COMMONWEALTH OF VIRGINIA

DEPARTMENT OF CONSERVATION
AND ECONOMIC DEVELOPMENT

DIVISION OF MINERAL RESOURCES

SOURCES OF AGGREGATE USED IN VIRGINIA HIGHWAY CONSTRUCTION

EDWIN O. GOOCH AND ROBERT S. WOOD
Division of Mineral Resources
and
WILLIAM T. PARROTT
Department of Highways

MINERAL RESOURCES REPORT 1

VIRGINIA DIVISION OF MINERAL RESOURCES

James L. Calver
Commissioner of Mineral Resources and State Geologist

CHARLOTTESVILLE, VIRGINIA
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Commonwealth of Virginia
Department of Purchases and Supply
Richmond
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ECONOMIC DEVELOPMENT

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SOURCES OF AGGREGATE USED IN VIRGINIA HIGHWAY CONSTRUCTION

By

EDWIN O. GOOCH, ROBERT S. WOOD AND WILLIAM T. PARROTT

ABSTRACT

Materials used for highway aggregate in Virginia range from highly metamorphosed rocks of Precambrian age to unconsolidated sand and gravel deposits of Recent age. Limestone, dolomite and quartzite are produced in the Ridge and Valley province. Granite, various types of gneiss, diabase, basalt, marble, limestone, sandstone and conglomerate are produced in the Blue Ridge and Piedmont provinces. Sand and gravel are produced in the Coastal Plain province.

Aggregate is classified into grades A, B and C on the basis of three physical properties: abrasion loss, specific gravity and absorption. Tests used in determining the physical properties are described in the text and the specifications for each grade are listed.

The name and location of each aggregate producer is given in the text and on the accompanying map. The geology of each pit and quarry is described, physical test data on the aggregate are listed with each description, and the size of the operation or rate of production during 1957 or 1958 is given.

INTRODUCTION

With the growing demands of State highway construction and maintenance and the Interstate Highway program upon aggregate producers, the Geological Section of the Virginia Department of Highways and the Virginia Division of Mineral Resources felt the need of a study of the quarries and pits from which aggregate is obtained. This report is the result of a study that was begun jointly by the two agencies in the fall of 1957. Most of the information on the geology of the quarries and pits was supplied by the Division of Mineral Resources and the production data, physical test data, and sieve analysis were supplied by the Department of Highways.

It is hoped that the information contained herein will be an aid to any one engaged in work pertaining to the aggregate industry, particularly the producers and contractors who are concerned with highway construction and maintenance.

FIELD WORK AND ACKNOWLEDGMENTS

Most of the field work for this report was done during the latter part of 1957 and during 1958; however, a few quarries were visited during early 1959.

The writers wish to express their deep appreciation to the producers for their cooperation and assistance. Expression of thanks are also due Mr. A. B. Cornthwaite, Materials and Tests Engineer of the Department of Highways and to members of the Testing Division for making the tests on the materials described; to Miss Anne Akers of the Department of Highways for compiling and typing the test data. Thanks are also due the Virginia Road Builders Association for technical assistance. Dr. C. R. B. Hobbs, Jr., of the Division of Mineral Resources, supplied information on several of the quarries in southwestern Virginia.

PHYSICAL PROPERTIES OF AGGREGATE

The physical properties of aggregate with which the geologist and materials engineer are concerned are abrasion loss, absorption, and specific gravity. Tests necessary to determine these properties on the aggregate described in this report were performed in conformity with standards devised and used by the American Society of Testing Materials and the American Association of State Highway Officials.

The most important physical property is the abrasion loss, which is determined by the Los Angeles Abrasion Test. In making the test, 5,000 grams of the material are rotated in a steel cylinder, 28 inches in

diameter and 20 inches long, which has an internal steel shelf 3½ inches wide. If the aggregate is to be tested for Grade A specifications, 12 steel balls, each of which weighs 390 grams, are put in the cylinder; if it is to be tested for Grade B, 11 steel balls are put in the cylinder. The cylinder is then rotated at a speed of from 30 to 33 rpm for 500 revolutions. The material is removed and screened on a No. 12 sieve. The amount passing through the screen is the abrasion loss and is expressed as a percent of the original weight. For Grade A classification, the loss must be between 0 and 35%; for Grade B between 35 and 43%, and for Grade C between 43 and 50%. However, none of the aggregate described in this report was tested for Grade C classification.

Grade A and Grade B aggregate are utilized for aggregate base course, soil aggregate surface course, bituminous concrete, Portland cement concrete, surface treatment, stabilization aggregate, or crusher run. Grade C is used for soil aggregate surface course and stabilization aggregate.

The specific gravity of a substance is the ratio of its weight to that of the weight of an equal volume of water. To determine the specific gravity, the weight in air is divided by the loss of weight in water. The method used by the Virginia Department of Highways is the bulk specific gravity (Saturated Surface Dried). The sample is placed in water for 24 hours, drained, and blotted with a damp towel. The saturated sample is weighed in air and then in water.

The absorption is expressed as the percentage of moisture absorbed and is an indication of the porosity. In determining the porosity, the sample is placed in water 24 hours, drained and blotted with a damp towel. After the sample is weighed, it is placed in an oven at 210 degrees Farenheit to dry; it is then weighed again. The difference in weight divided by the oven dry weight is the absorption. Any aggregate that absorbs over 1 to 1½ per cent of water is considered questionable and should be subjected to a soundness test.

MATERIALS USED FOR AGGREGATE

The production of aggregate for use in highway construction and maintenance is one of the leading mineral industries in Virginia. The quarries and pits from which aggregate is obtained are in materials that vary from the highly metamorphosed rock deposits of Precambrian age to the unconsolidated sand and gravel deposits of Recent age. In the Ridge and Valley province, aggregate is produced from limestone, dolomite and quartzite formations of Paleozoic age. In the Blue Ridge and Piedmont provinces igneous, metamorphic and sedimentary rock types

are utilized. These rocks range in age from Precambrian to Paleozoic in the Blue Ridge and from Precambrian to Mesozoic in the Piedmont. The rock types include granite and various types of gneiss, diabase, basalt, limestone, marble, sandstone and conglomerate. The sedimentary formations of the Coastal Plain province are covered by a rather thick veneer of sand, gravel and clay that occur as a series of terraces of Pleistocene age. In addition terrace deposits of Recent age occur along the streams. These Pleistocene and Recent terraces deposits are the source of aggregate from the Coastal Plain.

PRODUCERS IN THE RIDGE AND VALLEY PROVINCE

AUGUSTA STONE CORPORATION

The Augusta Stone Corporation quarry is located in Augusta County on the northeast side of Virginia Secondary Highway 728, approximately half a mile west of Shutterly Mill (Pl. 1, loc. 28).

The company is quarrying the upper portion of the Beekmantown formation, the New Market limestone and the lower portion of the Lincolnshire limestone, all of Ordovician age. The Beekmantown formation occurs in the lower portion of the quarry and is composed of thick-bedded, fine-grained, medium- to dark-gray dolomites, a few of which contain shaly partings parallel to the bedding. Large masses of calcite occur in solution cavities that have developed in the Beekmantown formation at the southwestern end of the quarry. The overlying New Market limestone consists of medium-bedded, medium-gray calcilutites that contain small "eyes" of calcite and a few bedding-plane styolites. The New Market is overlain by the Lincolnshire limestone, which is exposed at the top of the southeastern quarry face. This formation is composed of medium- to thick-bedded, fine- to medium-grained, dark-gray cherty limestone. Structures exposed in the quarry include a small syncline and two minor faults, all of which occur at the northeastern end. The beds strike about N30°E and dip approximately 15°SE except in the syncline where strike and dip are variable. Overburden varies from 0 to 15 feet in thickness.

In 1958 the portion of the quarry being worked was approximately 50 feet deep, 300 feet wide and 150 feet long. Production is at the rate of 700 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 14.7; absorption: .33; specific gravity: 2.82.

C. W. BARGER QUARRY

The C. W. Barger quarry is located in Rockbridge County on the northeast side of U. S. Highway 60, approximately a quarter of a mile southeast of the city limits of Lexington (Pl. 1, loc. 25).

The company is quarrying a 150 foot zone of impure limestone from the Edinburg formation (Edmundson, 1958, p. 88). In the quarry, this formation is a dark-gray, dense limestone with numerous veins of calcite parallel and transverse to the bedding. The limestone breaks with a concoidal fracture, contain black shaly partings and minor amounts of

fluorite and pyrite. A minor syncline occurs near the middle of the quarry. Overburden is approximately three feet thick.

In 1957 the quarry was 80 feet deep, 100 feet wide and 300 feet long. Production is at the rate of approximately 700 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.4; absorption: .50; specific gravity: 2.73.

BELMONT TRAP ROCK COMPANY

The Belmont Trap Rock Company quarry is located in Augusta County on the northeast side of U. S. Highway 250, approximately half a mile southeast of Staunton (Pl. 1, loc. 27).

The company is quarrying the upper part of the Beekmantown formation, the New Market limestone and the Lincolnshire limestone, all of Ordovician age. The upper part of the Beekmantown formation consists of medium- to thick-bedded, extremely fine-grained, light-gray dolomite and fine- to medium-grained, medium-gray dolomite. In the southeastern portion of the quarry, the dolomite contains vugs filled with large calcite crystals. The New Market limestone, which overlies the Beekmantown formation, consists of thick-bedded, dove-gray, compact limestone. The New Market limestone is overlain near the top of the quarry by medium-grained, dark-gray, cherty Lincolnshire limestone. The beds in the quarry strike N80°E and dip 45°NW. Overburden varies from 0 to 12 feet in thickness.

In 1958 the quarry was 1,500 feet long, 300 feet wide and 120 feet deep.

Physical test data are as follows: Los Angeles loss (500 rev.): 15.7; absorption: .03; specific gravity: 2.79.

FRED K. BETTS QUARRY

The Fred K. Betts quarry is located in Rockingham County on the northeast side of U. S. Highway 33, about one mile east of Harrisonburg (Pl. 1, loc. 30).

The rocks in the quarry consist mainly of extremely fine-grained, medium- to dark-gray limestones of Ordovician age. Pyrite is disseminated throughout some of the limestone beds and white calcite veins are common. These limestones are underlain by about 20 feet of fine-grained, medium-gray, dolomitic limestone, also of Ordovician age. A 15 to 18 inch zone of "gouge-like" material that is parallel to bedding occurs at the base of the dolomitic limestone. This zone is

well exposed in the eastern wall and can be traced westward approximately halfway across the quarry. At the southwestern end of the quarry this zone is complexly folded whereas to the northeast the folds become more open. A syncline and an anticline, both of which trend northeastward, are exposed in the quarry. Minor structural features include a normal fault, slickensided surfaces, gash fractures, and striated surfaces. According to Brent (1955, p. 69-71) the quarry is in a klippe composed of the Edinburg limestone of middle Ordovician age surrounded by the Beekmantown formation of early Ordovician age.

In 1959 the quarry was approximately 2,500 feet long, 500 feet wide and 70 feet deep. Production is at the rate of 900 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 14.9; absorption: .20; specific gravity: 2.77.

BLUE RIDGE STONE COMPANY (BEDFORD COUNTY)

The Blue Ridge Stone Company quarry in Bedford County is located on the northeast side of U. S. Highway 460, approximately one mile east of Blue Ridge Station, Botetourt County (Pl. 1, loc. 20).

Present operations are limited to the northern end of the quarry, which is in a succession of intercalated dolomites and magnesium limestones of the Elbrook formation. This formation is composed mainly of fine-grained, medium- to dark-gray dolomites and some fine-grained, medium- to dark-gray magnesium limestones; however, the lower part of the Elbrook formation is composed mainly of fine-grained, light- to medium-gray and light-olive gray, shaly dolomites. A few fine- to medium-grained, yellowish-orange and yellowish-brown calcitic dolomites also occur in the quarry. Styolitic seams and calcite-filled fractures occur in the magnesium limestones and pyrite occurs in the shaly dolomites as disseminated particles and in veins parallel to the bedding. The quarry is in an area of complexly folded and fractured rocks and a northwest-trending syncline and an overturned anticline are exposed at the northern end of the quarry.

In 1958 the quarry was 200 feet deep and 600 feet wide. Production is at the rate of approximately 3,500 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 16.2; absorption: .01, specific gravity: 2.74.

CHEMSTONE CORPORATION

The Chemstone Corporation quarry is located in Shenandoah County on the east side of Virginia Secondary Highway 629, ap-

proximately 2½ miles northeast of the city limits of Strasburg (Pl. 1, loc. 36).

The quarry is in the New Market limestone of Ordovician age. This limestone consists of medium- to thick-bedded, medium- to dark-gray calcilutites that contain small "eyes" of calcite and a few styolitic seams. The New Market limestone is overlain by the Lincolnshire limestone and underlain by the Beekmantown formation and although both formations occur in the quarry, they are not utilized. The Lincolnshire limestone, which outcrops at the southeastern edge of the quarry, consists of fine- to medium-grained, medium- to dark-gray limestones with dolomite-filled fractures. The Beekmantown formation, which outcrops in the northwestern part of the quarry, consists of dense, light- to medium-gray dolomites. The beds strike approximately N75°E and dip about 35°SE.

The quarry was approximately 100 feet deep, 300 feet wide and 1,000 feet long in 1958.

Physical test data are as follows: Los Angeles loss (500 rev.): 27.4-29.1; absorption: .13; specific gravity: 2.71.

CLINCH RIVER QUARRIES

The Clinch River Quarries operation is located in Russell County on the west side of U. S. Alt. Highway 58, approximately two miles south of Saint Paul (Pl. 1, loc. 5).

The quarry is in the Maryville limestone of Cambrian age. This formation is composed, in part, of medium- to thick-bedded, fine- to medium-grained, medium- to dark-gray magnesium limestones and medium- to thick-bedded, fine-grained, medium-gray limestones. In addition, medium- to thick-bedded, fine-grained, dark-gray dolomites are intercalated in the limestones. Some of the limestones are highly mottled with orange-weathering dolomite and contain calcite-filled fractures parallel to the bedding. A few of the dolomites contain black shaly partings and pebbles of laminated limestone. A zone of dark-gray, brecciated dolomite is exposed above a prominent ledge on the north side of the quarry and a number of secondary minerals, including fluorite, are found in this zone. Tight minor folding is also present. The beds in the quarry strike about N80°E and dip 45°SE. The overburden is approximately two feet thick.

In 1957 the quarry was approximately 250 feet deep, 300 feet wide and 400 feet long. Production is at the rate of approximately 700 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 20.0; absoprtion: .33; specific gravity: 2.76.

