,950
Agricultural purposes [1]	83	170	148	320
Cement and lime manufacture	W	W	1,802	3,066
Flux stone	1,075	2,469	W	W
Mine dusting	173	873	151	771
Railroad ballast	504	627	582	823
Riprap and jetty stone	52	117	W	W
Other uses [2]	2,756	4,241	1,230	2,563
Total [3]	11,732	22,821	10,954	22,308

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes agricultural limestone and other soil conditioners.
[2] Data include manufactured fine aggregate, chemical stone, refractory stone, roofing aggregates, filter stone (1973), and uses not specified.
[3] Data may not add to totals shown because of independent rounding.

METALS

Aluminum.—Although aluminum production declined 2.2% below the 1973 level, the total value increased by 17.4%. The average value per pound increased 20% over that of 1973. The Kaiser Aluminum & Chemical Corp. plant at Ravenswood, Jackson County, continued to be the sole producer of primary aluminum in the State. The source of the alumina was imported bauxite processed in Louisiana and transported by rail to the Ravenswood smelter.

Ferroalloys.—Three companies produced ferroalloys using electrometallurgical processes during 1974. The Chemetals Div. of the Diamond Shamrock Chemical Co. produced ferromanganese at its plant near Kingswood in Preston County. Ferroalloys were produced at Foote Mineral Co.'s plant at Graham Station in Mason County. Low-carbon ferrochrome, medium-carbon ferromanganese, and ferrosilicon were produced by the Ferroalloy Div. of Union Carbide Corp. at its Alloy plant in Fayette County.

Magnesium Compounds.—The AMAX Specialty Metals Corp., a subsidiary of American Metal Climax, Inc., produced anhydrous magnesium chloride as a by-product during the production of zirconium sponge metal at its plant at Washington in Wood County.

Nickel.—Huntington Alloy Products Div. of The International Nickel Co., Inc., produced wrought nickel and various types of high-nickel alloys at its Huntington plant in Cabell County. Production in 1974 increased with the principal products consisting of nickel and high-nickel alloys in mill forms such as strip, sheet, plate, pipe, tube, wire, rod, bar, and welding products such as nickel and high-nickel bare welding filler wire, coated electrodes, and welding fluxes.

Zinc.—The zinc plant at Spelter, Harrison County, produced zinc dust, zinc oxides, and other zinc products. Raw materials used are zinc drosses, zinc ashes, and various zinc residues.

Zirconium.—AMAX Specialty Metals Corp. produced zirconium at its plant near Parkersburg in Wood County. Corhart Refractories Co. produced slip cast and isostatically pressed high-density, zircon and chromic oxide refractory brick for the metallurgical industry at its plant near Buckhannon in Upshur County.

Table 8.—Principal producers

Commodity and company	Address	Type of activity	County
Cement: Martin-Marietta Corp.[1]	277 Park Ave. New York, N.Y. 10017	Plant	Berkeley.
Clays:			
Crescent Brick Co., Inc	Box 368 New Cumberland, W. Va. 26047	Underground mine.	Hancock.
Globe Refractories, Inc	Box D Newell, W. Va. 26050	do	Do.
Coal:			
Amherst Coal Co	Port Amherst Charleston, W. Va. 25306	Underground and strip mines.	Logan and Wyoming.
Armco Steel Co	703 Curtis Street Middletown, Ohio 45042	Underground mines.	Boone and Raleigh.
Bethlehem Mines Corp	Martin Tower Bethlehem, Pa. 18016	Underground and strip mines.	Barbour, Boone, Kanawha, Marion, Nicholas, Raleigh, Upshur.
Consolidation Coal Co	One Oliver Plaza Pittsburgh, Pa. 15222	Underground, strip, and auger mines.	Harrison, Marion, Marshall, Mercer, Monongalia, McDowell, Raleigh, Wyoming.
Eastern Associated Coal Corp.	Kopper Bldg. Pittsburgh, Pa. 15219	Underground and strip mines.	Boone, Marion, McDowell, Monongalia, Raleigh, Wyoming.
United States Steel Corp.[2]	600 Grant Street Pittsburgh, Pa. 15230	do	McDowell, Mingo, Wyoming.
Westmoreland Coal Co	123 South Broad St. Philadelphia, Pa. 19109	do	Boone, Fayette, Nicholas, Raleigh, Upshur, Wyoming.
Lime:			
Greer Limestone Co.[2]	Greer Building Morgantown, W. Va. 26505	Plant	Monongalia.
Jones & Laughlin Steel Corp.[2]	3 Gateway Center Pittsburgh, Pa. 15230	do	Berkeley.
Petroleum refineries:			
Pennzoil Company	Oil City, Pa. 16301	do	Kanawha.
Quaker State Oil Refining Corp.	Farmers Valley, Pa. 16749	Plants	Hancock and Pleasants.
Salt:			
Allied Chemical Corp	Box 1219R Morristown, N.J. 07960	Plant	Marshall.
FMC Corp	Box 8127 So. Charleston, W. Va. 25303	do	Tyler.
PPG Industries, Inc	1 Gateway Center Pittsburgh, Pa. 15222	do	Marshall.
Sand and gravel:			
Dravo Corp	One Oliver Plaza Pittsburgh, Pa. 15222	Dredge	Brooke and Hancock.
Duquesne Sand Co	144 East Beaver St. Sewickley, Pa. 15143	do	Brooke.
McDonough Co	Box 538 Parkersburg, W. Va. 26100	do	Berkeley, Tyler, Wetzel, Wood.
Shippingport Sand and Gravel Co.	1200 Stambough Bldg. Youngstown, Ohio 44501	Plant	Hancock.
Smelters: Kaiser Aluminum & Chemical Corp.	300 Lakeside Dr. Oakland, Calif. 94626	do	Jackson.
Stone:			
Acme Limestone Co	Box 27 Fort Spring, W. Va. 24936	Mine and quarry.	Greenbrier.
Black Rock Contracting, Inc.	Box 1913 Charleston, W. Va. 25327	Quarry	Randolph.
Elkins Limestone Co	Box 1228 Elkins, W. Va. 26241	Mine and quarry.	Do.
The H. Frazier Co., Inc	Box 1377 Richmond, Va. 23211	Quarry	Greenbrier.
Shenandoah Quarry, Inc	P.O. Box C Millville, W. Va. 25432	do	Jefferson.

[1] Also clays.
[2] Also stone.

The Mineral Industry of Wisconsin

This chapter has been prepared by the Bureau of Mines, U.S. Department of the Interior and the Geological and Natural History Survey of Wisconsin, under a memorandum of understanding for collecting information on all minerals except coal and liquid fuels.

By Ronald C. Briggs [1] and Meredith E. Ostrom [2]

The output from Wisconsin mineral operations in 1974 was not significantly different from that of 1973, reflecting the economic conditions prevailing during the year in the State and in the Nation. The value of mineral production reached a record high of $114.8 million as inflationary pressures caused unit prices for most mineral products to climb. Meanwhile, demand for minerals and mineral products was restrained by the combination of recessionary forces and higher prices.

Nonmetallic minerals, particularly sand and gravel and crushed stone produced for use as construction aggregates, continued to be dominant in State totals for both quantity and value. Of all nonmetallic minerals and products, including portland and masonry cement, only clays produced for the manufacture of brick showed more than a minor increase in the quantity produced during 1974 compared with that of 1973.

The mining of iron ore continued as the most important metallic mineral industry in Wisconsin. Although the output of taconite pellets during 1974 was nearly 6% less than the quantity produced the previous year, only sand and gravel and stone exceeded iron ore in tonnage and value. An improved market price for zinc resulted in an increase in the tonnage of zinc-lead concentrates produced in the State.

The sharp increase in base metal exploration, especially during the past several years, has brought with it an increase in conflict over land use and an increase in land negotiations for purposes of mineral prospecting and mining. Although this condition was rather widespread in the Upper Midwest, it was particularly true in Wisconsin where one rich deposit of copper and zinc, with minor amounts of gold and silver, had been located near Ladysmith, in Rusk County, and where the intensity of prospecting and land negotiations was at a very high level. At least eight companies were actively engaged in conducting geophysical exploration or drilling programs during 1974. Several other companies had completed their exploration programs and were in the process of either analyzing data or awaiting necessary additional exploration or mining permits from the Wisconsin Department of Natural Resources. It was estimated that more than 30 companies held mineral prospecting or mining leases on State, county, or private lands. In addition, several applications for prospecting permits on National forest lands in Wisconsin were pending and awaiting approval.

[1] State Liaison Officer—Minnesota and Wisconsin, Twin Cities, Minn.
[2] Director and State Geologist, Geological and Natural History Survey, Madison, Wis.

Table 1.—Mineral production in Wisconsin [1]

Mineral	1973		1974	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Clays ---------- thousand short tons --	2	$3	2	$4
Gem stones ----------	NA	1	NA	1
Iron ore (usable) thousand long tons, gross weight --	956	W	899	W
Lead (recoverable content of ores, etc.) short tons --	844	275	1,285	578
Lime ---------- thousand short tons --	310	6,004	311	6,764
Peat ---------- do ----	2	208	W	W
Sand and gravel ---------- do ----	40,250	43,647	28,850	34,577
Stone ---------- do ----	23,818	36,917	22,443	40,912
Zinc (recoverable content of ores, etc.) short tons --	8,672	3,583	8,737	6,273
Value of items that cannot be disclosed: Abrasive stone, cement, copper (1974), silver (1974), and values indicated by symbol W ----------	XX	23,701	XX	25,654
Total ----------	XX	114,339	XX	114,763
Total 1967 constant dollars ----------	XX	83,822	XX	p 54,880

p Preliminary. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.
[1] Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

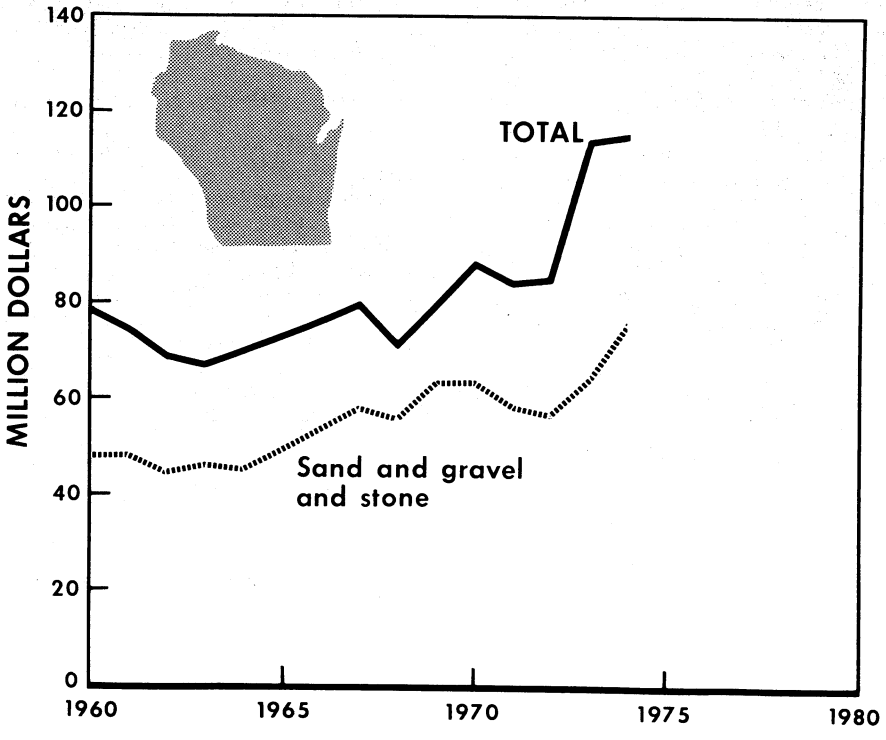

Figure 1.—Value of sand and gravel, stone, and total value of mineral production in Wisconsin.

Table 2.—Value of mineral production in Wisconsin, by county

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Adams	W	$401	Sand and gravel.
Ashland	W	W	Do.
Barron	$1,491	409	Sand and gravel, stone.
Bayfield	38	41	Sand and gravel.
Brown	W	W	Lime, stone, sand and gravel.
Buffalo	512	W	Stone, sand and gravel.
Burnett	W	W	Sand and gravel, stone.
Calumet	283	W	Stone, sand and gravel.
Chippewa	751	305	Sand and gravel.
Clark	966	213	Sand and gravel, stone.
Columbia	3,104	4,131	Do.
Crawford	W	799	Stone, sand and gravel.
Dane	4,336	3,450	Do.
Dodge	W	W	Stone, lime, sand and gravel.
Door	W	580	Sand and gravel, stone.
Douglas	W	W	Lime, sand and gravel, stone.
Dunn	92	142	Stone, sand and gravel.
Eau Claire	2,716	1,401	Sand and gravel.
Florence	28	39	Do.
Fond du Lac	W	W	Stone, lime, sand and gravel, clays.
Forest	W	W	Sand and gravel.
Grant	W	W	Stone, sand and gravel.
Green	W	502	Do.
Green Lake	772	1,644	Sand and gravel, stone.
Iowa	494	W	Stone, zinc, lead, silver, copper.
Iron	27	(1)	Sand and gravel.
Jackson	W	W	Iron ore, sand and gravel.
Jefferson	W	W	Sand and gravel, stone.
Juneau	W	W	Stone, sand and gravel.
Kenosha	154	808	Sand and gravel.
Kewaunee	W	439	Do.
La Crosse	W	W	Stone, sand and gravel.
Lafayette	4,332	W	Zinc, lead, stone, silver, copper, sand and gravel.
Langlade	149	W	Sand and gravel.
Lincoln	565	541	Sand and gravel, peat.
Manitowoc	2,762	4,788	Stone, sand and gravel, lime, cement.
Marathon	5,581	5,666	Stone, sand and gravel.
Marinette	W	W	Do.
Marquette	W	W	Do.
Menominee	--	W	Stone.
Milwaukee	10,727	8,425	Cement, stone.
Monroe	W	W	Stone.
Oconto	W	W	Sand and gravel, stone.
Oneida	761	517	Sand and gravel.
Outagamie	1,827	W	Stone, sand and gravel.
Ozaukee	W	W	Sand and gravel, stone.
Pepin	W	W	Stone, sand and gravel.
Pierce	834	W	Do.
Polk	W	W	Do.
Portage	1,816	927	Sand and gravel.
Price	109	35	Do.
Racine	3,573	W	Stone, sand and gravel.
Richland	W	W	Do.
Rock	2,736	2,814	Sand and gravel, stone.
Rusk	323	498	Sand and gravel.
St. Croix	W	W	Sand and gravel, stone.
Sauk	W	W	Stone, sand and gravel, abrasive stone.
Sawyer	W	W	Sand and gravel.
Shawano	W	W	Sand and gravel, stone.
Sheboygan	651	512	Do.
Taylor	377	553	Sand and gravel.
Trempealeau	W	W	Stone.
Vernon	W	W	Stone, sand and gravel.
Vilas	W	242	Sand and gravel.
Walworth	W	646	Sand and gravel, stone.
Washburn	W	W	Sand and gravel.
Washington	1,409	1,909	Sand and gravel, stone.
Waukesha	9,973	W	Stone, sand and gravel, peat.
Waupaca	429	350	Sand and gravel.
Waushara	218	W	Do.
Winnebago	1,896	3,258	Stone, sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Wisconsin, by county—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Wood	$331	$148	Stone, sand and gravel.
Undistributed [2]	47,195	67,626	
Total [3]	114,339	114,763	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Less than ½ unit.

