VIRGINIA DIVISION OF MINERAL RESOURCES PUBLICATION 76

CLAY MATERIAL TESTING PROGRAM, 1957-1986

Palmer C. Sweet

COMMONWEALTH OF VIRGINIA

DEPARTMENT OF MINES, MINERALS AND ENERGY
DIVISION OF MINERAL RESOURCES
Robert C. Milici, Commissioner of Mineral Resources and State Geologist

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FRONT COVER: Diatomaceous sediments (R-3044) in river bluff on the north bank of the Rappahannock River, Richmond County.

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DEPARTMENT OF MINES, MINERALS AND ENERGY
RICHMOND, VIRGINIA
O. Gene Dishner, Director

Commonwealth of Virginia
Department of Purchases and Supply
Richmond

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ABSTRACT

This report contains the locations and potential uses of 630 samples of clay, shale, and related materials sampled from Virginia. Approximately 850 samples were collected by the Division of Mineral Resources and evaluated by the U. S. Bureau of Mines from 1957 through 1986.

Following are potential end-uses of clay materials tested:

Absorbent
Artware
Ceramic ware
Chimney-flue lining (tile)
Clay dummies
Color additive (pigmenting clay)
Colored ceramic ware
Common brick
Decorative brick
Drain tile
Earthenware
Face brick
Filler in insulating material
Fire brick
Flower pots
Fluxing agent
Foundry soil
Garden pottery
High-duty refractory
Hot tops
Inert filler
Intermediate-duty refractory
Lightweight aggregate
Low-duty pottery
Low-duty refractory
Medium-duty refractory
Mineral filler
Nonplastic component
Paper filler (coater)
Plastic component
Pottery
Quarry tile
Refractories
Sewer pipe
Sintered aggregate
Stoneware bodies
Structural clay products
Structural tile
Super-duty refractory
Terra cotta
Tile
Whiteware industry

INTRODUCTION

Beginning in November 1957 and continuing through September 1986, the Virginia Division of Mineral Resources and the U. S. Bureau of Mines maintained a cooperative agreement to coordinate activities for exploration and evaluation of clays, shales, and related materials for ceramic and nonceramic uses. The Division planned and conducted the field investigations and sampling, transmitted the samples to the U. S. Bureau of Mines, and correlated field and laboratory data. Under the agreement, of the U. S. Bureau of Mines was to perform appropriate tests and determinations of properties required to evaluate the potential uses of the submitted materials.

Samples were evaluated by the U. S. Bureau of Mines Electrotechnical Experiment Station (later renamed Norris Metallurgy Research Center) at Norris, Tennessee until the laboratory closed in 1965. Evaluation of samples was then assigned to the Tuscaloosa Metallurgy Research Laboratory in Tuscaloosa, Alabama, until early 1969, when Morse Laboratories in Sacramento, California performed the testing for the Bureau. Commencing in November 1969, samples were once again evaluated at Tuscaloosa. The laboratory was renamed the Tuscaloosa Metallurgy Research Center in 1972 and later renamed the Tuscaloosa Research Center in 1979. Three samples were evaluated in 1986 by the Mineral Research Institute at the University of Alabama in Tuscaloosa, Alabama.

Eight reports based on the results of the sample evaluations, have been published by the Division of Mineral Resources (Table 1). The U. S. Bureau of Mines determined that 630 samples (4 of which are included in the present publication) are potentially suitable for ceramic and/or nonceramic uses. This represents seventy-four percent of the samples tested over almost 30 years. Specific reference is made to samples potentially suitable for refractories, to samples subjected to reflectance tests, and to samples containing more than 30 percent alumina (Al_2O_3). All of the sampled locations are plotted on the Plate as are active clay material operations. The samples are listed by their repository numbers under county or city headings and potential product headings (Appendices II and III).

Table 1. Virginia Division of Mineral Resources reports on clay materials.

Area	Publication	Author(s)	Date
Northern counties	MRR 2	Calver, J. L. and others	1961
West-Central counties	MRR 5	Calver, J. L. and others	1964
Southwestern counties	MRR 6	Johnson, S. S. and others	1966
Eastern counties	MRR 8	Johnson, S. S. and Tyrell, M.E.	1967
Southern counties	MRR 12	Sweet, P. C.	1973
Statewide	MRR 13	Sweet, P. C.	1976
Statewide	Pub. 36	Sweet, P. C.	1982
Statewide	Pub. 68	Sweet, P. C.	1986

SAMPLING

Samples were collected primarily from roadside and railroad-cut exposures and company stockpiles; several samples were taken from active and inactive pits. The roadcuts, from which most of the samples were collected, do not have sufficient exposures to determine total thickness or extent of the sampled materials. Consequently, descriptions of sample localities in the reports (Table 1) include only the exposed thickness. In some cases the clay material was augered, and its thickness determined. The data presented in the reports are based on laboratory tests that are preliminary in nature and will not suffice for plant or process design. Evaluation remarks are based on test data determined usually from one sample collected to be representative of material at each locality. Detailed exploration, sampling, and tests should be carried out to prove any particular locality for commercial development. Test results of a single sample may not be representative of all the material. Samples from other parts of the pit or roadcut, or from other locations of material of the same age, may not have the same physical characteristics as those determined for the sample that was tested. Localities, for which the test data indicate potential uses, should be thoroughly investigated to determine whether adequate raw materials are available for commercial development. Small portions of the raw sample, test briquettes, and other fired materials for most of the samples are preserved in the repository of the Division of Mineral Resources at Charlottesville.

TESTING AND EVALUATION

The testing procedure used at the Norris and Tuscaloosa Research Centers is described by Liles and Heystek (1977). The specifications of the various ceramic materials and the criteria generally used also apply to clay testing by Morse Laboratories in Sacramento, California and the Mineral Research Institute at the University of Alabama in Tuscaloosa, Alabama. The procedure, which is briefly described here, is divided into three distinct phases: (1) Preliminary ceramic testing, wherein each sample is evaluated for general properties; (2) extended ceramic testing, which is conducted on those samples that show promise in preliminary tests; and (3) miscellaneous tests, which are special tests specifically requested.

Preliminary Ceramic Testing

About 20 pounds of clay material are needed for testing. If necessary, the sample is dried at 105°C, then crushed by roll crusher to pass through a 3/4-inch screen. Pieces of 3/4-inch (2.0-cm) material are then picked at random for quick-firing. The remaining material is then split by riffling to obtain a representative 2 pound sample, which is crushed to pass through 20 mesh. About 1 pound of the crushed material is blended with incremental additions of water. From the mixed material, six individual 1- by 2- by 3/4-inch briquettes are extruded in a laboratory-size hydraulic ram press. The amount of water required to form the samples is recorded as the "water of plasticity." Shrinkage marks (always a standard distance apart) are pressed on the briquettes, which are then air-dried for 24 hours, and oven-dried at 110°C for an additional 24 hours. Linear shrinkage is determined by measuring the reduction space between the shrinkage marks, and dry strength is determined by visual inspection as "good," "fair," or "poor." One of the six briquettes is then fired, using a 24-hour cycle, to a temperature of 1,000°C, which is maintained for 1 hour. The briquette is allowed to cool in the kiln. The procedure is repeated for the five remaining briquettes, each at one of the following temperatures: 1,050°, 1,100°, 1,150°, 1,200°, and 1,250°C. After cooling, the linear shrinkages are determined for each firing temperature. The briquettes are weighed, then covered with water and boiled for 5 hours. The soaked briquettes are reweighed, first in air and then

immersed in water. From the three weights obtained on each briquette, the percent absorption, percent apparent porosity, and bulk density are calculated.

Each briquette is redried at 105°C, and the Mohs' hardness is determined. Next, the color of each briquette is classified using the Munsell Book of Colors, Neighboring Hues Edition.

To determine pH and degree of effervescence, 10 g of additional sample are mixed with 100 ml of distilled water, and the pH of the slurry is determined. Subsequently, 10 ml of concentrated reagent-grade hydrochloric acid are added to the slurry to visually assess the degree of effervescence as "none," "slight," or "high." Recommendation comments that are made on the preliminary evaluation form are based on American Society for Testing and Materials (ASTM) specifications. The evaluation of a sample is made solely on its own properties and does not preclude the use of the material in mixes.

A quick-fire test to determine the bloating characteristics of each sample for its possible use as lightweight aggregate is generally conducted concurrently with the briquette-testing procedure. The small, 3/4-inch (2-cm) pieces of the sample initially picked at random from the total sample are dried at 220°C, then placed in a small refractory boat, which in turn is placed in a kiln preheated to 1,100°C. If the sample shows any degree of expansion, additional tests are made over a complete range of temperatures (usually 1,000° to 1,250°C) to determine the optimum expansion temperature. After firing, the expanded samples are cooled, weighed, and allowed to soak in water for 24 hours. The weight of the sample while suspended in water is determined. The sample is also weighed in air after being patted dry to remove excess surface water. From these data, the percent absorption and bulk density are calculated.

Extended Ceramic Testing

A sample is generally subjected to extended testing only if it displays superior qualities in the preliminary tests or if it is specifically requested by the submitting agency. Extended evaluation encompasses one or more of the following tests:

1. Extrusion tests are made on those samples that are plastic in nature and have a long firing range, as determined in preliminary tests.
2. Dry-pressing is only performed on those samples that have low plasticity and a long firing range.
3. Rotary-kiln evaluation tests are usually made on those samples that show good expansion characteristics in the preliminary quick-fire test. This test requires no less than 200 lb. of sample to produce enough lightweight aggregate for a thorough evaluation. The Tuscaloosa Research Center uses a gas-fired rotary kiln 18 inches in diameter by 20 feet long, with a discharge slope of 1/4 inch per foot. The kiln has a retention period of approximately 15 minutes.

In preparing material for the rotary-kiln test, the sample is crushed to minus 3/4 inch (2 cm) and screened through 3/4-inch, 3/8-inch, and 4-mesh sieves in order to obtain size distribution of the raw material. It is preferable to have the majority of the material retained on the 3/8 inch screen. Only the minus 3/4-inch, plus 4-mesh material is used.

Platy particles generally do not produce good bloated aggregate. Therefore, such materials are usually crushed to minus 20 mesh and mixed, then either pelletized or extruded. Pelletizing is a method of agglomerating finely divided material into spherical pellets by wetting the fine clay particles with a water spray on a rotating disk. The Tuscaloosa Research Center's 36-inch diameter disk pelletizer is capable of producing sufficient feed for a rotary-kiln test. The pellets produced are approximately 1/2 inch (1.3-cm) in diameter and are dried at 105°C before firing. Material to be extruded is crushed, wetted, and pressed through a 1/2-inch (1.3-cm) square die with the laboratory de-airing extrusion unit. All extruded material is chopped by an automatic cutter into pieces approximately 1 inch (2.5-cm) long. The pieces are dried at 105°C and used as feed for the rotary kiln.

The "loose pour" weight is determined by filling a tared standard-size container to overflowing, leveling the surface of the aggregate at the top edge of the container with a straight edge, and weighing the filled container. To establish the screen analysis, a sample of the aggregate is passed through a laboratory roll crusher set at a 3/4-inch (2-cm) gap and subsequently screening the crushed material through a set of the following sieves: 3/4, 1/2, and 3/8 inch and 4, 8, 16, 50, and 100 mesh. The screened fractions are weighed and the data reported as percentage passing a specific screen size.

Miscellaneous Tests

A Pyrometric Cone Equivalent (PCE) test is made on samples that show potential as refractory material; it usually is requested by the submitting agency. Generally, samples that show low shrinkage, high absorption, and a light color at the highest firing temperature in the preliminary tests are further tested for their refractory properties. The test on materials that have a high melting point helps to indicate potential for use in

furnace linings and in kiln construction. Test cones are made from the sample and are compared with standard cones in accordance with ASTM specifications. A sample is generally classified as a low-duty refractory if it has a PCE of 15 to 28; as medium-duty when its PCE ranges between 29 and 31; and high-duty if it has a PCE of 31.5 to 32. With a PCE of 33 or higher, a clay is rated as a super-duty fire clay. The temperatures for each PCE in Table 2 are from Klinefelter and Hamlin (1957).

Reflectance tests are performed with a photovolt meter utilizing green and blue filters on raw material ground to minus 325 mesh. Tint, measured in tint, whiteness, and brightness values, the ability of a body to reflect light, are determined by the tests. A reflectance of 70 percent brightness or above may be considered to indicate potential as a filler in paint, plastic, rubber, linoleum, and as a coating and filler in paper. Reflectance evaluation tests on brightness and whiteness (Table 3) were performed on six samples by the U. S. Bureau of Mines, Tuscaloosa Research Center in Tuscaloosa, Alabama.

Additional tests, such as chemical analyses, are usually performed at other research centers of the U. S. Bureau of Mines. Sweet (1982) lists 21 samples that were tested at the U. S. Bureau of Mines, Reno Research Center, Reno, Nevada for alumina (Al_2O_3) content. Six of these samples contained more than 30 percent alumina (Table 4). Sample R-7525 (Figure 3) is a white clay residuum over anorthosite from the property of B. W. Thompson, northeast of Lowesville in Nelson County. Lintner (1942) notes that seven core holes and 22 auger holes were drilled on the property in the winter of 1942. Chemical analyses of samples performed by the Metallurgical Division of the Bureau of Mines in College Park, Maryland indicated the presence of more than 107,000 tons of clay with over 35 percent Al_2O_3 and more than 286,000 tons of clay with between 30 and 35 percent Al_2O_3.

Table 2. Samples potentially suitable for refractories.

Repository No.	County/City	PCE	Refractories Use
R-4	Nelson	33-34 (3169°-3205°F)	Super-duty
R-6	Nelson	33-34 (3169°-3205°F)	Super-duty
R-13	Rockbridge	27-28 (2984°-2995°F)	Low-duty
R-306	Stafford	23-26 (2921°-2950°F)	Low-duty
R-308	Stafford	23-26 (2921°-2950°F)	Low-duty (Figure 1)
R-309	Stafford	below 23 (2921°F)	Low-duty
R-310	Stafford	23-26 (2921°-2950°F)	Low-duty
R-311	Stafford	23-26 (2921°-2950°F)	Low-duty
R-1626	Augusta	34 (3205°F)	Super-duty
R-1660	Augusta	34 (3205°F)	Super-duty
R-2009	Nelson	33 (3169°F)	Super-duty
R-2918	Sussex		Refractory addition
R-2923	Sussex		Refractory addition
R-4070	Franklin	34+ (3205°F+)	Super-duty
R-4077	Bedford	15 (2606°F)	Low-duty
R-4099	Grayson	20 (2847°F)	Low-duty
R-4114	Amherst		Possible refractory
R-4123	Franklin	20 (2847°F)	Low-duty
R-4364	Brunswick	29 (3018°F)	Medium-duty
R-4365	Brunswick	20 (2847°F)	Low-duty
R-7477	Henry	19-20 (2806°-2847°F)	Low-duty
R-7478	Henry	30 (3029°F)	Medium-duty
R-7482	Pittsylvania	34-35 (3205°-3245°F)	Super-duty
R-7525	Nelson	31.5 (3090°F)	High-duty
R-7526B	Nelson	31 (3061°F)	Medium-duty
R-8616	Charlottesville (City of)	29 (3018°F)	Medium-duty
R-8629	Albemarle	33 (3169°F)	Super-duty

Table 3. Reflectance tests results.

Repository No.	County/City	Brightness	Whiteness
R-8561	Washington	72.0	56.0
R-8570B (Figure 2)	Page	85.5	71.5
R-8604	Roanoke	59.8	30.6
R-8616	Charlottesville (City of)	65.8	6.6
R-8645	Hanover	78.0	49.2
R-8713	Augusta	72.5	52.5

Table 4. Samples with more than 30 percent Al_2O_3.