H. D. CROWDER STONE COMPANY

The H. D. Crowder Stone Company quarry is located on the south side of Virginia Secondary Highway 607, approximately one-fifth of a mile east of Poplar Camp, Wythe County (Pl. 1, loc. 14).

The quarry is in the Shady dolomite of lower Cambrian age. This formation is composed of thin- to medium-bedded, fine- to medium-grained, dark-gray dolomites that are interbedded with massive, fine- to medium-grained, light- to medium-gray dolomites. A few of the dark-gray dolomites contain black shaly partings and both the light and dark gray beds contain fractures filled with dolomite. The beds strike N75°E and dip 25°SE. South of the quarry older Cambrian rocks are faulted over the Shady dolomite by the Poplar Camp overthrust. The overburden is approximately 10 feet thick.

In 1958 the quarry was approximately 80 feet deep, 300 feet wide, and 200 feet long. Production is at the rate of approximately 400 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.4; absorption: .01; specific gravity: 2.87.

ELKTON LIME AND STONE COMPANY

The Elkton Lime and Stone Company operates three quarries in Rockingham County just northwest of the junction of Virginia Secondary Highways 602 and 635 (Pl. 1, loc. 29). Two of the quarries are in interbedded limestones and dolomites of the upper Beekmantown formation.

The Beekmantown formation in the largest quarry consists of medium- to thick-bedded, extremely fine-grained, medium- to dark-gray limestones interbedded with medium- to thick-bedded, fine- to medium-grained, medium- to dark-gray dolomites and medium- to thick-bedded, fine-grained, dark-gray dolomitic limestones. A few of the dolomite beds contain black shaly partings and disseminated blebs of dolomite. The beds strike N25°E and dip 75°NW. This quarry was approximately 75 feet deep, 600 feet long and 200 feet wide in 1958.

The second quarry is located several hundred yards west of the large quarry. The Beekmantown formation in this quarry is composed of a few medium- to thick-bedded, fine-grained, light- to medium-gray dolomites intercalated with medium- to thick-bedded, fine-grained, medium-

to dark-gray limestones. Both the limestones and dolomites contain veins of calcite parallel and transverse to the bedding and in some cases the limestone and dolomite beds are separated by black argillaceous partings. The beds strike N25°E and dip 75°NW.

A third quarry, which is located west of the second quarry, was recently opened in extremely fine-grained, dark-gray, highly fractured limestones. When weathered, these limestones break down into light-brown, shaly particles. The beds in this quarry strike N25°E and dip 70°NW. Overburden varies from 0 to 15 feet in thickness.

Production is at the rate of approximately 700 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 20.9; absorption: .67; specific gravity: 2.75.

E. P. ELLIS QUARRY

The E. P. Ellis quarry is located in Smyth County, approximately a quarter of a mile south of the junction of U. S. Highway 11 and Virginia Secondary Highway 691 (Pl. 1, loc. 10).

The Seven Springs high angle fault, which strikes northeast and dips southeast, passes through the quarry and has thrust Honaker dolomite of Cambrian age over limestones and dolomites of Ordovician age. The trace of the fault is marked by a zone of intense brecciation. The Ordovician limestones and dolomites are in a northeast-trending, overturned syncline that apparently resulted from the drag folding associated with the fault. The Honaker dolomite consists, in part, of medium- to thick-bedded, fine-grained, medium-gray dolomitic limestones and medium- to thick-bedded, gray dolomites. A highly brecciated, thick-bedded, fine-grained, light-gray dolomite, which weathers pale yellowish-brown, is exposed on the northwestern side of the fault. This bed contains disseminated blebs and discontinuous stringers of white dolomite. The dolomite is overlain to the northwest by thick-bedded, dove-gray calcilutities that contain small "eyes" of calcite and styolitic seams. The calcilutites are in turn overlain to the northwest by highly brecciated, fine- and coarse-grained, black, shaly limestones interbedded with black shales. Upon weathering the limestones break down into light-brown, shaly particles. Due to a high organic content, these black limestones emit a very pungent odor when struck with a hammar. The overburden is approximately 6 feet thick.

In 1958 the quarry was approximately 150 feet deep, 1,500 feet long and 125 feet wide. Production is at the rate of about 450 tons per day.

Physical test data are as follows: Los Angles loss (500 rev.): 16.2; absorption: .50; specific gravity: 2.90.

R. Y. FRAZIER QUARRIES

The R. Y. Frazier quarry is located in Rockingham County on the northeast side of U. S. Highway 33, approximately half a mile west of the city limits of Harrisonburg (Pl. 1, loc. 31).

The quarry is in thin- to medium-bedded, dense, dark-gray limestone of the Edinburg formation of Ordovician age. The limestones, which strike approximately N25°E, contain numerous veins of clacite parallel and transverse to the bedding, and minor amounts of disseminated pyrite and fluorite. The quarry is in an area of minor folding on the western limb of a major northeast trending syncline; a tightly folded syncline, parallel to the major structure, is exposed near the western wall of the quarry. Overburden varies from 0 to 6 feet in thickness.

In 1957 the quarry was approximately 105 feet deep, 500 feet long and 250 feet wide. Production is at the rate of about 600 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 20.6; absorption: .16; specific gravity: 2.73;

M. J. GROVE LIME COMPANY

The M. J. Grove Lime Company mine is located in Frederick County on the south side of Virginia Secondary Highway 631, approximately half of a mile northwest of Stephens City (Pl. 1, loc. 37).

The mine is in the New Market limestone, which is being mined from four levels that extend along its strike. The New Market consists of medium- to thick-bedded, compact, dove-gray limestones that are underlain by interbedded gray dolomites and dark-colored limestones of the Beekmantown formation and overlain by the medium-bedded, granular, dark-gray Lincolnshire limestones. The mine is located near the southwestern end of a small anticline that pitches gently to the southwest; the beds in the mine dip approximately 30°NW.

Physical test data are as follows: Los Angeles loss (500 rev.): 22.8-30.8; absorption: .84; specific gravity: 3.72.

HOLSTON RIVER QUARRY, INCORPORATED

The operation of Holston River Quarry, Incorporated is located in Smyth County on the north side of U. S. Highway 11 at Marion (Pl. 1, loc. 9).

The quarry is in the Beekmantown formation, the Mosheim limestone and the Lenoir limestone, all of Ordovician age. The Beekmantown formation, which occurs in the northwestern part of the quarry, is a fine-

to medium-grained, gray dolomite that contains a few dark-gray laminae. Some of the beds of dolomite contain shaly partings. The Mosheim limestone, which occurs in the central part of the quarry, is medium-gray, fine-grained and contains numerous calcite eyes and a few stylolites. The Lenoir limestone, which occurs in the southeastern part of the quarry, is medium-grained, dark-gray to black and contains abundant nodules of chert. The quarry is in the southeastern part of the Walker Mountain thrust sheet and northwest of the Seven Springs fault. The beds strike approximately N45°E. Overburden is about 6 feet thick.

The quarry was opened in 1900 and in 1957 was about 1,200 feet long, 400 feet wide and 120 feet deep. Production is at the rate of 600 tons per day.

Physical Test data are as follows: Los Angeles loss (500 rev.): 25.8; absorption: .07; specific gravity: 2.70.

JAMES RIVER HYDRATE QUARRY

The James River Hydrate Quarry is located in Botetourt County on the east side of the Norfolk and Western Railway, approximately 1½ miles northeast of Buchanan (Pl. 1, loc. 22).

The quarry is the Shady dolomite of Cambrian age. The Shady is composed of thick-bedded, fine- to medium-grained, light-gray to cream-colored dolomites, which strike N40°E and dip, overturned, 80°SE. Several solution cavities occur in the faces of the quarry. The Shady is overlain northwest of the quarry by shales and dolomites of the Waynesboro formation, whereas to the southeast quartzites are faulted upon the Shady dolomite. Overburden varies from a few up to 30 feet in thickness.

The quarry was approximately 260 feet deep, 600 feet wide and 200 feet long in the fall of 1958. Production is at the rate of approximately 1,600 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 16.7; absorption: .50; specific gravity: 2.88.

KENTUCKY-VIRGINIA STONE COMPANY

The Kentucky-Virginia Stone Company quarry is located in Lee County on the west side of Virginia Secondary Highway 691 just west of Gibson Station (Pl. 1, loc. 1).

The quarry is in the Lowville limestone of Ordovician age. The Lowville is a thin- to medium-bedded, medium-grained, bluish-gray limestone that contains stringers and laminae of shale. The quarry is on

the northwest limb of a northeast-plunging anticline that is part of the Cumberland overthrust block. The beds strike N60°E and dip 12°NW. Overburden varies from 30 to 40 feet in thickness.

The quarry was originally opened in 1913 and Kentucky-Virginia Stone Company has been operating it since 1929. In the fall of 1957 the quarry was 1,000 feet long, 300 feet wide and 75 feet deep. Production is at the rate of 1,500 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 15.9; absorption: .07; specific gravity: 2.73.

LAMBERT BROTHERS, INCORPORATED

The Lambert Brothers, Incorporated quarry is located in Washington County on the south side of Virginia Secondary Highway 647 just east of Bristol (Pl. 1, loc. 6).

The quarry is in the Conococheague (?) limestone of Cambrian age. The limestone is fine- to medium-grained, dark-gray, medium- to thick-bedded, and contains many calcite-filled fractures. In the southern quarry face two synclines that are separated by a fault are exposed. The fault strikes N10°W in the southern face but changes to N10°E in the northern part of the quarry. An overturned anticline with its axial plane dipping to the west is exposed in the western part of the southern quarry face. The beds strike N10°W in the southern part of the quarry and N10°E in the northern part. Overburden varies from 15 to 25 feet in thickness.

The quarry was opened in 1952 and in the fall of 1957 was 1,000 feet wide and 115 feet deep. Production is at the rate of 1,600 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 26.1; absorption: .41; specific gravity: 2.76.

LIBERTY LIMESTONE CORPORATION (BUCHANAN)

The Buchanan quarry of the Liberty Limestone Corporation is located in Buchanan County on the east side of Virginia Primary Highway 43, approximately one mile east of Buchanan (Pl. 1, loc. 21).

The quarry is in the Shady dolomite of Cambrian age. This formation is composed of thick-bedded, fine- to medium-grained, light-gray to cream-colored dolomites and thick-bedded, fine-grained, dark-gray dolomites that contain disseminated blebs of white dolomite. The dolomites strike N40°E and dip, overturned, 60°SE. The Shady dolomite is overlain to the west, in normal sequence, by impure dolomites and shales of Cambrian age. However, to the southeast Cambrian

quartzite has been faulted upon the Shady dolomite and outcrops at the southeastern edge of the quarry and on a ridge above the southeastern wall of the quarry (Edmundson, 1958, p. 83). The overburden is approximately 2 feet thick.

The quarry is being developed along several levels in a face 500 feet wide. Production is at the rate of 1,200 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 17.3; absorption: .33; specific gravity: 2.84.

LIBERTY LIMESTONE CORPORATION (ROCKY POINT)

The Rocky Point quarry of the Liberty Limestone Corporation is located in Botetourt County along Roaring Run, approximately one mile north of Rocky Point (Pl. 1, loc. 23).

The quarry is in New Market limestone, the Lincolnshire limestone and the Edinburg formation, all of Ordovician age. The New Market limestone, which occurs in the northwestern part of the quarry, is composed of thick-bedded, dove-gray and dark-gray calcilutites that break with a concoidal fracture and that are veined with calcite. The Lincolnshire limestone is a fine- to medium-grained, dark-gray limestone with intercalated beds of medium- to coarse-grained, light-gray limestone of the Murat facies. The dark-gray limestone contains black shaly partings. The Edinburg formation consists of medium-grained, dark-gray, rusty-weathering limestone, known as the Botetourt member, and black shale, which weathers yellowish-brown (Edmundson, 1958, p. 32). At the southeastern side of the quarry, Cambrian limestones and dolomites are faulted upon the Edinburg formation along the Pulaski-Staunton fault. To the northwest of the quarry the New Market limestone is underlain by limestones and dolomites of the Beekmantown formation. The rocks in the quarry strike N45°E and dip 50°SE. The overburden is approximately 4 feet thick.

The quarry was 275 feet wide and 4,000 feet long in 1958. Production is at the rate of 1,500 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 19.5; absorption: .10; specific gravity: 2.74.

LONE JACK LIMESTONE COMPANY, INCORPORATED

The two quarries of the Lone Jack Limestone Company, Incorporated are located in Rockbridge County next to Virginia Secondary Highway 679, approximately 1¾ miles north of Glasgow (Pl. 1, loc. 24).

The company recently opened a quarry near the northwestern edge of an overthrust block of Erwin quartzite at the northwestern end of Miller Mountain, where the quartzite has been thrust over younger rocks of the Waynesboro (?) formation along the Blue Ridge fault. The Erwin quartzite is composed of thick-bedded, fine- to medium-grained, light-gray, highly brecciated quartzites, which weather yellowish-brown.

The company is developing a second quarry in the Waynesboro (?) formation several hundred yards northwest of the quartzite quarry. In this quarry, the formation consists of thin- to medium-bedded, fine-grained, light-gray and medium-gray, banded dolomites and fine-grained, dark-gray dolomites that contain black shaly partings. The dolomites in the quarry are overlain to the northwest by red and green shales typical of the Waynesboro formation. The quarry is on the western limb of a northeast-trending syncline and the beds strike approximately N70°E and dip about 45°SE. Overburden varies from 10 to 35 feet in thickness.

Production from both quarries is at the rate of approximately 500 tons per day.

Physical test data on the dolomites are as follows: Los Angeles loss (500 rev.): 17.8; absorption: .84; specific gravity: 2.82.

Physical test data on the quartzite are as follows: Los Angeles loss (500 rev.): 22.1; absorption: .67; specific gravity: 2.67.

MEADOWVIEW LIME COMPANY

The Meadowview Lime Company quarry is located in Washington County on the north side of U. S. Highway 11 just west of Meadowview (Pl. 1, loc. 7).

The quarry is in the Honaker dolomite of Cambrian age. The Honaker is a dark-gray, medium-grained, medium- to thick-bedded dolomite that contains calcite-filled fractures. In the southeastern quarry face there is an iron-stained zone that contains dolomite with pinkish argillaceous partings and a few beds of dark-gray, coarse-grained dolomite are scattered throughout the quarry. The beds strike N55°E and the dip varies from 80°SE to vertical. Overburden varies from 10 to 15 feet in thickness.

