

The Mineral Industry of Puerto Rico, the Virgin Islands, and Pacific Island Possessions

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the Department of Natural Resources of the Commonwealth of Puerto Rico for collecting information on all nonfuel minerals.

By Doss H. White, Jr.¹ and John W. Sweeney²

PUERTO RICO

Mineral production in Puerto Rico in 1978 and 1979 added \$132.9 million and \$135.5 million, respectively, to the Island's economy. Puerto Rican nonfuel mineral production was restricted primarily to minerals used directly or indirectly in construction.

Trends and Developments.—The construction industry in Puerto Rico experienced a decline in activity from 1974

through 1977. Conditions improved in 1978 when construction permits increased 23% to a total value of \$444 million. As a result, construction employment and sales of construction materials showed positive signs of recovery for the first time since the recession began. In 1978, production of all mineral commodities increased, with the exception of salt, which remained the same as in the previous year.

Table 1.—Nonfuel mineral production in Puerto Rico¹

Mineral	1977		1978		1979	
	Quantity	Value (thousands)	Quantity	Value (thousands)	Quantity	Value (thousands)
Cement, portland thousand short tons	1,367	\$67,775	1,442	\$78,981	1,406	\$70,197
Clays ----- do -----	272	387	286	544	260	556
Lime ----- do -----	40	3,007	41	3,249	37	3,307
Salt ----- do -----	27	639	27	639	27	639
Sand and gravel ----- do -----	^c 12,000	^e 21,000	NA	NA	NA	NA
Stone:						
Crushed ----- do -----	12,043	42,648	13,765	47,611	14,747	59,733
Dimension ----- do -----	144	1,633	143	1,898	79	1,105
Total -----	XX	137,089	XX	² 132,922	XX	² 135,537

^cEstimate. NA Not available. XX Not applicable.

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

²Total does not include value of items not available.

Table 2.—Value of nonfuel mineral production in Puerto Rico, by district

(Thousands)

District	1977	1978	Minerals produced in 1978 in order of value
Aguadilla -----	\$981	W	Stone.
Arecibo -----	W	W	Do.
Humacao -----	W	W	Do.
Mayaguez -----	2,781	\$2,864	Stone and salt.
Ponce -----	W	W	Cement, lime, stone, clays.
San Juan -----	W	W	Cement, stone, clays.
Undistributed ¹ -----	133,324	130,057	
Total ² -----	137,089	³ 132,922	

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

¹Includes some stone and sand and gravel (1977) that cannot be assigned to specific districts, and values indicated by symbol W.

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

³Incomplete total, excludes value of sand and gravel.

The upward trend continued through the first quarter of 1979. However, severe rains from mid-April through September severely hampered construction when rainfall exceeded the average annual rate by 51%. The Island was hit by two hurricanes in August, seriously disrupting construction activities. In October, a strike by independent truckers that lasted 5 weeks virtually paralyzed the Island's construction industry. The weather conditions and truckers' strike created a \$160 million backlog in construction.

The development of the Utado-Adjuntas-Lares porphyry copper deposits of west-central Puerto Rico continued to be of prime interest to the Commonwealth. Discussions between Government representatives and the Kennecott Copper Corp.-AMAX partnership through 1979 did not significantly change the basic technical proposals; however, allocation of revenues among the companies and the Commonwealth was a major point of concern. The deposits collectively contain about 250 million short tons of ore averaging 0.7% copper. The average annual output of refined copper over a 30-year mine life would be over 58,000 tons with significant recovery of byproduct silver, gold, and sulfuric acid.

Estimates of development costs prepared by the Commonwealth in September 1977 indicated that the total capital investment for the project would be approximately \$500 million. About 2,000 persons would be employed in the first 3-year development stage. Later, 800 to 1,000 persons would be employed annually.

The Commonwealth and Universal Oil Products Co. (UOP) continued an evaluation of the Guanajibo nickel laterites near Ma-

yaguez. In 1978, bulk samples were sent to UOP's facilities in Tucson, Ariz., for further metallurgical testing. In addition, a small sample was sent to the Federal Bureau of Mines Metallurgy Research Center at Albany, Oreg., for evaluation using a Bureau-developed recovery process. The reserves are estimated at 200 million tons at a grade of 0.9% nickel and 0.09% cobalt. At the end of 1979, no decision had been reached on development.

Legislation and Government Programs.—The U.S. Department of Commerce accepted Puerto Rico's Coastal Zone Management Program. It cited the program as a model tailored to meet the Island's problems, and allocated a \$1,474,000 grant for program management.

In 1978 and 1979, the Puerto Rican Department of Natural Resources and the U.S. Geological Survey investigated offshore sand deposits. Bulk samples for four potential offshore sand deposits were sent to the Puerto Rico Highway Authority to determine suitability for making concrete. Investigation continued on the resources and environmental consequences of sand recovery in the Cabo Rojo area.

The Puerto Rican Government, through its Department of Natural Resources, collected a royalty for sand and gravel produced from public lands. These royalty assessments are \$0.45 per cubic meter for sand and gravel, \$0.75 per cubic meter for unprocessed river-run sand, and \$0.20 per cubic meter for fill material. A \$250 annual extraction permit was required from all operations extracting sand and gravel from either public or private lands. The royalty payment through December 1978 was \$129,320.

REVIEW BY NONFUEL MINERAL COMMODITIES

Cement.—The Puerto Rican Cement Co., Inc., at Ponce and the San Juan Cement Co., Inc., at Dorado produced portland cement using the wet grinding process.

Although the value of cement sales in 1979 exceeded that of 1978, production declined because of the decreased activity in the construction industry. This was caused by abnormal weather conditions and a truckers' strike, resulting in a drop in sales of over 1.5 million bags of cement.