Repository No.	County	Wt. % Al_2O_3
R-7476A	Henry	30.27
R-7476B	Henry	32.15
R-7525	Nelson	35.55
R-7526A	Nelson	33.91
R-7526B	Nelson	31.22
R-7482	Pittsylvania	37.99

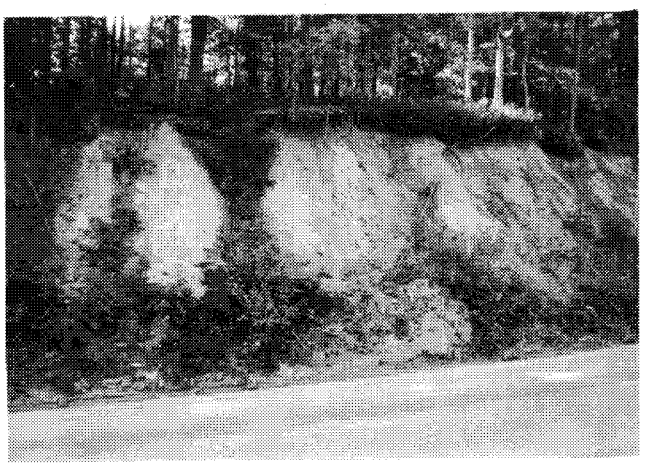

Figure 1. Cretaceous clay (R-308), suitable for refractories, exposed in roadcut along State Road 608, Stafford County.

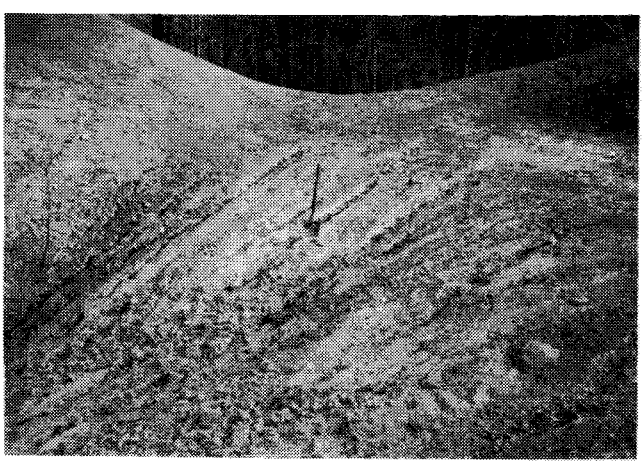

Figure 2. Leached shale of the Rome Formation (R-8570B), suitable for structural clay products, structural tile and brick, exposed at the abandoned Smith Bank mine, Page County.

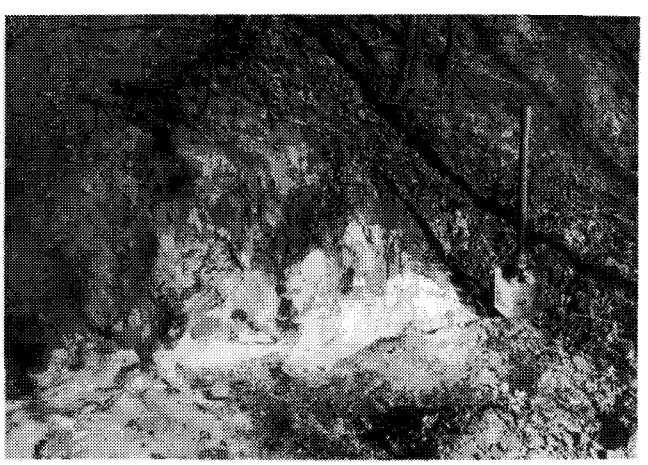

Figure 3. White clay residuum (R-7525) in trench on the property of B. W. Thompson, northeast of Lowesville, Nelson County.

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Figure 1. Cretaceous clay (R-308), suitable for refractories, exposed in roadcut along State Road 608, Stafford County.

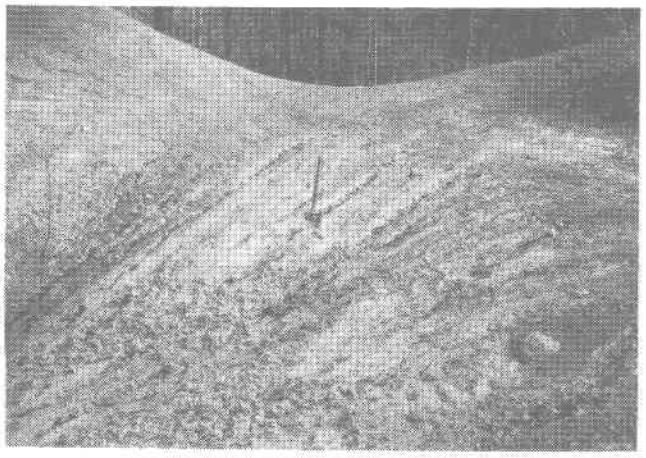

Figure 2. Leached shale of the Rome Formation (R-8570B), suitable for structural clay products, structural tile and brick, exposed at the abandoned Smith Bank mine, Page County.

Figure 3. White clay residuum (R-7525) in trench on the property of B. W. Thompson, northeast of Lowesville, Nelson County.

VALUE OF TEST DATA

The test data produced during the clay materials testing program helped a brick company in the Richmond area to obtain a satisfactory raw material and to expand their reserves on two separate occasions. Data in one of the reports were useful to a Lynchburg group interested in setting up a brick plant in that area. This plant (Boral Brick, Inc.), with capacity for 35 million brick per year, began production in 1981. The data have also been useful for foreign contingents (Italy, Japan, and West Germany) interested in raw materials suitable for ceramic wall and floor tiles.

The Division has shown many industrial clients useful data, as well as samples of the raw material and fired briquettes which are kept in its repository. Recently several companies and individuals have become interested in white-burning clays that occur throughout the State and in the absorbent clays associated with the diatomaceous sediments in the northeastern part of Virginia. The Division has taken many samples of these materials which have been tested by the Bureau during this program.

REFERENCES CITED

Calver, J. L., Hamlin, H. P., and Wood, R. G., 1961, Analyses of clay, shale and related materials-northern counties: Virginia Division of Mineral Resources Mineral Resources Report 2, 194 p.

Calver, J. L., Smith, C. E., and Le Van, D. C., 1964, Analyses of clay, shale and related materials-west-central counties: Virginia Division of Mineral Resources Mineral Resources Report 5, 230 p.

Johnson, S. S., Denny, M. V., and Le Van, D. C., 1966, Analyses of clay, shale and related materials-southwestern counties: Virginia Division of Mineral Resources Mineral Resources Report 6, 186 p.

Johnson, S. S. and M. E. Tyrell, 1967, Analyses of clay, shale and related materials-eastern counties: Virginia Division of Mineral Resources Mineral Resources Report 8, 232 p.

Klinefelter, T. A., and H. P. Hamlin, 1957, Syllabus of clay testing: U. S. Bureau of Mines Bulletin 565, 67 p.

Kollomorgan Corporation, 1973, Munsell book of color, Neighboring hues edition: Newburg, New York, 21 color plates.

Liles, K. J., and Heystek, H., 1977, The Bureau of Mines test program for clay and ceramic raw materials: U. S. Bureau of Mines Information Circular 8729, 28 p.

Lintner, E. J., 1942, Kaolin deposits in Nelson County: U. S. Bureau of Mines Project 1231 - Open File Report, 31 p.

Sweet, P. C., 1973, Analyses of clay, shale and related materials—southern counties: Virginia Division of Mineral Resources Mineral Resources Report 12, 183 p.

——— 1976, Clay-material resources in Virginia: Virginia Division of Mineral Resources Mineral Resources Report 13, 56 p.

——— 1982, Virginia clay material resources: Virginia Division of Mineral Resources Publication 36, 178 p.

——— 1986, Clay-material samples collected 1981-1984: Virginia Division of Mineral Resources Publication 68, 107 p.

APPENDICES

APPENDIX I: Clay material test results for eight previously undescribed samples.

Test results of the following eight (8) samples are not included in the previous reports; they are arranged by county and repository number.

Bath	-	R-8727
Botetourt	-	R-8747
Campbell	-	R-8743
Charlotte	-	R-8744, R-8745
Mecklenburg	-	R-8726
Rockingham	-	R-8748
Wythe	-	R-8746

Information for the samples includes, in order: the sample number and its county location; the date that samples were submitted for analysis and the name of the laboratory performing the tests; detailed location data, beginning with UTM (Universal Transverse Mercator coordinates, for example, N4,225,610 E623,670 -Zone 17): the name of the 7.5-minute quadrangle in which the sample site is located and other location data; a hand-sample description of the material from which the sample was taken; formation or age of material; description of the sampled interval; the raw properties of the material; the results of a slow-firing test, the results of the preliminary bloating test; and the potential use of the material.

Abbreviations and Terms Used in Tables.

Abbreviations:

Abs. - Absorption
Appr. Por. - Apparent porosity
Lin. Shk. - Linear shrinkage
LOF - Loss on firing (chemical analyses)

Terms: Color as used in slow firing test is based on Munsel Book of Colors.

A word of caution: the data presented in this appendix are based on laboratory tests that are preliminary in nature and will not suffice for plant or process design. Evaluation remarks are based on test data determined usually for only one sample believed to be representative of material at each locality. Detailed exploration, sampling, and tests should be carried out to prove any particular locality for commercial development.

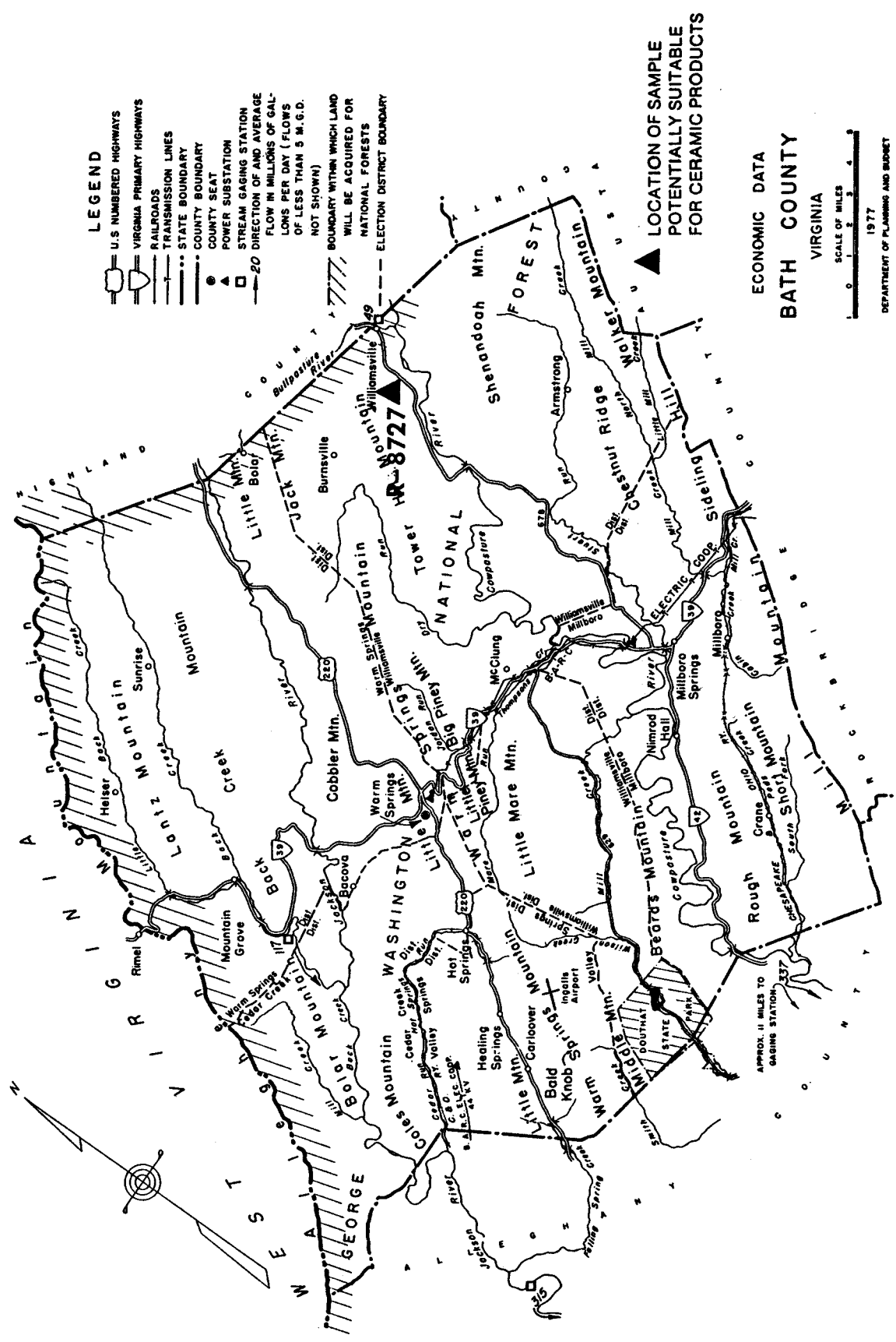

Figure 4. Location of clay-material sample in Bath County.

SAMPLE: R-8727 COUNTY: Bath

DATE: May, 1985 -Tuscaloosa Research Center

LOCALITY: N4,225,610 E623,670 (Zone 17). Williamsville 7.5-minute quadrangle. Roadcut 1.9 miles southwest of Williamsville, on the west side of State Road 678, approximately 1.5 miles by road northeast of its intersection with State Road 627.

DESCRIPTION: Grayish-orange to dark yellowish-brown and moderate brown tuffaceous platy shale is present in a long roadcut. The shale has a strike of N34°E and dips 40°SE.

FORMATION OR AGE: Devonian

SAMPLED INTERVAL: Representative sample across 15 feet of shale.

RAW PROPERTIES:

Working properties:	short
Water of plasticity:	15.1%
Drying shrinkage:	2.5%
Dry strength:	fair
pH:	6.4

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Moderate orange	3	2.5	18.8	33.7	1.79
1050	Brownish-orange	4	5.0	13.8	26.8	1.94
1100	Strong brown	4	7.5	7.6	16.2	2.14
1150	Moderate reddish-brown	5	10.0	4.6	10.3	2.21
1200	-	-	Melted	-	-	-
1250	-	-	-	-	-	-

Remarks: No effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Structural clay products (e.g., building brick at 1050°-1150°C).

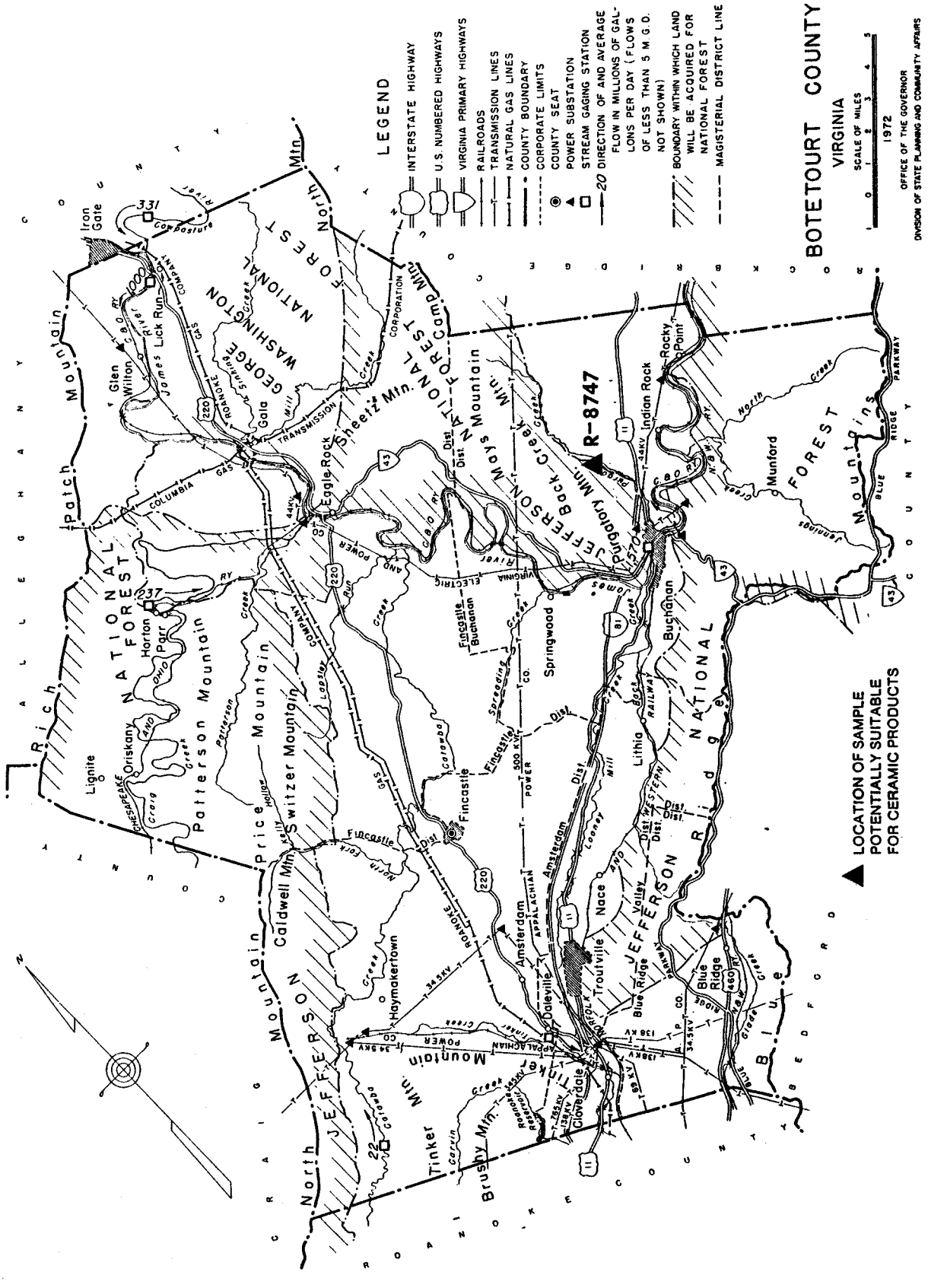

Figure 5. Location of clay-material sample in Botetourt County.