In 1957 the quarry was about 125 feet wide and 60 feet deep. Production is at the rate of 500 tons per day.

Physical test data are as follows: Los Angeles loss: (500 rev.): 17.6; absorption: .33; specific gravity: 2.82.

MONTGOMERY LIME COMPANY

The Montgomery Lime Company quarry is located in Montgomery County just west of Virginia Secondary Highway 723, approximately half a mile north of Ellett (Pl. 1, loc. 18).

The company is quarrying the upper 50 feet of the Five Oaks limestone and a small portion of the overlying Lincolnshire limestone. The Five Oaks limestone is a thick-bedded, dove-gray calcilutite that contains small "eyes" of calcite and numerous styolitic seams. The Lincolnshire limestone is composed of thick-bedded, fine- to medium-grained, dark-gray limestones that contain minor amounts of pyrite and some lenticular bodies of white calcite. The limestones strike N30°E and dip 30°SE. Overburden varies from 0 to 5 feet in thickness.

In 1957 the quarry was 110 feet high, 75 feet long, and 400 feet wide. Production is at the rate of 400 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.7; absorption: .67; specific gravity: 2.73.

C. S. MUNDY QUARRIES, INCORPORATED (ROCKINGHAM COUNTY)

The Rockingham County operation of the C. S. Mundy Quarries Incorporated is located northwest of Virginia Secondary Highway 613, approximately three miles southwest of Cootes Store (Pl. 1, loc. 32).

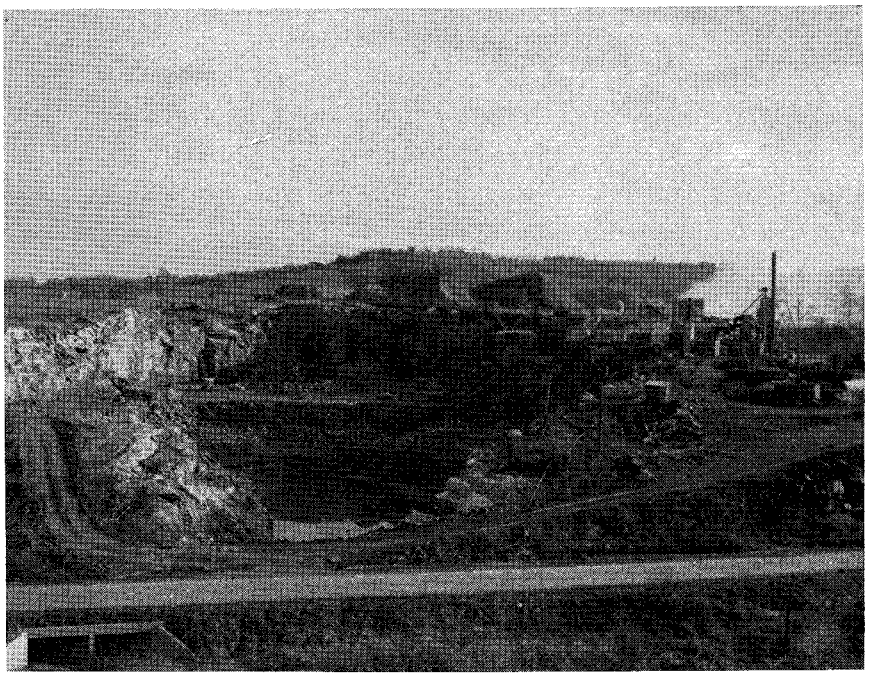
The quarry is in dolomites of the Elbrook formation of Cambrian age and is just east of the trace of the North Mountain fault. The Elbrook formation is composed of medium- to thick-bedded, fine-grained, light- and dark-gray, mealy weathering, brecciated dolomites that strike N30°E and generally dip 60° to 70°SE. However, at the western end of the quarry the dip of the lower beds changes to the northwest. Overburden varies from 0 to 2 feet in thickness.

This quarry was approximately 70 feet deep, 250 feet wide and 200 feet long in 1957. Production is at the rate of 800 tons per day.

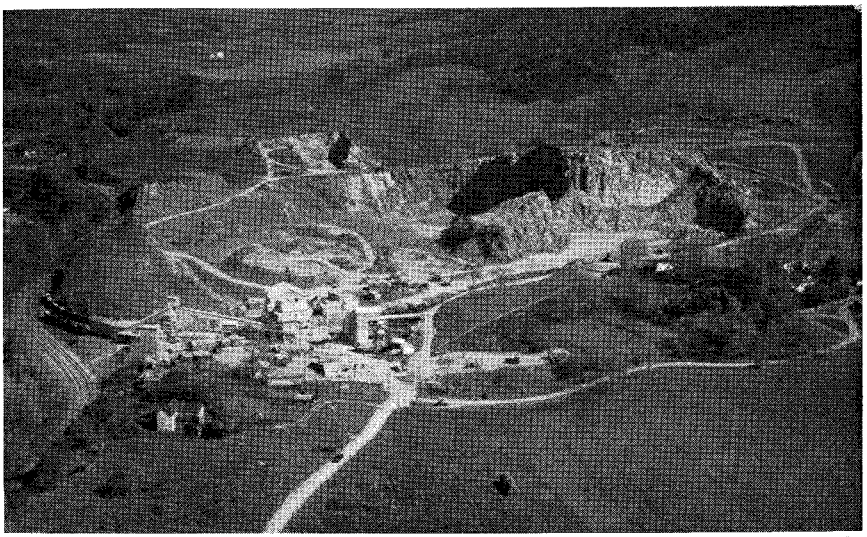
Physical test data are as follows: Los Angeles loss (500 rev.): 23.4; absorption: .33; specific gravity: 2.86.

C. S. MUNDY QUARRIES, INCORPORATED (SHENANDOAH COUNTY)

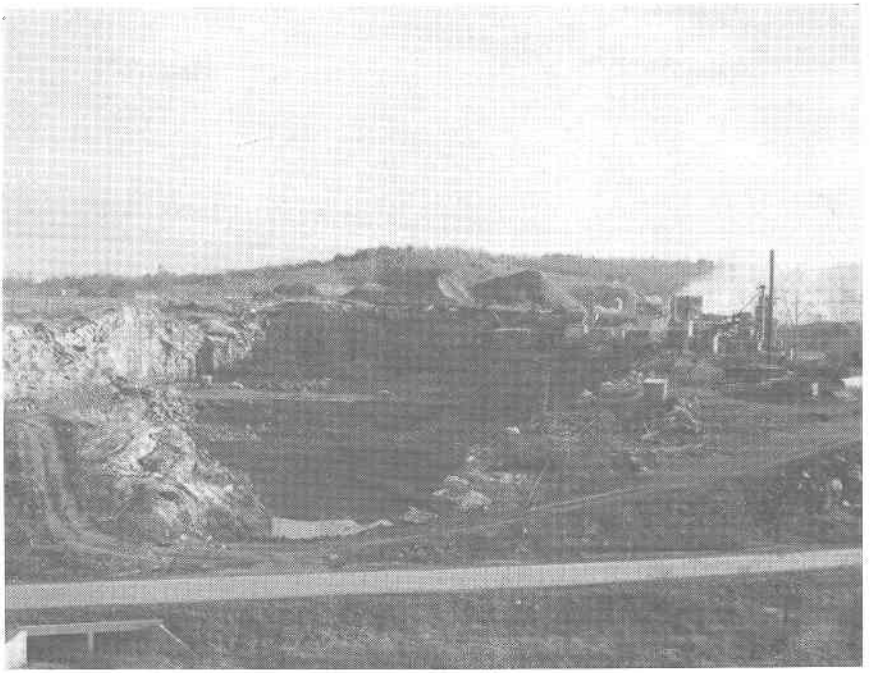
The Shenandoah County operation of the C. S. Mundy Quarries, Incorporated is located on the north side of Virginia Secondary Highway 733, approximately a quarter of a mile southwest of the junction of



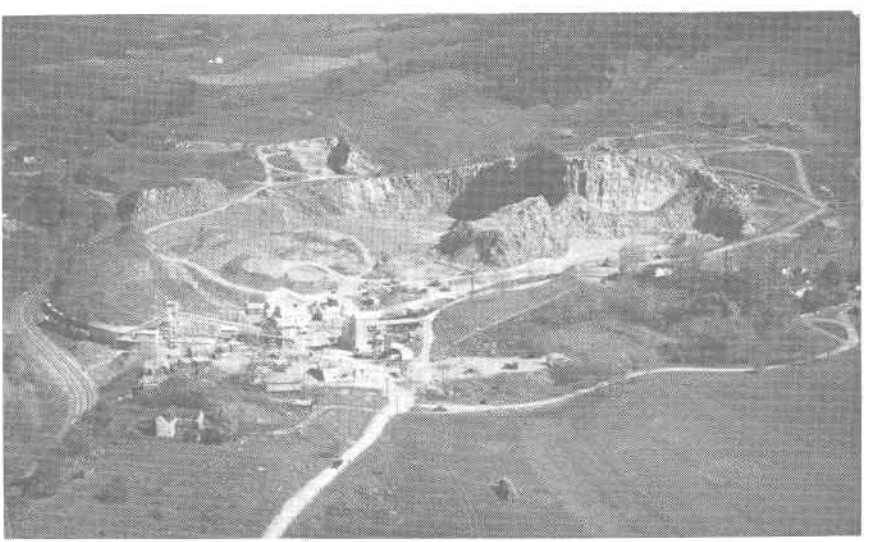
A. C. W. Barger quarry and plant near Lexington, Rockbridge County.



B. Quarry and plant of Pounding Mill Quarry Corporation near Pounding Mill, Tazewell County (photo courtesy of the company).



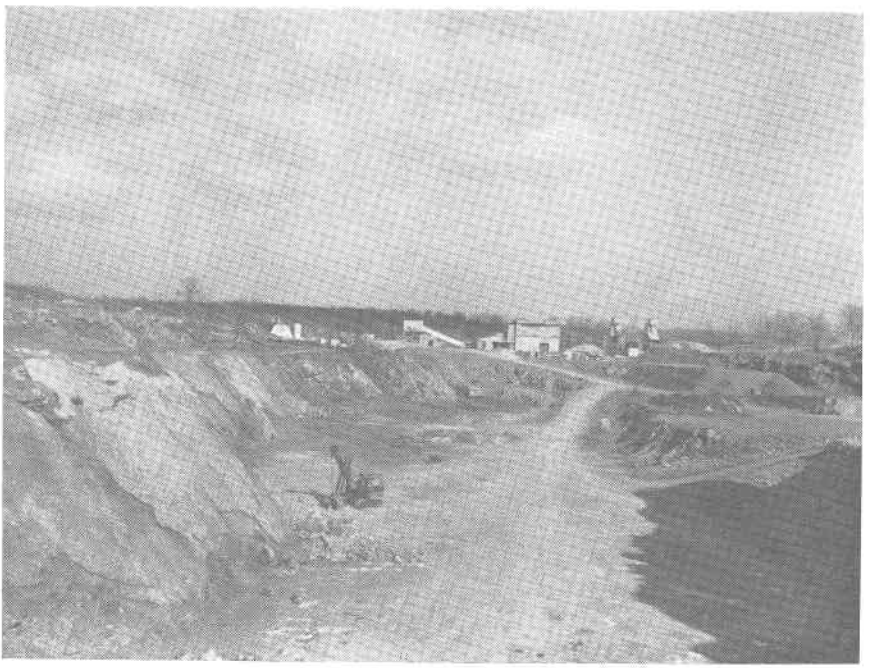
A. C. W. Barger quarry and plant near Lexington, Rockbridge County.



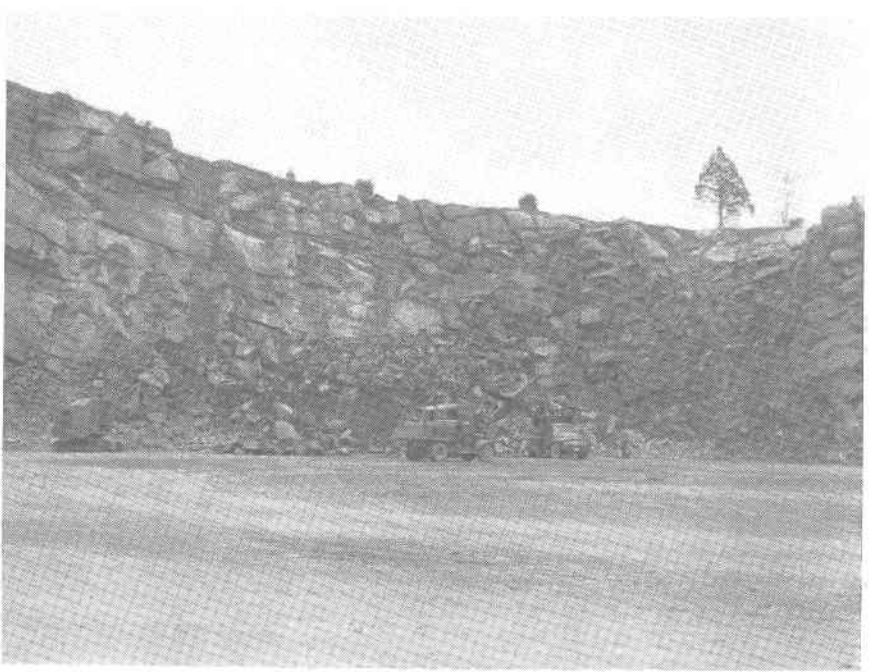
B. Quarry and plant of Pounding Mill Quarry Corporation near Pounding Mill, Tazewell County (photo courtesy of the company).

A. Stuart M. Perry quarry and plant near Winchester, Frederick County.

B. Montgomery Lime Company quarry near Ellett, Montgomery County.



A. Stuart M. Perry quarry and plant near Winchester, Frederick County.



B. Montgomery Lime Company quarry near Ellett, Montgomery County.

Virginia Primary Highway 42 and Virginia Secondary Highway 733 (Pl. 1, loc. 33).

The company is quarrying a succession of extremely fine-grained, dark-gray, argillaceous limestones from the Edinburg formation of Ordovician age. Because of closely spaced jointing, these limestones tend to break up into small rectangular blocks. The quarry is located northwest of the trace of the Saumsville fault (Thornton, 1953, p. 145) and a minor fault occurs in the southwestern part of the quarry. The beds strike northeast and dip to the southeast. Overburden varies from 4 to 6 feet in thickness.

The quarry was approximately 25 feet deep, 200 feet wide, and 500 feet long in 1958. Production is at the rate of 400 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.0; absorption: .13; specific gravity: 2.69.