Table 3.—Puerto Rico: Portland cement salient statistics

	1978	1979
Number of active plants	2	2
Production	1,495,207	1,412,769
Shipments from mills:		
Quantity	1,441,626	1,406,214
Value	\$78,981,428	\$70,197,172
Stocks at mills, Dec. 31	30,657	37,212

Clays.—In 1978 and 1979, the Puerto Rican Cement Co., Inc., and the San Juan Cement Co., Inc., produced common clay for use in cement manufacturing.

Graphite.—Union Carbide Corp. manufactured synthetic graphite electrodes at the Yabucoa facility from petroleum coke obtained from the company's Penuelas operation.

Lime.—Chemical grade lime was produced by the Puerto Rican Cement Co., Inc., at the Ponce facility. The lime was marketed in Puerto Rico and the Virgin Islands primarily for water purification, sugar refining, and S-type mason's lime for construction and plastering in tropical climates.

Salt.—Three companies recovered salt from the solar evaporation of seawater. Production for the 2-year period remained about the same as in previous years.

Sand and Gravel.—Sand and gravel was produced for construction purposes by commercial and Government operators.

Stone.—In 1978 and 1979, the stone industry produced crushed limestone, marble, traprock, and granite for road building, concrete aggregate, and other construction-related uses.

Sulfur.—Commonwealth Oil Refining Co. and Puerto Rico Sun Oil Co. recovered elemental sulfur as a byproduct of oil refining.

Table 4.—Puerto Rico: Crushed stone¹ sold or used by producers, by use

(Thousand short tons and thousand dollars)

Use	1977		1978		1979	
	Quantity	Value	Quantity	Value	Quantity	Value
Agricultural limestone	—	—	—	—	49	106
Concrete aggregate	¹ 1,027	² 2,673	1,340	3,504	1,229	3,739
Bituminous aggregate	202	607	232	694	444	1,729
Macadam aggregate	W	W	28	65	23	50
Dense-graded roadbase stone	180	403	270	639	211	650
Other construction aggregate and roadstone	7,721	33,678	8,849	37,281	9,823	47,233
Manufactured fine aggregate (stone sand)	¹ 17	¹ 44	—	—	W	W
Terrazzo and exposed aggregate	57	281	76	423	48	445
Other uses ²	2,839	4,962	2,970	5,003	2,919	5,781
Total³	12,043	42,648	13,765	47,611	14,747	59,733

¹Revised. W Withheld to avoid disclosing company proprietary data; included with "Other uses."

²Includes limestone, granite, marble, and traprock.

³Includes stone used for surface treatment aggregate, filter stone (1979), cement manufacture, lime manufacture, asphalt filler (1977 and 1979), and roofing granules.

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

VIRGIN ISLANDS

The U.S. Virgin Islands, purchased from Denmark in 1917 for \$25 million, are part of the Antilles, which form the boundary between the Caribbean Sea and the Atlantic Ocean. The island group, located about 34 miles east of Puerto Rico, consists of 3 large

and 62 small islands covering an area of 133 square miles. The three main islands, St. Croix, St. Thomas, and St. John, dominate the commercial activity of the group.

Basalt (traprock), crushed for use as concrete aggregate and roadstone, was the

primary mineral commodity produced. Two companies, Caribbean Materials Supply Co. and St. Croix Stone and Sand Co., accounted for the total production.

Martin Marietta Aluminum Co. continued work on expanding the St. Croix alumina facility. When completed, plant

capacity will increase from 550,000 to 700,000 tons per year. The plant uses bauxite from Guinea to produce alumina, which was imported by aluminum producers in the United States, Norway, and the Soviet Union.

PACIFIC ISLAND POSSESSIONS

American Samoa.—American Samoa consists of Tutuila, Swains, and five smaller islands approximately 3,500 miles west of Australia and 2,200 miles southwest of Hawaii. About 80% of the 31,000 Samoans live on Tutuila, the principal island in the group. Virtually all of the mineral production, restricted to volcanic cinder and coral, was from Tutuila Island.

Guam.—Located at the southern end of the Mariana chain, 1,500 miles north of New Guinea, Guam is the largest island in the group. The northern half of the island is

an elevated coral and limestone plateau, while the southern half is underlain by volcanic rock. Guam has an area of 209 square miles and a population of approximately 100,000. Crushed stone was the major mineral commodity produced in 1978 and 1979. During this period, Hawaiian Rock Products Co., Perez Bros., Inc., Pacific Rock Corp., and the Guam Department of Public Works produced crushed limestone from six quarries. This material was utilized domestically by the construction industry.

TRUST TERRITORY OF THE PACIFIC ISLANDS

This Territory comprises about 2,000 islands with a land area of 1,335 square miles. The islands, commonly called Micronesia, were transferred to United States stewardship by the United Nations in 1947 under an agreement that will expire in 1981. In 1975, the Northern Mariana Islands voted to leave the Trust Territory and become a United States commonwealth. This status, achieved in January 1978, grants increased self-government, but retains protection by the United States. The 14 islands comprising the Northern Marianas have a land area of 182 square miles and a population estimated at over 16,000, with the majority

concentrated on Saipan Island.

The Japanese controlled the Territory from 1919 until 1945 and were active in mineral exploration and the mining of bauxite, manganese, and phosphate. In recent years, mineral production has been restricted to construction materials such as volcanic rock, limestone, sand, and coral. Aggregate shipments are common between islands, because some of them are deficient in aggregate material.

¹State mineral specialist, Bureau of Mines, Pittsburgh, Pa.

²Supervisory mining engineer, Bureau of Mines, Tuscaloosa, Ala.