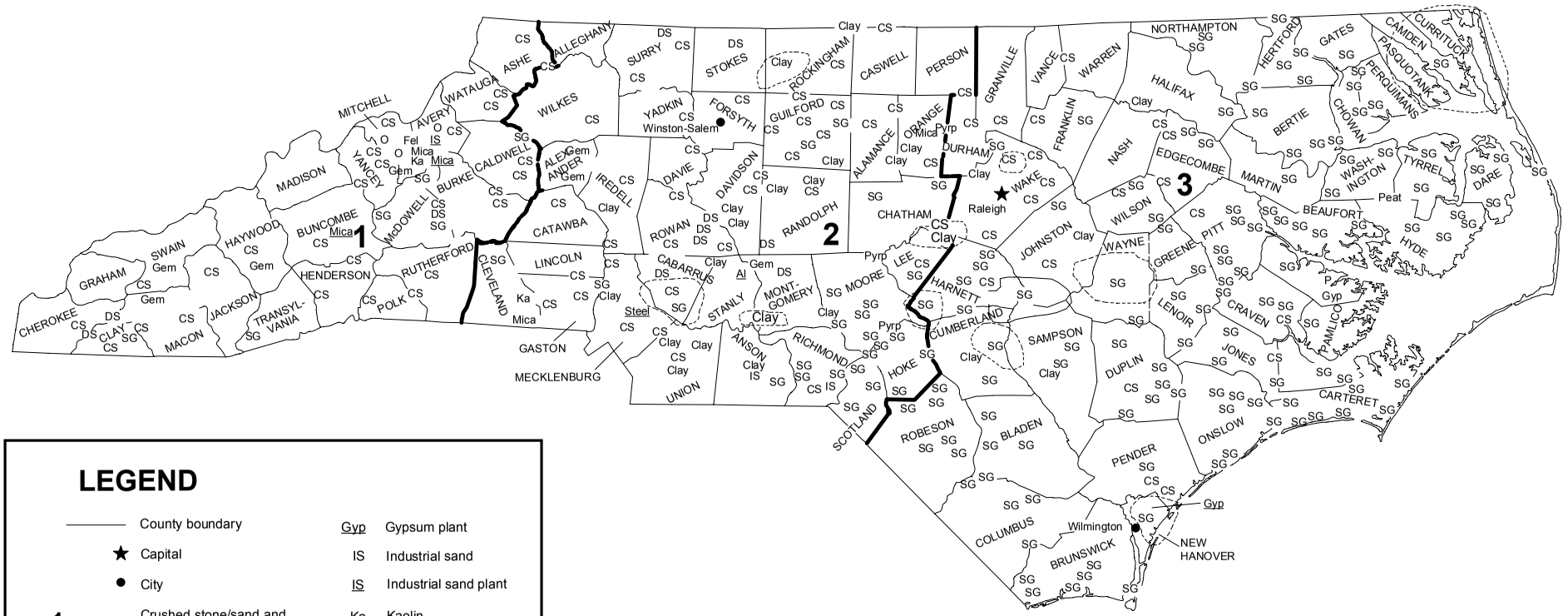
NORTH CAROLINA



LEGEND

- County boundary
- ★ Capital
- ● City
- 1 Crushed stone/sand and gravel districts

MINERAL SYMBOLS
(Major producing areas)

Al	Aluminum plant
Clay	Common clay
CS	Crushed stone
DS	Dimension stone
Fel	Feldspar
Gem	Gemstones
Gyp	Gypsum
Gyp	Gypsum plant
IS	Industrial sand
IS	Industrial sand plant
Ka	Kaolin
Mica	Mica
Mica	Mica plant
O	Olivine
P	Phosphate rock
Peat	Peat
Pyrp	Pyrophyllite
SG	Construction sand and gravel
Steel	Steel plant
	Concentration of mineral operations

Source: North Carolina Geological Survey/U.S. Geological Survey (2001)

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 2001, the estimated value[1] of nonfuel mineral production for North Carolina was $744 million, based upon preliminary U.S. Geological Survey (USGS) data. This was unchanged from that of 2000[2] and followed a marginal increase from 1999 to 2000. For the fourth consecutive year, the State was 19th in rank among the 50 States in total nonfuel mineral production value, of which North Carolina accounted for about 2% of the U.S. total.