NATURAL TUNNEL STONE COMPANY

The Natural Tunnel Stone Company quarry is located in Scott County on the northeast side of U. S. Highway 23-58 at Glenita (Pl. 1, loc. 4).

The quarry is in the lower portion of the Knox dolomite. In the lower part of the quarry the dolomite is fine- to medium-grained and medium- to dark-gray. In the upper part of the quarry it is medium- to thick-bedded, banded, and contains a few layers of fine- to medium-grained, light-gray dolomite in which there are randomly distributed quartz sand grains. The beds are nearly horizontal. Overburden varies from 0 to 2 feet in thickness.

The quarry was originally opened in 1915 and in 1957 was 500 feet wide, 800 feet long and 275 feet deep. Production is at the rate of 800 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 17.6; absorption: .23; specific gravity: 2.82.

PENDLETON CONSTRUCTION COMPANY

The Pendleton Construction Company quarry is located in Wythe County on the south side of U. S. Highway 11, approximately two miles east of the city limits of Wytheville (Pl. 1, loc. 13).

The quarry is in the Conococheague (?) formation of Cambrian age. Most of the rocks in the quarry are thin- to thick-bedded, fine-grained, medium- to dark-gray dolomites in which there are laminations, dolo-

mite-filled fractures and several zones of brecciated dolomite recemented with calcite. A few medium- to thick-bedded, dense, pinkish-gray dolomites are interbedded with the medium- to dark-gray dolomites. Fine-grained, medium-gray, shaly dolomites that contain fractures filled with dolomite occur at the southeastern end of the quarry. The beds in the quarry strike N70°E; the dip gradually increases from 60°NW at the southeastern end of the quarry until the beds become vertical at the northwestern end. A minor fault occurs in the dolomite beds near the northwestern end of the quarry.

In 1958 the quarry was approximately 100 feet deep, 700 feet wide and 500 feet long. Production is at the rate of about 1,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.0; absorption: .23; specific gravity: 2.84.

STUART M. PERRY COMPANY

The Stuart M. Perry Company quarry is located in Frederick County on the south side of U. S. Highway 50, approximately two miles west of Winchester (Pl. 1, loc. 38).

The quarry is in the Conococheague formation of Cambrian age. This formation consists, in part, of medium- to thick-bedded, fine- to medium-grained, dark-gray, banded limestones and medium- to thick-bedded, fine-grained, dark-gray laminated dolomitic limestones. Both contain calcite-filled fractures that are parallel to the bedding. The remainder of the Conococheague formation is composed of a few thin layers of medium- to coarse-grained, friable sandstone and a few layers of fine-grained, gray dolomite. The beds strike N50°E and dip 50°SE. Overburden is approximately 10 feet thick.

In 1957 the quarry was approximately 100 feet deep, 445 feet wide and 2,500 feet long. Production is at the rate of 2,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.1; absorption: .33; specific gravity: 2.73.

POUNDING MILL QUARRY CORPORATION, QUARRY NO. 1

Pounding Mill Quarry Corporation quarry no. 1 is located in Tazewell County at Pounding Mill (Pl. 1, loc. 11).

The quarry is in the Lincolnshire limestone, the Ward Cove limestone, the Peery limestone, the Benbolt limestone, and the Gratton limestone, all of Ordovician age. These limestones occur in a normal stratigraphic sequence with the Lincolnshire limestone being the oldest. The Lincolnshire limestone, which occurs in the north wall of the quarry,

consists of fine-grained, dark-gray, cherty limestones. The chert occurs in pod-shaped masses and as discontinuous stringers. The lower portion of the Ward Cove limestone is composed of medium- to course-grained, dark-gray limestones, which contain small masses of dove-gray calcilutites. The upper portion of the Ward Cove limestone consists of dark-gray, dense, cherty limestones that contain calcite-filled fractures and a few styolitic seams. A dark bluish-gray cherty limestone occurs at the base of the Peery limestone (Cooper, 1945, p. 88). This limestone is overlain by a layer of medium- to coarse-grained, dark-gray limestone. The upper Peery limestone is composed of dove-gray calcilutites that contain calcite-filled fractures and a few styolitic seams. The lower portion of the Benbolt limestone consists of fine- grained, dark-gray, nodular, impure limestones above which there is a zone of fine- to medium-grained, dark-gray, cross-bedded limestone. The remainder of the Benbolt limestone is composed of fine- to medium-grained, dark-gray, cherty limestones. The Gratton limestone is composed of fine-grained, dove-gray limestones and dark-gray, cherty limestones. Impure limestones and shale of the Wardell formation overlie the Gratton limestone. The quarry is on the western limb of a northeast-trending syncline. The beds strike N60°E and dip 30°SE. Minor structure in the quarry includes some folding in the Benbolt and Gratton limestones.

East of the main operation the Peery limestone is being quarried for fluxing stone purposes.

In 1957 the main quarry was approximately 600 feet deep and covered 34 acres. Production is at the rate of 3,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 22.5; absoprtion: .27; specific gravity: 2.72.

POUNDING MILL QUARRY CORPORATION, QUARRY NO. 2

Pounding Mill Quarry Corporation quarry no. 2 is located in Tazewell County on the north side of U. S. Highway 460, approximately two miles southwest of Bluefield (Pl. 1, loc. 12).

According to Cooper's Geologic Map of the Burkes Garden quadrangle (1945), the quarry is in a succession of Middle Ordovician limestones stratigraphically above the Knox dolomite. South of the quarry older dolomites have been thrust over these limestones by the southern branch of the St. Clair fault. The following description represents a generalized cross section of the rocks exposed in the quarry. Thin to massive, dove-gray calcilutitis and thin, interbedded, dark-gray limestones occur in the northwestern part of the quarry. White calcite-

filled blebs and fractures occur in the limestones and some of the calcilutitities contain styolitic seams, shaly partings, and small, dark-gray calcilutite pebbles. The next overlying zone contains thick-bedded, medium- to coarse-grained, dark-gray fossiliferous limestones and interbedded, laminated, medium-gray calcilutities. These rocks are overlain by thick-bedded, fine-grained, dark-gray limestones and thin to massive, dove-gray calcilutities, some of which contain black shaly partings, calcite-filled fractures and small dark-gray calcilutite pebbles. The deformation of the rocks in the quarry resulting from movement along the St. Clair fault is shown by the presence of slickensided surfaces, folding, faulting, fracture cleavage, and several highly brecciated zones.

In 1958 the quarry was approximately 60 feet deep, 400 feet long, and 200 feet wide. Production is at the rate of approximately 2,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 32.4; absorption: .00; specific gravity: 2.74.

RADFORD LIMESTONE COMPANY, INCORPORATED

The Radford Limestone Company, Incorporated quarry is located in Pulaski County on the west side of Virginia Secondary Highway 605, approximately 2½ miles south of Radford (Pl. 1, loc. 17).

The quarry is in medium- to thick-bedded, fine-grained, medium- to dark-gray dolomites of the Beekmantown formation of Ordovician age. The darker colored dolomites occur in a 60 foot zone in the northwestern part of the quarry (Cooper, 1948, p. 50). Light-gray to black chert occurs as disseminated nodules in minor amounts and in several distinct beds. A few of the dolomites contain argillaceous partings. A fine- to medium-grained, light-gray sandstone crops out at the top of the quarry. According to the Geologic Map of the Appalachian Valley of Virginia (1933), the quarry is in the southeastern limb of an overturned syncline in the Pulaski overthrust block. The strike of the beds in the quarry is N45°E and the dip, overturned, 75°SE. Overburden varies from 0 to 50 feet in thickness.

The quarry was about 400 feet deep, 700 feet wide and 1,000 feet long in 1957. Production is at the rate of approximately 1,200 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.0; absorption: .07; specific gravity: 2.80.

RIVERTON LIME AND STONE COMPANY

The Riverton Lime and Stone Company quarry is located in Warren County on the east side of the Shenandoah River, approximately half a mile north of Front Royal (Pl. 1, loc. 35).

The company is quarrying limestones and dolomites of the Beekmantown formation from a new opening near the southern end of a large quarry. This formation is of Ordovician age, and consists of medium- to thick-bedded, fine-grained, medium-gray dolomites interbedded with thick-bedded, fine-grained, dark-gray limestones that contain some disseminated nodules of chert and a few pinkish shaly partings. Both the limestone and dolomite beds contain fractures filled with white calcite. The strike of the beds varies from NW to N15°E and dip from 25°E to 45°E.

The new opening in the floor of the old quarry was approximately 40 feet deep, 100 feet wide, and 150 feet long in 1958. Production is at the rate of 1,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 23.1; absorption: .16; specific gravity: 2.78.

ROCKYDALE STONE SERVICE CORPORATION (ROANOKE COUNTY)

The Roanoke County plant of Rockydale Stone Service Corporation is located just east of Virginia Secondary Highway 789, approximately two miles south of Roanoke (Pl. 1, loc. 19).

The quarry is on the crest of a northeast-trending anticline in the Shady dolomite of Cambrian age. The Shady dolomite is composed, for the most part, of thick-bedded, medium-grained, dark-gray dolomites that tend to break with an angular fracture. These rocks contain blebs and fractures filled with white dolomite and a few layers of medium-gray and light olive-gray dolomitic shales. Some of the dolomite beds near the top of the quarry contain a few nodules of chert. The beds strike northeast, dip approximately 3°NW on the west side of the quarry and from 30°SE to 40°SE on the east side. A joint set in the quarry that strikes northeast parallels the major folds and faults in the area. The thickness of the overburden varies from 0 to 4 feet.

The quarry was approximately 275 feet deep and 750 feet wide in 1957. Production is at the rate of 3,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.6; absorption: .50; specific gravity: 2.84.

SOUTHWEST QUARRIES, INCORPORATED

The operation of Southwest Quarries, Incorporated is located in Big Stone Gap, Wise County, on the north side of U. S. Alternate Highway 58 (Pl. 1, loc. 3)

The quarry is in the Newman "seam" of Mississippian age. The Newman "seam" consists of the St. Genevieve (?) limestone and the overlying Gasper (?) limestone. These are thin- to thick-bedded, light- to medium-gray, compact limestones that contain a few thin layers of greenish-gray, high magnesium limestones. The quarry is on the northwest limb of a northeast-plunging anticline that is part of the Cumberland overthrust block. Except where the beds increase in thickness in the western part of the quarry they have a uniform strike of N40°E and dip of 40°NW. Overburden varies from 0 to 3 feet in thickness.

The quarry was originally opened in 1900 and in 1957 was 500 feet wide and 350 feet deep. Production is at the rate of 250 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 24.8; absorption: .84; specific gravity: 2.72.

TOMS BROOK LIME AND STONE COMPANY

The Toms Brook Lime and Stone Company quarry is located in Shenandoah County on the north side of Virginia Secondary Highway 653, approximately a quarter of a mile east of Toms Brook (Pl. 1, loc. 34).

The quarry is in the Beekmantown formation, the New Market limestone, the Lincolnshire limestone and the Edinburg (?) formation, all of Ordovician age. The Beekmantown formation, which occurs at the northwestern end of the quarry, is composed of thick-bedded, fine-grained, light- to dark-gray dolomites with a few intercalated beds of bluish-gray limestone. Some of the dolomites contain black shaly partings and blebs of dolomite. The overlying New Market limestone consists of thick-bedded, medium- to dark-gray calcilutitites that contain small "eyes" of calcite. The Lincolnshire limestone, which overlies the New Market, consists of thick-bedded, fine- to medium-grained, dark-gray, cherty limestone. In the southwestern portion of the quarry the basal portion of the Lincolnshire limestone contains black cherty nodules, whereas towards the northeastern edge chert is absent in the bed directly overlying the New Market limestone. The overlying Edinburg (?) formation is exposed in a new opening in

the southwestern portion of the quarry. The basal portion of this formation is composed of medium-bedded, extremely fine-grained limestones that contain numerous veins of calcite transverse to the bedding. These limestones are overlain by a bed of sandy shale 2 to 5 feet in thickness, which in turn is overlain by extremely fine-grained, dark-gray, nodular limestones. The beds strike approximately N50°E and dip about 40°SE. Overburden varies from 4 to 10 feet in thickness.

Production is at the rate of approximately 100 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.9; absorption: .20; specific gravity: 2.72.

VALLEY STONE COMPANY

The Valley Stone Company quarry is located in Augusta County on the northeast side of U. S. Highway 250, approximately 1½ miles east of Staunton (Pl. 1, loc. 26).

The company is quarrying the upper portion of the Beekmantown formation, the New Market limestone and a small portion of the Lincolnshire limestone, all of Ordovician age. The Beekmantown formation, which occurs in the lower part of the quarry, is composed of thick-bedded, fine-grained, light-gray dolomites with a few intercalated dark-gray limestones. The Beekmantown formation is overlain by the New Market limestone, which is composed of thick-bedded, medium- to dark-gray calcilutities that contain a few bedding-plane styolites and small "eyes" of calcite. A medium- to coarse-grained, light-gray limestone, probably a facies of the New Market, occurs between the Beekmantown dolomites and the overlying calcilutities in the eastern part of the quarry. The New Market limestone is overlain at the top of the quarry by thick-bedded, fine- to medium-grained, dark-gray, cherty Lincolnshire limestone. The rocks in the quarry strike east and dip 25°N. Overburden varies from 0 to 15 feet in thickness.

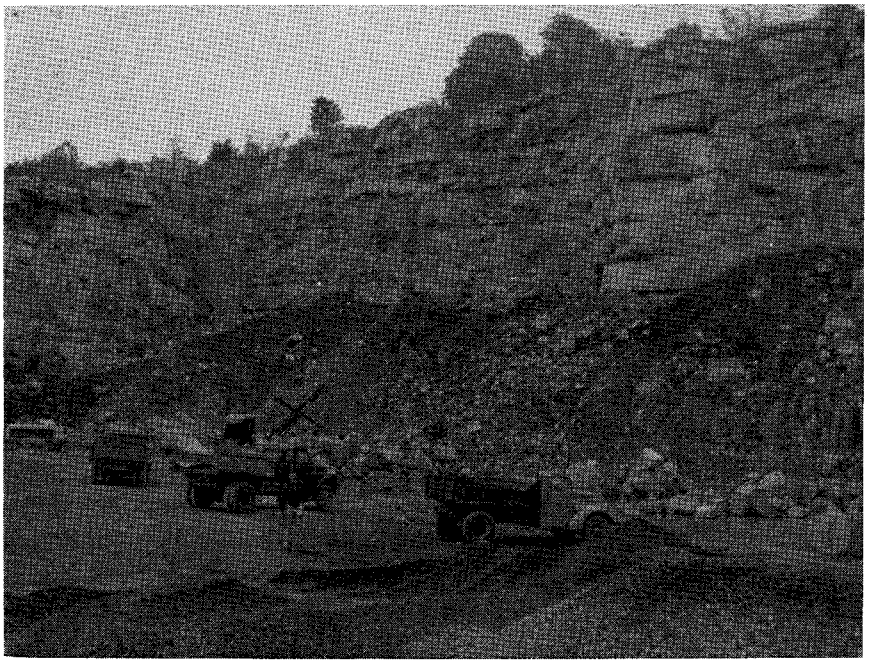
The quarry was about 70 feet deep, 250 feet wide and 1,000 feet long in 1959. Production is at the rate of 400 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.3; absorption: .10; specific gravity: 2.79.