SAMPLE: R-8747 COUNTY: Botetourt

DATE: April, 1986 - Mineral Resources Institute

LOCALITY: N4,159,600 E617,000 (Zone 17). Buchanan 7.5-minute quadrangle. Roadcut 3.4 miles north of Buchanan, on the west side of State Road 611, approximately 1.9 miles by road north of its intersection with the Interstate Highway 81 west frontage road.

DESCRIPTION: Light olive-gray to olive-gray hard, silty shale is present in a long roadcut that has a maximum height of 20 feet. Some of the shale on the surface is weathered to a pale yellowish-brown with some pale yellowish-orange dusting on some surfaces. Some dusky brown to black stain is also present on the bedding planes. The shale has a north strike with a dip of 48°E. The shale grades down section into a medium-gray limestone, which was not sampled.

FORMATION OR AGE: Martinsburg Formation

SAMPLED INTERVAL: Representative composite sample across 30 feet of shale.

RAW PROPERTIES:

Working properties:	short
Water of plasticity:	16.0%
Drying shrinkage:	0.0%
Dry strength:	poor
pH:	7.5

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Strong brown	3	2.5	13.6	26.7	1.96
1050	Moderate orange	4	5.0	8.7	18.6	2.14
1100	Strong brown	7	7.5	3.9	9.0	2.29
1150	-	-	Melted	-	-	-
1200	-	-	-	-	-	-
1250	-	-	-	-	-	-

Remarks: Presence of carbonates could cause problems; slight effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Structural clay products (e.g., building brick at 1050°-1150°C).

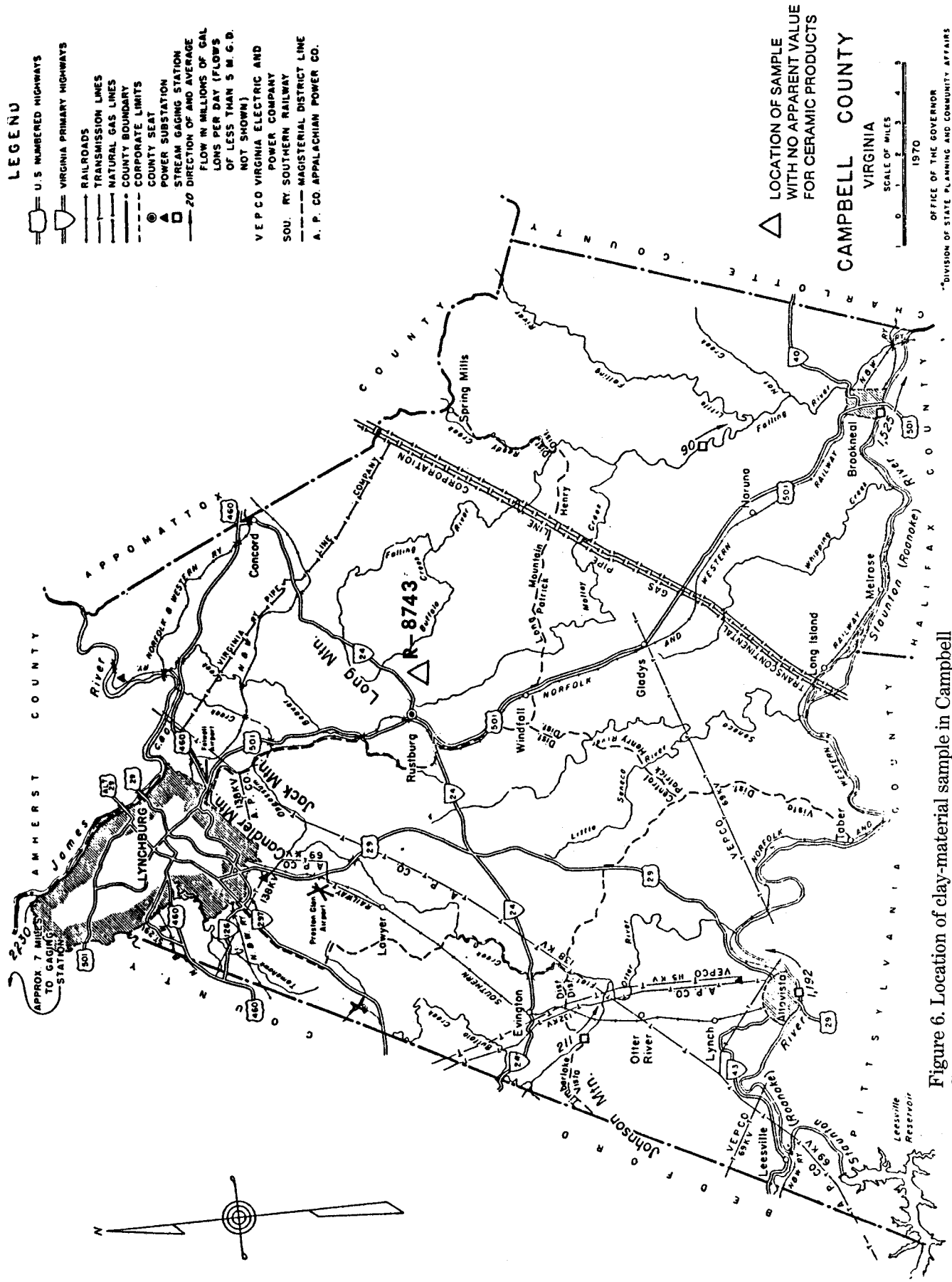

Figure 6. Location of clay-material sample in Campbell County.

SAMPLE: R-8743 COUNTY: Campbell

DATE: May, 1985 -Tuscaloosa Research Center

LOCALITY: N4,126,920 E670,830 (Zone 17). Rustburg 7.5-minute quadrangle. Roadcut 1.5 miles east of Rustburg, on the north side of State Road 663, approximately 0.65 mile by road east of its intersection with State Road 615.

DESCRIPTION: Light to dark reddish-brown plastic clay is present in a 275-foot-long roadcut that has a maximum height of 5.5 feet. An exposure of dark yellowish-orange schist is present in the extreme western end of the exposure but was not sampled.

FORMATION OR AGE: Residual clay

SAMPLED INTERVAL: Channel sample across 4.5 feet of clay.

RAW PROPERTIES:

Working properties:	plastic
Water of plasticity:	40.2%
Drying shrinkage:	7.5%
Dry strength:	good
pH:	6.3

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Moderate-reddish orange	3	10.0	25.2	43.2	1.71
1050	Deep orange	3	12.5	22.2	40.2	1.81
1100	Brownish-orange	5	17.5	11.5	25.8	2.24
1150	Strong brown	5	20.0	9.1	21.3	2.35
1200	Strong brown	5	22.5	5.0	12.4	2.51
1250	Strong brown	5	22.5	3.8	9.9	2.59

Remarks: High shrinkage; no effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Not suitable for structural clay products.

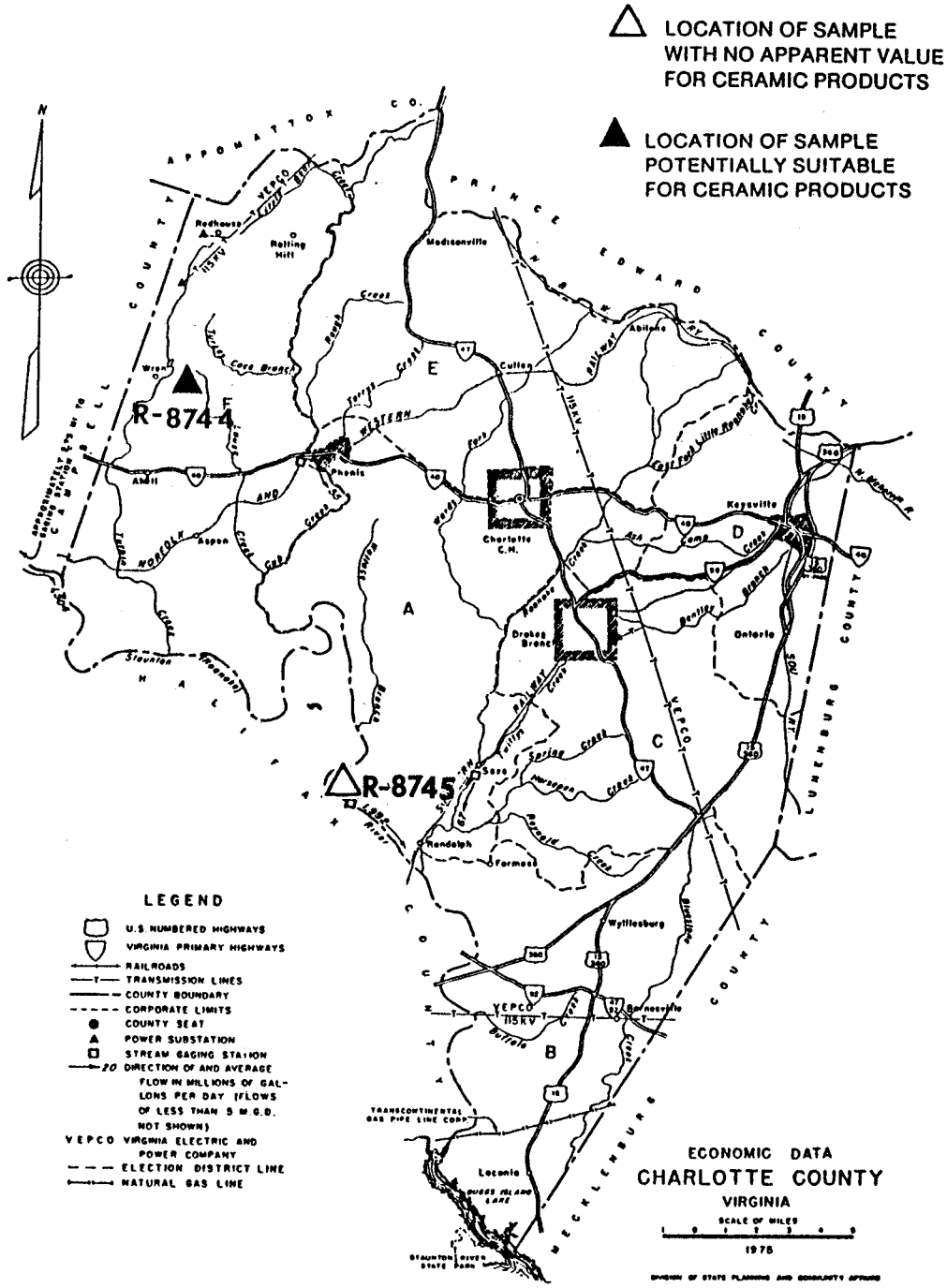

Figure 7. Location of clay-material samples in Charlotte County.

SAMPLE: R-8744 COUNTY: Charlotte

DATE: May, 1985 - Tuscaloosa Research Center

LOCALITY: N4,110,030 E692,850 (Zone 17). Aspen 7.5-minute quadrangle. Roadcut 5.1 miles northwest of Phenix, on the southeast side of State Road 672, approximately 0.3 mile by road southwest of its intersection with State Road 694.

DESCRIPTION: Moderate reddish-orange plastic clay and variegated dark yellowish-orange and red slightly micaceous clay is present in the upper 3.5 feet of a 275-foot-long roadcut. The lower 2.5 feet consists of light to dark yellowish-orange plastic clay mottled with red, very pale orange and grayish-orange micaceous clay. The clay material becomes more micaceous and also gritty with quartz fragments.

FORMATION OR AGE: Residual clay

SAMPLED INTERVAL: Composite channel sample across the top 5 feet of the exposure of clay.

RAW PROPERTIES:

Working properties:	plastic
Water of plasticity:	32.9%
Drying shrinkage:	2.5%
Dry strength:	good
pH:	6.4

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Moderate orange	3	5.0	27.2	42.3	1.56
1050	Moderate orange	3	7.5	26.0	41.4	1.59
1100	Moderate orange	3	10.0	21.0	36.2	1.73
1150	Moderate orange	4	12.5	18.0	32.6	1.82
1200	Deep orange	4	12.5	15.8	29.6	1.87
1250	Brownish-orange	4	12.5	14.9	28.3	1.90

Remarks: Slightly high shrinkage; no effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Marginal for structural clay products (e.g., building brick at 1150°-1250°C).

SAMPLE: R-8745 COUNTY: Charlotte

DATE: May, 1985 - Tuscaloosa Research Center

LOCALITY: N4,087,840 E702,010 (Zone 17). Saxe 7.5-minute quadrangle. Roadcut 2.5 miles northwest of Randolph, on the southwest side of State Road 607, approximately 0.35 mile by road southeast of its intersection with State Road 746.

DESCRIPTION: Light to moderate reddish-brown plastic residual clay is present over a granite in a 0.1-mile-long roadcut that has a maximum height of 7 feet. The reddish-brown clay becomes mottled with a plastic dark yellowish-orange, pale red and micaceous pinkish-gray clay towards the base of the exposure.

FORMATION OR AGE: Residual clay

SAMPLED INTERVAL: Composite channel sample across 6 feet of clay.

RAW PROPERTIES:

Working properties:	plastic
Water of plasticity:	36.2%
Drying shrinkage:	7.5%
Dry strength:	good
pH:	6.3

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Moderate orange	3	7.5	25.5	41.2	1.61
1050	Strong brown	3	7.5	23.8	40.0	1.68
1100	Deep orange	3	12.5	18.6	33.3	1.80
1150	Brownish-orange	4	15.0	17.1	31.8	1.83
1200	Strong brown	4	15.0	17.0	31.4	1.87
1250	Strong brown	4	15.0	16.3	30.6	1.87

Remarks: High shrinkage; no effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Not suitable for structural clay products.