In 2001, the largest increase in value was that of crushed stone, up about $7 million. But this and other smaller increases were balanced out by a larger decrease in phosphate rock, a $4 million drop in the value of construction sand and gravel, and several smaller decreases in other mineral commodities. In 2000, increases in the values of crushed stone (up $19 million), along with smaller increases in feldspar, industrial sand and gravel, and pyrophyllite, more than offset decreases that occurred in phosphate rock (down $15 million), construction sand and gravel (down $4 million), gemstones (down $2.5 million), plus several smaller decreases, resulting in the year's net increase.

Based upon 2001 USGS estimates of the quantities of minerals produced in the 50 States, North Carolina was the only pyrophyllite-producing State, and it continued as the leading State in common clay, feldspar, and mica; second of 2 States that produced olivine; and eighth in crushed stone. While the State increased to 5th from 6th in kaolin and to 10th from 11th in dimension stone, it decreased to 3d from 2d in phosphate rock and to 8th from 7th in industrial sand and gravel. Additionally, the State was a significant producer of construction sand and gravel and gemstones. Metal production in the State, especially that of primary aluminum and raw steel, resulted 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 Survey[3] (NCGS). PCS Phosphate Co., Inc. (PotashCorp.) set production records. Purified acid production was 169,000 metric tons (t), which was 20% greater than the previous record; hydroflurosilic acid (HFSA) production was 7,479 t (100% strength), which was 16% greater than the previous record. A purified acid plant project began in March 2002; a facility in Charleston, SC, was scheduled to receive an acid shipment in July 2002. Full production startup is scheduled for March 2003. Additional facility engineering and equipment updating is in progress.

According to PCS' annual report, diammonium phosphate (DAP) production was cut back at the Aurora, NC, plant along with that of other producers. The company's purified acid plant production was consolidated at Aurora in January 2002. Aurora now produces the acid for both the company's Aurora and Cincinnati, OH, plants. Because of Aurora's vertical integration, which offers cost savings, PCS has invested $80 million to expand by 50% capacity at the Aurora purified phosphate plant. Much of the output is sold under contract for industrial and food-grade products. Also PCS is building a $51 million plant to produce 144,000 metric tons per year of the poultry feed ingredient defluorinated phosphate (DFP). This plant will make the lowest cost DFP in the world; much of the production will go to offshore markets (PotashCorp., 2002§[4]). The plant is slated for startup in mid-2002.

PCS achieved 1 million hours worked without a lost time injury. Prior to that, it had achieved 9.9 million hours until it had one lost time accident.

The Wildlife Habitat Council certified Unimin Corp.'s Green Mountain olivine production facility near Burnsville, NC, in 2001. The Council is an international nonprofit organization working to improve wildlife habitat on company lands through cooperation between companies, the local communities, and environmental groups. The Green Mountain operation joins three other Unimin, NC, operations (Marston, Red Hill, and Schoolhouse Plants) that received certification in 1999. In total, Unimin has 27 facilities in the United States and Canada certified by the Wildlife Habitat Council.

Suzorite Mineral Products Inc. (part of Zemex Corp.), Murphy, NC, continued grinding of small quantities of barite imported from a Tennessee mine.

Vulcan Materials Co. was ranked among the top 10 companies in the United States for social responsibility in Fortune Magazine's "America's Most Admired Companies" list.

In March 2002, 3M's roofing granule production plant started, and full production is anticipated by mid-2002. Raw materials were being mined by the Luck Stone Co. The operation is located south of Pittsboro, NC.