VIRGINIA STONE AND CONSTRUCTION COMPANY

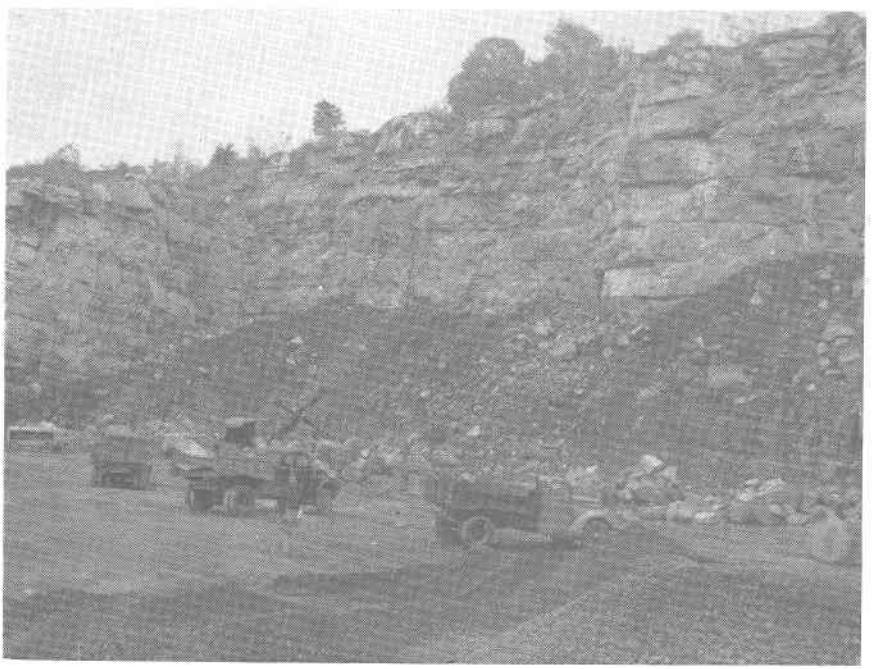
The Virginia Stone and Construction Company quarry is located in Wythe County on the south side of U. S. Highway 11, approximately 2¾ miles east of Fort Chiswell (Pl. 1, loc. 15).

A. Virginian Limestone Corporation quarry near Klotz, Giles County.



B. Washington County Stone Company quarry near Glade Spring, Washington County.

A. Virginian Limestone Corporation quarry near Klotz, Giles County.



B. Washington County Stone Company quarry near Glade Spring, Washington County.

The company is quarrying a succession of intercalated fine-grained, medium- to dark-gray dolomites and fine-grained, medium- to dark-gray magnesium limestones of Cambrian age. The magnesium limestones contain calcite-filled fractures and black argillaceous partings and a few of the dolomites contain calcite- and dolomite-filled fractures. An eight foot zone of breccia that occurs near the southern end of the quarry contains irregular blocks and rounded fragments of dolomite, magnesium limestone, red and green phyllitic rock, and white quartzite (Cooper, 1939, p. 60). A zone of highly fractured red and green shales occurs in the southeastern corner of the quarry. The rocks in the quarry strike northeast and generally dip steeply to the southeast; however, at the northern end of the quarry the dip of the lower beds gradually changes to the northwest.

This quarry was opened in 1958 and is 75 feet long, 50 feet wide and 20 feet deep.

Physical test data are as follows: Los Angeles loss (500 rev.): 21.6; absorption: .60; specific gravity: 2.81.

VIRGINIAN LIMESTONE CORPORATION

The Virginian Limestone Corporation quarry is located in Giles County on the east side of the New River at Klotz (Pl. 1, loc. 16).

The quarry is in an alternating succession of fine-grained, light-gray and dark-gray dolomites of the upper part of the Beekmantown formation of Ordovician age. The dark-gray dolomites occur in beds approximately 8 feet thick. A minor fault occurs near the southeastern end of the quarry and several solution cavities have developed along the fault plane. In the southeastern part of the quarry the rocks strike approximately N50°E and dip gently to the southeast. The Beekmantown formation is overlain by cherty dolomite of the Blackford formation that is exposed along Virginia Secondary Highway 635, which passes along the rim of the quarry. Very little overburden is present.

Production is at the rate of approximately 2,400 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.1; absorption: .20; specific gravity: 2.82.

WASHINGTON COUNTY STONE CORPORATION

The Washington County Stone Corporation quarry is located in Washington County half a mile southwest of the junction of Virginia Primary Highway 91 and Virginia Secondary Highway 736 (Pl. 1, loc. 8).

The quarry is in a succession of Cambrian limestones and dolomites of the Conococheague formation. This formation is composed, in part, of medium-bedded, fine-grained, medium-gray dolomites and fine-grained, light- to dark-gray banded limestones; however, some medium- to thick-bedded, fine-grained, dark-gray limestones also occur in the quarry. A few of the limestones contain rounded olive-gray calcilutite pebbles and bedding-plane styolites and one of the dolomite beds contains a layer composed of rounded quartz grains in a limestone matrix. Disseminated nodules of fractured black chert occur in a bed near the floor of the quarry and a medium-bedded, yellowish-orange weathering sandstone crops out at the top of the quarry. The beds strike northeast and dip 15°SE. The overburden is approximately three feet thick.

In 1957 the quarry was approximately 100 feet deep and 250 feet wide. Production is at the rate of approximately 500 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 16.3; absorption: .10; specific gravity: 2.74.

WOODWAY STONE COMPANY

The Woodway Stone Company quarry is located in Lee County on the east side of Virginia Secondary Highway 642 just east of Woodway (Pl. 1, loc. 2).

The quarry is in the Lowville limestone of Ordovician age. A fine-grained, medium-gray limestone that is mottled with grayish-green blebs occurs at the base of the quarry and is overlain by a dense, dove-gray limestone that contains medium-gray crystalline blebs. The dove-gray limestone bed is overlain by a fine- to medium-grained, thin- to medium-bedded gray limestone that contains laminae and stringers of dolomite. This bed is overlain by a medium-gray limestone that is partly mottled with chocolate-colored areas. Dark-gray limestones that contain black chert nodules occur at the top of the quarry. Bedding plane and transverse faults, both of minor displacement, and a joint set that strikes N45°W are exposed. Overburden varies from 0 to 8 feet in thickness.

The quarry was opened in 1937 and in 1957 was 350 feet wide, 350 feet long and 100 feet deep. Production is at the rate of about 450 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 19.8; absorption: .13; specific gravity: 2.74.

PRODUCERS IN THE BLUE RIDGE AND PIEDMONT PROVINCES

ARLINGTON STONE COMPANY

The Arlington Stone Company quarry is located in Loudoun County on the west side of Virginia Secondary Highway 659, about 4½ miles southeast of Leesburg (Pl. 1, loc. 40).

The quarry is in the Belmont Stock (Roberts, 1928, p. 44), one of the diabase or "trap rock" intrusives associated with the Triassic basin of northern Virginia. The diabase is rather uniform throughout the quarry and is composed essentially of augite and labradorite. Some common accessory minerals are albite, orthoclase and quartz intergrowths, apatite, hornblende, and chlorite. Two well-developed joint sets are present. One set, which has closely spaced joints, strikes N20°E and dips 68°SE. The quarry is developed parallel to this set. The joints in the other set strike N80°W and dip 80°N. Overburden is 10 to 20 feet thick.

The quarry was opened in 1880 (Roberts, 1928, p. 121), worked intermittently until 1928 and continuously since. In 1957 the quarry was about 400 feet wide and 1,000 feet long and was being worked on two 35-foot levels. Production is at the rate of 800 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 22.5; absorption: .10; specific gravity: 3.04.

J. E. BAKER COMPANY

The J. E. Baker Company quarry is located in Hanover County on the west side of Virginia Secondary Highway 685, about half a mile south of Verdon (Pl. 1, loc. 54).

The quarry is in a granite gneiss that is mapped as the Baltimore gneiss on the Geologic Map of Virginia (1928). For the most part, the rock is a fine- to medium-grained, light- to dark-gray gneiss that is composed essentially of quartz, potash feldspar, biotite, chlorite and some plagioclase feldspar. In places the gneiss becomes very coarse-grained with large pink feldspar phenocrysts. The gneissic structure strikes N45°E and dips 45°SE. The rock is highly jointed and the most prominent joint set strikes N55°W and dips 70°NE. Overburden is about 20 feet thick and consists of alluvial material, mostly sand and gravel.

The quarry was opened in 1950 and in 1959 was about 300 feet wide, 800 feet long and 50 feet deep. Production is at the rate of 150 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 21.1; absorption: 1.18; specific gravity: 2.70.

BARNES STONE COMPANY, INCORPORATED

The Barnes Stone Company, Incorporated quarry is located in Pittsylvania County on the north side of Virginia Secondary Highway 723, about 3½ miles northeast of Danville (Pl. 1, loc. 64).

The quarry is in a granite gneiss that is unnamed on the Geologic Map of Virginia (1928). The rock is medium-grained, light-gray and composed essentially of quartz, potash feldspar, biotite and some plagioclase feldspar. Because of the gneissic structure, the rock has a very distinct horizontal lineation that strikes N40°E. The most prominent joint sets strike N50°W and N15°E and dip 80°SW and 70°W, respectively. Closely spaced sheet joints are well developed near the top of the quarry. Small pegmatites intrude the granite gneiss and are parallel to the gneissic structure. Overburden is about 5 feet thick.

The quarry was opened in October 1955 and in 1957 was about 1,000 feet long and 350 feet wide. The rock is quarried on two levels, a lower 18-foot level and an upper 24-foot level. Production is at the rate of approximately 100 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 32.5; absorption: .74; specific gravity: 2.65.

BLUE RIDGE STONE COMPANY—LYNCHBURG PLANT

The Blue Ridge Stone Company quarry in Campbell County is located on the east side of Virginia Secondary Highway 670, about five miles southeast of Lynchburg (Pl. 1, loc. 60).

The quarry is in the Arch marble, a blue-gray, banded, fine-to medium-grained marble that contains variable amounts of muscovite, biotite, chlorite, and pyrite (Brown, 1958, p. 34). In the eastern part of the quarry the beds strike N60°E and dip 50°SE; however, the dip of the beds becomes steeper in the western part of the quarry. Several joint sets are present; one set strikes N25°E and dips 66°NW and another S80°E and 68°N. Slickensides are present on bedding planes and joint surfaces in the western quarry face. Numerous quartz and calcite veins occur throughout the quarry. Overburden is 5 to 15 feet thick.

The quarry was opened in May 1956 and in late 1957 was 200 feet wide, 500 feet long and 50 feet deep. Production is at the rate of about 200 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 18.0; absorption: .07; specific gravity: 2.69.

BOSCOBEL GRANITE COMPANY

The Boscobel Granite Company quarry is located in Goochland County on the north side of the Chesapeake and Ohio Railway, about one mile southwest of Manakin (Pl. 1, loc. 57).

The quarry is in a gneiss that is mapped as granitized Wissahickon gneiss on the Geologic Map of Virginia (1928). The gneiss is composed of three different rock types. One is a fine-grained, pale-green rock composed of quartz, plagioclase feldspar, and minor amounts of biotite and potash feldspar. This rock type appears to have been intruded by nearly horizontal sheets of pink granite. This granite is medium- to coarse-grained and is composed of quartz, potash feldspar, plagioclase feldspar, and muscovite. The third rock type is a mixture of the other two and is found along the contact between them. Overburden averages about 35 feet in thickness; however, part of this is saprolite that is quarried for use as soil aggregate.

The rocks in the quarry are highly jointed. The two principal joint sets strike N70°E and N45°E and dip 74°SE and 77° NW, respectively. A fault that passes through the extreme eastern end of the quarry separates the gneiss from shales and sandstones of the Richmond Triassic basin. The fault is well exposed on the north side of the road that leads into the quarry and at this point it strikes N10°W and dips 57°E.

The present quarry operation began in 1924, although it is reported that rock was quarried from this location over one hundred years ago. In 1958 the quarry was approximately 2,500 feet long, 400 feet wide and 150 feet deep. Production is at the rate of 200 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 25.3; absorption: 1.11; specific gravity: 2.61.

BRYAN ROCK AND SAND COMPANY

The Bryan Rock and Sand Company quarry is located in Brunswick County about half a mile north of Virginia Secondary Highway 629 and three-fourths of a mile east of Rawlings (Pl. 1, loc. 67).

The quarry is in a granite gneiss that is mapped as Petersburg granite on the Geologic Map of Virginia (1928). The rock is medium-gray and occurs as fine- and medium-grained varieties, both of which are composed essentially of quartz, potash feldspar, biotite, and plagioclase feldspar. A lineation strikes N10°E and plunges to the south at 15 de-

grees. Joints are well developed in the rocks in the quarry. One prominent joint set strikes N50°W and dips 60°E, another set strikes N80°E and is vertical. Small pegmatites are found throughout the quarry and five small diabase dikes occur near the center. Overburden is about 15 feet thick.

The quarry was opened in April 1955 and in late 1957 was 600 feet wide, 800 feet long and 90 feet deep. Production is at the rate of 200 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 31.1; absorption: .20; specific gravity: 2.66.

BULL RUN STONE COMPANY

The Bull Run Stone Company quarry is located in Loudoun County on the east side of Virginia Secondary Highway 659, about half a mile north of the Loudoun-Prince William County Line (Pl. 1, loc. 41).

The quarry is in one of the diabase or "trap rock" intrusives associated with the Triassic basin of northern Virginia. The diabase is dark-gray, medium-grained and composed essentially of augite and labradorite. Two prominent joint sets are present in the quarry. One set, in which the joints are closely spaced, strikes N10°E and dips 87°E. The other set strikes N65°W and dips 85°NE. The overburden varies from 5 to 10 feet in thickness and consists of residual brown soil that contains diabase boulders.

