

THE MINERAL INDUSTRY OF NORTH CAROLINA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the North Carolina Geological Survey for collecting information on all nonfuel minerals.

In 1997, North Carolina ranked 20th nationally in total nonfuel mineral production value,¹ according to the U.S. Geological Survey (USGS). The State was 18th in 1996. The estimated value for 1997 was \$758 million, a nearly 10% increase from that of 1996. This followed a 6.1% decrease from 1995 to 1996 (based on final 1996 data). The State accounted for almost 2% of the U.S. total nonfuel mineral production value.

In 1997, the increased values of crushed stone, construction sand and gravel, and common clays (*table 1*) combined to more than offset a substantial decrease in the production value of lithium minerals. Smaller increases in the values of phosphate rock and industrial sand and gravel also made significant contributions to the State's net increase in nonfuel mineral production value for the year. All other commodities increased in value in 1997 except for gemstones, olivine, and peat, which showed small decreases. In 1996, decreases in the values of phosphate rock, lithium minerals, and gemstones accounted for most of the year's drop in value. Only crushed stone showed a significant gain in value.

Based on 1997 USGS estimates of the quantities of minerals produced in the 50 States, North Carolina continued as the leading State in feldspar and crude mica production; first of two States that produced lithium minerals and olivine; third of four States that produce phosphate rock; fifth in talc and pyrophyllite; and sixth in kaolin. North Carolina remained 10th in dimension stone; rose to 8th from 10th in crushed stone; and dropped from 1st to 2nd in the production of common clays. North Carolina mines have produced exclusively industrial minerals since the early 1970's, particularly since the 1971 closing of the Tungsten Queen Mine, an underground tungsten mine in Vance County. Metal production in the State, especially that of primary aluminum, results from the processing of recycled materials or raw materials received from other domestic and foreign sources.

The following narrative information was provided by the North Carolina Geological Survey² and was based on publicly available

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending on the minerals or mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 1997 USGS mineral production data published in this chapter are estimates as of January 1998. For some commodities (for example, construction sand and gravel, crushed stone, and portland cement), estimates are updated periodically. To obtain the most current information, please contact the appropriate USGS mineral commodity specialist. Call MINES FaxBack at (703) 648-4999 from a fax machine with a touch-tone handset, and request Document # 1000 for a telephone listing of all mineral commodity specialists, or call USGS information at (703) 648-4000 for the specialist's name and number. This telephone listing may also be retrieved over the Internet at <http://minerals.er.usgs.gov/minerals/contacts/comdir.html>. All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved by way of MINES FaxBack or over the Internet at <http://minerals.er.usgs.gov/minerals/>.

²Jeffrey Reid, Chief Geologist, Division of Land Resources, authored the text of mineral industry information provided by the North Carolina Geological Survey.

10-K and company annual reports. Zemex is a niche producer of industrial minerals and metal products. Its major products include aluminum dross derivatives, feldspar, ferrous and nonferrous powders, kaolin, mica, sand, and talc. The industrial minerals segment consists of five wholly-owned subsidiaries as follows: The Feldspar Corp., Suzorite Mica Products Inc., Suzorite Mineral Products, Inc., Zemex Industrial Minerals, Inc. and Zemex Mica Corp. The group is collectively referred to as Zemex Industrial Minerals.

During 1997, considerable efforts by Zemex were directed to product development, marketing, capital expansion projects, and product quality improvement. Capital expenditures for Zemex were \$9.9 million in 1997 compared with \$11.9 million in 1996 and \$9.7 million in 1995. Major capital spending in 1997 included the completion of the sodium feldspar facility and the low-iron sand plant at Spruce Pine, NC.

Potash Corp. of Saskatchewan (PCS) mines phosphate ore and manufactures animal feed supplements, purified phosphoric acid (used in food products and industrial processes), and solid and liquid fertilizers. PCS conducts its phosphate operations primarily at two facilities, one near Aurora, NC, and the other near White Springs in northern Florida. PCS believes the Aurora facility to be the largest integrated phosphate mine and phosphate processing complex at one site in the world. The Aurora facility includes a 6-million-metric-ton-per-year mining operation, four sulfuric acid plants, four phosphoric acid plants, a liquid fertilizer plant, a superphosphoric acid plant, two diammonium phosphate (DAP) plants, and a solid fertilizer plant capable of producing DAP, granular triple superphosphate or monoammonium phosphate. PCS produces high purity phosphoric acid at Aurora in a joint venture with Albright and Wilson Americas.

According to PCS, the annual production capacity of the company's mines is currently 9.6 million tons of phosphate rock. During 1997, the Aurora facility's total production of phosphate rock was 4.8 million tons. The company generally operates its phosphate mine and phosphate processing plants 24 hours a day, 7 days a week, using rotating shifts.

Phosphate rock is the major input in the company's phosphorus processing operations. In addition to phosphate ore, the principal raw materials required by the company are sulfur, sulfuric acid, and ammonia.