[2] Includes gem stones, some sand and gravel (1973), and stone which cannot be assigned to specific counties, and values indicated by symbol W.

[3] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Wisconsin business activity

	1973	1974 p	Change, percent
Employment and labor force, annual average:			
Total labor force ---- thousands --	2,063	2,082	+0.9
Unemployment ---- do ----	84.0	94.0	+11.9
Employment:			
Manufacturing ---- do ----	531.7	546.3	+2.7
Construction ---- do ----	66.6	65.7	−1.4
Mining ---- do ----	2.6	2.7	+3.8
Transportation and public utilities ---- do ----	84.1	85.3	+1.4
Wholesale and retail trade ---- do ----	364.4	376.6	+3.3
Finance, insurance, real estate ---- do ----	68.2	71.8	+5.3
Services ---- do ----	266.6	281.0	+5.4
Government ---- do ----	276.3	276.9	+0.2
Personal income:			
Total ---- do ----	$21,703	$23,790	+9.6
Per capita ----	$4,781	$5,210	+9.0
Construction activity:			
Value of authorized nonresidential construction - millions --	$314.8	$268.3	−14.8
Number of private and public residential units authorized -	34,179	24,413	−28.6
State highway commission contracts awarded -- millions --	$116	$72	−37.9
Portland cement shipments to and within Wisconsin thousand short tons --	1,837	1,621	−11.8
Farm marketing receipts ---- millions --	$2,280	$2,464	+8.1
Mineral production value ---- do ----	$114.3	$114.8	+0.4

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and U.S. Bureau of Mines.

Transportation facilities, vital to Wisconsin mineral resources as well as the mineral operations of other states, received a great deal of attention during 1974. Burlington Northern, Inc. announced plans to begin a $40 million expansion project of the firm's taconite transshipment terminal in Superior. Plans called for dock improvements and construction of a storage facility, reclaim plant, and conveyor system. This expansion of present facilities would permit loading of 1,000-foot ore carriers. The new complex would have an annual capacity of 15 million tons initially, and the company stated that it may eventually be expanded to 30 million tons per year. The dock facilities were being built to handle the expected increase in shipments from new or expanded taconite operations in Minnesota. Another $35 million reportedly will be invested by the Orba Corp., West Caldwell, N.J., and C. Reiss Coal Co., Sheboygan, Wis., to build a coal terminal on a 225-acre tract in Superior. The joint venture will operate under the corporate name of Ortran. The terminal will serve as a transfer point for low-sulfur coal from the Decker Mining Co. operation in Montana that will be transported to Superior by Burlington Northern 110-car unit trains. The principal customer of the coal will be the Detroit-Edison Co., which will use it to fuel electric generating plants at St. Clair, Mich. Construction on the new coal terminal began in December 1974, and was scheduled for completion in early 1976. It reportedly will have an initial shipping capacity of 10 million tons per year and an eventual capacity of twice that quantity.

To handle the anticipated increased tonnage of mineral products from Upper Great Lakes ports, more and larger bulk carriers will be required. A 770-foot bulk freighter with a capacity of 42,000 tons was already under construction at the Bay Shipbuilding Co., Sturgeon Bay, and there was talk of building three 1,000-foot vessels before 1980 to be used primarily for carrying coal from the port of Superior.

The Fraser Shipyards, Inc., Superior, completed lengthening projects on four vessels during 1974. All vessels were enlarged by inserting a 120-foot long midbody. The extension projects added about 20,000 tons of capacity to the Great Lakes fleet of iron ore carriers. A total of six lake carriers have been lengthened at the Fraser Shipyards during recent years, and the firm currently has orders for five additional lengthening projects.

Vessel-lengthening projects at the Fraser Shipyards were aided by the installation of a bubbler system in the Duluth-Superior Harbor. The bubbler system, which utilizes air forced upward from a pipe on the harbor bottom, prevents the formation of solid ice and allows movement of vessels inside the Superior harbor. The recently completed system connects with one previously installed on an experimental basis. The bubbler systems were a key to completing three vessel repair jobs at the shipyard during the 1973–74 winter. As a result, it marked the first time in Great Lakes navigation history that there was vessel traffic in the Twin Ports during each of the 12 months.

Lakehead Pipeline Co. announced plans to construct a $12 million refined petroleum products transshipment terminal near Superior. The expansion project would accommodate large oil tankers that would transport about 2 billion gallons of refined petroleum products annually to other Great Lakes ports. Construction did not begin as scheduled during 1974 because the firm did not receive the required State permits.

Wisconsin's minerals industries were not overly disrupted by the 1973–74 energy crisis. A mild winter helped to ease the pressure on tight supplies of residual and fuel oil and natural gas provided to industrial customers on an interruptible basis during the early part of the year. Largely through conservation efforts, the energy situation showed improvement toward midyear only to become unsettled by the threat of a nation-wide coal mine strike in November. Although tight fuel supplies were cause for concern for the minerals industries all during the year, the principal impact was the increased price for all types of fuel.

Employment and Injuries.—Statistics on employment and injuries in the mineral industry, compiled by the Mining Enforcement and Safety Administration, are shown in table 4.

Table 4.—Wisconsin: Worktime and injury experience in the mineral industries

Industry	1973						1974 p					
	Average men working daily	Man-hours worked (thousands)	Number of injuries		Injury frequency rate per million man-hours		Average men working daily	Man-hours worked (thousands)	Number of injuries		Injury frequency rate per million man-hours	
			Fatal	Nonfatal	Fatal	Nonfatal			Fatal	Nonfatal	Fatal	Nonfatal
Iron:												
Surface	59	113	--	11	--	97.58	60	111	--	10	--	89.79
Mill	150	305	--	2	--	6.55	151	299	--	1	--	3.35
Total	209	418	--	13	--	31.09	211	410	--	11	--	26.83
Zinc-Lead:												
Underground	48	88	1	4	11.32	45.30	51	103	--	9	--	87.68
Mill	21	46	--	2	--	43.12	30	58	--	1	--	17.32
Total	69	135	1	6	7.42	44.55	81	160	--	10	--	62.35
Stone:												
Underground [1]	6	5	--	3	--	600.00	3	4	--	1	--	250.00
Surface	3,023	1,149	2	34	1.74	29.59	1,712	1,236	1	31	.81	25.08
Mill	925	553	--	1	--	10.85	303	509	--	5	--	9.82
Total	3,954	1,706	2	43	1.17	25.21	2,018	1,749	1	37	.57	21.15
Cement:												
Mill	44	81	--	--	--	--	NA	NA	NA	NA	NA	NA
Lime:												
Mill	66	152	--	7	--	26.39	93	182	--	6	--	32.96
Sand and gravel:												
Surface	1,000	1,064	1	20	.94	16.91	2,114	936	4	20	4.27	19.24
Clay:												
Surface	2	(2)	--	--	--	--	NA	NA	NA	NA	NA	NA
Mill	9	3	--	--	--	--	NA	NA	NA	NA	NA	NA
Total	11	3	--	--	--	--	NA	NA	NA	NA	NA	NA
Peat:												
Surface	3	4	--	--	--	--	4	4	--	--	--	--
Mill	7	8	--	--	--	--	8	8	--	--	--	--
Total	10	12	--	--	--	--	12	13	--	--	--	--
State totals:												
Underground	54	94	1	7	10.66	74.61	54	106	--	10	--	94.06
Surface	4,087	2,329	3	65	1.29	25.76	3,890	2,288	5	61	2.19	25.35
Mill	1,222	1,150	--	17	--	12.18	585	1,055	--	13	--	12.32
Total	5,363	3,573	4	89	1.12	22.67	4,529	3,449	5	84	1.45	23.48

p Preliminary. NA Not available.
[1] Includes underground silica sand operations.
[2] Less than 500 hours.

Source: Mining Enforcement and Safety Administration.

Legislation and Government Programs.—A long list of bills, ranging from limited to considerable importance, was introduced into both houses of the State Legislature during the 1973–74 Session. The following Wisconsin Statutes represent some of the more significant environmental and mineral-related legislation that was signed into law during 1974:

Chapter 260—Mineral Rights Tax.—Requires any person who claims ownership of mineral rights severed from the surface rights, and who has a legal document to prove it, to record his claim with the Register of Deeds of the county in which the land is located. This requirement also applies to anyone with a mineral rights lease of more than 10 years' duration. The mineral rights owner must pay an annual registration fee of 15 cents per acre or fraction of an acre. Failure to register mineral rights, or to pay the fee within 3 years will result in all rights reverting to the surface fee owner. It further directs the attorney general to seek a declaratory judgment on the constitutionality of the Act.

Chapter 283—Copper Ore Tax.—Levies a State-collected tax on any establishment engaged in the production of copper-bearing ores and copper concentrates in lieu of a property tax. The tax is 1.5% of the value of metals recovered from concentrates from copper ore during the preceding year. The taxable value of metals will be based upon Engineering and Mining Journal price quotations. Creates a Study Committee on Mineral Taxation to propose a State policy regarding the taxation of minerals and mineral rights.

Chapter 305—Wisconsin Solid Waste Recycling Authority.—Creates a Wisconsin Solid Waste Recycling Authority, consisting of seven members appointed by the Governor, with Senate approval, to coordinate and operate all solid waste recycling facilities in the State regions. Initial regions established, in order of implementation, are: (1) Fond du Lac, Outagamie, and Winnebago Counties; (2) Lincoln, Marathon, Portage, and Wood Counties; and (3) Milwaukee, Ozaukee, Washington, and Waukesha Counties.

Chapter 318—Metallic Mining Reclamation Act.—Requires permits from the Department of Natural Resources (DNR) to engage in prospecting or metallic ore mining or reclamation. Applies to present operators and requires as a condition for a mining permit that the applicant have an approved plan for mining and reclamation of project site. Specifies that no operator, as a condition to securing a permit may be required to restore a site abandoned by another operator. Enables plans to be reviewed and amended but plans may not be reevaluated for 15 years. Operators to report to DNR every 12 months after issuance of a permit, within 30 days after completion of mining at the site, and within 30 days after completion of the plan. DNR to cancel permit of operator refusing to report. Requires DNR to adopt minimum standards for prospecting, mining, and reclamation, including minimum standards for grading and stabilization of excavation and deposits of mine refuse, adequate drainage, backfilling, covering of pollutant-bearing materials, removal and stockpiling to protect topsoil, and adequate vegetative cover and screening. DNR and Geological and Natural History Survey to submit to the Governor and Legislature a State program of mineral resources zoning and financial incentives by July 1, 1976. Creates in DNR a five-member Mine Reclamation Council to serve as liaison between the Department and the metallic mining industry.

Although the laws became effective during 1974, there was little immediate impact on the minerals industry in the State. The mineral rights law was challenged in a court action brought by the Chicago & North Western and Milwaukee Road railroads. The complaint alleges that the law takes property from one person and gives it to another without just compensation, and that loss of property rights would take place without notification to the owners. Until the law is subjected to tests of its validity, as provided for in the enabling legislation, it will not be enforced. Before any copper mining operations begin in the State, the copper ore tax could be changed significantly. The findings and recommendations of the Study Committee on Mineral Taxation created by the law could have an effect on not only the taxes applied to the mining of copper ore, but also the taxation of all other minerals and mineral rights in the State. Shortly after the law was signed creating the Solid Waste Recycling Authority, its constitutionality was challenged and a test case was prepared for the Wisconsin Supreme Court. Legal questions involved the Recycling Authority's powers to condemn land and to require municipalities to abandon their

dumps and participate at prices set by the State agency. Until the legal questions were resolved, the Authority was prevented from spending any of the funds authorized.

A bill to establish a land resources inventory in Wisconsin was introduced into the Assembly. The bill was designed to catalog the kinds of land, their present use, and future possible demand for land in the State. The inventory would be conducted by the Department of Administration and Land Resource Advisory Committees established under the bill in each county. The information developed would be turned over to a joint legislative committee to determine legislation to approve laws dealing with land resource protection. The bill was recommended for passage by the Joint Committee on Finance but it was tabled and never acted upon by the Assembly.

For more than 75 years, the Geological and Natural History Survey has developed and disseminated information on the State's natural resources. In keeping with its broad mission to inventory, investigate, and interpret Wisconsin's geologic, water, soil, and biologic resources, the Survey issued the following publications relating to mining and mineral resources during 1974:

Information Circular 23.—Mineral Prospecting and Mining Transactions.

Information Circular 24.—Model Mineral Reservation and Mine Zoning Ordinance.

Information Circular 25.—Mineral Rights in Wisconsin.

Information Circular 27.—Measurement of Water Movement in Soil Peddons Above the Water Table.

Special Report 2.—Bibliography and Index of Wisconsin Groundwater, 1851–1972.

Geologic Map of Depth to Bedrock in Wisconsin at a scale of 1:1,000,000, with a Contour Interval of 100 feet.

Bouguer Anomaly Gravity Map of Wisconsin, scale 1:500,000.

A map showing the soil regions of Wisconsin.

In addition, an aeromagnetic survey of north-central Wisconsin by the Geological and Natural History Survey was in progress. Data were being collected along north-south flight lines, spaced one-half mile apart, and were taped for computer interpretation. The information, presented on overlay maps, was placed on open file.

REVIEW BY MINERAL COMMODITIES

NONMETALS

Abrasive Materials.—Baraboo Quartzite Co., Inc. produced deburring and burnishing media from a quartzite deposit near Baraboo in Sauk County. After quarrying, the quartzite is crushed, milled to remove sharp edges, and screened into uniform sizes. The company produces 15 sizes of the reddish-brown pebbles, ranging in size from 3/16 by 1/8 inch to 1 3/4 by 1 1/4 inches. The material is sold in bags of 100 pounds to a wide variety of manufacturing industries. Although the total output decreased from that of 1973, the total value of sales increased.

Cement.—Shipments of portland and masonry cement from Wisconsin mills during 1974 were considerably below those for the previous year. The Marquette Cement Manufacturing Co. continued to operate its plant at Milwaukee and produced Types I, II, and III portland cement as well as masonry cement. The only other cement manufacturing plant in the State, operated by Medusa Cement Co. at Manitowoc, produced white portland cement.

Additionally, grinding facilities were operated by Universal Atlas Cement Div. of United States Steel Corp. and Huron Cement Div. of National Gypsum Co. at Milwaukee and Superior, respectively. Partially manufactured cement materials were shipped to these facilities from plants outside Wisconsin.

Tight supplies of natural gas somewhat hampered cement production. Cement manufacturing plants in the State are supplied with natural gas on an interruptible basis. When gas supplies to the plants were restricted or discontinued at an earlier than usual date in the fall of 1974, one plant ceased operations for the year.

Cement produced in Wisconsin was used for everything from burial vaults to highway, building, and other construction projects. Most of the cement was distributed by rail and truck to consumers within the State.

Clays.—Production of common clay and shale during 1974 was markedly greater than in 1973, reflecting a recovery from an off year in demand and reversing a continuous 7-year decline in output. The mining of clay and shale in Wisconsin reached a peak in the early 1900's when more than 150 plants were engaged in brick and tile manufacture. In contrast, during 1974 the Oakfield Shale Brick & Tile Co. was not only the sole clay and shale producer, but the only brick manufacturer in Wisconsin. All clay produced by the company from its operation near Oakfield in Fond du Lac County was used to manufacture bricks that were sold to distributors within about a 100-mile range of the plant.