The quarry was opened in April 1957 and in early 1959 was about 150 feet long, 100 feet wide and 15 feet deep. Production is at the rate of 80 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 20.7; absorption: .94; specific gravity: 2.97.

BURKEVILLE STONE COMPANY

The Burkeville Stone Company quarry is located in Nottoway County on Virginia Secondary Highway 690, about a quarter of a mile northeast of Burkeville (Pl. 1, loc. 66).

The quarry is in a fine-grained, gray granite composed essentially of potash feldspar, plagioclase feldspar, quartz and biotite. The granite is intruded by numerous small pegmatities that range from 1 to 3 inches in width. Joints are widely spaced and in the deeper part of the quarry are very tight and poorly developed. Vertical joint sets strike N40°E, N40°W, and N30°W. The granite has a distinct rift that strikes N5°W,

is vertical and independent of jointing (Steidtmann, 1945, p. 70). Overburden is 10 to 30 feet thick.

Granite was first quarried from this location over 100 years ago and used for building stone (Steidtmann, 1945, p. 71). The granite was later quarried for such purposes as base and die monumental block, straight and curved curbstone, paving and sewer block; however, only crushed stone is produced at present. The quarry covers several acres and is worked on two levels, a 20-foot level and a 30-foot level. Production is at the rate of about 200 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 40.8; absorption: .77; specific gravity: 2.66.

CHARLOTTESVILLE STONE COMPANY

The Charlottesville Stone Company quarry is located in Albemarle County on the south side of U. S. Highway 250, about one mile west of Shadwell (Pl. 1, loc. 52).

The quarry is in the Catoctin greenstone, a metabasalt that is dense, fine-grained, greenish and that is composed essentialy of chlorite, hornblende, actinolite and tremolite. Amygdules in the greenstone are usually filled with quartz and ringed by epidote or chlorite (Steidtmann, 1945, pp. 46-47). Veins and irregular masses of quartz, epidote and pink feldspar are scattered throughout the rocks in the quarry. A number of other minerals have also been reported (Giannini and Rector, 1958, p. 427). A felsite dike that strikes N15°W and dips 40°NE intrudes the greenstone. Jointing is well developed in the rocks in the quarry. One set strikes N75°E and dips 75°SE and another set strikes N20°E and dips 18°E. Overburden is 10 to 15 feet thick.

The quarry was opened in 1933 and in 1958 was approximately 900 feet long, 600 feet wide and 50 feet deep. Production is at the rate of about 100 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 14.8; absorption: .64; specific gravity: 2.91.

CULPEPER STONE COMPANY

The Culpeper Stone Company quarry is located in Culpeper County on the south side of Virginia Primary Highway 3, about one mile west of Stevensburg (Pl. 1, loc. 48).

The quarry is in the Manassas sandstone of Triassic age (Roberts, 1928, pp. 24-38). The rock is a medium-bedded, fine-grained, red and gray sandstone composed mostly of quartz and feldspar, with some cal-

cite. Pyrite is disseminated throughout the sandstones and sphalerite is found occasionally. Thin beds of black shale are interbedded with the sandstones and one bed of oolitic limestone that ranges from 6 to 9 inches in thickness has been reported (Young and Edmundson, 1954, pp. 275-279). The strike of the beds varies from N35°E to N45°E and dip from 6° to 8°NW. Vertical joint sets that strike N45°E, N15°E, and east are present. Overburden is 1 to 5 feet thick.

The quarry was originally developed and operated by the Virginia Department of Highways; however, the Culpeper Stone Company has been operating it since 1954. In early 1959 the quarry covered about six acres. Production is at the rate of 100 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 15.6; absorption: 1.32; specific gravity: 2.76.

FAIRFAX QUARRIES, INCORPORATED

The Fairfax Quarries, Incorporated quarry is located on the south side of U. S. Highway 29-211 in Fairfax County, about half a mile north of the Fairfax-Prince William County line (Pl. 1, loc. 42).

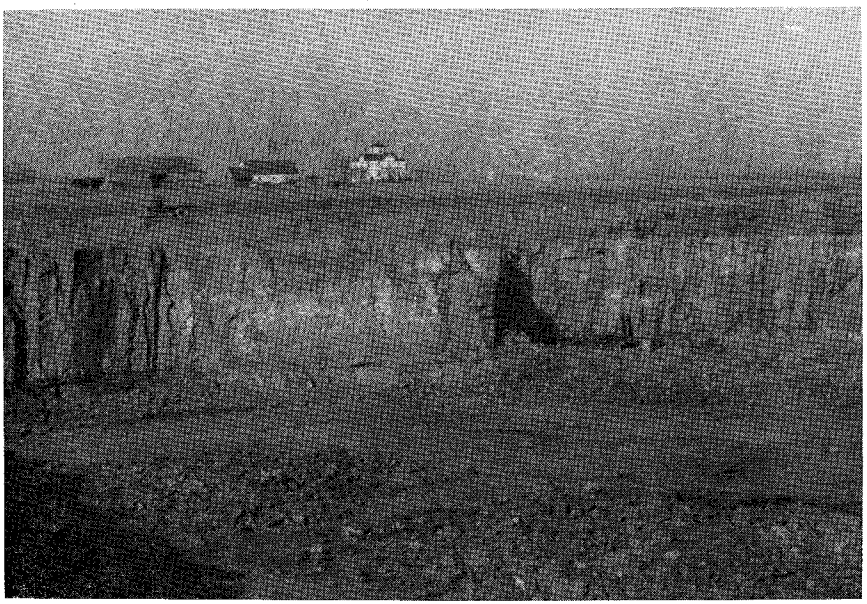
The quarry is in one of the diabase or "trap rock" intrusives associated with the Triassic basin of northern Virginia. The diabase is medium-grained, grayish-black, uniform in texture and is composed essentially of augite and labradorite. Prehnite and the zeolites, thaumasite and natrolite, are found in vugs or cavities that are occasionally encountered in the quarrying operations (Parrott, 1954, p. 308). Two well-developed joint sets are present in the quarry. One set, in which the joints are closely spaced, strikes N5°W and dips 75°E. The other set strikes N55°E and dips 84°NW. Sheeting or horizontal joints are present near the top of the quarry. Overburden averages about 10 feet in thickness and consists of a brown residual soil that contains diabase boulders.

The quarry was opened in 1926 and in 1957 was 520 feet wide, 600 feet long and 80 feet deep. Quarrying operations are on two 40-foot levels and production is at the rate of 2,000 tons per day.

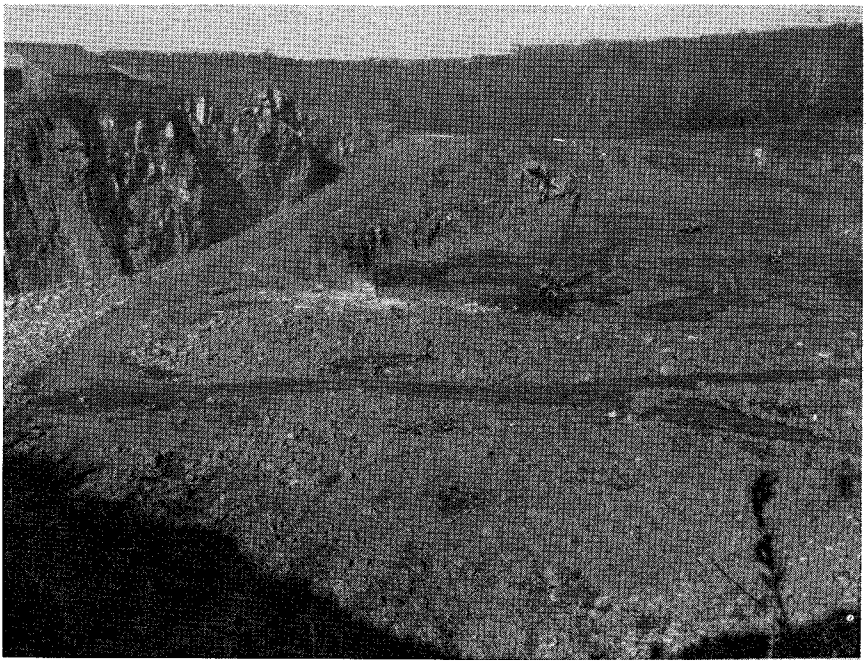
Physical test data are as follows: Los Angeles loss (500 rev.): 20.0; absorption: .33; specific gravity: 3.00.

FREDERICKSBURG STONE COMPANY

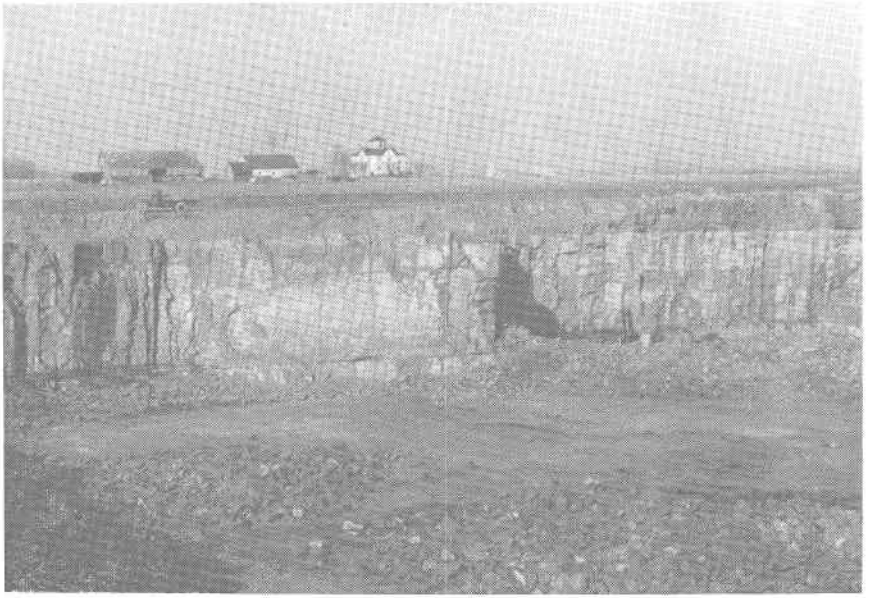
The Fredericksburg Stone Company quarry is located in Spotsylvania County on the north side of Virginia Secondary Highway 639, about one mile northwest of Fredericksburg (Pl. 1, loc. 49).



A. Culpeper Stone Company quarry near Stevensburg. Smooth surface in foreground is a bedding plane.

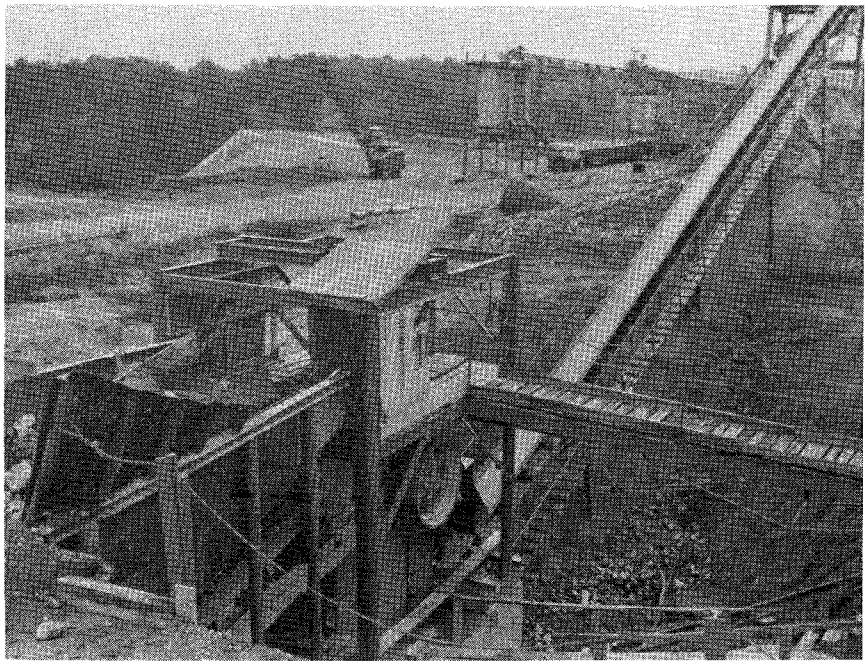


B. Arlington Stone Company quarry near Leesburg, Loudoun County.

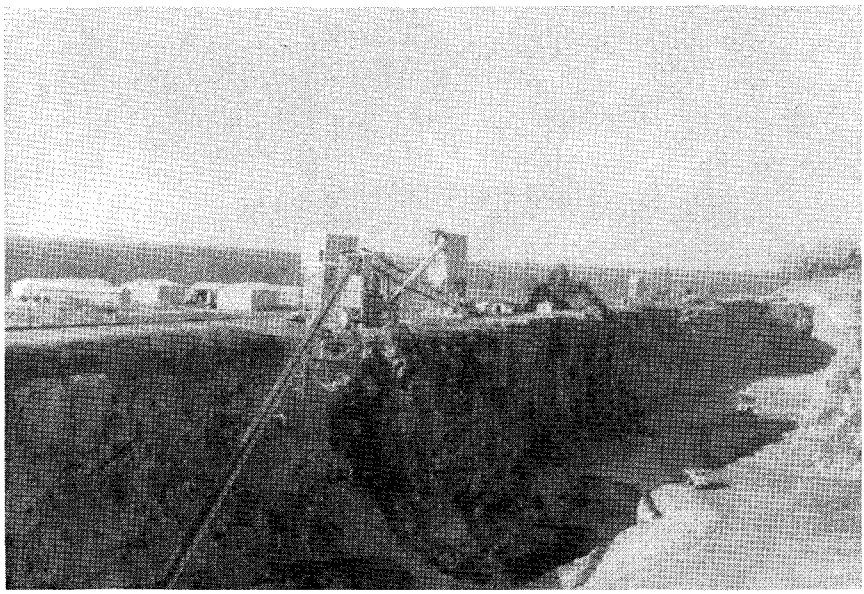


A. Culpeper Stone Company quarry near Stevensburg. Smooth surface in foreground is a bedding plane.

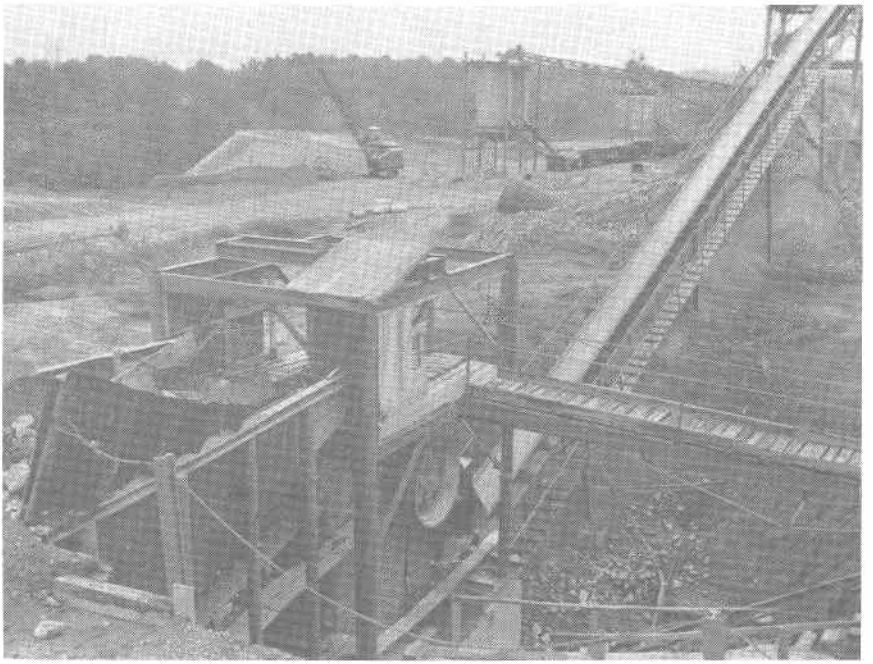
B. Arlington Stone Company quarry near Leesburg, Loudoun County.