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[1]The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon 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 2001 USGS mineral production data published in this chapter are preliminary estimates as of August 2002 and are expected to change. For some mineral commodities, such as 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. Specialist contact information may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals/contacts/comdir.html; alternatively, specialists' names and telephone numbers may be obtained by calling USGS information at (703) 648-4000 or by calling the USGS Earth Science Information Center at 1-888-ASK-USGS (275-8747). All Mineral Industry Surveys—mineral commodity, State, and country—also may be retrieved over the Internet at URL http://minerals.usgs.gov/minerals.

[2]Values, percentage calculations, and rankings for 2000 may differ from the Minerals Yearbook, Area Reports: Domestic 2000, Volume II, owing to the revision of preliminary 2000 to final 2000 data. Data for 2001 are preliminary and are expected to change; related rankings may also change.

[3]Jeffrey Reid, Senior Geologist for Minerals and Geographic Information Systems, authored the text of mineral industry information submitted by the North Carolina Geological Survey.

[4]A reference that includes a section twist (§) is found in the Internet Reference Cited section.

North Carolina brick manufacturers supply approximately 15% of the Nation's brick supply. Eleven companies produced more than 1.2 billion units in 2001. With a national output of nearly 8 billion units for all manufacturers, North Carolina ranks first among the single State producers. Other major brick producers include the States of Georgia, Ohio, and Texas.

Hendrick Industries won top honors in two National Awards Programs (Interstate Mining Compact Commission and National Association of State Land Reclamationists) that recognized public outreach in education efforts in 2001. The North Carolina Mining Commission's Award Selection Committee selected Hendrick Industries as the 2002 Mining Stewardship Award winner for its public outreach efforts in western North Carolina. Hendrick did an extensive exhibit at the Colburn Minerals Museum in Asheville, NC. It also has a community advisory council that conducts open houses at its quarry operations in the western part of the State.

Zemex Mica Corp., located in Yancey Co., NC, won three reclamation awards in 2001. These included the Department of Environment and Natural Resources' Land Quality Section Outstanding Mine Reclamation Award, the Interstate Mining Compact Commission's Honorable Mention Award, and first place from National Association of State Land Reclamationists.

Government Programs

Two new segments, "Crushed stone (aggregate) resources of North Carolina," and "Building stone (dimension stone) of North Carolina," were added to NCGS's Internet site. These will be of interest to academia, industry, and government, and are found under the "What's New" part of URL http://www.geology.enr.state.nc.us. Both segments provide virtual quarry tours, product information, location of operators, and contact information. The Crushed Stone Resources segment provides a summary of 30 years of production and value for crushed stone, construction sand and gravel, and industrial sand and clay.

NCGS staff continued to assist Land Quality Section staff with mine permit review (new and renewals). Mine permit applications, other forms, and contact information are at the Land Quality Section's Internet site at URL http://dlr.enr.state.nc.us/mining.html. Links to a list of permitted active and inactive mines in North Carolina as of May 8, 2002, are on the NCGS' "What's New" page (follow link from the NCGS home page at URL http://www.geology.enr.state.nc.us). Updates to the permitted mine list are posted periodically throughout the year; alternatively, clients may contact the Land Quality Section for updates.

Mining permits are a good gauge of minerals activity in North Carolina. A synopsis consisting of Internet-based tables and a Microsoft PowerPoint overview is available at the NCGS' home page via the "Minerals Information" and "Permitted Active and Inactive mines, updated May 8, 2002" links.

NCGS released a CD-ROM publication entitled "Mines and Prospects of Cabarrus, Gaston, Lincoln, Mecklenburg, Stanly, and Union Counties, North Carolina," Open-file reports 2002-2007. These reports contained maps of known mine locations in the six North Carolina counties and were prepared as planning aids for local governments and private citizens. Publication of the maps and data was prompted by subsidence over abandoned underground workings at the Phoenix Gold Mine, Cabarrus County, NC, during February 2000.