The production of phosphoric acid requires substantial quantities of sulfur which PCS purchases from third parties. In December 1997, PCS entered into a 10-year supply contract with an offshore supplier to supply a portion of its sulfur requirements. PCS produces sulfuric acid on site and generally purchases very little sulfuric acid from unaffiliated sellers. Sulfur and sulfuric acid have been in abundant supply in recent years and remain so at the present time. In 1998, the company may transport surplus production of sulfuric acid at the White Springs facility to the

Aurora facility as needed.

Substantially all of the phosphate rock produced by the company is used internally for the production of phosphoric acid, superphosphoric acid, chemical fertilizers, purified phosphoric acid, and animal feed products.

According to PCS, its Aurora phosphate mine had estimated proven and probable reserves of approximately 393 million tons of phosphate rock at an average grade of 30.7% P₂O₅. These reserves would permit mining to continue at current rates for about 75 years. The Aurora phosphate mine has an estimated annual capacity of 6.0 million tons of phosphate rock and its processing plants have the capacity to produce 1.152 million tons of phosphoric acid (as P₂O₅).

PCS receives ammonia for its phosphate operations at Aurora through its ammonia terminal in Savannah, GA. The ammonia is shipped by rail from Savannah to the Aurora facility.

A significant portion of the PCS phosphate reserves in Aurora is located in wetlands. Under the U.S. Federal Clean Water Act, a permit must be obtained from the U.S. Army Corps of Engineers (the Corps) before mining activity that will disturb the wetlands may occur. PCS requested that an alternative that would disturb the least amount of wetlands be approved by the Corps and that

a permit be issued. In 1997, PCS received its required authorizations from the State of North Carolina and on August 14, 1997, the Corps issued a permit granting approval through 2017 to mine certain areas described in a Environmental Impact Statement. The permit contains a section on wetlands mitigation approach and methods regarding wetland impacts associated with mining covered by the permit. PCS has recently acquired additional land adjacent to its Aurora facilities for this purpose. In order to demonstrate the feasibility of such activities, as of December 31, 1997, PCS had created or restored 979 hectares of wetlands.

In addition to the wetlands permit from the Corps, the PCS also needs additional authorizations from North Carolina to continue its mining activities. PCS is required to have State mining permits that contain bonding and reclamation requirements. PCS has a State mining permit for the areas presently being mined by the company that is effective through 2003, but this permit must be amended periodically to add additional areas during this period. PCS also holds another mining permit from the State for the area of the property that contains the wetlands covered by the permit issued by the Corps. This State permit has been renewed until 2005.

TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN NORTH CAROLINA 1/ 2/

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral	1995		1996		1997 p/	
	Quantity	Value	Quantity	Value	Quantity	Value
Clays, common	2,430	12,500	2,400	12,400	2,550	23,700
Feldspar metric tons	497,000	18,400	481,000	18,400	481,000	19,000
Gemstones	NA	4,440	NA	693	NA	581
Mica, crude	74	3,690	62	4,900	56	5,050
Peat	19	340	15	311	11	225
Sand and gravel:						
Construction	10,100	50,100	10,000	50,500	12,800	66,000
Industrial	1,330	21,900	1,500	21,700	1,550	23,600
Stone:						
Crushed	57,300	384,000	57,200	394,000	66,000	460,000
Dimension	41,100 3/	15,400 3/	37,300	14,300	37,500	14,300
Combined value of clays (kaolin), lithium minerals, olivine, phosphate rock, stone [dimension quartzite, sandstone, slate and miscellaneous (1995)], and talc and pyrophyllite	XX	225,000	XX	172,000	XX	144,000
Total	XX	735,000	XX	690,000	XX	758,000

p/ Preliminary. NA Not available. XX Not applicable.

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

2/ Data are rounded to three significant digits; may not add to totals shown.

3/ Excludes certain stones; value included with "Combined value" data.

TABLE 2
NORTH CAROLINA: CRUSHED STONE SOLD OR USED, BY KIND 1/

Kind	1995				1996			
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Unit value
Limestone	12	5,680	\$38,800	\$6.83	11	6,250	\$43,200	\$6.91
Dolomite	1	265	1,820	6.86	1	251	1,720	6.85
Calcareous marl	3	135	942	6.98	3	131	917	7.00
Granite	72 r/	43,600 r/	288,000 r/	6.62	71	42,400	289,000	6.83
Traprock	7	4,540	30,600	6.74	7	4,500	31,300	6.94
Slate	2	W	W	7.39	3	W	W	7.35
Volcanic cinder and scoria	1	W	W	7.21	1	W	W	7.39
Quartzite	2	W	W	6.70	2	W	W	7.09
Miscellaneous stone	1 r/	W	W	8.00 r/	1	W	W	8.20
Total	XX	57,300	384,000	6.69	XX	57,200	394,000	6.89

r/ Revised. W Withheld to avoid disclosing company proprietary data; included in "Total." XX Not applicable.

1/ Data are rounded to three significant digits; may not add to totals shown.