Gem Stones.—Amateur mineral collectors and rockhounds collected semiprecious gem stones and mineral specimens, primarily from old mines, quarries, gravel pits, and dumps. Value of the material found was estimated at $1,000.

Lime.—Lime production and value increased slightly over that of the previous year, and for the third consecutive year a record high output was established in the State. Both quicklime and hydrated lime were produced at each of the five plants operated by CLM Corp., Western Lime & Cement Co., and Rockwell Lime Co. in Brown, Dodge, Douglas, Fond du Lac, and Manitowoc Counties.

Table 5 shows quantity and value of lime used, by consuming industry. Thirty-nine percent of the output was consumed in Wisconsin, with out-of-State shipments made to Minnesota, Illinois, and other destinations. Total lime consumption in Wisconsin was 167,800 tons.

CLM Corp. announced a 2-phase expansion program that would result in a 75% increase in the capacity of its Superior facility. The first phase included construction of two oil storage tanks to handle the increased amount of fuel oil needed in operating the kilns. One of the new tanks reportedly would have a capacity of 56,000 barrels and the other would hold 30,500 barrels. The second phase of the project involved the reconstruction of a huge rotary kiln which CLM Corp. purchased from the Federal Bureau of Mines' Iron Range Demonstration Plant at Keewatin, Minn. The 250-foot long, 10-foot diameter kiln was disassembled and transported by truck to Superior, where an additional 65-foot section was to be added when reassembled during 1975. It was expected to be in operation by 1976, supplementing the production of two rotary kilns that have operated at the plant since it opened in the mid-1940's. The plant burns Michigan limestone, and produces quicklime and hydrated lime for chemical and industrial purposes.

Table 5.—Wisconsin: Lime sold or used by producers, by use

Use	1973		1974	
	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)
Paper and pulp	112,278	$2,130	107,336	$2,284
Mason's lime	59,522	1,240	71,192	1,672
Water purification	W	W	44,837	955
Basic oxygen furnaces	10,382	196	W	W
Soil stabilization	9,339	194	W	W
Food and food byproducts	4,807	91	4,133	88
Agriculture	1,925	39	1,833	46
Paint	1,369	26	1,711	36
Other uses[1]	110,481	2,088	80,048	1,683
Total	310,103	6,004	311,090	6,764

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."

[1] Includes sewage treatment, electric steel furnaces, copper and other ore concentration, tanning, finishing lime, calcium carbide (1973), plastics, oil well drilling, sulfur removal, wire drawing (1974), petroleum refining, glass (1974), insecticides, rubber, acid mine water neutralization (1974), other chemical and metallurgical uses, and uses indicated by symbol W.

Perlite.—Crude perlite mined outside the State was expanded at two plants in Appleton and Milwaukee. The expanded perlite was used primarily in plaster and concrete aggregate, with lesser amounts used for masonry and cavity fill insulation, horticultural aggregate, and other uses. Quantity and value of sales increased over those of 1973.

Sand and Gravel.—Output of sand and gravel during 1974 was 28% less than the quantity produced in 1973. A general reduction in construction activity throughout the State and the completion of several major highway projects in the north-central part were the principal factors causing the drop. Even with the substantial decline, sand and gravel mining and processing continued as the largest mineral industry in the State in terms of tonnage and was exceeded in total value only by stone. This marked the first time since 1957 that the sand and gravel industry did not rank first in both quantity and value among all mineral commodities produced in Wisconsin.

Sand and gravel was produced in 67 of the 72 counties in the State by 259 companies from 319 sites. Most of the sand and gravel was used within a short distance of the pit because the low unit value and high transportation costs prohibit long distance shipments.

Table 6.—Wisconsin: Construction and industrial sand and gravel sold or used by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction:				
Processed:				
Sand	39,041	39,429	6,770	8,169
Gravel			17,184	18,672
Unprocessed:				
Sand and gravel			3,520	1,892
Industrial:				
Sand	1,209	4,218	1,376	5,813
Gravel			--	--
Total	40,250	43,647	28,850	34,546

[1] Value data may not be directly comparable to that in tables 1, 7, 8, and 9 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 7.—Wisconsin: Construction aggregate and industrial sand and gravel sold or used commercially by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	22,810	25,979	4,017	6,088
Highway and bridge construction			1,126	1,285
Other uses (dams, waterworks, airports, etc.)			467	607
Concrete products (cement blocks, bricks, pipe, etc.)			2,652	3,261
Bituminous paving (asphalt and tar paving)			1,917	1,950
Roadbase and subbase			3,755	3,871
Unprocessed aggregate			2,729	1,640
Fill	2,884	1,699	936	695
Other uses [2]	2,748	2,467	432	500
Industrial sand and gravel	1,209	4,218	1,376	5,813
Total	29,651	34,363	19,407	25,710

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.
[2] Includes railroad ballast, and miscellaneous (1973).

Table 8.—Wisconsin: Construction aggregate sold or used for publicly funded projects by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction	9,349	8,738	160	192
Highway and bridge construction			1,322	1,656
Other uses (dams, waterworks, airports, etc.)			180	156
Concrete products (cement blocks, bricks, pipe, etc.)			240	370
Bituminous paving (asphalt and tar paving)			2,748	2,724
Roadbase and subbase			3,563	3,215
Unprocessed aggregate			790	252
Fill	568	167	293	166
Other	683	379	146	136
Total	10,600	9,284	9,442	8,867

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Table 9.—Wisconsin: Sand and gravel sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Adams	4	W	W	3	235	401
Barron	11	1,179	1,473	9	318	391
Bayfield	1	48	38	1	45	41
Brown	8	2,021	1,842	5	604	682
Buffalo	1	62	24	1	76	21
Burnett	1	174	143	1	171	135
Chippewa	6	772	751	4	394	305
Clark	5	1,053	965	3	219	211
Columbia	5	W	W	6	1,112	3,709
Crawford	3	252	W	3	161	335
Dane	18	1,303	2,364	19	1,094	1,431
Dodge	9	402	266	10	590	440
Door	5	433	W	4	366	460
Douglas	6	W	W	11	320	257
Dunn	1	66	48	1	76	67
Eau Claire	5	2,186	2,716	3	912	1,401
Florence	1	62	28	1	22	39
Fond du Lac	9	346	276	4	W	187
Forest	3	W	W	2	217	W
Grant	2	31	W	2	W	W
Green	3	60	57	2	W	W
Green Lake	7	409	691	7	572	1,445
Iron	2	W	27	1	W	(1)
Jackson	4	184	223	3	226	381
Jefferson	8	415	341	9	435	334
Juneau	1	35	3	1	W	W
Kenosha	5	217	154	5	674	808
Kewaunee	4	565	W	4	540	439
Lafayette	1	1	1	1	1	1
Langlade	2	173	149	3	W	W
Lincoln	5	613	564	5	464	541
Manitowoc	11	1,119	857	11	884	922
Marathon	12	1,329	1,512	8	721	833
Marinette	4	398	477	3	300	416
Oconto	7	599	500	4	320	257
Oneida	9	630	761	8	542	517
Ozaukee	8	550	605	9	482	579
Pierce	6	233	394	4	100	163
Polk	7	417	491	6	474	459
Portage	6	1,576	1,813	3	895	927
Price	1	98	109	1	63	35
Racine	5	668	587	4	430	291
Richland	2	48	63	2	67	73
Rock	13	1,640	2,258	10	1,605	2,386
Rusk	3	W	323	3	449	498
St. Croix	2	W	W	4	536	617
Sauk	9	1,218	1,391	7	459	558
Sawyer	2	118	W	1	W	W
Shawano	7	499	438	6	362	375
Sheboygan	7	551	627	5	521	482
Taylor	5	408	377	4	347	553
Trempealeau	1	53	26	--	--	--
Vernon	2	W	91	2	W	W
Vilas	5	166	215	5	161	242
Washburn	2	W	W	2	97	W
Washington	11	1,476	1,373	8	1,873	1,728
Waukesha	35	5,929	5,347	27	3,948	3,687
Waupaca	5	443	347	5	427	350
Waushara	3	213	218	2	W	W
Winnebago	8	W	744	8	539	851
Wood	1	342	188	1	222	57
Undistributed [2]	r 30	6,471	8,371	22	2,185	2,258
Total [3]	375	40,250	43,647	319	28,850	34,577

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Less than ½ unit.

[2] Includes Ashland, Calumet, La Crosse, Marquette (1974), Milwaukee (1973), Monroe (1973), Outagamie, Pepin, and Walworth Counties and some sand and gravel that cannot be assigned to specific counties (1973).

[3] Data may not add to totals shown because of independent rounding.

Stone.—The stone industry in Wisconsin produced both dimension and crushed and broken stone from sedimentary, igneous, and metamorphic rocks found in the State. Although the total quantity of all kinds of stone produced during 1974 was less than the 1973 production, the total value was greater as unit values, particularly for dimension limestone, and showed a marked increase.

The total value of stone in 1974 reached a record $40.9 million, making it the single most valuable commodity produced in the State. Twelve companies operating 106 quarries accounted for over 50% of the total quantity and 48% of the value.

Although the number of dimension stone quarries has declined over the years, there remained 38 active quarries in 1974. Over 94% of the total dimension stone produced was limestone with the greatest quantity coming from Waukesha County, an area long noted as the center of the dimension stone industry in the State.

Production of crushed and broken stone during 1974 declined from the output of 1973, reflecting primarily a reduction in the amount of State funds available for construction projects. Of the total crushed and broken stone, 83% of the tonnage was limestone and dolomite.

Stone production was reported from quarries located in 49 of the State's 72 counties. Most of the 1974 output came from the southern part of the State, notably those counties near large metropolitan centers.

Table 10.—Wisconsin: Stone sold or used by producers, by kind
(Thousand short tons and thousand dollars)

Kind of stone	1973			1974		
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value
Granite:						
Dimension	7	8	2,231	7	8	2,452
Crushed and broken	12	1,920	783	13	1,347	1,179
Total[1]	19	1,928	3,014	20	1,354	3,632
Limestone and dolomite:						
Dimension	25	63	1,347	25	155	3,973
Crushed and broken	360	19,565	27,351	351	18,566	27,789
Total[1]	378	19,628	28,699	369	18,721	31,762
Other stone:						
Dimension	8	1	30	6	1	35
Crushed and broken	10	2,261	5,175	10	2,367	5,482
Total	18	2,262	5,205	16	2,368	5,517
Total stone:						
Dimension	40	72	3,608	38	164	6,461
Crushed and broken	382	23,746	33,309	374	22,279	34,451
Total[1]	415	23,818	36,917	405	22,443	40,912

[1] Data may not add to totals shown because of independent rounding.

Table 11.—Wisconsin: Limestone and dolomite sold or used by producers, by use
(Thousand short tons and thousand dollars unless otherwise specified)

Use	1973		1974	
	Quantity	Value	Quantity	Value
Dimension:				
Irregular-shaped stone	11	166	12	189
Rubble	20	245	27	384
Cut stone thousand cubic feet	9	W	W	W
House stone veneer do	161	466	237	1,032
Sawed stone do	15	53	88	W
Construction do	80	135	72	134
Flagging do	97	137	111	173
Other uses[1] do	31	145	934	2,061
Total thousand short tons	63	1,347	155	3,973
Crushed and broken:				
Bituminous aggregate	1,366	1,843	1,190	1,655
Concrete aggregate	1,097	1,675	1,669	2,467
Dense graded roadbase stone	8,835	11,711	8,009	10,876
Macadam aggregate	668	969	W	W
Surface treatment aggregate	1,376	1,895	1,362	2,115
Unspecified construction aggregate and roadstone	4,708	6,304	3,535	5,428
Agricultural purposes[2]	625	1,277	907	1,962
Fill	W	W	29	58
Filter stone	W	W	23	52
Railroad ballast	172	231	149	204
Riprap and jetty stone	297	683	182	391
Other uses[3]	422	765	1,509	2,582
Total[4]	19,565	27,351	18,566	27,789
Grand total[4]	19,628	28,699	18,721	31,762

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Includes rough blocks, and other unspecified rough stone.
[2] Includes agricultural limestone, and other soil conditioners.
[3] Includes stone used in manufactured fine aggregate (stone sand), terrazzo (1973), lime manufacture, flux stone, bedding material (1973), disinfectant and animal sanitation, other fillers (1974), and other uses not specified.
[4] Data may not add to totals shown because of independent rounding.

Table 12.—Wisconsin: Stone sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974			Kind of stone produced in 1974 [1]
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Barron	1	9	18	1	8	18	Limestone.
Bayfield	1	(2)	(2)	--	--	--	
Brown	9	898	1,135	9	944	1,276	Do.
Buffalo	12	340	W	9	186	W	Do.
Burnett	1	W	W	1	W	W	Other stone.
Calumet	3	36	W	4	167	312	Limestone.
Clark	1	1	1	1	1	2	Granite.
Columbia	5	337	W	8	279	422	Limestone.
Crawford	13	404	504	15	360	464	Do.
Dane	26	1,388	1,972	26	1,214	2,019	Do.
Dodge	9	655	940	9	774	1,059	Do.
Door	3	64	62	5	106	120	Do.
Douglas	1	7	12	2	39	60	Traprock.
Dunn	1	50	44	3	57	75	Limestone.
Fond du Lac	13	580	1,360	14	567	1,474	Do.
Grant	34	980	1,177	33	727	1,153	Do.
Green	20	W	W	21	W	W	Do.
Green Lake	2	54	81	4	187	199	Do.
Iowa	17	532	494	20	590	678	Do.
Jackson	2	45	W	--	--	--	
Jefferson	1	W	W	1	35	W	Do.
Juneau	2	W	W	1	W	W	Do.
La Crosse	7	439	541	3	W	W	Do.
Lafayette	19	524	473	21	419	450	Do.
Manitowoc	2	W	W	2	W	W	Do.
Marathon	19	2,527	4,069	21	2,004	4,833	Granite, quartzite, sandstone.
Marinette	2	W	W	2	W	W	Traprock.
Marquette	2	W	W	2	W	W	Granite, limestone.
Menominee	--	--	--	1	19	W	Limestone.
Milwaukee	2	W	W	2	W	W	Do.
Monroe	7	W	W	6	W	W	Do.
Oconto	1	W	W	2	W	W	Do.
Outagamie	5	W	W	7	740	1,080	Do.
Ozaukee	1	W	W	1	W	W	Do.
Pepin	2	39	W	3	46	W	Do.
Pierce	10	351	440	8	271	W	Do.
Polk	2	W	W	2	W	W	Limestone, traprock.
Portage	1	(2)	3	--	--	--	
Racine	3	W	W	5	W	W	Limestone.
Richland	9	227	W	10	230	W	Do.
Rock	12	319	478	14	288	428	Do.
St. Croix	9	374	476	6	W	W	Do.
Sauk	12	W	W	10	W	W	Limestone, quartzite, sandstone.
Shawano	4	W	W	4	W	W	Limestone.
Sheboygan	1	3	24	1	W	30	Do.
Trempealeau	9	298	W	8	282	W	Do.
Vernon	27	W	W	26	419	W	Do.
Vilas	1	25	W	--	--	--	
Walworth	3	W	62	3	W	W	Do.
Washington	1	32	36	3	106	181	Limestone, sandstone.
Waukesha	29	2,726	4,419	25	2,613	5,423	Limestone.
Waupaca	2	38	82	--	--	--	
Winnebago	3	744	1,152	14	1,497	2,407	Do.
Wood	3	104	143	3	49	91	Granite, sandstone.
Various	28	W	W	3	W	W	Limestone.
Undistributed	--	8,669	16,719	--	7,219	16,657	
Total [3]	415	23,818	36,917	405	22,443	40,912	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] "Limestone" used generally to include dolomite.