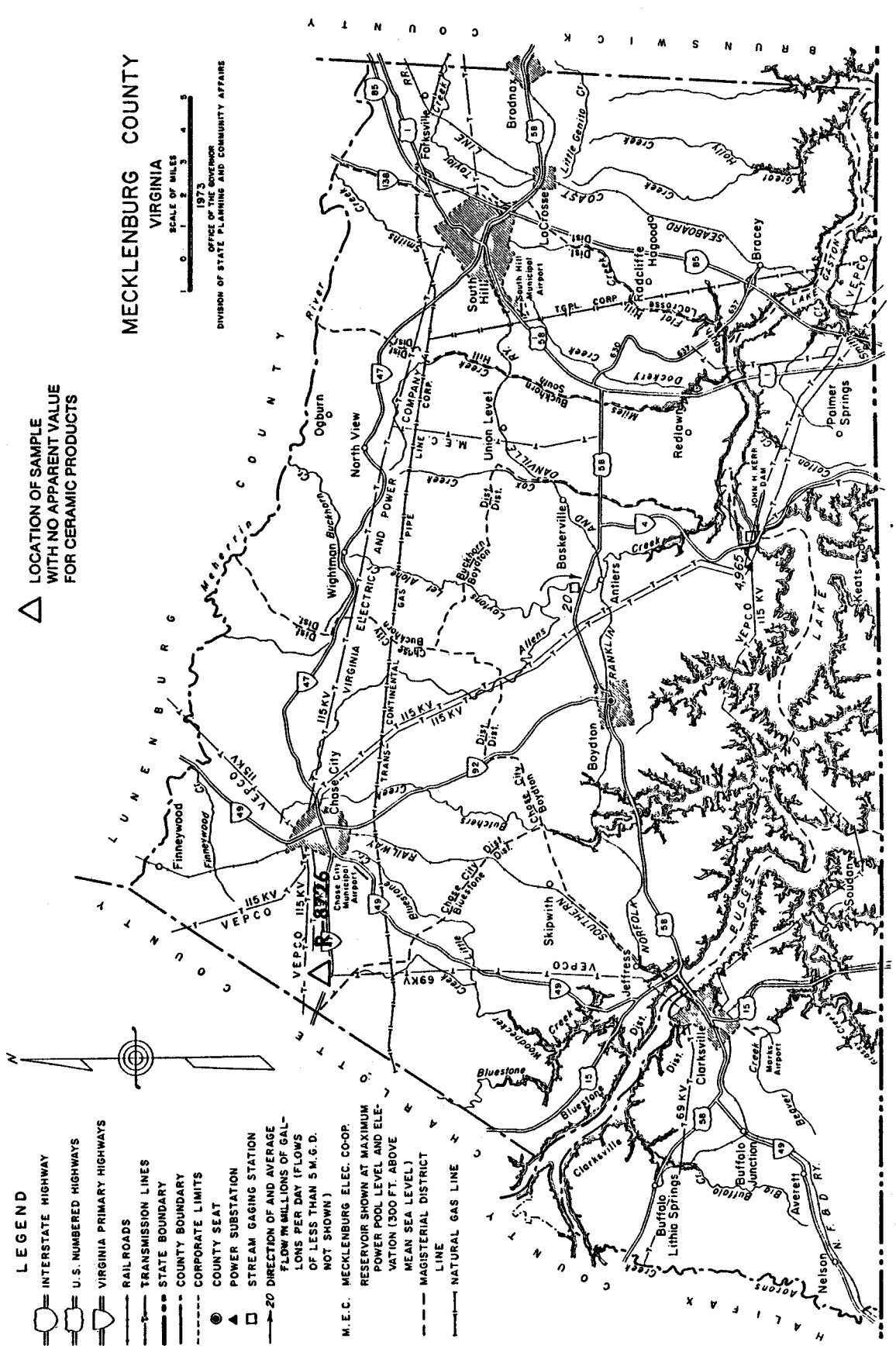

Figure 8. Location of clay-material sample in Mecklenburg County.

SAMPLE: R-8726 COUNTY: Mecklenburg

DATE: May, 1985 - Tuscaloosa Research Center

LOCALITY: N4,075,560 E719,510 (Zone 17). Wylliesburg 7.5-minute quadrangle. Roadcut 0.55 mile northwest of Spanish Grove, on the northeast side of State Road 609, approximately 0.5 mile by road northwest of its intersection with State Road 684.

DESCRIPTION: Pale to moderate reddish-brown plastic clay and yellowish-orange plastic clay is present in a 200-foot-long roadcut that has a maximum height of 5 feet. Brown silty overburden is present above the clay.

FORMATION OR AGE: Residual clay

SAMPLED INTERVAL: Channel sample across 4.5 feet of clay.

RAW PROPERTIES:

Working properties:	plastic
Water of plasticity:	40.0%
Drying shrinkage:	7.5%
Dry strength:	good
pH:	6.5

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Moderate reddish-orange	3	12.5	26.1	43.4	1.66
1050	Deep orange	3	12.5	24.7	42.2	1.71
1100	Brownish-orange	4	17.5	16.3	32.6	2.00
1150	Strong brown	4	20.5	11.5	25.2	2.19
1200	-	4	22.5	7.0	16.8	2.40
1250	-	5	22.5	5.8	14.2	2.44

Remarks: High shrinkage; no effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Not suitable for structural clay products.

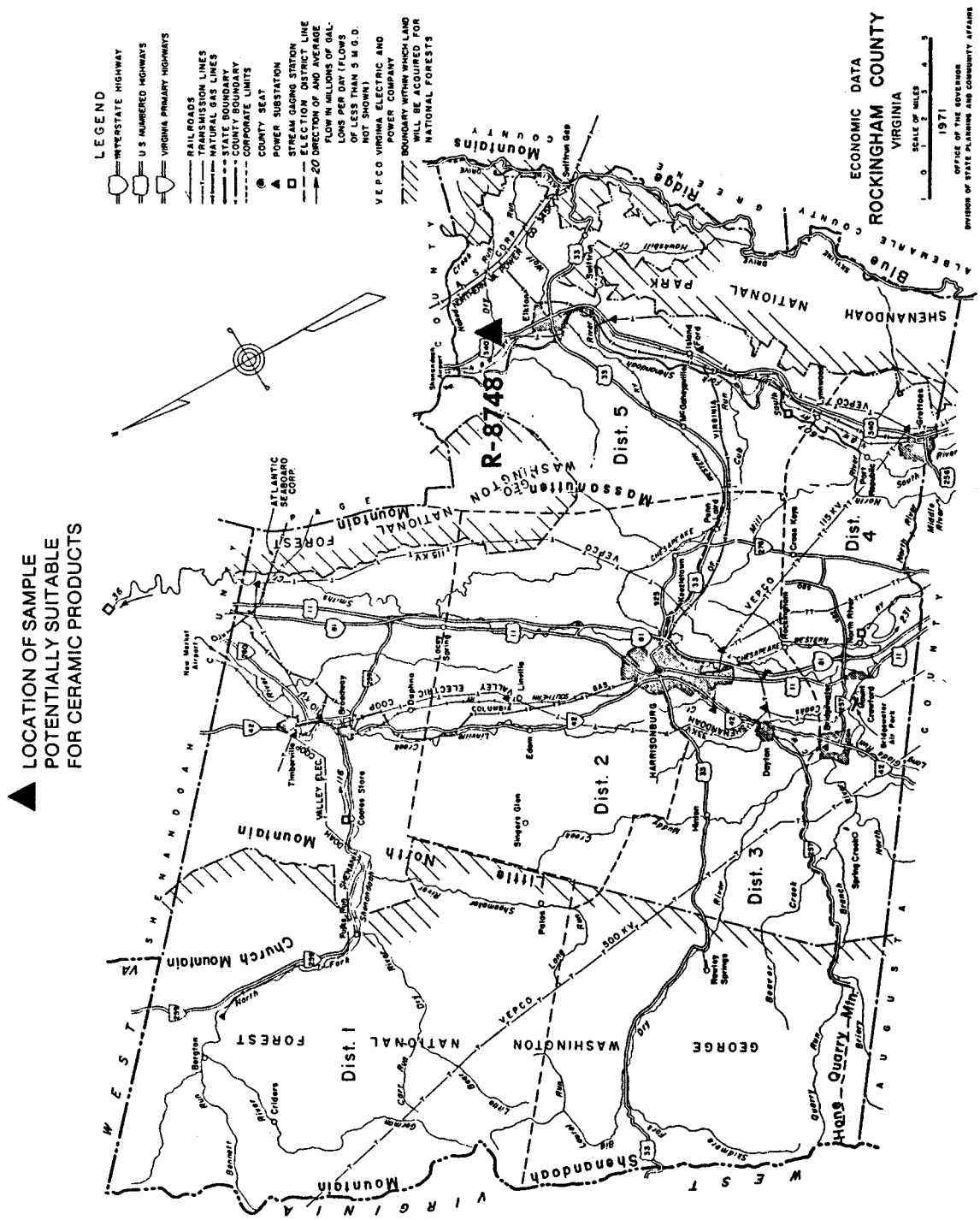

Figure 9. Location of clay-material sample in Rockingham County.

SAMPLE: R-8748 COUNTY: Rockingham

DATE: April, 1986 - Mineral Resources Institute

LOCALITY: N4,257,830 E708,620 (Zone 17). Elkton East 7.5-minute quadrangle. Roadcut 2.1 miles north of Elkton, on the south side of State Road 607, approximately 0.25 mile east of its intersection with U. S. Highway 340.

DESCRIPTION: Variegated dark red and moderate to dark reddish-brown plastic to partly gritty clay is present in a 185-foot-long roadcut that has a maximum height of 5 feet (Figure 10). Some dark yellowish-orange clay mottlings are also present in the exposure, which contains some sandstone pebbles on the surface. The clay is a residuum over the Elbrook Formation.

FORMATION OR AGE: Residual clay

SAMPLED INTERVAL: Representative channel sample across 4 feet of exposed clay.

RAW PROPERTIES:

Working properties:	plastic
Water of plasticity:	21.3%
Drying shrinkage:	2.5%
Dry strength:	fair
pH:	4.6

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Strong orange	5	5.0	22.7	39.4	1.74
1050	Strong orange	5	7.5	19.6	36.1	1.85
1100	Brownish-orange	5	10.0	9.1	20.6	2.28
1150	Brownish-orange	7	12.5	8.4	19.2	2.28
1200	Brownish-orange	7	12.5	8.0	18.5	2.33
1250	Brownish-orange	7	12.5	7.9	18.4	2.33

Remarks: Slightly high shrinkage at 1150°-1250°C; no effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Structural clay products (e.g., building brick at 1000°-1250°C).

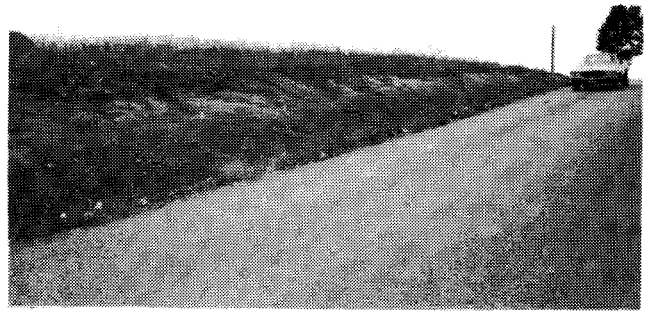

Figure 10. Clay residuum (R-8748) over Elbrook Formation, suitable for structural clay products and brick, exposed in roadcut along State Road 607, north of Elkton, Rockingham County.

SAMPLE: R-8748 COUNTY: Rockingham

DATE: April, 1986 - Mineral Resources Institute

LOCALITY: N4,257,830 E708,620 (Zone 17). Elkton East 7.5-minute quadrangle. Roadcut 2.1 miles north of Elkton, on the south side of State Road 607, approximately 0.25 mile east of its intersection with U. S. Highway 340.

DESCRIPTION: Variegated dark red and moderate to dark reddish-brown plastic to partly gritty clay is present in a 185-foot-long roadcut that has a maximum height of 5 feet (Figure 10). Some dark yellowish-orange clay mottlings are also present in the exposure, which contains some sandstone pebbles on the surface. The clay is a residuum over the Elbrook Formation.

FORMATION OR AGE: Residual clay

SAMPLED INTERVAL: Representative channel sample across 4 feet of exposed clay.

RAW PROPERTIES:

Working properties:	plastic
Water of plasticity:	21.3%
Drying shrinkage:	2.5%
Dry strength:	fair
pH:	4.6

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Strong orange	5	5.0	22.7	39.4	1.74
1050	Strong orange	5	7.5	19.6	36.1	1.85
1100	Brownish-orange	5	10.0	9.1	20.6	2.28
1150	Brownish-orange	7	12.5	8.4	19.2	2.28
1200	Brownish-orange	7	12.5	8.0	18.5	2.33
1250	Brownish-orange	7	12.5	7.9	18.4	2.33

Remarks: Slightly high shrinkage at 1150°-1250°C; no effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Structural clay products (e.g., building brick at 1000°-1250°C).

Figure 10. Clay residuum (R-8748) over Elbrook Formation, suitable for structural clay products and brick, exposed in roadcut along State Road 607, north of Elkton, Rockingham County.

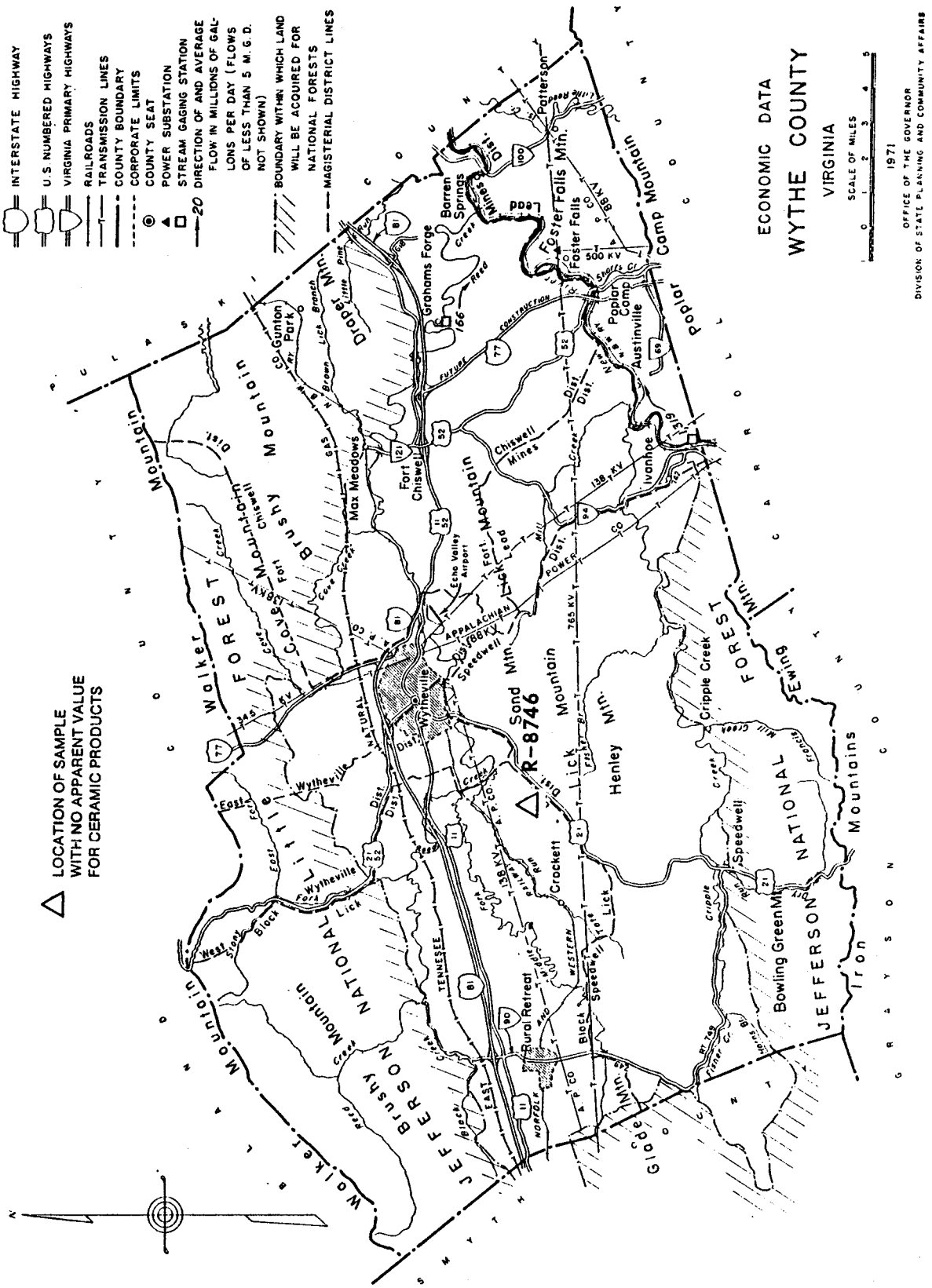

Figure 11. Location of clay-material sample in Wythe County.