Mining for gold and other precious metals occurred in the 18th and 19th centuries at hundreds of locations in North Carolina and into the early 20th century at some localities. Although relatively rare, the potential for damaging subsidence will increase as urban growth spreads into once sparsely populated areas where underground mining occurred. Public awareness, zoning, and building permit requirements can help reduce the risk of damaging subsidence or injury. A report of investigation is in progress about residential development over the abandoned North State gold mine workings, located near High Point, NC.

Recognizing the need for planning of available aggregate resources for the future has prompted industry, the State government, and university agencies to partner with the National Academies of Engineering and Science to develop collaborative research programs. The initial studies, which will take about 1 year, are expected to move toward a better understanding of the need to plan for adequate future aggregate supplies.

K-T Feldspar Corp., owned by Imerys USA, Inc., signed an agreement with the Blue Ridge Parkway Foundation to support its educational activities and to sponsor the Museum of North Carolina Minerals. The Blue Ridge Parkway is the most visited site in the U.S. National Park Service system with more than 20 million visitors per year. The museum's objective is to educate children, residents of the community, and the visiting public of mining's contribution to society and the modern quality of life. This is an excellent opportunity for K-T Feldspar, a mica and feldspar producer, to participate in educational activities related to earth sciences and to further display its commitment to the development of its employees' local communities.

The Museum of North Carolina Minerals building renovation was scheduled to be completed by July 2002, and exhibits were undergoing development and should be installed by the 2003 visitors' season that traditionally starts in April or May.

The North Carolina Geological Survey, in cooperation with North Carolina State University, University of North Carolina-Wilmington, University of North Carolina-Asheville, and Western Carolina University, continued detailed geologic mapping funded in part by Public Law 102-285 (National Geologic Mapping Act) in the Raleigh, Asheville, and Henderson, NC, areas. Rapid growth in these regions has accentuated many geologic-related problems, including land-use and infrastructure planning, mineral resource identification—particularly construction aggregates, and environmental assessment and planning related to highway construction, waste disposal siting, and ground water conservation and development. Further information about the geologic mapping in North Carolina and elsewhere in the United States is at URL http://ngmdb.usgs.gov/.

By action of the North Carolina General Assembly, the topographic mapping program was restored to the NCGS in late 2001. A comprehensive photoinspection program was initiated on all 7.5-minute quadrangles east of 80° W. longitude to the Atlantic Ocean using National Technical Means imagery. Expected deliverables are the minor revisions of 100 of the State's 953 quadrangles. Products will consist of paper maps and digital raster graphics. Each State dollar is matched by a

Federal dollar in a cooperative program with the USGS.

The North Carolina Minerals Research Laboratory (MRL), in Asheville, a unit of the North Carolina State University's College of Engineering, conducts minerals process research in industrial and metallic minerals for clients worldwide and also conducts State-sponsored mineral process investigations. The MRL conducts extensive mineral science outreach programs, including rock kit distribution in western North Carolina. In 2000-01, mica and quartz continued to be major minerals of industry interest. The MRL conducted studies on the following commodities: boiler ash, clay, feldspar, fly ash, kaolin, iron oxide, mica, phosphate, pyrophyllite, quartz, sand and gravel, smectite, and tantalite.

The MRL initiated a cooperative industry, academic, and State agency project to evaluate the production of lightweight aggregate from high-volume solid waste in western North Carolina. The objective is to use high-volume solid waste generated by local industry to produce a value-added and environmentally benign product that will assist the State's goal of solid waste reduction. The goal is to construct a commercial lightweight aggregate plant located in western North Carolina. Further information about MRL, staff expertise, and laboratory equipment is available at URL http://www.engr.ncsu.edu/mrl/.

Internet Reference Cited

PotashCorp, 2002, PotashCorp is the lowest-cost producer, An Overview of PotashCorp and Its Industry 2002, accessed November 20, 2002, at URL http://www.potashcorp.com/media/pdf/npk_markets/ industry_overview/ 2002_overview.pdf.