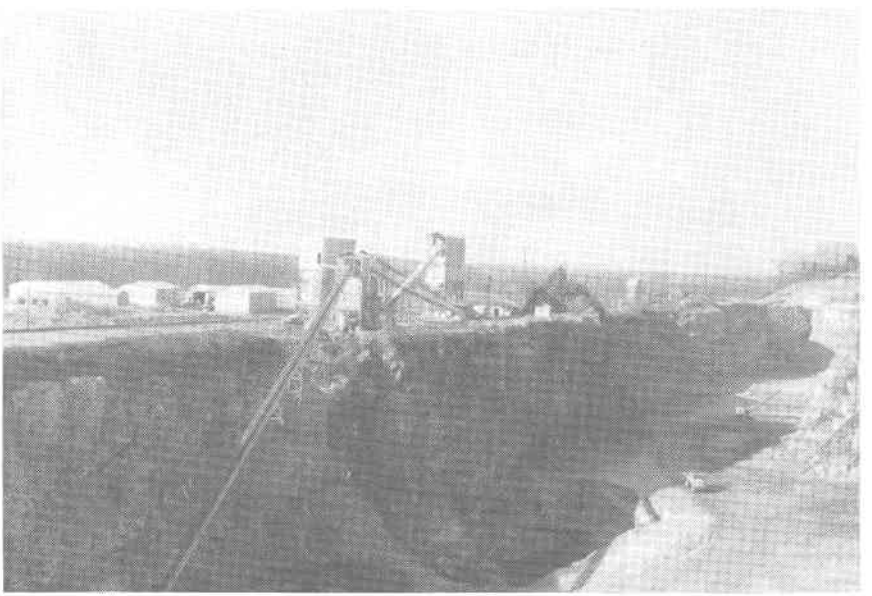
A. Bryan Rock and Sand Company plant near Rawlings, Brunswick County.



B. Boscobel Granite Company quarry and plant near Manakin, Goochland County. Conveyor, lower left, transports stone from primary crusher, which is located in the quarry, to secondary crushers and screens.



A. Bryan Rock and Sand Company plant near Rawlings, Brunswick County.



B. Boscobel Granite Company quarry and plant near Manakin, Goochland County. Conveyor, lower left, transports stone from primary crusher, which is located in the quarry, to secondary crushers and screens.

The quarry is in a fine-grained, light- to dark-gray granite that is mapped as the Petersburg granite on the Geologic Map of Virginia (1928). The granite is uniform throughout the quarry except for several zones that contain a high concentration of biotite. The composition of the granite is essentially biotite, potash feldspar, quartz, and some plagioclase feldspar. Several small pegmatitics occur in the quarry and two prominent joint sets are present. One set strikes N80°E and dips 80°N; the other set strikes N20°E and dips 70°W. The overburden is about 15 feet thick.

The present quarry operations began in late 1958; however, monumental stone was quarried from this locality about 50 years ago. Present production is at the rate of 150 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 38.5; absorption: 6.7; specific gravity: 2.65.

GAINESVILLE STONE QUARRY, INCORPORATED

The Gainesville Stone Quarry, Incorporated operation is located in Prince William County on the south side of U. S. Highway 29-211, about three-fourths of a mile southwest of Gainesville (Pl. 1, loc. 43).

The quarry is in one of the diabase or "trap rock" intrusives associated with the Triassic basin of northern Virginia. The diabase is uniformly dark-gray, medium-grained, and is composed essentially of augite and labradorite. Two prominent joint sets are exposed in the quarry. One set strikes N38°E and dips 80°NW; the other set strikes north and dips 75°E. The overburden is 5 to 10 feet thick and consists of residual soil that contains diabase boulders.

The quarry was opened in April 1958 and at present is 120 feet long, 100 feet wide and about 25 feet deep. Production is at the rate of 200 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 16.7-22.3; absorption: .37; specific gravity: 2.93.

GRAHAM VIRGINIA QUARRIES, INCORPORATED

The Graham Virginia Quarries, Incorporated quarry is located in Fairfax County on the west side of Virginia Primary Highway 123 just north of Occoquan, Prince William County (Pl. 1, loc. 46).

The quarry is in a granite gneiss that is unnamed on the Geologic Map of Virginia (1928). For the most part, the gneiss is medium-grained, light-gray and is composed essentially of quartz, potash feldspar, and biotite, with some plagioclase feldspar, muscovite and chlorite.

Schistose zones scattered throughout the gneiss are composed of chlorite, biotite and muscovite. The most prominent joint set, which in places has closely spaced joints, is parallel to schistosity and strikes N40°E and dips 72°NW. Another prominent joint set strikes N40°W and dips 75°NE. Overburden is about 15 feet thick.

A quarry was originally opened at this location to produce riprap (Steidtmann, 1945, p. 33). After being closed for a number of years, the quarry was reopened by the present operator in May 1957 to produce road and concrete aggregate. The quarry extends for a distance of about 1,000 feet in a westerly direction along a cliff on the north bank of the Occoquan Creek; however, the present quarry operations are confined to the eastern part. At this point the quarry has been developed about 150 feet northward into the cliff and has a face about 100 feet high. Production is at the rate of 1,500 tons per day.

Physical test data are as follows: Los Angeles loss: (500 rev.): 36.3; absorption: .60; specific gravity: 2.68.

GREYSTONE QUARRIES, INCORPORATED

The Greystone Quarries, Incorporated quarry is located in Mecklenburg County on the east side of Virginia Primary Highway 4, about three miles north of Buggs Island (Pl. 1, loc. 65).

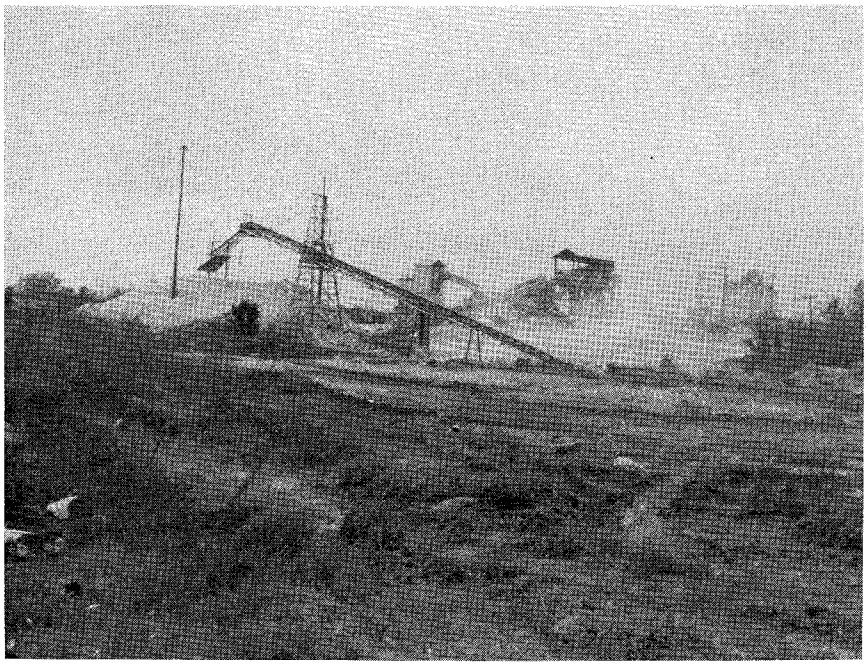
The quarry is in the Red Oak granite (Geologic Map of Virgina, 1928), which at this locality is a light-gray, medium-grained, even-textured rock. The granite is composed essentially of potash feldspar, quartz and biotite, with some muscovite, plagioclase feldspar and epidote. Joints are widely spaced in the rocks in the quarry. The most prominent joint set strikes N43°W and is vertical. Overburden is about 15 feet thick.

The quarry was opened in the early 1940's to produce stone for use in the construction of the Buggs Island dam and reservoir. The present production, which is at the rate of 150 tons per hour, is used as road and concrete aggregate and riprap. In 1957 the quarry was about 1,000 feet long, 1,000 feet wide, and 100 feet deep.

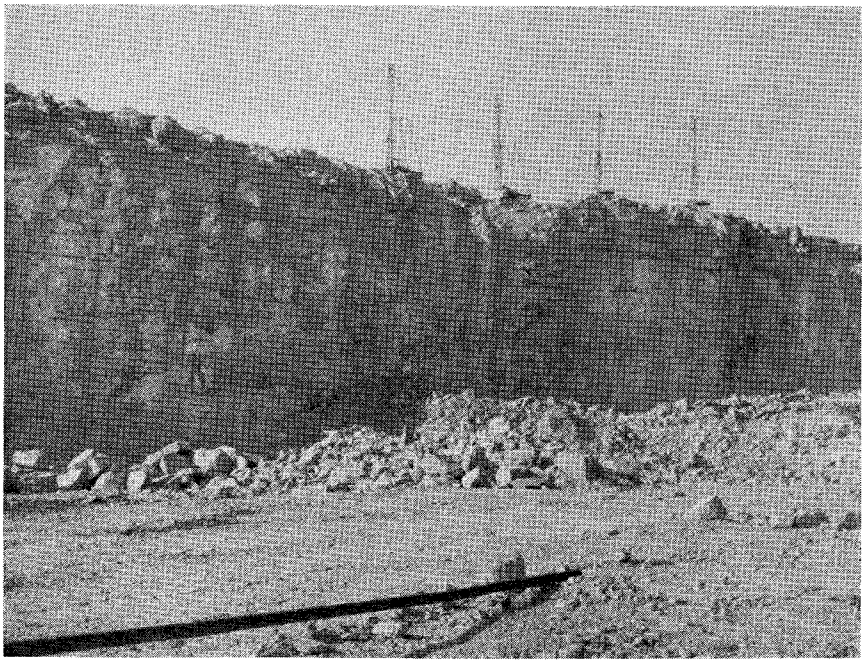
Physical test data are as follows: Los Angeles loss (500 rev.): 42.0; absorption: .50; specific gravity: 2.61.

LOUISA STONE COMPANY

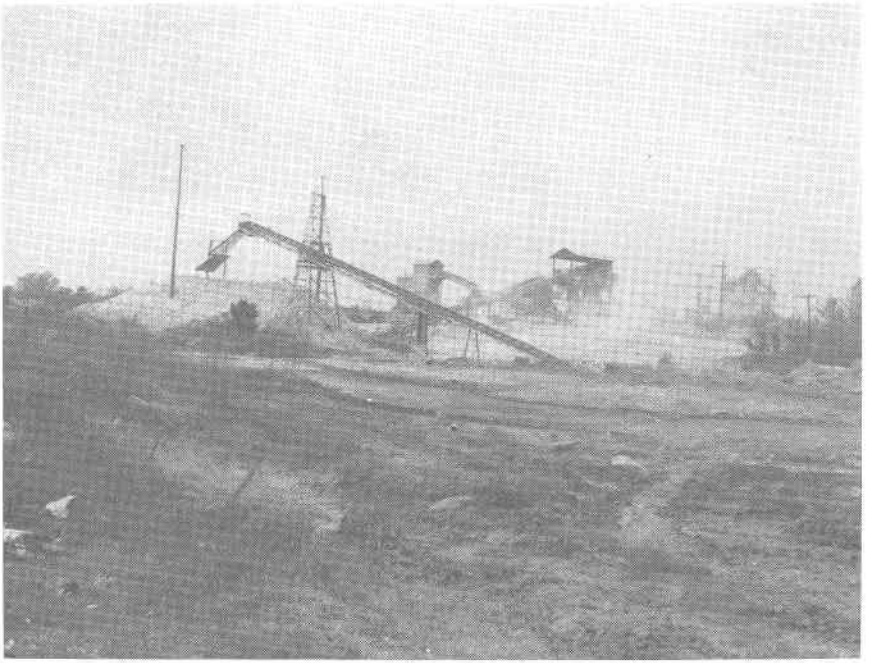
The Louisa Stone Company quarry is located in Louisa County on the east side of Virginia Secondary Highway 624, about five miles northwest of Mineral (Pl. 1, loc. 50).



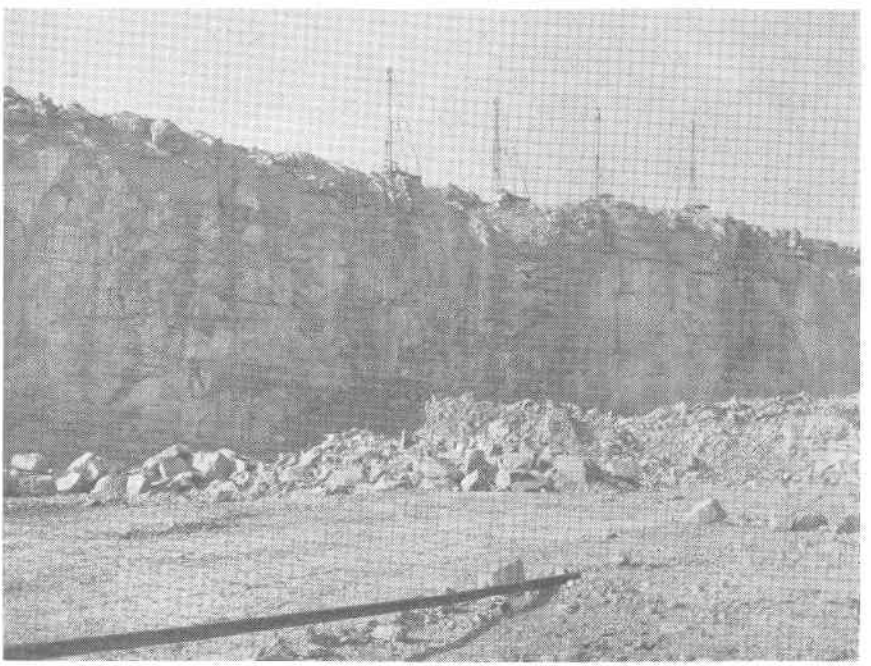
A. Greystone Granite, Inc., plant near Buggs Island, Mecklenburg County.