SAMPLE: R-8746 COUNTY: Wythe

DATE: April, 1986 - Mineral Resources Institute

LOCALITY: N4,082,400 E487,000 (Zone 17). Crockett 7.5-minute quadrangle. Roadcut 2.6 miles east of Crockett, on the south side of State Road 652, just east of its intersection with State Road 654.

DESCRIPTION: Moderate brown to dark-yellowish brown plastic clay is present in a long roadcut that has a maximum height of 8 feet. Some grayish-orange and dark yellowish-orange clay mottlings are also present. Some dusky yellowish-brown (iron-manganese) stain is present on the moderate brown clay. The top 2 to 3 feet of the roadcut is grassed over.

FORMATION OR AGE: Residual clay

SAMPLED INTERVAL: Representative channel sample across 5.5 feet of clay.

RAW PROPERTIES:

Working properties:	plastic
Water of plasticity:	30.9%
Drying shrinkage:	5.0%
Dry strength:	fair
pH:	5.25

SLOW FIRING TEST:

Temp. °C.	*Color*	*Hard-ness*	*% Lin. Shk.*	*% Abs.*	*% Appr. Por.*	*Bulk Dens. gm/cc*
1000	Strong brown	5	12.5	21.9	38.4	1.76
1050	Brownish-orange	5	22.5	3.1	7.9	2.54
1100	-	-	Melted	-	-	-
1150	-	-	-	-	-	-
1200	-	-	-	-	-	-
1250	-	-	-	-	-	-

Remarks: High shrinkage; no effervescence with HCl.

PRELIMINARY BLOATING TEST: Negative

POTENTIAL USE: Not suitable for structural clay products.

APPENDIX II: Uses listed by county/city.

Appendix II contains a listing of clay material samples, listed numerically with their potential use under county/city headings. All of 630 samples, collected during the 1957-1986 Program, have one or more potential uses. Potential uses for individual samples have been listed as reported by individual laboratories. One exception is the various types of brick (eg. common brick, face brick, "NW" brick, "SW" brick) which have all been listed under the heading - brick. In parentheses after each county or city heading, the Mineral Resources Report or Publication number (Table 1), in which the location map, geologic descriptions, and sample test data can be found, is noted. An asterisk (*) after the sample indicates that the test data are present in the Appendix of this report.

ALBEMARLE (5, 36, 68)

Sample Number	Potential Use
R-2	Brick, tile, quarry tile
R-1973	Brick, quarry tile
R-1974	Color additive (pigment)
R-7523	Brick, structural clay products
R-8629	Refractories
R-8644	Brick, structural clay products

ALLEGHANY (5, 13, 68)

Sample Number	Potential Use
R-1818	Brick, tile, sewer pipe
R-1819	Brick, tile, drain tile, terra cotta
R-1820	Brick, tile, drain tile, terra cotta, pottery
R-1828	Brick, tile, drain tile, terra cotta, pottery
R-1829	Whiteware
R-1849	Brick
R-1976	Brick, tile, lightweight aggregate
R-1977	Brick, tile
R-1978	Brick, lightweight aggregate
R-1981	Brick, lightweight aggregate
R-1986	Brick
R-1987	Brick
R-4911	Lightweight aggregate
R-4912	Lightweight aggregate
R-8567	Brick, structural clay products, lightweight aggregate
R-8568	Brick, structural clay products, lightweight aggregate

AMELIA (12)

Sample Number	Potential Use
R-3474	Brick
R-3477	Brick
R-3481	Brick
R-3482	Brick

AMHERST (12)

Sample Number	Potential Use
R-3530	Structural clay products, drain tile, porous clay products, pottery
R-3531	Porous clay products
R-3532	Brick, tile
R-3533	Structural clay products
R-3534	Structural clay products
R-3535	Nonplastic component
R-3861	Nonplastic component
R-4114	Refractories
R-4124	Structural clay products, sewer pipe
R-4362	Brick, tile, lightweight aggregate

APPOMATTOX (12)

Sample Number	Potential Use
R-3522	Brick, tile
R-3523	Drain tile, porous clay products, pottery
R-3524	Brick, tile
R-3525	Brick

AUGUSTA (5, 36)

Sample Number	Potential Use
R-1	Brick, tile
R-38	Brick, tile, lightweight aggregate
R-39	Brick, tile, lightweight aggregate
R-40	Whiteware, mineral filler
R-1614	Brick, quarry tile, lightweight aggregate
R-1615	Lightweight aggregate
R-1616	Brick
R-1617	Brick
R-1618	Brick, lightweight aggregate
R-1622	Brick, tile
R-1624	Brick
R-1625	Brick, tile
R-1626	Refractories, colored ceramic ware
R-1660	Refractories, colored ceramic ware
R-1661	Lightweight aggregate
R-1663	Brick, tile, lightweight aggregate
R-1664	Brick, lightweight aggregate
R-1720	Brick
R-1850	Brick, tile
R-1852	Brick, tile
R-7190	Brick, structural clay products

BATH (5, 36, 68)

Sample Number	Potential Use
R-1719	Brick, tile
R-1822	Brick, tile, quarry tile, pottery
R-7167	Brick, structural clay products
R-8727*	Brick, structural clay products

BEDFORD (12)

Sample Number	Potential Use
R-3546	Brick, structural clay products, sewer pipe
R-3547	Brick, structural clay products, sewer pipe
R-3549	Structural clay products, sewer pipe
R-3550	Nonplastic component
R-4077	Whiteware, refractories

BLAND (6)

Sample Number	Potential Use
R-2054	Brick
R-2055	Brick, lightweight aggregate
R-2056	Brick
R-2057	Brick, tile, lightweight aggregate
R-2058	Brick, tile
R-2059	Brick
R-2060	Brick, lightweight aggregate

BOTETOURT (5, 36, 68)

Sample Number	Potential Use
R-1715	Brick
R-1716	Brick
R-1770	Lightweight aggregate
R-1771	Brick, lightweight aggregate
R-1774	Brick, lightweight aggregate
R-1775	Brick, lightweight aggregate
R-1776	Brick
R-1777	Brick, quarry tile
R-1812	Brick, tile, terra cotta, pottery
R-1813	Brick, tile, drain tile, pottery
R-1815	Brick, tile
R-1923	Brick
R-2092	Brick, tile
R-6921	Brick, structural clay products
R-8510	Brick, structural clay products, lightweight aggregate
R-8511	Brick, structural clay products, lightweight aggregate
R-8747*	Brick, structural clay products

BRUNSWICK (12)

Sample Number	Potential Use
R-4100	Structural clay products, sewer pipe
R-4101	Brick, tile
R-4102	Brick, tile
R-4103	Brick, tile
R-4363	Brick, tile
R-4364	Brick, refractories
R-4365	Brick, refractories

BUCHANAN (6)

Sample Number	Potential Use
R-1930	Brick, tile, drain tile
R-2556	Lightweight aggregate
R-2557	Lightweight aggregate

BUCKINGHAM (5, 36, 68)

Sample Number	Potential Use
R-1728	Lightweight aggregate
R-1830	Color additive (pigment)
R-2062	Mineral filler
R-6811	Brick, structural clay products
R-7464	Brick, structural clay products
R-7466	Brick, structural clay products
R-7502	Brick, structural clay products
R-7505	Brick, structural clay products
R-7506	Brick, structural clay products
R-8626	Brick, structural clay products

CAMPBELL (12)

Sample Number	Potential Use
R-3537	Structural clay products, sewer pipe, lightweight aggregate
R-3538	Nonplastic component
R-3540	Brick, tile
R-3541	Brick, tile, structural clay products, porous clay products, pottery
R-3544	Brick, tile, porous clay products, pottery
R-3663	Structural clay products

CAROLINE (8, 36, 68)

Sample Number	Potential Use
R-2797	Flue lining
R-2798	Pottery
R-2807	Brick, drain tile, lightweight aggregate

Sample Number	Potential Use
R-2808	Brick, structural tile
R-7317	Brick, structural clay products
R-7318	Brick, structural clay products
R-7319	Brick, structural clay products
R-7320	Brick, structural clay products
R-7321	Brick, structural clay products
R-7535	Brick, structural clay products
R-8612	Brick, structural clay products
R-8613	Lightweight aggregate

CARROLL (12)

Sample Number	Potential Use
R-4073	Nonplastic component
R-4076	Brick, tile, sewer pipe
R-4094	Structural clay products, sewer pipe

CHARLES CITY (8, 36)

Sample Number	Potential Use
R-2870	Brick, quarry tile, sewer pipe
R-2873	Brick
R-2874	Brick, quarry tile, sewer pipe
R-2875	Brick, tile
R-2876	Brick, structural tile, pottery
R-7752	Brick, structural clay products

CHARLOTTE (12, 68)

Sample Number	Potential Use
R-3551	Brick, tile
R-3553	Nonplastic component
R-3558	Brick, tile
R-3559	Brick, tile
R-3692	Brick, tile
R-8744*	Brick, structural clay products

CHARLOTTESVILLE (CITY OF) (68)

Sample Number	Potential Use
R-8616	Brick, structural clay products, refractories, structural tile

CHESAPEAKE (CITY OF)

Sample Number	Potential Use
R-7399	Brick, structural clay products, structural tile

CHESTERFIELD (8, 13, 36, 68)

Sample Number	Potential Use
R-2709	Brick
R-2866	Brick, tile
R-2869	Brick, sewer pipe
R-2890	Nonplastic component
R-2891	Brick, quarry tile, sewer pipe
R-6193	Brick, sewer pipe
R-6195	Brick, structural tile
R-7753	Brick, structural clay products
R-7754	Brick, structural clay products
R-7950	Brick, structural clay products
R-8615	Brick, structural clay products

CLARKE (2, 36)

Sample Number	Potential Use
R-1704	Lightweight aggregate
R-6949	Brick, structural clay products

CRAIG (5, 68)

Sample Number	Potential Use
R-1816	Brick, tile, pottery
R-1817	Brick, drain tile
R-1968	Brick, tile, lightweight aggregate
R-1972	Brick
R-1979	Brick
R-1984	Brick, lightweight aggregate
R-8506	Brick, structural clay products
R-8507	Brick, structural clay products
R-8509	Brick, structural clay products
R-8512	Brick, structural clay products

CULPEPER (2, 68)

Sample Number	Potential Use
R-677	Brick
R-679	Brick, tile
R-680	Plastic component
R-8459	Brick, structural clay products

CUMBERLAND (12, 36, 68)

Sample Number	Potential Use
R-3458	Brick
R-3459	Brick
R-3460	Brick
R-3461	Brick
R-3545	Porous clay products
R-7489	Brick, structural clay products
R-7490	Brick, structural clay products
R-8578	Brick, structural clay products

DICKENSON (6, 36)

Sample Number	Potential Use
R-2558	Clay dummies
R-2560	Lightweight aggregate
R-7352	Brick, structural clay products

DINWIDDIE (8, 68)

Sample Number	Potential Use
R-2914	Pottery
R-2915	Pottery
R-2916	Nonplastic component
R-2917	Nonplastic component
R-8468	Brick, structural clay products

ESSEX (8, 36)

Sample Number	Potential Use
R-2779	Flue lining
R-2801	Flue lining
R-2802	Brick
R-7322	Brick, structural clay products

FAIRFAX (2)

Sample Number	Potential Use
R-417	Brick
R-419	Brick
R-424	Brick
R-425	Brick, tile
R-426	Brick
R-529	Brick, tile

FAUQUIER (2, 68)

Sample Number	Potential Use
R-242	Brick
R-593	Brick, tile
R-594	Brick, tile
R-595	Brick, tile
R-596	Brick
R-597	Brick
R-598	Brick, tile
R-8460	Brick, structural clay products
R-8461	Brick, structural clay products
R-8462	Brick, structural clay products
R-8463	Brick, structural clay products
R-8500	Brick, structural clay products
R-8501	Brick, structural clay products

FLOYD (12)

Sample Number	Potential Use
R-4062	Nonplastic component
R-4074	Brick, tile, porous clay products
R-4719	Nonplastic component

FLUVANNA (5, 68)

Sample Number	Potential Use
R-1544	Brick
R-1546	Brick, tile
R-1713	Brick, tile
R-1932	Brick, quarry tile, lightweight aggregate
R-1934	Brick
R-1936	Brick
R-1940	Brick
R-8609	Brick, structural clay products

FRANKLIN (12, 13, 36)

Sample Number	Potential Use
R-2007	Whiteware, mineral filler
R-4065	Brick, tile
R-4070	Whiteware, refractories, paper coater, mineral filler
R-4123	Refractories, mineral filler
R-6952	Brick, structural clay

FREDERICK (2, 68)

Sample Number	Potential Use
R-519	Brick, quarry tile
R-520	Brick, quarry tile
R-521	Brick, quarry tile
R-522	Brick, quarry tile
R-524	Brick, quarry tile
R-525	Brick, quarry tile
R-526	Brick, quarry tile
R-652A	Brick, tile, lightweight aggregate
R-652B	Brick, tile, lightweight aggregate
R-1190A	Lightweight aggregate
R-1190B	Brick, tile
R-1191A	Brick, lightweight aggregate
R-1191B	Brick
R-8636	Brick, structural clay products

GILES (6)

Sample Number	Potential Use
R-2572	Lightweight aggregate
R-2573	Brick, lightweight aggregate

GLOUCESTER (8)

Sample Number	Potential Use
R-2775	Brick

GOOCHLAND (12)

Sample Number	Potential Use
R-3462	Brick
R-3463	Brick
R-3464	Brick
R-3465	Brick

GRAYSON (12)

Sample Number	Potential Use
R-8525	Brick, structural clay products

GREENSVILLE (8)

Sample Number	Potential Use
R-4072	Brick, tile
R-4092	Brick, tile
R-4093	Brick, tile
R-4096	Structural clay products, sewer pipe
R-4097	Brick, tile
R-4098	Brick, tile
R-4099	Flue lining, pottery, refractories

GREENE (68)

Sample Number	Potential Use
R-2712	Brick
R-2906	Flue lining
R-2907	Brick, structural tile
R-2908	Brick, structural tile
R-2909	Brick, quarry tile, sewer pipe
R-2910	Flue lining, pottery
R-2911	Brick, pottery

HALIFAX (12, 13, 36, 68)

Sample Number	Potential Use
R-3670	Brick, tile, drain tile, pottery
R-3688	Brick, structural clay products
R-4066	Brick, tile, pottery
R-4067	Brick, tile
R-4068	Brick, tile
R-5338	Brick, sewer pipe
R-5339	Brick, quarry tile, sewer pipe
R-6812	Brick, structural clay products
R-6813	Brick, structural clay products
R-7530	Brick, structural clay products
R-8627	Brick, structural clay products

HANOVER (8, 13, 68)

Sample Number	Potential Use
R-2858	Brick, drain tile
R-2861	Flue lining
R-2863	Brick, structural tile
R-6189	Lightweight aggregate
R-8610	Brick, structural clay products

HENRICO (8, 13, 36)

Sample Number	Potential Use
R-2864	Flue lining
R-2865	Brick, structural tile
R-2968	Brick
R-5006	Brick, quarry tile
R-5007	Brick
R-5731	Brick
R-5732	Brick, structural tile, sewer pipe
R-6190	Brick
R-6196	Brick
R-7510	Brick, structural clay products, structural tile
R-7533	Brick, structural clay products, lightweight aggregate
R-7534	Brick, structural clay products
R-7867	Brick, structural clay products, lightweight aggregate
R-7868	Brick, structural clay products, structural tile

HENRY (12)

Sample Number	Potential Use
R-3813	Nonplastic component
R-3815	Nonplastic component
R-7477	Refractories
R-7478	Refractories

HIGHLAND (5)

Sample Number	Potential Use
R-1824	Brick
R-1825	Brick
R-1826	Brick, tile
R-1859	Brick, tile, lightweight aggregate
R-1861	Brick

ISLE OF WIGHT (8, 36)

Sample Number	Potential Use
R-1992	Lightweight aggregate
R-2960	Brick, drain tile
R-2961	Brick, drain tile

Sample Number	Potential Use
R-3214	Brick
R-7404	Brick, structural clay products

JAMES CITY (8, 36)