[2] Less than ½ unit.

[3] Data may not add to totals shown because of independent rounding.

Sulfur (Recovered Elemental).—Murphy Oil Corp. recovered approximately 1,600 long tons of sulfur during 1974, the first full year of operation of the company's sulfur extraction plant at its Superior refinery in Douglas County. All sulfur was shipped by railroad tank car to a consumer in central Minnesota.

Vermiculite.—Crude vermiculite shipped into the State was exfoliated by Construction Products Div. of W. R. Grace & Co. at Milwaukee, and by Koos, Inc., at Kenosha. The exfoliated material was used for loose fill and block insulation, fertilizer, horticulture, concrete aggregate, plaster aggregate, fireproofing, and other purposes. Consumption in nearly all categories registered declines from 1973.

METALS

Copper.—Since 1971, the northern counties in Wisconsin have been the scene of intense base metal exploration activities. Aerial and ground surveys as well as drilling programs have been focused on massive Precambrian rock formations similar to those in Canada and Michigan that are known to contain deposits of iron, copper, and nickel.

Some 30 companies have purchased or leased thousands of acres of private and county lands for prospecting purposes. Companies conducting base metal exploration programs or active in land acquisition during 1974 included Beth-Cliffs Corp., Duval Corp., Exxon Corp., Flambeau Mining Corp., Homestake Mining Co., International Minerals & Chemical Corp., NL Industries, Inc., Noranda Exploration, Inc., North Central Mining Ventures, and Universal Oil Products.

During 1974, the principal activity of the Flambeau Mining Corp., a wholly owned subsidiary of Kennecott Copper Corp., was the continued acquisition of land over its recently discovered copper deposit in Rusk County. The firm submitted a comprehensive Environmental Impact Report to the DNR in midyear. This report examined aspects of the proposed 55-acre, 285-foot-deep open pit mining operation relative to the local physical, biological, and economic environments. Initial construction reportedly could get underway in 1976, and the mine could be in production by the end of 1977 provided the DNR completed the required Environmental Impact Statement and issued the necessary permits before the end of 1975. Once in production, the mine is expected to produce 11,300 tons of copper annually, with small quantities of gold and silver, over an 11-year period. Copper concentrates would be shipped to one of Kennecott's existing smelters in a western State.

Iron Ore.—The Jackson County Iron Co., a wholly owned subsidiary of Inland Steel Co., was the only iron ore producer in the State during 1974. Output of taconite pellets from the firm's mine and processing facilities near Black River Falls in Jackson County was about 6% less than the 1973 production, but was still substantially above the rated annual capacity of 750,000 tons. The pellet production decrease was attributed mainly to a decline in the grade of the ore. Delays in delivery of replacement equipment also had an impact on the production. All pellets were shipped by rail to the parent company's Indiana Harbor Works in East Chicago, Ind.

Zinc and Lead.—An increase in the price of zinc in late 1973 helped push the 1974 production of crude ore above the 1973 output. Eagle-Picher Industries, Inc. continued to operate its Shullsburg mill at capacity during the year. Ore was supplied from the Shullsburg and Bear Hole mines in Lafayette County. About midyear, the same firm began developing the Jewell mine and rehabilitating the Linden mill, both in Iowa County. The first concentrates from this new mine were milled late in the fall. Ivey Construction Co. did not operate a mine during 1974, but it was milling ore stockpiled prior to the closing of its mine in 1970. Concentrates from Wisconsin mills were shipped by rail to smelters outside the State.

MINERAL FUELS

Coke.—Milwaukee Solvay Coke Co., a division of Pickands Mather & Co., continued to produce coke at its plant in Milwaukee County. Foundries were the principal consumers of the coke, with lesser amounts used for residential and commercial heating and other industrial uses. Shipments were primarily to consumers in Wisconsin and surrounding States.

Peat.—Sales of peat during 1974 increased substantially over those of 1973, and established a record high value. The tonnage sold was the largest marketed by Wisconsin producers since 1962, but was considerably less than the record sales of

8,500 tons sold in 1960. Certified Peat & Sod, Inc. and Demilco, Inc. produced moss and humus peat, respectively, in Waukesha County. Also, Superior Brand Peats produced a small quantity of moss and humus peat from a bog near Tomahawk in Lincoln County. The entire output was used for seed inoculant and general soil improvement.

Petroleum Refineries.—A period of energy and economic uncertainty had its effect on the Murphy Oil Corp. refinery in Superior during 1974. Changes in Canadian export policies reduced the quantity of crude oil available to the refinery, and greatly increased its price. The location of the refinery, constructed in 1951, was predicated on the availability of Canadian crude oil. Consequently, the only active refinery in the State had little or no alternative supply.

Despite the unstable conditions, the major capital project in 1974 was the revamping of the crude distillation section. The expansion program increased the refinery capacity to about 41,000 barrels per day Even with the larger capacity, the economic impact of the higher priced Canadian crude oil resulted in a cutback of the processing rate. Consequently, production dropped from an average of about 36,000 barrels per day during 1973 to approximately 28,500 barrels per day during 1974.

In the first part of the year, the Kickapoo Oil Co., Inc., Hillsboro, announced plans to build a petroleum products refinery near Oxford in Marquette County. The site selected was about in the center of the network of retail gasoline stations operated by the company. A railroad and a crude oil pipeline near the proposed site made it a seemingly ideal location. The firm purchased land and constructed storage tanks before deciding to delay the plans indefinitely because of the uncertainty of supply of Canadian crude oil.

Table 13.—Principal producers

Commodity and company	Address	Type of activity	County
Abrasive stone:			
Baraboo Quartzite Co., Inc	Box 123 Baraboo, Wis. 53913	Quarry; stationary plant.	Sauk.
Cement:			
Marquette Cement Manufacturing Co.	20 N. Wacker Dr. Chicago, Ill. 60606	Portland and masonry, dry process.	Milwaukee.
Medusa Cement Co., Div., Medusa Corp.	Box 5668 Cleveland, Ohio 44101	White, dry process.	Manitowoc.
Clays and shale:			
Oakfield Shale Brick & Tile Co	Oakfield, Wis. 53065	Pit and plant	Fond du Lac.
Coke:			
Milwaukee Solvay Coke Co., Div. Pickands Mather & Co.	311 E. Greenfield Ave Milwaukee, Wis. 53204	Coke ovens	Milwaukee.
Iron ore:			
Jackson County Iron Co., Inland Steel Co.: Black River Falls	30 W. Monroe St. Chicago, Ill. 60603	Mine, concentrator, agglomerator.	Jackson.
Iron-oxide pigments, finished:			
Delta Oil Co	6263 Teutonia North Milwaukee, Wis. 53209	Plant	Milwaukee.
Lead and zinc:			
Eagle-Picher Industries, Inc.:	Box 406 Galena, Ill. 61036		
Jewell		Mine and mill	Iowa.
Bear Hole		Mine	Lafayette.
Shullsburg		Mine and mill	Do.
Ivey Construction Co	Mineral Point, Wis. 53565	Stockpile shipments.	Iowa.
Lime:			
CLM Corp	12th Ave. & Waterfront Duluth, Minn. 55802	Quick and hydrated, 2 rotary kilns, 1 continuous hydrator.	Douglas.
Rockwell Lime Co	Route 4 Manitowoc, Wis. 54220	Quick and hydrated, 1 rotary kiln, 1 continuous hydrator.	Manitowoc.

Table 13.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Lime—Continued			
Western Lime & Cement Co.:	Box 2076 Milwaukee, Wis. 53201		
Green Bay plant	----------	Quick and hydrated, 5 shaft kilns, 1 batch hydrator.	Brown.
Knowles plant	----------	Quick and hydrated, 5 shaft kilns, 1 continuous hydrator.	Dodge.
Eden plant	----------	Quick and hydrated, 5 shaft kilns, 1 batch hydrator.	Fond du Lac.
Peat:			
Certified Peat & Sod, Inc	19000 W. Lincoln Ave. New Berlin, Wis. 53151	Bog, processing plant.	Waukesha.
Demilco, Inc	3101 W. Custer Ave. Milwaukee, Wis. 53209	---- do -------	Do.
Perlite, expanded:			
Construction Products Div., W. R. Grace & Co.	62 Whittemore Ave. Cambridge, Mass. 02140	Processing plant.	Milwaukee.
Midwest Perlite Co	912 College Ave. Appleton, Wis. 54911	---- do -------	Outagamie.
Petroleum refinery:			
Murphy Oil Corp	200 Jefferson Ave. El Dorado, Ark. 71730	Refinery ------	Douglas.
Sand and gravel:			
American Materials Corp	1 American Blvd. Eau Claire, Wis. 54701	Pits; stationary and portable plants.	Eau Claire.
Janesville Sand & Gravel Co	P.O. Box 427 Janesville, Wis. 53545	Pit; stationary and portable plants.	Rock.
Johnson Sand & Gravel, Inc	22750 W. Bluemound Rd. Waukesha, Wis. 53186	Pit; stationary plant.	Waukesha.
Edward Kraemer & Sons, Inc	Plain, Wis. 53577 --------	Pits; portable plants.	Dane, Eau Claire, Lincoln, Ozaukee, St. Croix, Sheboygan, Taylor, Washburn.
McHenry Sand & Gravel Co., Inc.	920 N. Front St. McHenry, Ill. 60050	Pit; stationary plant.	Kenosha.
Manley Brothers of Indiana, Inc.	P.O. Box 67 Chesterton, Ind. 46304	Pit; stationary plant; industrial sand.	Rock.
Manley Sand Div., Martin Marietta Corp.	Rockton, Ill. 61072 -------	---- do -------	Columbia.
Mann Brothers, Inc	P.O. Box 48 Elkorn, Wis. 53121	Pits; portable plants.	Jefferson, Rock, Walworth.
F. F. Mengel Co	P.O. Box 466 Wisconsin Rapids, Wis. 54494	Pit; stationary plant.	Portage.
Schuster Construction Co	300 Elizabeth St. Green Bay, Wis. 54302	Pits; stationary plants.	Brown, Kewaunee.
Tews Lime & Cement Co	6200 W. Center St. Milwaukee, Wis. 53210	Pit; stationary plant.	Waukesha.
Wissota Sand & Gravel Co	P.O. Box 1268 Eau Claire, Wis. 54701	Pits; stationary plants.	Barron, Rusk, Washington.
Stone:			
Granite:			
Anderson Bros & Johnson Co.	Box 26 Wausau, Wis. 54401	Quarries; stationary plant.	Marathon.
Ben Gottschalk, Inc	Route 2 Edgar, Wis. 54426	Quarries; portable plant.	Do.
Lawrence Ladick, Inc	Route 1 Vesper, Wis. 54489	Quarry -------	Do.
Lake Wausau Granite Co	Box 397 Wausau, Wis. 54401	Quarries; stationary plant.	Do.

Table 13.—Principal producers—Continued

Commodity and company	Address	Type of activity	County
Stone—Continued			
Limestone and dolomite:			
Courtney & Plummer, Inc	Box 767 Neenah, Wis. 54956	Quarries; stationary and portable plants.	Calumet, Outagamie, Winnebago.
Daanen & Janssen	Box 127 De Pere, Wis. 54115	Quarries; portable plants.	Brown.
Halquist Lannon Stone Co	Sussex, Wis. 53089	Quarries; stationary plant.	Waukesha.
Edward Kraemer & Sons, Inc.	Plain, Wis. 53577	Quarries; portable plants.	Buffalo, Columbia, Crawford, Marquette, Menominee, Pepin, Pierce, Richland, St. Croix, Sauk, Trempealeau, Vernon.
Lannon Stone Products	Box 361 Lannon, Wis. 53046	Quarries; stationary plants.	Washington, Waukesha.
C. C. Linck, Inc	1226 N. Center St. Beaver Dam, Wis. 53916	Quarries; portable plants.	Dodge, Fond du Lac, Green Lake.
Arthur Overgaard, Inc	Box 87 Elroy, Wis. 53929	Quarries; stationary and portable plants.	Juneau, La Crosse, various counties.
J. W. Peters & Sons, Inc	Box 160 Burlington, Wis. 53105	Quarries; portable plants.	Racine.
Valders Lime & Stone Co., Inc.	Valders, Wis. 54245	Quarry; stationary plant.	Manitowoc.
Vulcan Materials Co., Midwest Division.	Box 6 Countryside, Ill. 60525	Quarries; stationary plants.	Milwaukee. Racine, Waukesha, Winnebago.
Waukesha Lime & Stone Co.	Box 708 Waukesha, Wis. 53186	Quarry; stationary and portable plants.	Waukesha.
Quartzite:			
Foley Bros., Inc	450 Endicott on 4th Bldg. St. Paul, Minn. 55101	Quarry; stationary plant.	Sauk.
Minnesota Mining & Manufacturing Co.	2501 Hudson Rd. St. Paul, Minn. 55119	Quarries; stationary plant.	Marathon.
Sandstone:			
Ellis Quarries, Inc	Box 366 Stevens Point, Wis. 55481	---- do ----	Marathon, Wood.
Johann Sand & Gravel Co	Route 4 West Bend, Wis. 53095	Quarry; stationary plant.	Washington.
Traprock (basalt):			
Bryan Dresser Trap Rock, Inc.	Box 215 Chaska, Minn. 55318	Quarry; stationary and portable plants.	Polk.
GAF Corp	Pembine, Wis. 54156	Quarry; stationary plant.	Marinette.
Sulfur, recovered elemental:			
Murphy Oil Corp	200 Jefferson Ave. El Dorado, Ark. 71730	Byproduct sulfur recovery.	Douglas.
Vermiculite, exfoliated:			
Construction Products, Div., W. R. Grace & Co.	62 Whittemore Ave. Cambridge, Mass. 02140	Processing plant.	Milwaukee.
Koos, Inc	4500 13th Court Kenosha, Wis. 51340	---- do ----	Kenosha.

The Mineral Industry of Wyoming

By Charles A. Koch [1]

Wyoming's mineral industry in 1974 continued to be a major contributor to the State's economy. The total value of mineral production exceeded $1 billion for the first time with a record $1.4 billion compared with $929 million in 1973. This placed the per capita value of mineral production at about $4,000. The principal mineral commodities according to value were crude oil, sodium carbonate, coal, natural gas and uranium. The energy minerals were valued at about $1.1 billion, or 80% of the total value.

Crude oil production again ranked fifth in the Nation and first in the Rocky Mountain region, despite a slight decline in production from 1973, but the value of the crude increased remarkably over that of 1973. The marketed quantities of both natural gas and natural gas liquids declined, but their value rose.

[1] State Liaison Officer, Bureau of Mines, Cheyenne, Wyo.