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

(Thousand metric tons and thousand dollars unless otherwise specified)

Mineral		1999 Quantity	1999 Value	2000 Quantity	2000 Value	2001 p/ Quantity	2001 p/ Value
Clays, common		2,430	18,700	2,430	18,600	2,430	18,600
Feldspar	metric tons	381,000	16,100	W	W	W	W
Gemstones		NA	2,860	NA	372	NA	203
Mica, crude		W	W	W	W	45	4,380
Sand and gravel:							
Construction		11,600	62,900	12,000	59,100	10,800	54,000
Industrial		1,470	27,300	1,480	28,300	1,620	29,900
Stone:							
Crushed		67,000	459,000	69,500	478,000	68,400	485,000
Dimension	metric tons	54,700	17,700	40,500	16,800	40,000	16,000
Combined values of clays (kaolin), olivine, peat, phosphate rock, pyrophyllite (crude), and values indicated by symbol W		XX	138,000	XX	143,000	XX	136,000
Total		XX	742,000	XX	744,000	XX	744,000

p/ Preliminary. NA Not available. W Withheld to avoid disclosing company proprietary data; values included with "Combined values" data. XX Not applicable.
1/ Production as measured by mine shipments, sales, or marketable production (including consumption by producers).
2/ Data are rounded to no more than three significant digits; may not add to totals shown.

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

Kind	1999 Number of quarries	1999 Quantity (thousand metric tons)	1999 Value (thousands)	1999 Unit value	2000 Number of quarries	2000 Quantity (thousand metric tons)	2000 Value (thousands)	2000 Unit value
Limestone	10	6,070	$40,700	$6.70	11	5,710	$38,400	$6.73
Dolomite	1	354	2,360	6.65	1	325	2,170	6.66
Granite	76 r/	50,000	343,000	6.86	75	53,200	365,000	6.87
Calcareous marl	1	W	W	6.00 r/	--	--	--	--
Quartzite	2	W	W	8.05	2	W	W	8.19
Traprock	7 r/	5,130 r/	37,100 r/	7.24 r/	6	5,330	39,600	7.43
Slate	2 r/	W	W	6.61 r/	2	W	W	6.61
Volcanic cinder and scoria	1	W	W	6.61	1	W	W	6.61
Miscellaneous stone	5 r/	2,370 r/	14,800 r/	6.62 r/	5	2,180	13,100	6.02
Total or average	XX	67,000	459,000	6.85	XX	69,500	478,000	6.88

r/ Revised. W Withheld to avoid disclosing company proprietary data, included in "Total." XX Not applicable. -- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 3
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS
IN 2000, BY USE 1/ 2/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Construction:			
Coarse aggregate (+1 1/2 inch):			
Macadam	264	$1,520	$5.77
Riprap and jetty stone	687	6,980	10.16
Filter stone	234	2,030	8.68
Other coarse aggregate	476	3,030	6.37
Total or average	1,660	13,600	8.17
Coarse aggregate, graded:			
Concrete aggregate, coarse	3,040	22,400	7.35
Bituminous aggregate, coarse	1,950	18,700	9.59
Bituminous surface-treatment aggregate	W	W	8.59
Railroad ballast	1,270	6,920	5.43
Other graded coarse aggregate	5,010	42,000	8.38
Total or average	11,300	90,000	7.98
Fine aggregate (-3/8 inch):			
Stone sand, concrete	395	2,700	6.82
Stone sand, bituminous mix or seal	W	W	7.94
Screening, undesignated	1,800	11,300	6.25
Other fine aggregate	1,050	7,950	7.59
Total or average	3,250	21,900	6.75
Coarse and fine aggregates:			
Graded road base or subbase	7,780	47,200	6.07
Unpaved road surfacing	194	1,470	7.58
Terrazzo and exposed aggregate	W	W	22.28
Crusher run or fill or waste	689	3,460	5.02
Other coarse and fine aggregates	3,000	17,900	5.97
Total or average	11,700	70,000	6.00
Agricultural:			
Agricultural limestone	(3/)	(3/)	5.78
Other agricultural uses	(3/)	(3/)	(3/)
Unspecified: 4/			
Reported	40,400	275,000	6.79
Estimated	1,200	7,800	6.60
Total or average	41,600	282,000	6.79
Grand total or average	69,500	478,000	6.88

W Withheld to avoid disclosing company proprietary data; included with "Other."
1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
2/ Includes calcareous marl, dolomite, granite, limestone, miscellaneous stone, quartzite, slate, traprock, and volcanic cinder and scoria.
3/ Withheld to avoid disclosing company proprietary data, included in "Grand total."
4/ Reported and estimated production without a breakdown by end use.