Sample Number	Potential Use
R-1722	Brick, tile
R-1907	Brick, tile
R-2877	Brick, drain tile, sewer pipe, pottery
R-7368	Brick, structural clay products
R-7539	Brick, structural clay products
R-7540	Brick, structural clay products
R-7541	Brick, structural clay products
R-7542	Brick, structural clay products
R-7543A	Brick, structural clay products
R-7543B	Brick, structural clay products

KING AND QUEEN (8)

Sample Number	Potential Use
R-2855	Brick, drain tile

KING GEORGE (8, 36)

Sample Number	Potential Use
R-2636	Brick
R-2637	Mineral filler
R-3043	Mineral filler
R-7316	Brick, structural clay products

KING WILLIAM (8)

Sample Number	Potential Use
R-2809	Pottery
R-2812	Pottery
R-2857	Brick

LANCASTER (13)

Sample Number	Potential Use
R-669	Brick, tile
R-670	Brick, tile
R-671	Brick, tile

LEE (6)

Sample Number	Potential Use
R-2467	Brick
R-2475	Lightweight aggregate
R-2480	Brick, drain tile
R-2481	Brick
R-2482	Brick
R-2487	Brick

LOUDOUN (2, 36)

Sample Number	Potential Use
R-238	Brick
R-239	Brick
R-241	Brick
R-517	Brick, lightweight aggregate
R-518	Brick, lightweight aggregate
R-590	Brick
R-591	Brick, tile, pottery
R-592	Brick, tile
R-6950	Brick, structural clay products

LOUISA (68)

Sample Number	Potential Use
R-8606	Brick, structural clay products

LUNENBURG (12)

Sample Number	Potential Use
R-3693	Brick, tile, porous clay products
R-8596	Brick, structural clay products

MADISON (2)

R-1708	Brick, tile

MATHEWS (8)

Sample Number	Potential Use
R-2767	Lightweight aggregate, pottery

MECKLENBURG (12, 68)

Sample Number	Potential Use
R-3687	Nonplastic component
R-3689	Brick, tile
R-3690	Structural clay products, sewer pipe
R-3691	Nonplastic component
R-8571	Brick, structural clay products
R-8614	Brick, structural clay products

MIDDLESEX (8)

Sample Number	Potential Use
R-2768	Pottery
R-2769	Brick

MONTGOMERY (5, 68)

Sample Number	Potential Use
R-638	Brick
R-639	Brick
R-641	Brick
R-643	Brick, tile
R-644A	Brick, lightweight aggregate
R-644B	Brick
R-644C	Brick
R-645	Brick
R-1924	Brick
R-1925	Brick, tile
R-1926	Brick
R-8513	Brick, structural clay products

NELSON (5, 36)

Sample Number	Potential Use
R-4	Whiteware, refractories
R-6	Whiteware, refractories
R-2009	Refractories, ceramic ware
R-7525	Refractories
R-7526A	Lightweight aggregate, structural clay products
R-7526B	Refractories

NEW KENT (8)

Sample Number	Potential Use
R-2879	Pottery
R-2881	Brick, quarry tile
R-2882	Brick

NORTHUMBERLAND (13)

Sample Number	Potential Use
R-646	Brick, tile
R-667	Brick, tile
R-668	Brick, tile

NOTTOWAY (12)

Sample Number	Potential Use
R-3484	Brick
R-3485	Brick
R-3487	Brick, tile, structural clay products
R-3490	Structural clay products

ORANGE (2, 68)

Sample Number	Potential Use
R-623	Brick
R-1187	Brick
R-1189	Brick
R-8456	Brick, structural clay products

PAGE (2, 13, 36, 68)

Sample Number	Potential Use
R-650	Brick
R-673	Brick, tile, lightweight aggregate
R-1675	Brick
R-1676	Quarry tile
R-1677	Quarry tile
R-1678	Brick, tile
R-6954	Brick, structural clay products
R-6957	Brick, structural clay products
R-6958	Brick, structural clay products
R-8537	Brick, structural clay products
R-8544	Brick, structural clay products
R-8560	Brick, structural clay products
R-8570A	Brick, structural clay products
R-8570B	Brick, structural clay products, structural tile

PITTSYLVANIA (12, 36)

Sample Number	Potential Use
R-3664	Brick, tile
R-3667	Structural clay products, sewer pipe, foundry soil
R-3668	Brick, structural clay products, sewer pipe
R-3671	Brick, tile, structural clay products
R-7482	Refractories

POWHATAN (12)

Sample Number	Potential Use
R-3467	Brick
R-3468	Brick
R-3469	Brick
R-3470	Brick
R-3471	Brick
R-3472	Brick

PRINCE EDWARD (12)

Sample Number	Potential Use
R-3489	Nonplastic component
R-3493	Brick, tile
R-3554	Brick, structural clay products, sewer pipe

PRINCE GEORGE (8, 36)

Sample Number	Potential Use
R-1991	Brick, tile
R-2897	Brick, flue lining
R-2898	Brick, flue lining
R-7418	Brick, structural clay products
R-7419	Brick, structural clay products

PRINCE WILLIAM (2, 36)

Sample Number	Potential Use
R-234	Brick, tile
R-422	Lightweight aggregate
R-423	Brick, tile
R-600	Brick
R-622	Brick
R-745	Brick
R-1543	Brick, tile
R-7244	Brick, structural clay products

Sample Number	Potential Use

PULASKI (6)

R-2085	Brick, lightweight aggregate
R-2087	Brick, lightweight aggregate
R-2088	Brick
R-2089	Brick, tile
R-2091	Brick

RAPPAHANNOCK (68)

Sample Number	Potential Use
R-8526	Brick, structural clay products
R-8536	Brick, structural clay products
R-8559	Brick, structural clay products

RICHMOND (8, 36)

Sample Number	Potential Use
R-2770	Brick, structural tile, flue lining
R-3039	Mineral filler
R-3040	Mineral filler
R-3041	Mineral filler
R-3042	Mineral filler
R-3044	Mineral filler, absorbent
R-7558	Brick, structural clay products, structural tile

RICHMOND (CITY OF) (13)

Sample Number	Potential Use
R-6191	Brick

ROANOKE (5, 68)

Sample Number	Potential Use
R-1862	Brick
R-1864	Brick
R-1865	Brick
R-1867	Lightweight aggregate
R-1868	Brick, lightweight aggregate
R-1927	Brick
R-8482	Brick, structural clay products
R-8586	Brick, structural clay products
R-8604	Brick, structural clay products, structural tile
R-8605	Brick, structural clay products

ROCKBRIDGE (5, 36)

Sample Number	Potential Use
R-13	Pottery, whiteware, refractories, mineral filler
R-1665	Brick, tile, lightweight aggregate
R-1668	Brick, lightweight aggregate
R-1669	Brick, tile, lightweight aggregate
R-1670	Brick, tile
R-1724	Lightweight aggregate
R-1726	Lightweight aggregate
R-1911	Brick, tile, flue lining, pottery
R-1912	Brick, sewer pipe
R-1913	Brick, sewer pipe
R-6942	Brick, structural clay products
R-7163	Plastic component

ROCKINGHAM (2, 13, 36, 68)

Sample Number	Potential Use
R-11	Brick, tile
R-12	Brick, tile
R-377	Brick, tile
R-396	Brick
R-397A	Brick
R-397B	Brick, lightweight aggregate
R-398	Brick
R-1182	Brick, tile
R-1183A	Brick, lightweight aggregate
R-1183B	Brick
R-1184	Brick, tile, lightweight aggregate
R-1185	Brick, tile
R-7170	Brick, structural clay products
R-8475	Brick, structural clay products
R-8748*	Brick, structural clay products

RUSSELL (6)

Sample Number	Potential Use
R-2525	Flue lining
R-2526	Brick
R-2527	Brick
R-2528	Brick, drain tile, sewer pipe
R-2531	Lightweight aggregate
R-2532	Brick

SCOTT (6)

Sample Number	Potential Use
R-1877	Lightweight aggregate
R-1878	Lightweight aggregate
R-1879	Lightweight aggregate
R-1880	Lightweight aggregate
R-1881	Lightweight aggregate
R-1882	Brick, lightweight aggregate
R-1883	Brick, lightweight aggregate
R-1941	Brick
R-1943	Brick
R-2466	Brick
R-2468	Brick
R-2470	Lightweight aggregate
R-2474	Brick
R-2479	Brick
R-2484	Brick
R-2485	Lightweight aggregate

SHENANDOAH (2)

Sample Number	Potential Use
R-657	Brick
R-658	Lightweight aggregate
R-660	Brick
R-663	Brick, lightweight aggregate
R-665	Brick, lightweight aggregate
R-674	Brick, tile, lightweight aggregate
R-675	Brick, lightweight aggregate
R-676	Brick, lightweight aggregate

SMYTH (6)

Sample Number	Potential Use
R-46	Pottery
R-1889	Brick, tile, lightweight aggregate
R-1890	Brick, tile, lightweight aggregate
R-1904	Brick, drain tile
R-1908	Brick, tile, lightweight aggregate
R-2061	Brick, lightweight aggregate
R-2544	Brick
R-2545	Lightweight aggregate
R-2547	Lightweight aggregate
R-2548	Brick, pottery

SOUTHHAMPTON (8)

Sample Number	Potential Use
R-2926	Brick
R-3206	Brick
R-3208	Brick

SPOTSYLVANIA (2, 68)

Sample Number	Potential Use
R-681	Brick
R-682	Brick
R-8607	Brick, structural clay products

STAFFORD (2, 36)

Sample Number	Potential Use
R-306	Refractories
R-308	Refractories
R-309	Refractories
R-310	Refractories
R-311	Refractories
R-312	Refractories, tile
R-313	Refractories, tile
R-7243	Brick, structural clay products
R-7536	Brick, structural clay products
R-7537	Brick, structural clay products
R-7538	Brick, structural clay products

SUFFOLK (CITY OF) (8)

Sample Number	Potential Use
R-2927	Brick
R-2959	Brick, structural tile, pottery

SURRY (8, 36)

Sample Number	Potential Use
R-2658	Pottery
R-2892	Brick
R-2893	Brick
R-2894	Brick
R-2895	Flue lining
R-7377	Brick, structural clay products

SUSSEX (8)

Sample Number	Potential Use
R-2896	Brick
R-2912	Brick, structural tile, flue lining
R-2918	Refractories
R-2919	Brick, flue lining
R-2920	Brick
R-2921	Brick, sewer pipe
R-2922	Brick, sewer pipe
R-2923	Refractories

TAZEWELL (6, 68)

Sample Number	Potential Use
R-1891	Brick, tile, lightweight aggregate
R-1892	Brick, tile, lightweight aggregate
R-1906	Brick, tile, lightweight aggregate
R-2561	Clay dummies
R-2562	Brick
R-2563	Brick
R-2564	Lightweight aggregate
R-2565	Lightweight aggregate
R-2566	Brick
R-2567	Brick
R-8646	Brick, structural clay products

VIRGINIA BEACH (CITY OF) (36)

Sample Number	Potential Use
R-6810	Lightweight aggregate, structural clay products
R-7173	Brick, structural clay products
R-7176	Brick, structural clay products
R-7177	Brick, structural clay products
R-7178A	Brick, structural clay products
R-7179	Brick, structural clay products
R-7400	Brick, structural clay products, structural tile
R-7401	Brick, structural clay products, structural tile

WARREN (2, 36)

Sample Number	Potential Use
R-648	Brick, lightweight aggregate
R-649	Brick, tile
R-666	Brick
R-6953	Brick, structural clay products
R-7484	Brick, structural clay products

WASHINGTON (6, 13, 36, 68)

Sample Number	Potential Use
R-2514	Lightweight aggregate
R-2516	Brick, structural tile
R-2517	Brick
R-2518	Brick
R-2519	Brick
R-2520	Brick
R-2521	Brick, drain tile
R-2522	Brick
R-2523	Brick, lightweight aggregate
R-2524	Pottery
R-6205	Lightweight aggregate
R-6206	Brick, lightweight aggregate
R-6207A	Lightweight aggregate
R-6207B	Brick, lightweight aggregate
R-6209	Brick
R-6211	Brick, structural clay products
R-7165	Brick, structural clay products
R-8561	Brick, structural clay products

WESTMORELAND (8, 36)

Sample Number	Potential Use
R-2639	Mineral filler
R-2735	Brick, sewer pipe
R-2736	Brick, sewer pipe
R-2737	Brick, structural tile
R-6975	Brick, structural clay products
R-7362	Brick, structural clay products
R-7364	Brick, structural clay products
R-7365	Brick, structural clay products

WISE (6, 36)

Sample Number	Potential Use
R-1945	Brick, tile
R-1948	Brick
R-1950	Brick
R-1951	Lightweight aggregate
R-1952	Brick
R-1953	Lightweight aggregate
R-1954	Brick, quarry tile, lightweight aggregate
R-1955	Brick, lightweight aggregate
R-1956	Brick, quarry tile
R-1957	Brick
R-1958	Lightweight aggregate
R-6699	Brick, structural clay products

WYTHE (6, 36)

Sample Number	Potential Use
R-2538	Brick
R-2539	Brick
R-2541	Brick
R-2542	Brick
R-2543	Flue lining
R-7353	Brick, structural clay products, structural tile

YORK (8)

Sample Number	Potential Use
R-2714	Brick

APPENDIX III: Clay material samples listed by potential product.

ABSORBENT

Sample	County/City
R-3044	Richmond

BRICK

Sample	County/City
R-1	Augusta
R-2	Albemarle
R-11	Rockingham
R-12	Rockingham
R-38	Augusta
R-39	Augusta
R-234	Prince William
R-238	Loudoun
R-239	Loudoun
R-241	Loudoun
R-242	Fauquier
R-312	Stafford
R-313	Stafford
R-377	Rockingham
R-396	Rockingham
R-397A	Rockingham
R-397B	Rockingham
R-398	Rockingham
R-417	Fairfax
R-419	Fairfax
R-423	Prince William
R-424	Fairfax
R-425	Fairfax
R-426	Fairfax
R-517	Loudoun
R-518	Loudoun
R-519	Frederick
R-520	Frederick
R-521	Frederick
R-522	Frederick
R-524	Frederick
R-525	Frederick
R-526	Frederick
R-529	Fairfax
R-590	Loudoun
R-591	Loudoun
R-592	Loudoun
R-593	Fauquier
R-594	Fauquier
R-595	Fauquier
R-596	Fauquier
R-597	Fauquier
R-598	Fauquier
R-600	Prince William
R-622	Prince William
R-623	Orange

BRICK (continued)

Sample	County/City
R-638	Montgomery
R-639	Montgomery
R-641	Montgomery
R-643	Montgomery
R-644A	Montgomery
R-644B	Montgomery
R-644C	Montgomery
R-645	Montgomery
R-646	Northumberland
R-648	Warren
R-649	Warren
R-650	Page
R-651	Frederick
R-652A	Frederick
R-652B	Frederick
R-657	Shenandoah
R-660	Shenandoah
R-663	Shenandoah
R-664	Shenandoah
R-665	Shenandoah
R-666	Warren
R-667	Northumberland
R-668	Northumberland
R-669	Lancaster
R-670	Lancaster
R-671	Lancaster
R-673	Page
R-674	Shenandoah
R-675	Shenandoah
R-676	Shenandoah
R-677	Culpeper
R-679	Culpeper
R-681	Spotsylvania
R-682	Spotsylvania
R-745	Prince William
R-1182	Rockingham
R-1183A	Rockingham
R-1183B	Rockingham
R-1184	Rockingham
R-1185	Rockingham
R-1187	Orange
R-1189	Orange
R-1190B	Frederick
R-1191A	Frederick
R-1191B	Frederick
R-1543	Prince William
R-1544	Fluvanna
R-1546	Fluvanna
R-1614	Augusta
R-1616	Augusta
R-1617	Augusta
R-1618	Augusta

BRICK (continued)