Table 1.—Mineral production in Wyoming [1]

Mineral	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
Clays ---- thousand short tons	2,343	$24,043	2,511	$29,339
Coal (bituminous) ---- do ----	14,886	60,939	20,703	103,915
Feldspar ---- short tons --	2,588	56	W	W
Gem stones ----	NA	142	NA	140
Gypsum ---- thousand short tons--	312	1,348	315	960
Iron ore (usable) gross weight, thousand long tons --	2,070	W	2,105	W
Lime ---- thousand short tons --	30	548	29	464
Natural gas ---- million cubic feet --	357,731	64,749	326,657	80,031
Natural gas liquids:				
Natural gas and cycle products thousand 42-gallon barrels --	3,351	10,647	2,933	18,577
LP gases ---- do ----	7,237	22,507	6,804	31,707
Petroleum (crude) ---- do ----	141,914	541,820	139,997	914,360
Sand and gravel ---- thousand short tons --	6,201	11,635	5,532	9,508
Stone ---- do ----	3,191	6,716	2,384	[2] 5,989
Uranium (recoverable) ---- thousand pounds --	[r] 10,134	[r] 65,868	7,449	78,213
Value of items that cannot be disclosed: Cement, phosphate rock, pumice (1973), sodium carbonates and sulfates, and values indicated by symbol W ----	XX	117,565	XX	163,997
Total ----	XX	[r] 928,583	XX	1,437,200
Total 1967 constant dollars ----	XX	680,744	XX	[p] 687,269

[p] Preliminary. [r] Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data; included with "Value of items that cannot be disclosed." XX Not applicable.

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

[2] Excludes value of dimension stone; included with "Value of items that cannot be disclosed."

The coal industry had another banner year as production increased by about 5.8 million tons over 1973 production. Despite this increase the State ranked eighth in production nationally. The majority of the coal was produced from surface mining operations. This low-sulfur coal is continuing to find its way in increasing quantities to out-of-State markets where it is used for generation of electric power. Three new mining operations began during the year, and many companies have initiated plans for further surface mining operations.

Uranium production decreased and value increased for the year. After leading the Nation in production of recoverable U_3O_8 in 1973, Wyoming dropped to second place behind New Mexico. The State's reserves continued to rank second in the Nation.

The production and reserves of sodium carbonate ranked first in both the Nation and the world. All producers in the State showed an increase in production over 1973. Sodium carbonate is the most important hard rock mineral in the State.

Over the past few years, the most important operation next to mineral extraction has been reclamation. During 1973, the most recent year for which information was available, 3,456 acres were affected by surface mining. This was an 8% increase over the area mined in 1972. During the same year, 1,593 acres were reclaimed, a decrease of 5% from the acreage reclaimed in 1972. The coal sector accounted for about 38% of the acreage surface mined and 35% of the acreage reclaimed.

The land covered by mineral-related wastes through 1973 totaled an estimated 24,598 acres, of which coal mining wastes comprised about 5,799 acres. The reclaimed mineral-waste areas totaled an estimated 8,163 acres, including 2,261 acres reclaimed by the coal industry.

According to a summary of fuel and energy consumed by the State, Wyoming's consumption in 1974 consisted of 7.1 million tons of coal, 21.3 million barrels of petroleum products, 134.7 billion cubic feet of natural gas, and 4.1 million megawatt-hours of electricity. Wyoming is an exporter of energy. During the year the percentage of various energy sources exported were petroleum 85%, coal 66%, natural gas 59%, electricity 58%, and uranium 100%.

Table 2.—Value of mineral production in Wyoming, by county
(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Albany	$6,542	W	Cement, petroleum, stone, clays, sand and gravel, gypsum, iron ore.
Big Horn	21,849	$34,434	Petroleum, clays, gypsum, natural gas, lime, sand and gravel.
Campbell	160,493	261,624	Petroleum, natural gas liquids, natural gas, coal.
Carbon	r 59,476	84,540	Coal, uranium, natural gas liquids, natural gas, petroleum, sand and gravel, stone.
Converse	r 51,872	84,844	Petroleum, uranium, coal, natural gas liquids, natural gas.
Crook	23,882	33,239	Petroleum, clays, natural gas, stone, sand and gravel.
Fremont	r 89,254	126,231	Petroleum, uranium, iron ore, natural gas, natural gas liquids, sand and gravel, stone, feldspar.
Goshen	359	W	Lime, sand and gravel, petroleum.
Hot Springs	37,942	67,694	Petroleum, natural gas, coal, sand and gravel.
Johnson	17,416	28,350	Petroleum, clays, natural gas liquids, natural gas, sand and gravel.
Laramie	3,660	W	Stone, petroleum, sand and gravel, natural gas.
Lincoln	21,824	31,012	Coal, natural gas liquids, phosphate rock, petroleum, natural gas, sand and gravel.
Natrona	r 78,342	119,630	Petroleum, uranium, natural gas, natural gas liquids, sand and gravel, clays, stone.
Niobrara	1,829	3,088	Petroleum, natural gas.
Park	115,489	179,548	Petroleum, natural gas, natural gas liquids, gypsum, sand and gravel.

See footnotes at end of table.

Table 2.—Value of mineral production in Wyoming, by county—Continued

(Thousands)

County	1973	1974	Minerals produced in 1974 in order of value
Platte	$5,636	W	Iron ore, stone, sand and gravel.
Sheridan	3,253	$7,238	Coal, petroleum, stone, sand and gravel.
Sublette	24,327	33,008	Petroleum, natural gas, sand and gravel, natural gas liquids.
Sweetwater	129,631	198,292	Sodium carbonate, petroleum, natural gas, coal, sand and gravel, natural gas liquids.
Teton	W	W	Stone, sand and gravel.
Uinta	1,521	W	Natural gas liquids, clays, sand and gravel.
Washakie	12,606	17,401	Petroleum, natural gas, natural gas liquids, clays, lime, sand and gravel, stone.
Weston	13,766	21,191	Petroleum, clays, natural gas, sand and gravel.
Undistributed [1]	47,620	105,845	
Total [2]	r 928,583	1,437,200	

r Revised. W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."

[1] Includes value of mineral production that cannot be assigned to specific counties and values indicated by symbol W.

[2] Data may not add to totals shown because of independent rounding.

Table 3.—Indicators of Wyoming business activity

		1973	1974 p	Change, percent
Employment and labor force, annual average:				
Total labor force	thousands	155.9	NA	NA
Employment	do	150.7	NA	NA
Unemployment	do	5.2	NA	NA
Nonagricultural employment:				
Mining	do	13.0	15.5	+19.2
Contract construction	do	11.8	14.9	+26.3
Manufacturing	do	8.4	8.2	−2.4
Government	do	31.5	32.0	+1.6
Services	do	19.7	20.5	+4.1
Wholesale and retail trade	do	27.5	28.0	+1.8
Transportation and public utilities	do	11.3	12.1	+7.1
Finance, insurance, and real estate	do	4.0	4.3	+7.5
Personal income:				
Total	millions	$1,657	$1,851	+11.7
Per capita		$4,696	$5,156	+9.8
Construction activity:				
Number of new residential units authorized		2,185	2,436	+11.5
Value of authorized nonresidential construction	millions	$14.6	$25.6	+75.3
Highway construction contracts awarded	do	$39.4	$36	−8.6
Cement shipments to and within Wyoming	thousand short tons	207	248	+19.8
Farm marketing receipts	millions	$389	NA	NA
Mineral production value	do	$929	$1,437	+54.7

p Preliminary. NA Not available.

Sources: Survey of Current Business; Employment and Earnings; Farm Income Situation; Construction Review; Area Trends in Employment and Unemployment; Roads and Streets; and U.S. Bureau of Mines.

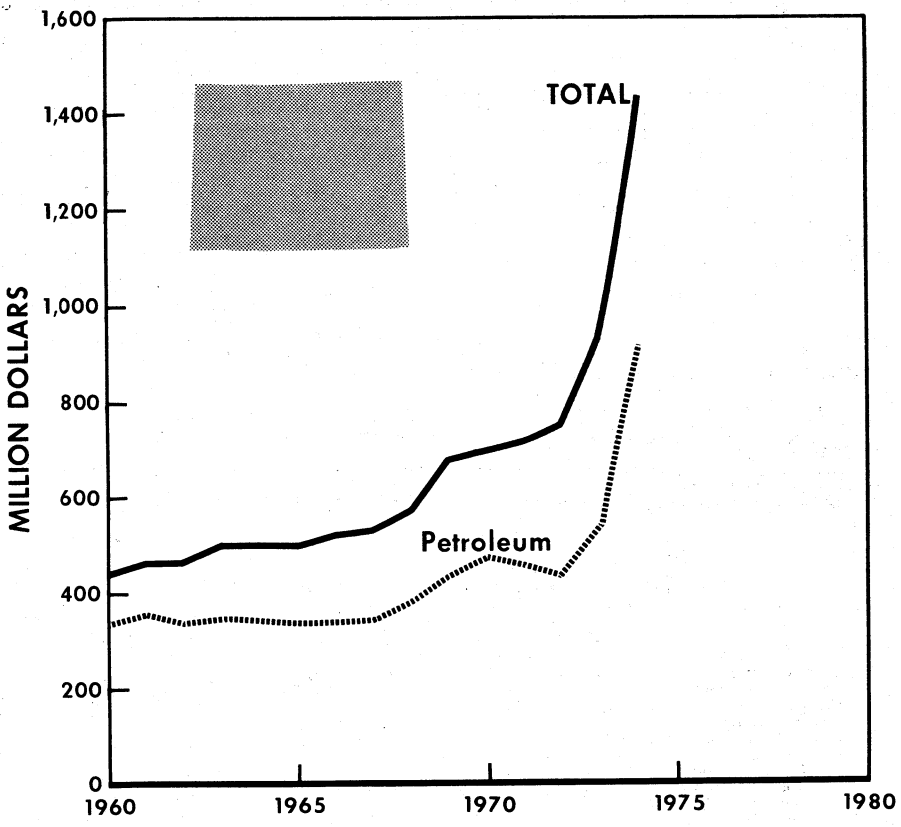

Figure 1.—Value of petroleum and total value of mineral production in Wyoming.

Legislation and Government Programs.—The Governor in addressing the 20-day budget session of the 42d Wyoming Legislature asked that consideration be given at the 1975 regular session to the following mineral-related measures: Amendment to the Environmental Quality Act to control nonstationary sources of pollution, a new water development law that would prohibit surface and ground water above 2,500 feet below ground level from being exported, and increasing the present 1% severance tax on minerals to 3% to be applied only to oil, gas, coal, and oil shale.

The 20-day special budget session of the legislature, which adjourned February 11, passed and had signed by the Governor a number of bills related to the mineral industry. A summary of the major bills affecting the industry follows:

HB 8—Designates the State Land Board to distribute proceeds from oil shale and geothermal sources for schools and roads and to help impacted areas.

HB 9—Changes the 1973 Environmental Quality Act to meet Federal requirements.

HB 36—Three percent excise tax on trona, coal, oil shale, and petroleum (excluding wells producing less than 10 barrels per day.

HB 39—Gives the State Engineer authority to determine the economic impact of a water rights transfer.

HB 46—New formula for mineral valuation to eliminate disparities in coal assessment.

SF 14—The Coal Slurry Pipeline Bill authorized the Wyoming-Arkansas slurry pipeline, but required legislative approval for similar projects.

The proposed regulations covering land rehabilitation requirements for all mining operations that the Environmental Quality Act set forth in the statutes as being under the control of the Land Quality Division are in the second draft stage. The draft when completed will be reviewed by the Land Quality Division's Advisory Board, and from there the recommendations will go to the Environmental Council, which will schedule public hearings.

Wyoming's Environmental Quality Department celebrated its first year of existence in July. All basic steps outlined by the 1973 legislature have been accomplished except for the solid waste management program. Lack of office space and professional expertise have delayed this program.

The Land Quality Division reported that all 168 mining permit holders under the now defunct 1969 Open Cut Land Reclamation Act have been converted to the 1973 laws. The Air Quality Division has adopted a permit system for new potential pollution sources and reported they have not encountered any major pollution problems to date.

Bills proposed for the general session of the legislature included one for a tax on coal and one on plant siting. The additional tax on coal is to meet the need of about $65 million in extra revenues over the next 5 years for State, county, and city roads, sewers, water supplies, and schools. The plant siting bill would require new industries employing over 200 people to provide within 1 year socio-impact information to State, county, and city governments. It would require a review and processing fee and would give local and city officials the option to require industries to appear at a public meeting to discuss projected impacts on housing, sewers, water supplies, and health facilities.

The U.S. Bureau of Land Management has reported that it will study reclamation possibilities on 2,240 acres of federally administered lands 15 miles northwest of Hanna at a cost of $200,000. They have contracted with the U.S. Geological Survey and the U.S. Bureau of Reclamation for the intensive study of overburden on coal deposits to a depth of 200 feet. The study will include inventory mapping of soil types and vegetation and intensive testing of ground and surface water. A first report on the possibility of reclaiming the Hanna site by restoration to its natural conditions, as nearly as possible, is due by April 1975.

The Bureau of Mines awarded a $24,780 grant to the State Geological Survey for a project to analyze coal in the State. The Survey will collect the coal samples and provide site descriptions, and the analytical portion will be conducted by the Bureau. Samples are to be collected from all the approximately 50 actively mined coal seams and are to represent the entire depth of each seam, ranging from 4 to about 100 feet.

The University of Wyoming's Water Resources Research Institute received a $20,000 grant from the U.S. Forest Service to study the environmental consequences of strip mining in the Powder River Basin. The purposes of the study are to look at undergound water supplies and the impact of strip mining on streams, plants, and animals. The study is designed to develop methods of restoring strip-mined areas and minimizing the esthetic and environmental effects of mining development.

Table 4.—Wyoming: Estimated acreage of surface mined and reclaimed land

Commodity	1972		1973	
	Surface mined	Reclaimed	Surface mined	Reclaimed
Clay	608	380	688	190
Coal	1,142	555	1,303	563
Gypsum	9	--	--	--
Iron ore	1	14	--	28
Phosphate	12	--	14	--
Sand and gravel	188	73	197	80
Stone	19	4	21	8
Other and unknown	1,222	659	1,283	724
Total	3,201	1,685	3,456	1,593

Source: Wyoming Department of Environmental Quality, Land Quality Division.

REVIEW BY MINERAL COMMODITIES

MINERAL FUELS

Coal.—Wyoming's coal mining industry continued to set records with a production of 20.7 million tons, compared to 14.9 million tons in 1973. The value of the coal produced increased 71% from $60.9 million to $103.9 million. This increased production ranked Wyoming eighth nationally, replacing Alabama. Strip mining accounted for 97% of production, the same as in 1973. The increased production resulted from the opening of 2 new strip mines, bringing the total number to 14; the underground mines held constant at 5. Four counties—Campbell, Carbon, Converse, and Lincoln—accounted for 89% of the State's production according to the State Inspector of Mines 1974 annual report.

During the year about 7.1 million tons of coal, approximately 34% of the State's production, was used instate. According to Bureau of Mines data, about 93% of the coal was used in the generation of electricity, and 86% of this total was for mine mouth operations. This instate use of coal compared closely with the 94% used in the generation of electricity for out-of-State shipments. In 1974, Wyoming's coal was shipped to 18 States and overseas. The three leading States receiving Wyoming coal are Colorado 2.4 million tons, Indiana 2.3 million tons, and Iowa 2.1 million tons.