TABLE 3
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 1996, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Coarse aggregate (+1 1/2 inch):			
Macadam	20	\$138	\$6.90
Riprap and jetty stone	618	5,210	8.43
Filter stone	297	2,060	6.92
Other coarse aggregate	48	361	7.52
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,290	24,300	7.38
Bituminous aggregate, coarse	1,770	14,400	8.15
Bituminous surface-treatment aggregate	1,240	9,200	7.40
Railroad ballast	1,440	7,400	5.14
Other graded coarse aggregate	W	W	8.85
Fine aggregate (-3/8 inch):			
Stone sand, concrete	403	2,010	4.98
Stone sand, bituminous mix or seal	743	4,220	5.68
Screening, undesignated	1,270	7,930	6.24
Other fine aggregate	W	W	6.31
Coarse and fine aggregates:			
Graded road base or subbase	8,200	48,500	5.92
Unpaved road surfacing	581	3,680	6.34
Terrazzo and exposed aggregate	W	W	12.95
Crusher run or fill or waste	973	5,650	5.80
Other coarse and fine aggregates	W	W	5.43
Other construction materials 3/	3,740	26,400	7.06
Agricultural:			
Agricultural limestone	(4/)	(4/)	5.56
Poultry grit and mineral food	(4/)	(4/)	4.00
Other agricultural uses	(4/)	(4/)	6.00
Special:			
Mine dusting or acid water treatment	(4/)	(4/)	8.85
Other specified uses not listed	(4/)	(4/)	6.61
Unspecified: 5/			
Actual	31,200	223,000	7.16
Estimated	1,270	8,190	6.45
Total	57,200	394,000	6.89

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Includes calcareous marl, dolomite, granite, limestone, miscellaneous stone, quartzite, slate, traprock, and volcanic cinder and scoria.

2/ Data are rounded to three significant digits except unit value; may not add to totals shown.

3/ Includes lightweight aggregate (slate).

4/ Withheld to avoid disclosing company proprietary data; included in "Total."

5/ Includes production reported without a breakdown by end use and with estimates for nonrespondents.

TABLE 4
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 1996,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction aggregates:						
Coarse aggregate (+1 1/2 inch) 2/	303	2,390	(3/)	(3/)	(3/)	(3/)
Coarse aggregate, graded 4/	2,950	20,300	W	W	W	W
Fine aggregate (-3/8 inch) 5/	892	5,960	W	W	W	W
Coarse and fine aggregate 6/	3,970	25,100	W	W	W	W
Other construction materials 7/	48	324	12,100	81,000	3,680	21,500
Agricultural 8/	(3/)	(3/)	(3/)	(3/)	(3/)	(3/)
Special 9/	(3/)	(3/)	--	--	--	--
Unspecified 10/						
Actual	48	337	18,100	128,000	13,000	94,700
Estimated	385	2,290	62	379	822	5,530
Total	8,730	57,600	30,700	213,000	17,800	123,000

W Withheld to avoid disclosing company proprietary data; included with "Other construction materials."

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.

3/ Withheld to avoid disclosing company proprietary data; included in "Total."

4/ Includes concrete aggregate (coarse), bituminous aggregate (coarse), bituminous surface-treatment aggregate, railroad ballast, and other graded coarse aggregate.

5/ Includes stone sand (concrete), stone sand (bituminous mix or seal), screening (undesignated), and other fine aggregate.

6/ Includes graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, crusher run (select material or fill), and other coarse and fine aggregates.

7/ Includes lightweight aggregate (slate).

8/ Includes agricultural limestone, poultry grit and mineral food, and other agricultural use.

9/ Includes mine dusting or acid water treatment and other specified uses not listed.

10/ Includes production reported without a breakdown by end use and with estimates for nonrespondents.

TABLE 5
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Value per ton
Concrete aggregate (including concrete sand)	3,280	\$13,600	\$4.15
Plaster and gunite sands	15	82	547
Concrete products (blocks, bricks, pipe, decorative, etc.)	669	2,040	305
Asphaltic concrete aggregates and other bituminous mixtures	669	2,380	356
Road base and coverings 2/	658	3,600	547
Fill	1,550	7,020	453
Snow and ice control	19	92	484
Other miscellaneous uses 3/	837	10,700	1,276
Unspecified: 4/			
Actual	1,680	8,820	5.25
Estimated	665	2,220	3.33
Total or average	10,000	50,500	5.03

1/ Data are rounded to three significant digits except value per ton; may not add to totals shown.

2/ Includes road and other stabilization (lime).

3/ Includes filtration and railroad ballast.

4/ Includes production reported without a breakdown by end use and with estimates for nonrespondents.

TABLE 6
 NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 1996,
 BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products 2/	352	2,770	1,170	4,270	2,440	8,690
Asphaltic concrete aggregate and road base materials 3/	602	3,620	957	6,100	1,340	3,370
Other miscellaneous uses 4/	143	984	657	9,600	37	107
Unspecified: 5/						
Actual	--	--	613	2,950	1,070	5,880
Estimated	54	118	216	808	395	1,290
Total	1,150	7,490	3,610	23,700	5,280	19,300

1/ Data are rounded to three significant digits; may not add to totals shown.

2/ Includes plaster and gunite sands.

3/ Includes fill, road and other stabilization (lime), and snow and ice control.

4/ Includes filtration and railroad ballast.

5/ Includes production reported without a breakdown by end use and with estimates for nonrespondents.