Sample	County/City
R-1622	Augusta
R-1624	Augusta
R-1625	Augusta
R-1663	Augusta
R-1664	Augusta
R-1665	Rockbridge
R-1668	Rockbridge
R-1669	Rockbridge
R-1670	Rockbridge
R-1675	Page
R-1678	Page
R-1708	Madison
R-1713	Fluvanna
R-1715	Botetourt
R-1716	Botetourt
R-1719	Bath
R-1720	Augusta
R-1722	James City
R-1771	Botetourt
R-1774	Botetourt
R-1775	Botetourt
R-1776	Botetourt
R-1777	Botetourt
R-1812	Botetourt
R-1813	Botetourt
R-1815	Botetourt
R-1816	Craig
R-1817	Craig
R-1818	Alleghany
R-1819	Alleghany
R-1820	Alleghany
R-1822	Bath
R-1824	Highland
R-1825	Highland
R-1826	Highland
R-1828	Alleghany
R-1849	Alleghany
R-1850	Augusta
R-1852	Augusta
R-1859	Highland
R-1861	Highland
R-1862	Roanoke
R-1864	Roanoke
R-1865	Roanoke
R-1868	Roanoke
R-1882	Scott
R-1883	Scott
R-1889	Smyth
R-1890	Smyth
R-1891	Tazewell
R-1892	Tazewell
R-1904	Smyth
R-1906	Tazewell
R-1907	James City
R-1908	Smyth

BRICK (continued)

Sample	County/City
R-1911	Rockbridge
R-1912	Rockbridge
R-1913	Rockbridge
R-1923	Botetourt
R-1924	Montgomery
R-1925	Montgomery
R-1926	Montgomery
R-1927	Roanoke
R-1930	Buchanan
R-1932	Fluvanna
R-1934	Fluvanna
R-1936	Fluvanna
R-1940	Fluvanna
R-1941	Scott
R-1943	Scott
R-1945	Wise
R-1948	Wise
R-1950	Wise
R-1952	Wise
R-1954	Wise
R-1955	Wise
R-1956	Wise
R-1957	Wise
R-1968	Craig
R-1972	Craig
R-1973	Albemarle
R-1976	Alleghany
R-1977	Alleghany
R-1978	Alleghany
R-1979	Craig
R-1981	Alleghany
R-1984	Craig
R-1986	Alleghany
R-1987	Alleghany
R-1991	Prince George
R-2054	Bland
R-2055	Bland
R-2056	Bland
R-2057	Bland
R-2058	Bland
R-2059	Bland
R-2060	Bland
R-2061	Smyth
R-2085	Pulaski
R-2087	Pulaski
R-2088	Pulaski
R-2089	Pulaski
R-2091	Pulaski
R-2092	Botetourt
R-2466	Scott
R-2467	Lee
R-2468	Scott
R-2474	Scott
R-2479	Scott
R-2480	Lee

BRICK (continued)

Sample	County/City
R-2481	Lee
R-2482	Lee
R-2484	Scott
R-2487	Lee
R-2516	Washington
R-2517	Washington
R-2518	Washington
R-2519	Washington
R-2520	Washington
R-2521	Washington
R-2522	Washington
R-2523	Washington
R-2526	Russell
R-2527	Russell
R-2528	Russell
R-2532	Russell
R-2538	Wythe
R-2539	Wythe
R-2541	Wythe
R-2542	Wythe
R-2544	Smyth
R-2548	Smyth
R-2562	Tazewell
R-2563	Tazewell
R-2566	Tazewell
R-2567	Tazewell
R-2573	Giles
R-2636	King George
R-2709	Chesterfield
R-2712	Greensville
R-2714	York
R-2735	Westmoreland
R-2736	Westmoreland
R-2737	Westmoreland
R-2769	Middlesex
R-2770	Richmond
R-2775	Gloucester
R-2802	Essex
R-2807	Caroline
R-2808	Caroline
R-2855	King and Queen
R-2857	King William
R-2858	Hanover
R-2863	Hanover
R-2865	Henrico
R-2866	Chesterfield
R-2869	Chesterfield
R-2870	Charles City
R-2873	Charles City
R-2874	Charles City
R-2875	Charles City
R-2876	Charles City
R-2877	James City
R-2881	New Kent
R-2882	New Kent

BRICK (continued)

Sample	County/City
R-2891	Chesterfield
R-2892	Surry
R-2893	Surry
R-2894	Surry
R-2896	Sussex
R-2897	Prince George
R-2898	Prince George
R-2907	Greensville
R-2908	Greensville
R-2909	Greensville
R-2911	Greensville
R-2912	Sussex
R-2915	Dinwiddie
R-2919	Sussex
R-2920	Sussex
R-2921	Sussex
R-2922	Sussex
R-2926	Southampton
R-2927	Suffolk (City of)
R-2959	Suffolk (City of)
R-2960	Isle of Wight
R-2961	Isle of Wight
R-2968	Henrico
R-3206	Southampton
R-3208	Southampton
R-3214	Isle of Wight
R-3458	Cumberland
R-3459	Cumberland
R-3460	Cumberland
R-3461	Cumberland
R-3462	Goochland
R-3463	Goochland
R-3464	Goochland
R-3465	Goochland
R-3467	Powhatan
R-3468	Powhatan
R-3469	Powhatan
R-3470	Powhatan
R-3471	Powhatan
R-3472	Powhatan
R-3474	Amelia
R-3477	Amelia
R-3481	Amelia
R-3482	Amelia
R-3484	Nottoway
R-3485	Nottoway
R-3487	Nottoway
R-3493	Prince Edward
R-3522	Appomattox
R-3524	Appomattox
R-3525	Appomattox
R-3532	Amherst
R-3540	Campbell
R-3541	Campbell

BRICK (continued)

Sample	County/City
R-3544	Campbell
R-3546	Bedford
R-3547	Bedford
R-3551	Charlotte
R-3554	Prince Edward
R-3558	Charlotte
R-3559	Charlotte
R-3664	Pittsylvania
R-3668	Pittsylvania
R-3670	Halifax
R-3671	Pittsylvania
R-3688	Halifax
R-3689	Mecklenburg
R-3692	Charlotte
R-3693	Lunenburg
R-4065	Franklin
R-4066	Halifax
R-4067	Halifax
R-4068	Halifax
R-4072	Grayson
R-4074	Floyd
R-4076	Carroll
R-4092	Grayson
R-4093	Grayson
R-4097	Grayson
R-4098	Grayson
R-4101	Brunswick
R-4102	Brunswick
R-4103	Brunswick
R-4362	Amherst
R-4363	Brunswick
R-4364	Brunswick
R-4365	Brunswick
R-5006	Henrico
R-5007	Henrico
R-5338	Halifax
R-5339	Halifax
R-5731	Henrico
R-5732	Henrico
R-6190	Henrico
R-6191	Richmond (City of)
R-6193	Chesterfield
R-6195	Chesterfield
R-6196	Henrico
R-6206	Washington
R-6207B	Washington
R-6209	Washington
R-6211	Washington
R-6699	Wise
R-6811	Buckingham
R-6812	Halifax
R-6813	Halifax
R-6921	Botetourt
R-6942	Rockbridge
R-6949	Clarke

BRICK (continued)

Sample	County/City
R-6950	Loudoun
R-6952	Franklin
R-6953	Warren
R-6954	Page
R-6957	Page
R-6958	Page
R-6975	Westmoreland
R-7165	Washington
R-7167	Bath
R-7170	Rockingham
R-7173	Va. Beach (City of)
R-7176	Va. Beach (City of)
R-7177	Va. Beach (City of)
R-7178A	Va. Beach (City of)
R-7179	Va. Beach (City of)
R-7190	Augusta
R-7243	Stafford
R-7316	King George
R-7317	Caroline
R-7318	Caroline
R-7319	Caroline
R-7320	Caroline
R-7321	Caroline
R-7322	Essex
R-7352	Dickenson
R-7353	Wythe
R-7362	Westmoreland
R-7364	Westmoreland
R-7365	Westmoreland
R-7368	James City
R-7377	Surry
R-7399	Chesapeake (City of)
R-7400	Va. Beach (City of)
R-7401	Va. Beach (City of)
R-7404	Isle of Wight
R-7418	Prince George
R-7419	Prince George
R-7422	Prince William
R-7464	Buckingham
R-7466	Buckingham
R-7484	Warren
R-7489	Cumberland
R-7490	Cumberland
R-7502	Buckingham
R-7505	Buckingham
R-7506	Buckingham
R-7510	Henrico
R-7523	Albemarle
R-7530	Halifax
R-7533	Henrico
R-7534	Henrico
R-7535	Caroline
R-7536	Stafford
R-7537	Stafford
R-7538	Stafford

BRICK (continued)

Sample	County/City
R-7539	James City
R-7540	James City
R-7541	James City
R-7542	James City
R-7543A	James City
R-7543B	James City
R-7558	Richmond
R-7752	Charles City
R-7753	Chesterfield
R-7754	Chesterfield
R-7867	Henrico
R-7868	Henrico
R-7950	Chesterfield
R-8456	Orange
R-8459	Culpeper
R-8460	Fauquier
R-8461	Fauquier
R-8462	Fauquier
R-8463	Fauquier
R-8468	Dinwiddie
R-8475	Rockingham
R-8482	Roanoke
R-8500	Fauquier
R-8501	Fauquier
R-8506	Craig
R-8507	Craig
R-8509	Craig
R-8510	Botetourt
R-8511	Botetourt
R-8512	Craig
R-8513	Montgomery
R-8525	Greene
R-8526	Rappahannock
R-8536	Rappahannock
R-8537	Page
R-8544	Page
R-8559	Rappahannock
R-8560	Page
R-8561	Washington
R-8570A	Page
R-8570B	Page
R-8571	Mecklenburg
R-8567	Alleghany
R-8568	Alleghany
R-8578	Cumberland
R-8586	Roanoke
R-8596	Lunenburg
R-8604	Roanoke
R-8605	Roanoke
R-8606	Louisa
R-8607	Spotsylvania
R-8609	Fluvanna
R-8610	Hanover
R-8612	Caroline
R-8614	Mecklenburg

BRICK (continued)

Sample	County/City
R-8615	Chesterfield
R-8616	Charlottesville (City of)
R-8626	Buckingham
R-8627	Halifax
R-8636	Frederick
R-8644	Albemarle
R-8646	Tazewell
R-8727*	Bath
R-8744*	Charlotte
R-8747*	Botetourt
R-8748*	Rockingham

CERAMIC OR COLORED CERAMIC WARE

Sample	County/City
R-1626	Augusta
R-1660	Augusta
R-2009	Nelson

CLAY DUMMIES

Sample	County/City
R-2558	Dickenson
R-2561	Tazewell

COLOR ADDITIVE (PIGMENT)

Sample	County/City
R-1830	Buckingham
R-1974	Albemarle

DRAIN TILE

Sample	County/City
R-1813	Botetourt
R-1817	Craig
R-1819	Alleghany
R-1820	Alleghany
R-1828	Alleghany
R-1904	Smyth
R-1930	Buchanan
R-2480	Lee
R-2521	Washington
R-2528	Russell
R-2807	Caroline
R-2855	King and Queen
R-2858	Hanover
R-2877	James City
R-2960	Isle of Wight
R-2961	Isle of Wight
R-3523	Appomattox
R-3530	Amherst
R-3670	Halifax

FLUE LINING

Sample	County/City
R-1911	Rockbridge
R-2525	Russell
R-2543	Wythe
R-2770	Richmond
R-2779	Essex
R-2797	Caroline
R-2801	Essex
R-2808	Caroline
R-2861	Hanover
R-2864	Henrico
R-2895	Surry
R-2897	Prince George
R-2898	Prince George
R-2906	Greensville
R-2910	Greensville
R-2912	Sussex
R-2919	Sussex
R-4099	Grayson

FOUNDRY SOIL

Sample	County/City
R-3667	Pittsylvania

LIGHTWEIGHT AGGREGATE

Sample	County/City
R-38	Augusta
R-39	Augusta
R-397B	Rockingham
R-38	Augusta
R-39	Augusta
R-397B	Rockingham
R-422	Prince William
R-517	Loudoun
R-518	Loudoun
R-644A	Montgomery
R-648	Warren
R-652A	Frederick
R-652B	Frederick
R-658	Shenandoah
R-663	Shenandoah
R-664	Shenandoah
R-665	Shenandoah
R-673	Page
R-674	Shenandoah
R-675	Shenandoah
R-676	Shenandoah
R-1183A	Rockingham
R-1184	Rockingham
R-1190A	Frederick
R-1191A	Frederick
R-1614	Augusta
R-1615	Augusta
R-1618	Augusta

LIGHTWEIGHT AGGREGATE (continued)

Sample	County/City
R-1661	Augusta
R-1663	Augusta
R-1664	Augusta
R-1665	Rockbridge
R-1668	Rockbridge
R-1669	Rockbridge
R-1704	Clarke
R-1724	Rockbridge
R-1726	Rockbridge
R-1728	Buckingham
R-1770	Botetourt
R-1771	Botetourt
R-1774	Botetourt
R-1775	Botetourt
R-1859	Highland
R-1867	Roanoke
R-1868	Roanoke
R-1877	Scott
R-1878	Scott
R-1879	Scott
R-1880	Scott
R-1881	Scott
R-1882	Scott
R-1883	Scott
R-1889	Smyth
R-1890	Smyth
R-1891	Tazewell
R-1892	Tazewell
R-1906	Tazewell
R-1908	Smyth
R-1932	Fluvanna
R-1951	Wise
R-1953	Wise
R-1954	Wise
R-1955	Wise
R-1958	Wise
R-1968	Craig
R-1976	Alleghany
R-1978	Alleghany
R-1984	Craig
R-1992	Isle of Wight
R-2055	Bland
R-2057	Bland
R-2060	Bland
R-2061	Smyth
R-2085	Pulaski
R-2087	Pulaski
R-2470	Scott
R-2475	Lee
R-2485	Scott
R-2514	Washington
R-2523	Washington
R-2531	Russell
R-2545	Smyth
R-2547	Smyth

LIGHTWEIGHT AGGREGATE (continued)

Sample	County/City
R-2556	Buchanan
R-2557	Buchanan
R-2560	Dickenson
R-2564	Tazewell
R-2565	Tazewell
R-2572	Giles
R-2573	Giles
R-2767	Mathews
R-2807	Caroline
R-3537	Campbell
R-4362	Amherst
R-4911	Alleghany
R-4912	Alleghany
R-6189	Hanover
R-6205	Washington
R-6206	Washington
R-6207A	Washington
R-6207B	Washington
R-6810	Virginia Beach (City of)
R-7533	Henrico
R-7867	Henrico
R-8510	Botetourt
R-8511	Botetourt
R-8567	Alleghany
R-8568	Alleghany
R-8613	Caroline

MINERAL FILLER

Sample	County/City
R-13	Rockbridge
R-40	Augusta
R-2007	Franklin
R-2062	Buckingham
R-2637	King George
R-2639	Westmoreland
R-3039	Richmond
R-3040	Richmond
R-3041	Richmond
R-3042	Richmond
R-3043	King George
R-3044	Richmond
R-4070	Franklin
R-4123	Franklin

NONPLASTIC COMPONENT

Sample	County/City
R-2890	Chesterfield
R-2916	Dinwiddie
R-2917	Dinwiddie
R-3489	Prince Edward
R-3535	Amherst
R-3538	Campbell
R-3550	Bedford

NONPLASTIC COMPONENT (continued)

Sample	County/City
R-3553	Charlotte
R-3687	Mecklenburg
R-3691	Mecklenburg
R-3813	Henry
R-3815	Henry
R-3861	Amherst
R-4062	Floyd
R-4073	Carroll
R-4719	Floyd

PAPER COATER

Sample	County/City
R-4070	Franklin

PLASTIC COMPONENT

Sample	County/City
R-680	Culpeper
R-7163	Rockbridge

POROUS CLAY PRODUCTS

Sample	County/City
R-3523	Appomattox
R-3530	Amherst
R-3531	Amherst
R-3541	Campbell
R-3544	Campbell
R-3545	Cumberland
R-3693	Lunenburg
R-4074	Floyd

POTTERY (Artware, flower pots, garden pottery, or stoneware)

Sample	County/City
R-13	Rockbridge
R-46	Smyth
R-591	Loudoun
R-1812	Botetourt
R-1813	Botetourt
R-1816	Craig
R-1820	Alleghany
R-1822	Bath
R-1828	Alleghany
R-1911	Rockbridge
R-2524	Washington
R-2548	Smyth
R-2658	Surry
R-2767	Mathews
R-2768	Middlesex

POTTERY (continued)