Five major companies, including their subsidiaries, produced about 18.9 million tons, or 91% of the State's production. These companies and their production, as reported by the State Inspector of Mines were Arch Minerals Corp., 5.7 million tons from two mines; Kemmerer Coal Co., 3.5 million tons from three mines; Pacific Power & Light Co. (PP&L), 3.4 million tons from two mines; Amax Coal Co. (Amax), 3.3 million tons from one mine; and Peter Kiewit Sons' Co., 3.0 million tons from two mines. New coal operations in the State were PP&L's Bridger Coal Co., which supplies coal to the Jim Bridger Powerplant, and Energy Development Co.'s Vanguard No. 2 underground mine, for use by the parent company, Iowa Public Service Co.

Table 5.—Wyoming: Bituminous coal production in 1974, by type of mine and county
(Excludes mines producing less than 1,000 short tons annually)

County	Number of mines			Production (thousand short tons)			Value (thousands)
	Underground	Strip	Total	Underground	Strip	Total	
Campbell	--	2	2	--	W	W	W
Carbon	2	5	7	418	8,325	8,743	$58,053
Converse	--	1	1	--	2,687	2,687	11,718
Hot Springs	2	1	3	6	1	7	W
Lincoln	--	2	2	--	W	W	W
Sheridan	--	2	2	--	1,023	1,023	5,692
Sweetwater	1	1	2	103	735	838	1,115
Total[1]	5	14	19	526	20,176	20,703	103,915

W Withheld to avoid disclosing individual company confidential data; included in "Total."
[1] Data may not add to totals shown because of independent rounding.

Amax, which began mining coal from the Belle Ayr strip mine late in 1972, reported that it plans to mine 35 million tons of coal per year in Campbell County by 1985. The Amax development involves two mines, one already in operation some 15 miles south of Gillette and the new Belle Ayr mine about 6 miles north of Gillette, scheduled for operation in 1976. All coal production from both mines will be shipped out of State. Expansion operations have begun with the addition of two new shovels at the south mine. The larger shovel will be used to strip-mine and load the silo-type storage bins, and the smaller one will be used to help load the seven 110-car coal trains dispatched each week. The addition of the shovels has resulted in a three-shift operation and a production increase from 0.9 million tons in 1973 to 3.3 million tons in 1974.

The No. 1 unit of the Jim Bridger steam electric powerplant, a 500-megawatt unit, came onstream late in 1974. The plant,

which is to have four units, is a joint venture between PP&L and Idaho Power Co. Units 2 and 3, which are presently under construction, were to be completed in March 1975 and December 1976 respectively. The fourth unit, which has not received the required U.S. Environmental Protection Agency and State Department of Air Quality permit approvals, has a completion date of June 1979.

Kerr-McGee Coal Corp. began construction of its mine near Gillette in Campbell County. The project will cost about $12 million and is expected to be in operation by mid-1976. Plans call for coal crushing and handling facilities rated at 3,900 tons per hour of mine-run coal. Also included will be four concrete storage silos with a total capacity of 60,000 tons and a unit-train-loading system capable of handling 6,000 tons of coal per hour with automated sampling and weighing systems. A total of 250 million tons of low-sulfur coal from the Kerr-McGee Jacobs Ranch mine is committed to electric utility companies in Arkansas, Louisiana, and Texas. After construction had been started the State Environmental Quality Department filed suit against Kerr-McGee in December seeking to have a $10,000 fine imposed for each day of the company's alleged violation of the Environmental QualityAct of 1973. (Kerr-McGee had filed for a mining permit on July 31, but began construction before receiving a permit.) The State also claimed that significant damage to the surface had been done at the site without protection of a reclamation plan or a bond covering the reclamation costs as required by law.

A $12 million contract for the construction of the Carter Mining Co. open pit coal mining facility was awarded to Morrison-Knudsen Co., Inc. This will be the Rawhide complex located 8 miles north of Gillette. Intial production will be 5 million tons per year; however, the mine will be designed for a maximum capacity of 12 million tons annually. Overburden has been estimated to average between 25 and 125 feet. First shipments of coal were expected in July 1976 to the Indiana and Michigan Electric Co. There is no rail line to the area now, but Burlington Northern Railroad and the Chicago and Northwestern Railroad have planned a 10-mile line from Gillette to Glenrock, where it will connect with an existing line.

The San Antonio City Public Service Board of San Antonio, Tex., signed a contract with Sunoco Energy Development Co., a subsidiary of Sun Oil Co., to buy 55.5 million tons of coal over a 20-year period at a total cost which may reach $1 billion. Delivery would begin in 1976, provided there are no delays in opening the mine, which is planned for Campbell County near Gillette. The contract also provides for a sinking fund to reclaim the 6,500-acre tract of land disturbed by the mining operation.

Texaco, Inc., has contracted Morrison-Knudsen Co., Inc. to do an engineering study to determine the best way to develop its coal land and water holdings at Lake De Smet near Buffalo, Johnson County. One of the important problems the engineering study is likely to deal with is the problem of water seeping from Lake De Smet into the area being mined. Texaco purchased two draglines which will not be assembled and ready to operate until about 1980.

Five consumer-owned electric power suppliers filed an application with the Wyoming Public Service Commission to build a 1,500-megawatt, $700 million electric generating plant. Plans for the plant, which is to be located near Wheatland in Platte County, are to build three units of 500 megawatts each, with the first unit to be in operation in 1979 and the third completed by mid-1980. A site has been acquired for construction of an earthen dam on the Laramie River for development of a 100,000-acre-foot reservoir, which combined with other water resources will provide the power project with an annual water supply in excess of 40,000 acre-feet. Negotiations for coal from mines in the State, to be hauled by unit train to the generating site, have been underway for some time; however, there were no firm commitments at yearend. The power companies, which are grouped together under the name of "Missouri Basin Power Project," have opened an office in Cheyenne. This office will coordinate the planning of the proposed coal-fired generating plant.

The U.S. Atomic Energy Commission (AEC) entered into an agreement with PP&L and Black Hills Power and Light Co. for the construction and operation of a dry cooling tower test facility. The test facility will be built in conjunction with the new 330-megawatt coal-fired steam

electric powerplant to be built by the two utility companies near Gillette. The plant and test facility are scheduled for completion in the spring of 1977. AEC will pay the costs involved in the construction and operation of the dry cooling tower. The contract is scheduled to run for 5 years after the plant begins commercial operation.

Officials of Ideal Basic Industries, Inc., and Union Pacific Corp. announced they will jointly reopen, expand, and operate the inactive Stansbury underground coal mine, located near Rock Springs, Sweetwater County, owned by Rocky Mountain Energy Co., a subsidiary of Union Pacific Corp. Ideal Basic will manage and operate the mine, and the low-sulfur coal will be used primarily at its cement plants in Western States. Production will start in 1975, and the mine initially will produce more than 1 million tons of coal per year. It has been estimated that there are enough coal reserves to last for decades. The mine initially was opened in 1943 to increase the wartime production of coal.

Natural Gas.—Marketed natural gas totaled 327 billion cubic feet in 1974, compared with 358 billion cubic feet in 1973. Despite the decline in the marketed production the value increased 24% to $80 million compared with $64.7 million in 1973. Field production continued to decrease, from 369.6 billion cubic feet in 1973 to 337.8 billion cubic feet in 1974. Percentage of production from public lands decreased slightly to 50.5% from 53% the previous year. The major gas producing counties and their production percentage according to the State Ad Valorem Tax Division were Sweetwater 27%, Fremont 18%, Sublette 17%, and Campbell 15%.

The Hilight Field in Campbell County continued to hold the top spot in production with an output of 29.3 billion cubic feet, down from the 33 billion feet in 1973 and from the 45.1 billion cubic feet in 1972. According to the Wyoming Oil and Gas Commission, the 25 largest gasfields produced 69% of the State's production in 1974. The leaders in cumulative production are (in billions of cubic feet): Worland 433.8, Beaver Creek 358.8, Church Buttes 251.6, Elk Basin 227.1, Tip Top 214.2, and Hogsback 201.1.

Although not listed in the State's 25 major fields, the Salt Creek field has the alltime high cumulative production with 750.1 billion cubic feet. The Church Butte field continues to hold the production depth record from a depth interval of 18,050 to 18,200 feet.

The American Gas Association (AGA) reported that Wyoming's natural gas reserves totaled 3.9 trillion cubic feet at yearend 1974, a slight decline as compared with 4.1 trillion cubic feet in 1973.

Wyoming's natural gas production far exceeds the internal demands, and therefore about 59% of the gas is exported. The State receiving about half the gas was Colorado; the remainder was shipped to Utah, Nebraska, Montana, and South Dakota.

Three privately owned Wyoming gas companies headquartered in Casper have been acquired by the Kansas-Nebraska Natural Gas Co. The acquisition puts the firm's pipeline distribution system closer to areas where much future gas exploration will take place.

Davis Oil Co. of Denver and Panhandle Eastern Pipe-Line Co., Texas, plan natural gas exploration in the southwestern part of the State. Under the program Panhandle will advance $5 million to Davis for drilling about 50 wells in Sweetwater, Lincoln, Sublette, Uinta, and Fremont Counties. An additional $10 million will be advanced should the exploration prove successful.

Another drilling program for the State was agreed upon by AMOCO Production Co. and Cities Service Gas Co. Under the agreement AMOCO has agreed to conduct a 3-year search for natural gas on more than 1 million acres in the southern part of the State for Cities Service, in return for increased prices on gas purchased by Cities Service from the Hugoton field in southwest Kansas. Natural gas found by the exploration, up to a maximum of 2 trillion cubic feet, will be committed to Cities Service.

According to the Wyoming Oil and Gas Conservation Commission, five new gasfields were discovered in 1974. One of the more significant discoveries was Colorado Interstate Gas Exploration (CIG), Inc.'s discovery about 60 miles southwest of Rawlins, which had an initial flow rate of 4.8 million cubic feet per day during testing. The field names and operators of the fields are Blue Gap—CIG, Doctor

Ditch—Gas Producing Enterprises, Golden Wall—Prenalta Corp., Hoback III—Belco Petroleum Corp., and Kanson Draw—Oil Development Co. of Texas.

Natural Gas Liquids.—The production of natural gas liquids decreased from 10.6 million barrels in 1973 to 9.7 million barrels in 1974. The decline in production was attributed primarily to the decline of natural gasoline, isopentane, and plant condensate from 3.4 million barrels in 1973 to 2.9 million barrels in 1974. Despite the 0.9-million-barrel drop in total output, the value of the products rose to $50.3 million, an increase of 51.7% over the 1973 value.

At yearend there were 32 plants operating. One plant at Well Draw field in Converse County operated by McCulloch Oil Corp. came on-stream in August. McCulloch's plant in the Ute field, Campbell County, was shut down in May; the gas from the field is to be processed at the Oedekoven plant. Reportedly, the processing plants were operating at 59% of capacity.[2]

Wyoming's proved reserves of natural gas liquids at yearend 1974, as estimated by AGA, totaled 78.1 million barrels, compared with 83.7 barrels in 1973.

Table 6.—Wyoming: Field production of natural gas, by major field
(Million cubic feet)

Field	County	1973	1974
Hilight	Campbell	32,953	29,276
Beaver Creek	Fremont	19,815	21,974
Elk Basin	Park	27,924	15,770
Hogsback	Sublette	16,562	14,065
Desert Springs	Sweetwater	15,411	13,841
Tip Top	Sublette	14,781	10,911
Canyon Creek	Sweetwater	11,838	10,478
Worland	Washakie	12,182	10,317
Table Rock	Sweetwater	9,113	9,236
West Side Canal	Carbon	9,225	8,913
Other fields		199,786	193,009
Total		369,590	337,790

Source: Wyoming Oil and Gas Conservation Commission.

Oil Shale.—During the year the Laramie Energy Research Center of the Federal Bureau of Mines continued its research on in situ oil shale retorting at a site 8 miles west of Rock Springs. The purpose of the study is to free the oil underground, thereby eliminating the need for mining the oil shale and disposing of the spent shale. In addition to the in situ project the Bureau was also studying the potential use of the gas produced during the in situ retorting.

The State of Wyoming planned to offer 1,280 acres of oil shale land for lease to make the proposed Federal shale tracts more attractive. The Federal tracts are located about 45 miles southwest of Rock Springs. The State Attorney General ruled that a public hearing must be held on the leasing program and its rules and regulation regarding the leasing of the State land. The Board of Land Commissioners must also approve the plan.

Two dates, May 7 and June 4, had been set for the bid openings of both State and Federal acreage. Bid openings were postponed until May 14 and June 11, and on the bid letting days no bids were received on the tracts.

Petroleum.—Total crude oil production declined to 140 million barrels from 142 million in 1973. Production has been declining since 1970, when it peaked at 160 million barrels. The major oil producing counties and their approximate share of production, as reported by the State Ad Valorem Tax Division, were Campbell 26%, Park 21%, Natrona 11%, Hot Springs 7%, Fremont 6%, and Sweetwater 5%. The county rankings have remained the same for the past several years. Approximately 56% of the production was from public lands. Although the total output declined, the value of the crude increased 69% over the 1973 value. The State's annual production continued to rank fifth in the Nation and first in the Rocky Mountain States.

Of the nearly 148 million barrels of

[2] Bickert, Browne, Coddington & Associates, Inc. Wyoming Energy Consumption—Minerals, Fuels, Electrical Generation and Agricultural Sectors. Denver, Colo., 1974, p. 15.

Wyoming crude refined in 1974, about 51 million barrels was refined in State; the remaining 97 million barrels was shipped out of State according to Bureau data. Shipments east of the Mississippi River were Indiana, 14.5 million barrels; Illinois, 14.2 million barrels; Michigan, 8.9 million barrels; Ohio, 5.7 million barrels; and Kentucky and Tennessee, 0.7 million barrels. Other destinations were Kansas, 20.1 million barrels; Montana, 18.2 million barrels; Colorado, 7.4 million barrels; Utah, 4.3 million barrels; Missouri and Nebraska, 2.4 million barrels; and North Dakota, 0.9 million barrels. During the year Wyoming received 1.2 million barrels from Colorado, 0.4 million barrels from Montana, and 0.3 million barrels from Utah.

The State's four principal oilfields, accounting for 28% of the year's production, were Salt Creek, Oregon Basin, Elk Basin, and Hilight. Salt Creek field, which was discovered in 1889 and continuously been the State's leading producer, has produced 15% of the State's cumulative production.

At yearend the reserves of the major fields were estimated as follows: Salt Creek, 82.1 million barrels; Oregon Basin, 79.7 million barrels; Elk Basin(including portion of the field in Montana), 69.8 million barrels; and Hilight, 85.6 million barrels.[3]

Wyoming's crude oil reserves at yearend 1974, as estimated by the American Petroleum Institute, totaled 903,360,000 barrels, down from 916,763,000 barrels in 1973. This represents 2.6% of the U.S. reserves and retains the State's ranking of sixth in the Nation.

The number of exploratory and development wells drilled rose to 988, up from 885 in 1973, according to the American Petroleum Institute. The total drilling footage reached 6.7 million feet, compared with 5.8 million feet in 1973. A total of 470 exploratory wells were drilled of which 73, or 15.5%, were successful. The 518 development wells drilled resulted in 385 producers, a success ratio of 74.3%. Active rotary rig count ranged from a high of 140 rigs to a low of 87 rigs operating during the year.[4] The average rig count for the year was 107 compared with 70 in 1973. Campbell County again was the leader with 225 wells drilled and 1.92 million feet of drilling.