TABLE 4
NORTH CAROLINA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2000,
BY USE AND DISTRICT 1/

(Thousand metric tons and thousand dollars)

Use	District 1		District 2		District 3		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Construction:								
Coarse aggregate (+1 1/2 inch) 2/	260	2,040	741	6,890	661	4,630	--	--
Coarse aggregate, graded 3/	2,860	20,200	W	W	W	W	--	--
Fine aggregate (-3/8 inch) 4/	W	W	W	W	W	W	--	--
Coarse and fine aggregate 5/	3,530	22,100	W	W	W	W	--	--
Agricultural 6/	W	W	W	W	--	--	--	--
Unspecified: 7/								
Reported	3,550	31,100	20,900	138,000	15,800	105,000	199	1,313
Estimated	140	950	180	970	860	5,900	--	--
Total	11,300	83,300	35,800	251,000	22,200	142,000	199	1,310

W Withheld to avoid disclosing company proprietary data, included in "Total." -- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Includes filter stone, macadam, riprap and jetty stone, and other coarse aggregate.
3/ Includes bituminous aggregate (coarse), bituminous surface-treatment aggregate, concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.
4/ Includes screening (undesignated), stone sand (bituminous mix or seal), stone sand (concrete), and other fine aggregate.
5/ Includes crusher run (select material or fill), graded road base or subbase, terrazzo and exposed aggregate, unpaved road surfacing, and other coarse and fine aggregates.
6/ Includes agricultural limestone and other agricultural uses.
7/ Reported and estimated production without a breakdown by end use.

TABLE 5
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2000,
BY MAJOR USE CATEGORY 1/

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	3,200	$11,600	$3.63
Plaster and gunite sands	56	351	6.27
Concrete products (blocks, bricks, pipe, decorative, etc.)	322	1,330	4.12
Asphaltic concrete aggregates and other bituminous mixtures	639	2,230	3.49
Road base and coverings 2/	2,580	10,700	4.14
Road stabilization (lime)	12	57	4.75
Fill	600	1,490	2.49
Railroad ballast	27	59	2.19
Snow and ice control	95	412	4.35
Other miscellaneous uses 3/	301	4,450	14.77
Unspecified: 4/			
Reported	2,310	17,900	7.76
Estimated	1,800	8,500	4.60
Total or average	12,000	59,100	4.93

1/ Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
2/ Includes road and other stabilization (cement).
3/ Includes filtration and roofing granules.
4/ Reported and estimated production without a breakdown by end use.

TABLE 6
NORTH CAROLINA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2000,
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/	W	W	W	W	2,480	8,650
Asphaltic concrete aggregate and road base materials 3/	W	W	W	W	2,180	5,410
Railroad ballast	--	--	--	--	27	59
Other miscellaneous uses 4/	801	6,730	1,770	10,200	570	1,600
Unspecified: 5/						
Reported	82	137	1,290	12,600	939	5,190
Estimated	--	--	670	2,500	1,200	5,900
Total	883	6,870	3,720	25,300	7,380	26,800

W Withheld to avoid disclosing company proprietary data; included with "Other miscellaneous uses." -- Zero.
1/ Data are rounded to no more than three significant digits; may not add to totals shown.
2/ Includes plaster and gunite sands.
3/ Includes road and other stabilization (cement and lime).
4/ Includes fill, filtration, railroad ballast, and snow and ice control.
5/ Reported and estimated production without a breakdown by end use.