Sample	County/City
R-2798	Caroline
R-2809	King William
R-2812	King William
R-2876	Charles City
R-2877	James City
R-2879	New Kent
R-2910	Greensville
R-2911	Greensville
R-2914	Dinwiddie
R-2959	Nansemond
R-3523	Appomattox
R-3530	Amherst
R-3541	Campbell
R-3544	Campbell
R-3670	Halifax
R-4066	Halifax
R-4099	Grayson

QUARRY TILE

Sample	County/City
R-2	Albemarle
R-519	Frederick
R-520	Frederick
R-521	Frederick
R-522	Frederick
R-524	Frederick
R-525	Frederick
R-526	Frederick
R-1614	Augusta
R-1676	Page
R-1677	Page
R-1777	Botetourt
R-1815	Botetourt
R-1822	Bath
R-1932	Fluvanna
R-1954	Wise
R-1956	Wise
R-1973	Albemarle
R-2870	Charles City
R-2874	Charles City
R-2881	New Kent
R-2891	Chesterfield
R-2909	Greensville
R-5006	Henrico
R-5339	Halifax

REFRACTORIES

Sample	County/City
R-4	Nelson
R-6	Nelson
R-13	Rockbridge
R-306	Stafford

REFRACTORIES (continued)

Sample	County/City
R-308	Stafford
R-309	Stafford
R-310	Stafford
R-311	Stafford
R-1626	Augusta
R-1660	Augusta
R-2009	Nelson
R-2918	Sussex
R-2923	Sussex
R-4070	Franklin
R-4077	Bedford
R-4099	Grayson
R-4114	Amherst
R-4123	Franklin
R-4364	Brunswick
R-4365	Brunswick
R-7477	Henry
R-7478	Henry
R-7482	Pittsylvania
R-7525	Nelson
R-7526B	Nelson
R-8616	Charlottesville (City of)
R-8629	Albemarle

SEWER PIPE

Sample	County/City
R-1818	Alleghany
R-1912	Rockbridge
R-1913	Rockbridge
R-2528	Russell
R-2735	Westmoreland
R-2736	Westmoreland
R-2869	Chesterfield
R-2870	Charles City
R-2874	Charles City
R-2877	James City
R-2891	Chesterfield
R-2909	Greensville
R-2915	Dinwiddie
R-2921	Sussex
R-2922	Sussex
R-3537	Campbell
R-3546	Bedford
R-3547	Bedford
R-3549	Bedford
R-3554	Prince Edward
R-3667	Pittsylvania
R-3668	Pittsylvania
R-3688	Halifax
R-3690	Mecklenburg
R-4076	Carroll
R-4094	Carroll
R-4096	Grayson

SEWER PIPE (continued)

Sample	County/City
R-4100	Brunswick
R-4124	Amherst
R-5338	Halifax
R-5339	Halifax
R-5732	Henrico
R-6193	Chesterfield

STRUCTURAL CLAY PRODUCTS

Sample	County/City
R-3487	Nottoway
R-3490	Nottoway
R-3530	Amherst
R-3533	Amherst
R-3534	Amherst
R-3537	Campbell
R-3541	Campbell
R-3546	Bedford
R-3547	Bedford
R-3549	Bedford
R-3554	Prince Edward
R-3663	Campbell
R-3667	Pittsylvania
R-3668	Pittsylvania
R-3671	Pittsylvania
R-3688	Halifax
R-3690	Mecklenburg
R-4094	Carroll
R-4096	Grayson
R-4100	Brunswick
R-4124	Amherst
R-6211	Washington
R-6699	Wise
R-6810	Va. Beach (City of)
R-6811	Buckingham
R-6812	Halifax
R-6813	Halifax
R-6921	Botetourt
R-6942	Rockbridge
R-6949	Clarke
R-6950	Loudoun
R-6952	Franklin
R-6953	Warren
R-6954	Page
R-6957	Page
R-6958	Page
R-6975	Westmoreland
R-7165	Washington
R-7167	Bath
R-7170	Rockingham
R-7173	Va. Beach (City of)
R-7176	Va. Beach (City of)
R-7177	Va. Beach (City of)
R-7178A	Va. Beach (City of)

STRUCTURAL CLAY PRODUCTS (continued)

Sample	County/City
R-7179	Va. Beach (City of)
R-7190	Augusta
R-7243	Stafford
R-7244	Prince William
R-7316	King George
R-7317	Caroline
R-7318	Caroline
R-7319	Caroline
R-7320	Caroline
R-7321	Caroline
R-7322	Essex
R-7352	Dickenson
R-7353	Wythe
R-7362	Westmoreland
R-7364	Westmoreland
R-7365	Westmoreland
R-7368	James City
R-7377	Surry
R-7399	Chesapeake (City of)
R-7400	Va. Beach (City of)
R-7401	Va. Beach (City of)
R-7404	Isle of Wight
R-7418	Prince George
R-7419	Prince George
R-7464	Buckingham
R-7466	Buckingham
R-7484	Warren
R-7489	Cumberland
R-7490	Cumberland
R-7502	Buckingham
R-7505	Buckingham
R-7506	Buckingham
R-7510	Henrico
R-7523	Albemarle
R-7526A	Nelson
R-7530	Halifax
R-7533	Henrico
R-7534	Henrico
R-7535	Caroline
R-7536	Stafford
R-7537	Stafford
R-7538	Stafford
R-7539	James City
R-7540	James City
R-7541	James City
R-7542	James City
R-7543A	James City
R-7543B	James City
R-7558	Richmond
R-7752	Charles City
R-7753	Chesterfield
R-7754	Chesterfield
R-7867	Henrico
R-7868	Henrico
R-7950	Chesterfield

STRUCTURAL CLAY PRODUCTS (continued)

Sample	County/City
R-8456	Orange
R-8459	Culpeper
R-8460	Fauquier
R-8461	Fauquier
R-8462	Fauquier
R-8463	Fauquier
R-8468	Dinwiddie
R-8475	Rockingham
R-8482	Roanoke
R-8500	Fauquier
R-8501	Fauquier
R-8506	Craig
R-8507	Craig
R-8509	Craig
R-8510	Botetourt
R-8511	Botetourt
R-8512	Craig
R-8513	Montgomery
R-8525	Greene
R-8526	Rappahannock
R-8536	Rappahannock
R-8537	Page
R-8544	Page
R-8559	Rappahannock
R-8560	Page
R-8561	Washington
R-8567	Alleghany
R-8568	Alleghany
R-8570A	Page
R-8570B	Page
R-8571	Mecklenburg
R-8578	Cumberland
R-8586	Roanoke
R-8596	Lunenburg
R-8604	Roanoke
R-8605	Roanoke
R-8606	Louisa
R-8607	Spotsylvania
R-8609	Fluvanna
R-8610	Hanover
R-8612	Caroline
R-8614	Mecklenburg
R-8615	Chesterfield
R-8616	Charlottesville (City of)
R-8626	Buckingham
R-8627	Halifax
R-8636	Frederick
R-8644	Albemarle
R-8646	Tazewell
R-8727*	Bath
R-8744*	Charlotte
R-8747*	Botetourt
R-8748*	Rockingham

STRUCTURAL TILE

Sample	County/City
R-2516	Washington
R-2737	Westmoreland
R-2770 (glazed)	Richmond
R-2808	Caroline
R-2863	Hanover
R-2865	Henrico
R-2876 (glazed)	Charles City
R-2907	Greensville
R-2908	Greensville
R-2912	Sussex
R-2959	Suffolk (City of)
R-5732	Henrico
R-6195	Chesterfield
R-7319	Caroline
R-7353	Wythe
R-7399	Chesapeake (City of)
R-7400	Va. Beach (City of)
R-7401	Va. Beach (City of)
R-7510	Henrico
R-7526A	Nelson
R-7558	Richmond
R-7868	Henrico
R-8570B	Page
R-8604	Roanoke
R-8616	Charlottesville (City of)

TERRA COTTA

Sample	County/City
R-1812	Botetourt
R-1819	Alleghany
R-1820	Alleghany
R-1828	Alleghany

TILE

Sample	County/City
R-1	Augusta
R-2	Albemarle
R-11	Rockingham
R-38	Augusta
R-39	Augusta
R-234	Prince William
R-312	Stafford
R-313	Stafford
R-377	Rockingham
R-423	Prince William
R-425	Fairfax
R-529	Fairfax
R-591	Loudoun
R-592	Loudoun
R-593	Fauquier

TILE (continued)

Sample	County/City
R-594	Fauquier
R-595	Fauquier
R-598	Fauquier
R-643	Montgomery
R-646	Northumberland
R-649	Warren
R-651	Frederick
R-652A	Frederick
R-652B	Frederick
R-667	Northumberland
R-668	Northumberland
R-669	Lancaster
R-670	Lancaster
R-671	Lancaster
R-673	Page
R-674	Shenandoah
R-679	Culpeper
R-1182	Rockingham
R-1184	Rockingham
R-1185	Rockingham
R-1190B	Frederick
R-1543	Prince William
R-1546	Craig
R-1622	Augusta
R-1625	Augusta
R-1663	Augusta
R-1665	Rockbridge
R-1669	Rockbridge
R-1670	Rockbridge
R-1678	Page
R-1708	Madison
R-1713	Craig
R-1719	Bath
R-1722	James City
R-1812	Botetourt
R-1813	Botetourt
R-1815	Botetourt
R-1816	Craig
R-1818	Alleghany
R-1819	Alleghany
R-1820	Alleghany
R-1822	Bath
R-1826	Highland
R-1828	Alleghany
R-1850	Augusta
R-1852	Augusta
R-1859	Highland
R-1889	Smyth
R-1890	Smyth
R-1891	Tazewell
R-1892	Tazewell
R-1906	Tazewell
R-1907	James City
R-1908	Smyth
R-1911	Rockbridge

TILE (continued)

Sample	County/City
R-1922	Chesterfield
R-1923	Botetourt
R-1925	Montgomery
R-1930	Buchanan
R-1945	Wise
R-1968	Craig
R-1976	Alleghany
R-1977	Alleghany
R-1991	Prince George
R-2057	Bland
R-2058	Bland
R-2089	Pulaski
R-2092	Botetourt
R-2866	Chesterfield
R-2875	Charles City
R-3487	Nottoway
R-3493	Prince Edward
R-3522	Appomattox
R-3524	Appomattox
R-3525	Appomattox
R-3532	Amherst
R-3540	Campbell
R-3541	Campbell
R-3544	Campbell
R-3551	Charlotte
R-3558	Charlotte
R-3559	Charlotte
R-3664	Pittsylvania
R-3670	Halifax
R-3671	Pittsylvania
R-3689	Mecklenburg
R-3692	Charlotte
R-3693	Lunenburg
R-4065	Franklin
R-4066	Halifax
R-4067	Halifax
R-4068	Halifax
R-4072	Grayson
R-4074	Floyd
R-4076	Carroll
R-4092	Grayson
R-4093	Grayson
R-4097	Grayson
R-4098	Grayson
R-4101	Brunswick
R-4102	Brunswick
R-4103	Brunswick
R-4362	Amherst
R-4363	Brunswick
R-7543A	James City

WHITEWARE

Sample	County/City
R-4	Nelson
R-6	Nelson
R-13	Rockbridge
R-40	Augusta
R-1829 (flux)	Alleghany
R-2007	Franklin
R-4070	Franklin
R-4077	Bedford

GLOSSARY

Absorption (Abs.)—The relationship of the weight of water absorbed by a ceramic specimen to the weight of the specimen before immersion in water, expressed as a percent.

Apparent porosity (Appr. Por.)—The ratio of the volume of open pores in a specimen to the bulk volume, usually expressed in precent.

Bloating test—A test to determine the ability of a ceramic material or product to expand when heated. Data on this test reported here are chiefly preliminary. The results are reported as "negative," meaning no bloating—or "positive."

Bonding clay—A clay of high plasticity and high dry strength used to bond nonplastic materials; it may or may not be refractory.

Brightness—A percentage of the light that would be reflected under the same geometric conditions if the perfectly ideal white standard were substituted for the specimen.

Bulk density—The weight of a solid per unit of exterior volume expressed in gm/cc or lb/ft^3.

Ceramic products—Articles formed at least partly of clay materials and fired.

Color—As used in slow firing test, is based on Munsel Book of Colors, 1973. Neighboring Hues Edition: Newburg, New York, Kollomorgan Corp.

Diatomaceous—Containing microscopic shells (diatoms) composed of siliceous material.

Drying characteristics—Characteristics which develop in, or on, a ceramic body upon drying, such as strength, warping, etc.

Drying defects—Features such as cracking, warping, and efflorescence which develop during the drying of ceramic body.

Drying shrinkage—The percent of linear change of a ceramic body upon drying, usually at 110°C.

Dry strength—The mechanical strength of a ceramic body after being dried, usually at 110°C.

Efflorescence—The staining of a surface as a result of the deposition of water-soluble salts.

Extrusion—The forcing of clay material through an opening or die to form a continuous body of like cross section throughout its length.

Face brick—Brick of various colors, often with imparted surface texture, manufactured especially for use in exposed walls or masonry units. Face bricks are designated "NW," "MW," or "SW" to indicate suitability for use under negligible, mild, or severe weather conditions.

Flux—A substance that promotes fusion in a given ceramic mixture.

Grog—Ground up pieces of burned brick or clay added to the raw clay mixture for the purpose of decreasing the shrinkage and density of the burned brick.

Hardness—The resistance to scratching or abrasion expressed verbally or by Mohs scale of hardness as follows:

1. talc
2. gypsum
3. calcite
4. fluorite
5. apatite
6. orthoclase feldspar
7. quartz
8. topaz
9. corundum
10. diamond

lb./ft.^{3}—Pounds per cubic foot.

Lightweight aggregate—Aggregrate produced by expanding, or bloating, of such materials as clay, shale, or slate which have been heated.

Linear shrinkage—The percent of linear contraction of a ceramic body, measured both after drying and after firing.

Loss on ignition (L.O.I.)—The loss in weight, expressed in percent, which results from heating a sample of material to a high temperature, after preliminary drying at a temperature just above the boiling point of water.

Mealy—A granular feel caused by lumpy, soft particles.

Mineral filler—An inert mineral substance added to certain manufactured products to impart desirable properties such as weight, wear resistance, and opacity.

pH—Hydrogen ion concentration: a measurement of acidity or alkalinity.

Plasticity—The property of a moistened material to be deformed under pressure, with the deformed shape being retained when the deforming force is removed.

Porous clay products—Clay products capable of absorbing moisture, such as flower pots and garden pottery.

psi—Pounds per square inch.

Pyrometric cone—A trigonal cone, standardized as to shape and softening point, used as a control in firing ceramic products.

Pyrometric cone equivalent (PCE)—The designation number of a pyrometric cone which softens simultaneously with a cone of the ceramic material under investigation when tested in accordance with a standard method of testing.

Reflectance—A measure of the ability of a body to reflect light.

Refractories—Materials, usually non-metallic, used to withstand high temperature.

Residual clay—A clay deposit formed by the decay of rock in place.

Shrinkage—The reduction in size of ceramic material upon drying and firing.

GLOSSARY (continued)

Slow firing test—A test to determine the firing characteristics of ceramic raw materal in which dried samples are fired in a kiln started at room temperature and raised to a maximum temperature over a period of hours. Samples removed at specific temperatures are evaluated for hardness, color, percent of total linear shrinkage, percent absorption, percent apparent porosity, and bulk density. (Morse Laboratories fired briquets together for two successive firing temperatures. The first set was removed as soon as the designated temperature was reached; when the second temperature was reached, the kiln was shut down and the second set of briquets was left in the kiln to cool.) Testing ends upon fusion of the sample material.

Stoneware—Fine textured ceramic products, either vitreous or semivitreous, generally made from low-grade plastic fireclay.

Structural clay products—Any of a class of load-bearing, ceramic building units.

Surface checking—Fine cracks on a fired ceramic surface.

Tint—Quality by which an object color is judged to depart from a preferred white toward yellow.

Vitrification—The continual reduction in porosity of a ceramic object or material as a result of firing.

Water of plasticity—The percent of water required to make a clay material plastic.

Whiteness—An expression defining the nearness of approach of a color to a true white.

Workability—The consistency and moldability of plastic ceramic materials.