[3] Oil and Gas Journal. V. 73, No. 4, Jan. 27, 1975, p. 118.
[4] Page 109 of work cited in footnote 3.

Table 7.—Wyoming: Oil and gas well drilling completions in 1974, by county

County	Proved gas wells[1]			Exploratory wells			Total	
	Oil	Gas	Dry	Oil	Gas	Dry	Number of wells	Footage
Albany	--	--	1	--	--	6	7	33,487
Big Horn	12	--	1	--	--	17	30	154,973
Campbell	74	2	34	16	--	99	225	1,922,890
Carbon	3	--	1	--	3	16	23	134,244
Converse	83	1	13	17	2	39	155	1,234,624
Crook	10	--	13	3	--	34	60	308,615
Fremont	21	4	7	1	3	14	50	253,081
Goshen	--	--	2	1	--	4	7	49,834
Hot Springs	25	3	2	1	--	6	37	147,262
Johnson	3	--	2	6	--	23	34	323,357
Laramie	1	--	--	--	--	6	7	61,587
Lincoln	--	--	--	--	2	3	5	53,596
Natrona	22	--	9	1	--	21	53	293,045
Niobrara	3	--	3	2	--	17	25	117,033
Park	33	--	10	1	2	8	54	260,379
Platte	--	--	--	--	--	1	1	7,900
Sheridan	--	--	--	--	--	14	14	131,401
Sublette	3	1	5	--	--	4	13	74,305
Sweetwater	19	10	14	3	6	34	86	592,914
Teton	--	--	--	--	--	1	1	1,552
Uinta	3	--	1	--	1	4	9	67,243
Washakie	9	--	4	--	--	6	19	113,317
Weston	40	--	11	2	--	20	73	355,563
Total	364	21	133	54	19	397	988	6,692,202

[1] Development wells as defined by American Petroleum Institute.

Source: American Petroleum Institute.

Table 8.—Wyoming: Production of crude petroleum, by major field
(Thousand 42-gallon barrels)

Field	County	1973	1974
Salt Creek	Natrona	14,929	13,343
Oregon Basin	Park	11,309	11,346
Elk Basin	Park	10,255	7,898
Hilight	Campbell	7,875	7,217
Garland	Big Horn	3,755	4,722
Hamilton Dome	Hot Springs	3,759	4,691
Frannie[1]	Park		3,872
Raven Creek	Campbell	3,453	3,334
Lost Soldier	Sweetwater	3,945	3,059
Winkleman Dome	Fremont	3,189	3,040
Other fields		76,344	77,975
Total		[2]141,914	139,997

[1] During 1974 Frannie field replaced Grass Creek in top 10.
[2] Includes Grass Creek's 1973 production of 3,101 barrels.

Source: Wyoming Oil and Gas Conservation Commission.

AMOCO Production's Bitter Creek II unit made oil industry history by setting a Rocky Mountain drilling depth record of 20,574 feet, surpassing the 20,521-foot dry hole drilled in 1949 by Superior Oil Co. in Sublette County. The more than $2 million operation is located 13 miles southeast of the Weber production in the Brady field. The well has had good gas shows, although qualitative and quantitative values have not been determined.

No sooner had a depth record been set than another company, Union Oil Co. of California, announced plans to drill the deepest well in the Rockies. The well was staked in Natrona County on the Hell's Half Acre unit. The company plans to go down 22,000 feet into the Madison Formation.

Mountain Fuel Supply Co. completed the deepest oil and gas producer in the Rockies. The well is 3 miles southwest of the Butcher Knife Springs field and went to 18,750 feet into the Morgan Formation. The previous depth production record was in the Church Buttes field at a depth of 18,200 feet.

A report by Union Pacific Corp. indicated that Champlin Petroleum Co.'s share of oil production from the Nugget Formation of the Brady field, Sweetwater County, had passed the $3.3 million mark; the field was then slightly over a year old. Champlin has a 41½% interest in the field and planned to produce from the biggest Brady reserve, the Weber Formation, when a gas processing plant goes on-stream in mid-1975.

Production tests at the No. 1 Patterson oil well in the Spearhead Ranch field near Casper, which was in flames for a month in the winter of 1973–74, indicate it to be a very significant discovery. It has been tested at a rate of 2,000 barrels of oil and 4.9 million cubic feet of gas per day. The well was the first to be drilled under an agreement calling for exploration in the southern portion of the eastern Powder River Basin.

The new V-1 Oil Co. refinery at Glenrock was ready to go onstream late in the year, but was unable to start up because of a lack of crude. A company spokesman said they were waiting for an allocation from the Federal Energy Administration. The plant has a 1,000-barrel-per-day capacity and will produce fuel for sale by the company's 22 stations in Wyoming, Idaho, and Utah. An extenuating factor, according to company officials, was that new crude was selling in the $11-per-barrel range, compared with about $5.60 for old crude; the old crude, oil being pumped from wells discovered before the energy shortage, was all tied up, primarily by the major oil companies. The company did not consider it economically feasible to start up at the new price and planned to wait until it could buy crude at nearly the same price as anybody else.

The Wyoming Public Service Commission approved an application of Belle Fourche Pipeline Co. to construct two pipelines. One is a 15-mile line to connect the Hilight field in Campbell County to a line at Mush Creek Station in Weston County. The other line will be 7 miles long and serve the North Horse Creek field in Campbell County.

AMOCO Production Co., which expanded its refinery production in Casper to 43,000 barrels per day from 37,000

barrels per day, reported that the Federal Allocation Program reduced its refinery runs to about 34,000 barrels per day. The company had plenty of crude to run the refinery at the expanded capacity but had to share its supplies with other smaller refineries in the Rocky Mountain Region. The first phase of a two-phase expansion in the heavy oil division at the refinery was completed in 1973 and resulted in expanding production of lube-based stocks and waxes about 20%. The second phase is scheduled to start in mid-1975 and will increase heavy oil capacity by an additional 25%. The expansion is a significant step since it represents the first growth in heavy oils since the present unit was constructed in 1957–58. The plant is the only one between Tulsa and the west coast producing lube-base stocks and waxes.

During July the Wyoming Public Service Commission gave Pasco Pipeline Co. permission to construct its planned $5 million oil pipeline between its refinery at Sinclair and an existing pipeline near Casper. The order also authorized a 20-cent-per-barrel traffic charge for transportation of crude oil through the line, estimated to produce about $1.7 million in revenue annually. The new 10-inch line, paralleling a 7-inch line, will move 14,000 barrels of crude per day. Pasco expanded the throughput at its Sinclair refinery to 40,000 barrels per day and planned for continued expansion to 47,000 barrels per day before yearend.

Marathon Pipe Line Co., a wholly owned subsidiary of Marathon Oil Co., filed an application with the Bureau of Land Management for approval to build a 341-mile common carrier pipeline from the Uintah Basin of northeastern Utah to Casper. The $300 million project was to be designed with a capacity of 55,000 barrels per day. The line was contingent on sufficient commitment of crude, and when Shell Oil Co. and Marathon could not reach agreement plans for the line were dropped.

The total crude oil throughput capacity of the 12 refineries increased to 185,700 barrels per calendar day, compared with 169,000 barrels in 1973. Based on the capacity rating the refineries operated at 77% capacity in refining 52,430,000 barrels of crude oil.

Table 9.—Wyoming: Principal oil and gas discoveries in 1974

County and field	Operator	Producing formation	Total depth (feet)
CRUDE OIL			
Campbell: Empire	Texaco, Inc	Parkman	8,720
Converse:			
Hogs Draw	Davis Oil Co	Teapot	6,500
Spearhead Ranch	Chaparral Resources & American Quasar.	Frontier	14,199
Crook: County Line	Smith-Fancher	Minnelusa	7,618
Fremont: Popo Agie	Westrans Petroleum Co. & Quadrant Oil Co.	Phosphoria	4,892
Hot Springs: Aspen Creek	Oil Development Co. of Texas.	Dinwoody-Phosphoria.	3,825
Johnson:			
Heldt Draw	Woods Petroleum Co	Shannon	9,675
Indian Creek	Davis Oil Co	---- do	9,250
Niobrara:			
Buck Creek	McMoran Exploration Co	Dakota	6,500
Cedar Gulch	MACPET	---- do	8,234
Park: Silvertip, S.	True Oil Co	Phosphoria	9,550
Weston:			
Todd	Davis Oil Co	Turner	6,743
Quest	Union Oil Co. of Calif	Muddy	7,760
NATURAL GAS			
Carbon: Blue Gas	CIG Exploration Co	Mesaverde	9,741
Converse: Spearhead Ranch	Mountain Fuel Supply Co	Fall River and Lakota.	13,815
Fremont:			
Alkali Butte	Energistic, Inc., May Petroleum Co., & Westrans Petroleum Co.	Cloverly and Morrison.	8,894
Kanson Draw	Oil Development Co. of Texas.	Lance	10,557
Park: Doctor Ditch	Gas Producing Enterprises	Frontier and Muddy-Dakota.	13,640
Sublette: Hoback III	Belco Petroleum Corp	Muddy	15,896
Sweetwater:			
Golden Wall	Prenalta Corp., et al	Dakota	8,121
Unnamed	Jerry Chambers	Rock Springs	3,870

Source: Petroleum Information Corp. 1974 Resume Oil and Gas Operation in the Rocky Mountain Region.

NONMETALS

Cement.—According to the State Inspector of Mines Annual Report of 1974, Monolith Portland Midwest Co. in Laramie, the only cement plant in Wyoming, produced 205,885 tons during the year. Cements shipped were types I, II, and V. The major purchasers according to importance were ready-mix concrete companies, concrete products manufacturers, contractors, building material dealers, and other users.

Clays.—The production of clays rose to 2,511,151 tons in 1974, compared with 2,343,000 tons in 1973. The output in 1974 consisted of 2,295,248 tons of bentonite and 215,903 tons of common clay and shale. Eight companies mined bentonite. Production was from Albany, Big Horn, Crook, Johnson, Natrona, Uinta, Washakie, and Weston Counties. Crook County again was the leading producer with 966,000 tons, or about 42% of the State's total. Next was Big Horn County, with 876,000 tons, or about 38% of the total. Wyoming continued to be the Nation's major source of bentonite.

The Black Hills Bentonite Co. will be showing a sizable increase in 1975 with the completion of its Worland plant. The oil industry uses 30 to 35% of the total bentonite produced by the firm for drilling mud, foundry purposes, and sealing. Another primary use is for pelletizing of taconite ore. Econoseal is a relatively new product the firm is developing to be used as a sealant for lagoons, reservoirs, dam faces, and irrigation ditches. Black Hills participated in a Chicago pollution equipment exposition in May, displaying the abilities of Econoseal.

Feldspar.—Modern Mining and Milling Co., Inc., increased its production compared with 1973 production. During the year Modern Mining opened another underground mine at the Copper Mountain site. The two underground mines now operating are the Quien Sabe and White Spar No. 1.

The primary uses of the feldspar were for scouring soaps and abrasives. A large part of the output is shipped to Faultless Starch Co. in Kansas City, Mo. The operation is the only one in the State and has eight employees.

Gem Stones.—The value of gem stones produced in Wyoming in 1974 was estimated at $140,000, a slight decline compared to the $142,000 in 1973.

The Majestic Jade Co., a subsidiary of NORCO Oil Corp. at Riverton and the only commercial operator in the State, has five active mines on the Vera Irene claim north of Jeffrey City in Fremont County, and a plant south of Riverton. The company, which has been making jewelry, has ventured into the furniture business by manufacturing jade table tops. This is the only company in the United States to manufacture jade table tops. A company official stated that this is one way of utilizing the 96% of the jade mined not suitable for jewelry.

Gypsum.—There were only three active producers in 1974, one each in Albany, Big Horn and Park Counties. Total output rose, continuing the upward trend of production. Big Horn and Park Counties accounted for more than 90% of the year's output. According to the State Inspector of Mines annual report, Georgia-Pacific Corp. in Lovell and The Celotex Corp. near Cody produced 165,000 tons and 137,000 tons, respectively. Wyoming ranked 17th out of 30 States which produced calcined gypsum.

Lime.—Holly Sugar Corp. and Great Western Sugar Co. produced lime in Big Horn, Goshen, and Washakie Counties for use in sugar refining. Output decreased 3% below the 1973 record, to 29,000 tons. Consumption of lime in Wyoming was 35,060 tons.

Phosphate Rock.—Marketable production of phosphate rock increased about 33% in tonnage and 63% in per ton value compared to 1973. The Leefe mine of Stauffer Chemical Co. of Wyoming in Lincoln County remained the State's only producer. According to the State Inspector of Mines annual report, Dravo-Soda Springs, the mining contractor for Monsanto Chemical Co. in Idaho, was developing an open pit mine in Lincoln County.

Sand and Gravel.—The number of sand and gravel operations and the total output both decreased in 1974. The total value was $9.5 million, compared with $11.6 million in 1973. Sand production decreased to 1.5 million tons, compared with 2.13 million tons in 1973. The average price of sand was $1.58 per ton, a decrease of 36% compared with the 1973 price. Gravel production dropped to about 4.0 million tons in 1974 from 4.1 million tons the previous year. The average price per ton of gravel increased to $1.76 from $1.58 in 1973. A major part of the sand and gravel was used in paving.

Table 10.—Wyoming: Construction aggregate[1] sold or used by producers, by county

(Thousand short tons and thousand dollars)

County	1973			1974		
	Number of mines	Quantity	Value	Number of mines	Quantity	Value
Albany	8	247	197	6	131	152
Big Horn	4	39	62	2	W	W
Carbon	4	226	370	6	304	716
Crook	2	W	W	1	W	W
Fremont	8	W	W	10	1,071	1,668
Goshen	3	W	W	2	W	W
Hot Springs	2	27	45	1	15	32
Johnson	3	124	W	2	W	W
Laramie	8	338	W	5	445	1,203
Lincoln	3	24	37	1	13	27
Natrona	9	701	941	4	685	1,677
Park	4	148	172	3	92	168
Platte	1	56	56	1	W	W
Sheridan	3	40	W	2	W	W
Sublette	2	W	W	3	1,194	953
Sweetwater	7	485	1,015	7	911	1,820
Teton	2	W	W	4	W	W
Uinta	1	16	19	1	54	102
Washakie	3	41	64	2	W	W
Weston	3	64	59	3	142	180
Other counties[2]	8	3,625	8,600	--	474	811
Total[3]	88	6,201	11,685	66	5,532	9,508

W Withheld to avoid disclosing individual company confidential data; included with "Other counties".

[1] Construction aggregate is a sand and gravel blend.

[2] Also includes production from Campbell, Converse, and Niobrara Counties, in 1973.

[3] Data may not add to totals shown because of independent rounding.

Table 11.—Wyoming: Construction and industrial sand and gravel sold or used by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction:				
Processed: Sand	6,201	11,685	1,461	2,305
Processed: Gravel			3,895	6,962
Unprocessed: Sand and gravel			175	215
Industrial: Sand	--	--	1	6
Industrial: Gravel			--	--
Total	6,201	11,635	5,532	9,488

[1] Value data may not be directly comparable to those in tables 1, 12, and 13 because unit value of construction aggregate may be higher than the individual unit values for sand or gravel.

Table 12.—Wyoming: Construction aggregate and industrial sand and gravel sold or used commercially by producers

(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value[1]
Construction aggregate: Nonresidential and residential construction	2,918	4,011	960	2,351
Highway and bridge construction			47	70
Other uses (dams, waterworks, airports, etc.)			310	704
Concrete products (cement blocks, bricks, pipe, etc.)			147	277
Bituminous paving (asphalt and tar paving)			1,412	1,637
Roadbase and subbase			253	565
Unprocessed aggregate			175	215
Fill	164	143	293	283
Other uses[2]	336	321	1	1
Industrial sand and gravel	--	--	1	6
Total	3,418	4,475	3,599	6,109

[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

[2] Includes railroad ballast and miscellaneous (1973.)

Table 13.—Wyoming: Construction aggregate sold or used for publicly funded projects by producers
(Thousand short tons and thousand dollars)

Use	1973		1974	
	Quantity	Value	Quantity	Value [1]
Construction aggregate:				
Nonresidential and residential construction			13	33
Highway and bridge construction			357	668
Other uses (dams, waterworks, airports, etc.)			30	84
Concrete products (cement blocks, bricks, pipe, etc.)	2,706	6,948	--	--
Bituminous paving (asphalt and tar paving)			992	1,795
Roadbase and subbase			540	815
Unprocessed aggregate			--	--
Fill	71	209	W	W
Other	6	3	1	3
Total	2,783	7,160	1,933	3,398

W Withheld to avoid disclosing individual company confidential data; included with "Other uses."
[1] Unit value of construction aggregate may be higher than unit value of sand or gravel.

Sodium Carbonate.—Wyoming continued to rank as the Nation's principal producer of sodium carbonate. According to the State Inspector of Mines, the three trona mining companies had a total output of 7.6 million tons of trona from which the sodium carbonate was produced. The producers according to rank were FMC Corp., Stauffer Chemical Co., of Wyoming, and Allied Chemical Corp. At yearend they had a total production capacity of approximately 4.35 million tons of sodium carbonate per year. The total sodium carbonate processed from the trona in 1974 rose about 10%.

The new million-ton-per-year trona refinery planned by Texas Gulf, Inc., at Green River was granted conditional approval by the Environmental Protection Agency. Emissions of particulate matter and sulfur dioxide from the boilers and trona dryers are not expected to exceed limits set by the State and EPA; however, since the facility will add emissions to those currently being produced by FMC, Allied Chemical, and Stauffer Chemical refining plants, EPA officials recommended that Texas Gulf emissions be monitored. The administrator of the Wyoming Division of Air Quality requested that additional controls be installed on the trona dryers to reduce emissions and said that additional particulate matter controls may be necessary in order to control the downwind accumulations since the plants of Texas Gulf, FMC, and Allied are directly in line with each other and parallel the prevailing west to northwesterly winds in the area.

Work was progressing well at the Texas Gulf $75 million trona mining and soda ash project. When completed in 1976, the operation is designed to process 1.8 million tons of trona to yield 1 million tons of soda ash annually. The Cementation Co. of America, Inc., continued sinking the No. 2 shaft, reaching a depth of 1,100 feet of the projected 1,500-foot shaft. Stearns-Roger, Inc., started construction of the hoist house for the shaft. The Union Pacific Railroad Co. completed the rail spur to the plant site, and Brown & Root, Inc., had about 150 persons employed in the construction of the plant.

An organizational change in the Stauffer Chemical Corp. in Green River was brought about due to the increased size and complexity of the plant. Stauffer Chemical Corp. established its subsidiary, Stauffer Chemical Co. of Wyoming, as a separate operating division as of January 14, 1974. The company, which is jointly owned by Stauffer Chemical Corp. and the Union Pacific Mining Corp., has expanded its operations five times in the last 10 years and is presently conducting engineering studies on another major expansion.

According to the State Inspector of Mines, expansion at the FMC Corp. plant is nearly 40% complete with American Bechtel as contractor. The project is scheduled for completion in late 1975 and will add 750,000 tons of refining capacity, bringing the total capacity to 2.5 million tons. Another contractor, Dravo Corp., has completed the first of two 22-foot-diameter shafts to a depth of 1,600 feet. When the second shaft is completed there will be seven shafts operating at the Westvaco mine.

The No. 3 shaft of Allied Chemical was

completed by Centennial Development Co. The 1,600-foot-deep, 20-foot-diameter shaft was equipped with a 3,750-horsepower Koepe-type hoist and will be used primarily as a production shaft according to company officials. Other plant expansion by the Lummus Co. is scheduled for completion in 1975 and will bring the plant capacity to 2.2 million tons of refined soda ash.

Stone.—The production of stone was 2.4 million tons, down 25% from the 1973 production. Unit value, however, was up to $2.51 per ton, compared with $2.10 per ton in 1973. Granite again comprised the largest part of the total output and was produced at five quarries. Other stone, by production rank and number of quarries, follows: Dolomite 1, limestone 8, other stone 1, marble 1, and sandstone 5. Twenty quarries produced crushed and broken stone, and one produced dimension stone. Most stone was used as railroad ballast. Other major uses of the stone were in sugar refining, in bitumen aggregate, and as rip rap.

According to the State Inspector of Mines, Basins Engineering Co., Inc., Wyoming's largest producer of building and ornamental processed marble, sold 67,000 tons of stone in 1974. The production was 10% greater than that reported to the State in 1973.

Table 14.—Wyoming: Stone sold or used by producers, by county
(Thousand short tons and thousand dollars)

County	1973			1974			Kind of stone produced in 1974
	Number of quarries	Quantity	Value	Number of quarries	Quantity	Value	
Albany	5	W	256	5	283	270	Limestone, granite, sandstone.
Carbon	--	--	--	1	80	166	Limestone.
Fremont	5	W	W	4	53	104	Sandstone.
Laramie	2	928	W	2	W	W	Limestone, granite.
Natrona	2	131	128	1	21	67	Limestone.
Park	1	(1)	2	--	--	--	
Uinta	1	W	18	--	--	--	
Washakie	1	(1)	(1)	1	1	4	Granite.
Undistributed [2]	10	2,133	6,312	7	1,946	5,379	
Total [3]	27	3,191	6,716	21	2,384	[4]5,989	

W Withheld to avoid disclosing individual company confidential data; included with "Undistributed."
[1] Less than ½ unit.
[2] Includes production for Crook, Platte, Sheridan, Teton, and counties for which no breakdown is available (1973).
[3] Data may not add to totals shown because of independent rounding.
[4] Data represent crushed and broken stone only.

Sulfur.—Shipments of recovered elemental sulfur, a coproduct of sour natural gas, increased from 49,000 long tons in 1973 to 52,000 long tons in 1974. Park and Fremont Counties accounted for over 90% of the shipments. Four plants were in operation at yearend.

METALS

Copper.—Ambrose Walsh, New York consultant for American Metal Climax (AMAX), and James Cooper, manager of AMAX's Kirwin project near Meeteetse, have predicted that Wyoming's first large-scale copper mine will begin operating in 5 years. When in full production, the mine will turn out 21,000 tons of copper concentrate per year and employ a permanent work force of about 340. The concentrate will be trucked to railroad points in the Big Horn Basin and shipped to a smelter for refining.

Iron Ore.—Iron ore shipments rose to 2.4 million tons in 1974 compared with 2.3 million tons in 1973, according to published reports in Skillings' Mining Review of February 15 and March 15, 1975. United States Steel Corp. reported a peak shipment of 1,867,000 tons of pellets from its Atlantic City taconite operation near Lander.[5] The company employs 545 persons

[5] Skillings' Mining Review. U.S. Steel—Iron Ore Shipment From Its Western Operations. V. 64, No. 7, Feb. 15, 1975, p. 21.

at its open pit mine and beneficiation plant.

The State continued to have three mines in operation. The operators, listed according to size, and their locations, are U.S. Steel, Fremont County; CF&I Steel Corp., Platte County; and Maxwell Mining Co., Albany County.

Uranium.—Wyoming dropped to second place in national ranking after leading the Nation in production in 1973. According to the State Inspector of Mines' report, Wyoming's production in 1974 was 7.5 million pounds, down from 10 million pounds reported in 1973. The reduction in output was a result of the curtailment of mining and milling operations in both Shirley Basin and Crooks Gap.

Kerr-McGee Nuclear Corp. shifted emphasis of its Wyoming uranium operations from the Shirley Basin area to the Powder River Basin. The company closed operations during the year at its Sullivan mine, and final reclamation of the land was in progress. The drilling of the mine shaft at the Bill Smith mine in the Powder River Basin was near completion depth of 950 feet at yearend, and ore production from the mine was scheduled to be underway by late 1975 or early 1976. The mine is located about 40 miles northeast of Casper.

The shaft at Exxon's Highland uranium mine was completed at a total depth of 704 feet. The shaft was designed to serve two underground mines. Contractors still have to complete 11,000 feet of underground tunneling for the mines before the project is turned over to Exxon personnel. Projected plans were for ore production to start the latter part of 1976 and reach full capacity of about 1 million tons annually by 1977. Location of the operation is northwest of Douglas in Converse County.

American Nuclear Corp. president Cotter Ferguson announced the sale to the Tennessee Valley Authority (TVA) of one-half of the corporation's mineral interest in about 530 unpatented mining claims and 37,900 net acres of fee and State leases and mineral rights on uranium lands located primarily in the Powder River Basin. TVA as part of the transaction acquired an undivided 50% interest in coal rights in Wyoming. The newly acquired properties include mineral rights pertaining to uranium and coal on the Brown Ranch, one of the last extensive areas in the Powder River Basin not previously under lease. TVA and American Nuclear agreed to enter into an accelerated and expanded exploration program to identify sufficient reserves to warrant production in or before 1980 if the demand for urnauim reaches project expectations.

Western Nuclear Inc. started a $20.3 million project for city improvements, upgrading mill facilities, and developing uranium reserves in the Jeffrey City area. The mine expansion part of the project will be mainly concentrated in the Crooks Gap area; however, extensive shaft work is also planned for the Sheep Mountain operation. Drilling information acquired by early spring indicated that ore reserves at the new site contain about 11.5 million pounds of uranium. Bids were requested for construction of a changehouse and hoist building near the mill. Some of the town improvements include street paving, sidewalk construction, adding permanent housing, and upgrading utilities.

Work was started at Utah International's new uranium mine located in the Crooks Gap area. The initial project includes the sinking of a production shaft for mine No. 1.

A foreign company, Parnasse Co., Inc., of Paris, France, entered into an agreement with Timberline Minerals, Inc., for the transfer of 250 uranium claims on Copper Mountain in northeast Fremont County. Timberline reportedly will retain 20% interest in the property and will receive a 3% royalty on certain production.

Petrotomics Co. stopped operations at its uranium mill in the Shirley Basin after processing the remainder of the company stockpile. The mill also processed the ore from Kerr-McGee's Sullivan mine which closed during the year. The mill will be maintained on a standby basis pending future mining development in the area.

Silver Bell Industries, Inc., of Denver leased the last 6,000 acres of the firm's 120,000 acres in Colorado, Wyoming, and Utah. The acreage in Wyoming's Shirley Basin was leased to Wyoming Minerals Corp., a wholly owned subsidiary of Westinghouse Corp., for exploration and development. An evaluation of the acreage by an independent geologist indicated more than 1 million pounds of uranium in ore present.

Table 15.—Principal producers

Commodity and company	Address	Type of activity	County
Cement: Monolith Portland Midwest Co.[1]	3326 San Fernando Rd. Los Angeles, Calif. 90065	Plant	Albany.
Clays:			
American Colloid Co	5100 Suffield Ct. Skokie, Ill. 60076	Pits and plants	Big Horn, Crook, Weston.
Dresser Industries, Inc	P.O. Box 6504 Houston, Tex. 77005	do	Big Horn.
Federal Bentonite Co	4614 Prospect Ave. Cleveland, Ohio 44103	do	Crook and Weston.
International Minerals & Chemical Corp.	5401 Old Orchard Rd. Skokie, Ill. 60076	do	Crook.
NL Industries, Inc	P.O. Box 1675 Houston, Tex. 77001	do	Crook and Weston.
Wyo-Ben Products, Inc	P.O. Box 1979 Billings, Mont. 59103	do	Big Horn.
Coal, bituminous:			
Arch Minerals Corp	P.O. Box 459 Hanna, Wyo. 82327	Strip mines	Carbon.
Kemmerer Coal Co	Frontier, Wyo. 83121	Strip mines and plant.	Lincoln.
Pacific Power & Light Co	920 SW. Sixth Ave. Portland, Oreg. 97204	Strip mines	Converse.
Rosebud Coal Sales Co	P.O. Box 398 Hanna, Wyo. 82327	do	Carbon.
Gypsum:			
The Celotex Corp	1500 North Dale Mabry Tampa, Fla. 33607	Surface mine and plant.	Park.
Georgia-Pacific Corp	900 SW. Fifth Ave. Portland, Oreg. 97204	do	Big Horn.
Wyoming Construction Co.[2]	P.O. Box 907 Laramie, Wyo. 82070	Surface mine	Albany.
Iron ore:			
CF&I Steel Corp	P.O. Box 316 Pueblo, Colo. 81002	Underground mine and plant.	Platte.
United States Steel Corp	Lander, Wyo. 82520	Open pit mine and plant.	Fremont.
Lime:			
The Great Western Sugar Co.[2]	P.O. Box 5308 Denver, Colo. 80215	Plant	Big Horn.
Holly Sugar Corp	Holly Sugar Bldg. Colorado Springs, Colo. 80902	do	Washakie.
Natural gas and petroleum: [3]			
Phosphate rock: Stauffer Co. of Wyoming.[4]	636 California St. San Francisco, Calif. 94108	Open pit mine and plant.	Lincoln.
Sand and gravel:			
Gilpatrick Construction Co., Inc.	P.O. Box 973 Riverton, Wyo. 82501	Pit	Sublette.
Peter Kiewit & Sons Co	P.O. Box 1009 Sheridan, Wyo. 82801	Pits	Natrona and Sweetwater.
Rissler-McMurry Co., Inc	P.O. Box 2499 Casper, Wyo. 82602	Pits	Carbon, Fremont, Natrona.
Teton Construction Co	P.O. Box 3243 Cheyenne, Wyo. 82001	Pit	Laramie.
Sodium carbonate:			
Allied Chemical Corp	P.O. Box 70 Morristown, N.J. 07960	Underground mine and plant.	Sweetwater.
FMC Corp	P.O. Box 872 Green River, Wyo. 82935	do	Do.
Stone:			
Guernsey Stone Co	P.O. Box 337 Guernsey, Wyo. 82214	Quarry	Platte.
Union Pacific Railroad Co	1416 Dodge St. Omaha, Nebr. 68102	do	Laramie.
Uranium: Utah International Inc.	P.O. Box 831 Riverton, Wyo. 82501	Open pit and underground mines, and plants.	Carbon and Fremont.

[1] Also clays.
[2] Also stone.
[3] Most of the major oil and gas companies and many smaller companies operate in Wyoming, and several commercial directories contain complete lists of them.
[4] Also sodium carbonate.