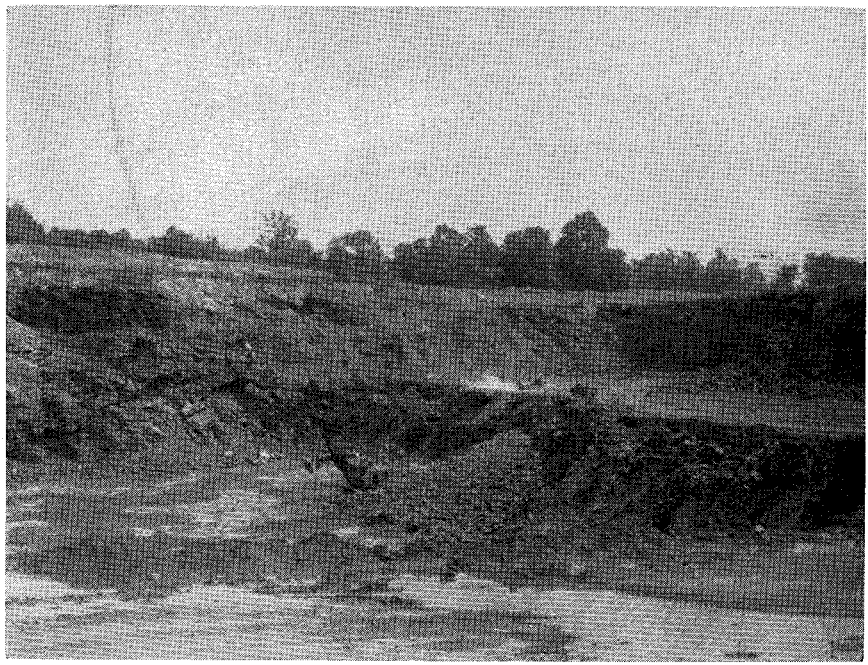
B. Quarry face at Trego Stone Company's operation near Skippers, Greensville County.



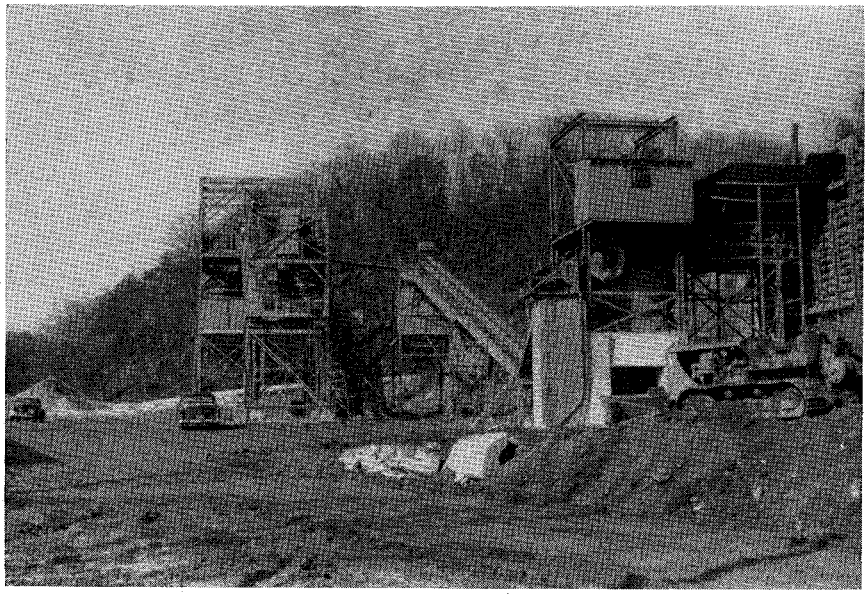
A. Greystone Granite, Inc., plant near Buggs Island, Mecklenburg County.



B. Quarry face at Trego Stone Company's operation near Skippers, Greensville County.

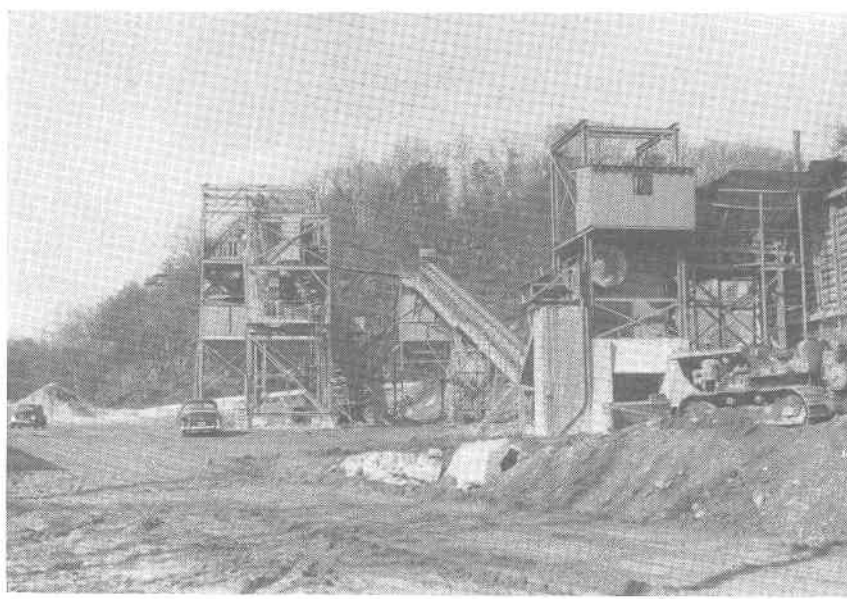


A. Quarry of Millbrook Quarries, Inc., near New Baltimore, Fauquier County.



B. Graham Virginia Quarries, Inc., plant near Occoquan, Fairfax County. Primary crusher on right; secondary crusher and screening plant on left.

A. Quarry of Millbrook Quarries, Inc., near New Baltimore, Fauquier County.



B. Graham Virginia Quarries, Inc., plant near Occoquan, Fairfax County. Primary crusher on right; secondary crusher and screening plant on left.

The quarry is in a medium-grained, light-gray granite that is unnamed on the Geologic Map of Virginia (1928). The rock is composed essentially of potash feldspar, quartz, biotite and plagioclase feldspar. Two prominent joint sets are present in the quarry. One set strikes N55°E and dips 83°SE; the other set strikes north and is vertical. The granite is exposed at the surface so there is very little overburden.

The quarry was opened in December 1958 and in February 1959 was 200 feet long, 100 feet wide and 30 feet deep. Production is at the rate of 500 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 42.8; absorption: .40; specific gravity: 2.69.

MARTINSVILLE STONE CORPORATION

The Martinsville Stone Corporation quarry is located in Henry County on the south side of Virginia Secondary Highway 882, about two miles northwest of Martinsville (Pl. 1, loc. 63).

The quarry is in the Leatherwood granite (Geologic Map of Virginia, 1928). The rock is a medium-grained, light- to dark-gray granite gneiss that is composed essentially of potash feldspar, plagioclase feldspar, quartz, and biotite. Garnets are abundant in places in the quarry and numerous quartz veins and small pegmatites intrude the gneiss. Jointing is well developed and the most prominent joint set strikes N20°W and dips 75°E. Overburden is about 15 feet thick.

Stone was originally quarried from this location by the Virginia Department of Highways. The present quarry operation began in January 1958 and in early 1959 the quarry was 320 feet long, 250 feet wide and the depth varied from 35 to 100 feet. Production is at the rate of 250 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 24.4 to 32.5; absorption: .64; specific gravity: 2.84.

MILLBROOK QUARRIES, INCORPORATED

The Millbrook Quarries, Incorporated quarry is located in Fauquier County on the east side of Virginia Secondary Highway 600, about three miles north of New Baltimore (Pl. 1, loc. 44).

The quarry is on the western edge of the Triassic basin of northern Virginia and just east of the Western Border fault (Roberts, 1928, pp. 75-77). The formations in the quarry, which are of Triassic age, are interbedded conglomerates and fine- to medium-grained sandstones. The boulders in the conglomerates are rounded to angular and

calcareous. The sandstones are calcareous, gray, green and maroon in color, and composed of calcite, quartz, potash and plagioclase feldspars, and muscovite. The overburden is 5 to 10 feet thick and consists of transported material in which there are numerous large boulders.

A major fault that has variable dip and that strikes N20°E passes through the quarry. Northwest of the fault the beds are very distorted; however, southeast of the fault, the beds are relatively undisturbed and strike N15°W and dip 25°W. Asphalt was noted in the quarry when it was first opened, and apparently it occurred along this fault (Parrott, 1949, pp. 134-135). A fault of minor displacement that occurs in the southeastern part of the quarry strikes N10°E and dips 38°SE.

The quarry was opened in 1947 and in 1958 was about 400 feet wide, 600 feet long and 100 feet deep. Production is at the rate of 1,500 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.) 26.6; absorption: .84; specific gravity: 2.71.

RIVERTON LIME AND STONE COMPANY—FAUQUIER PLANT

The Fauquier plant of the Riverton Lime and Stone Company is located in Fauquier County on the south side of Virginia Secondary Highway 688, about four miles south of Paris (Pl. 1, loc. 45).

The quarry is in the Catoctin greenstone. The rock is grayish-green, fine-grained and composed essentially of chlorite, epidote, and plagioclase feldspar. Actinolite, sericite and quartz are present in minor amounts. The greenstone is faintly schistose, with the schistosity striking N5°W and dipping 50°E. Two prominent joint sets are present in the quarry. One set that is vertical strikes N70°W; the other set strikes N50°E and dips 85°SE. Overburden is 10 to 15 feet thick.

The quarry was opened in March 1958 and in early 1959 was 250 feet long, 200 feet wide and 50 feet deep. Production is at the rate of 200 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 22.0; absorption: 0; specific gravity: 3.01.

ROCKYDALE STONE SERVICE CORPORATION—LYNCHBURG PLANT

The Rockydale Stone Service Corporation quarry in Campbell County is located on the east side of Virginia Secondary Highway 609, about five miles east of Lynchburg (Pl. 1, loc. 59).

The quarry is in the Arch marble, a blue-gray, banded, fine- to

medium-grained marble that contains variable amounts of muscovite, biotite, chlorite, and pyrite (Brown, 1958, p. 34). In the Rockydale quarry the beds are thin to massive, strike N50°E and vary in dip from 70°SE to 70°NW. Two prominent joint sets are present. One set strikes N55°W and dips 38°SW; the other set strikes N70°W and dips 40°N. Numerous quartz and calcite veins are present. Overburden is 10 to 30 feet thick.

The quarry was opened in May 1956 and in December 1957 was about 300 feet wide, 1,000 feet long and 55 feet deep. Production is at the rate of 250 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 29.7; absorption: .09; specific gravity: 2.76.

ROYAL STONE COMPANY

The Royal Stone Company quarry is located in Goochland County on the west side of Virginia Primary Highway 271, about one mile south of Hylas, Hanover County (Pl. 1, loc. 56).

According to the Geologic Map of Virginia (1928), the quarry is in the Baltimore gneiss. However, at this locality, the gneissic structure is very poorly developed and this rock is fine- to medium-grained, gray, and composed essentially of quartz, calcite, plagioclase feldspar, and potash feldspar. The amount of calcite is variable but it is usually abundant enough to cause the rock to effervesce. Joints are well developed and closely spaced but there are no well-defined sets. The joining causes the rock to break up into small angular fragments. Overburden is about 15 feet thick.

The quarry is just north of the Richmond Triassic basin and a fault that separates the Triassic formations from the gneiss is well exposed in a ditch on the eastern side of the property. Where it is exposed in this ditch, the fault strikes N75°W and dips 75°S.

The quarry was opened in 1958 and in May 1959 was 200 feet long, 150 feet wide and 30 feet deep. Production is at the rate of 225 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 21.4; absorption: .54; specific gravity: 2.65.

W. W. SAUNDERS QUARRY

The W. W. Saunders quarry is located in Fauquier County on the north side of Virginia Secondary Highway 643, about five miles southeast of Warrenton (Pl. 1, loc. 47).

The quarry is in one of the diabase or "trap rock" intrusives associated with the Triassic basin of Northern Virginia. The diabase is fine-grained, dark-gray and is composed essentially of augite and labradorite. Joints are well developed in the quarry but there are no well-defined sets. Columnar joining is developed in places and horizontal joints are present near the surface. As a result of the jointing, the diabase breaks into small fragments. Overburden is about 10 feet thick.

A quarry was originally opened at this locality by the Virginia Department of Highways but was later closed. The present operation began in 1945 and in November 1957 the quarry covered about 10 acres. Production is at the rate of 160 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 16.6; absorption: 1.22; specific gravity: 2.96.

SNYDER STONE COMPANY

The Snyder Stone Company quarry is located in Henry County on the north side of Virginia Secondary Highway 657, about one mile west of Figsboro (Pl. 1, loc. 62).

According to the Geologic Map of Virginia (1928), the quarry is in the Leatherwood granite. In the quarry the rock is a gneiss that is composed of alternating light-colored, fine-grained bands and dark-colored, coarse-grained bands. The light-colored bands are composed essentially of quartz, potash feldspar and biotite; the dark-colored bands are composed essentially of hornblende, potash feldspar, plagioclase feldspar and quartz. The gneissic structure strikes N80°E and dips 40°S. Several prominent joint sets are present. One set strikes N40°E and is vertical; another set strikes N20°E and dips 60°NW. Overburden is about 12 feet thick.

The quarry was opened in 1949 and in December 1957 was 200 feet long, 70 feet wide, and 140 feet deep. Production is at the rate of 80 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 34.2; absorption: .60; specific gravity: 2.74.

SUPERIOR STONE COMPANY—GORDONSVILLE QUARRY

The Gordonsville quarry of Superior Stone Company is located in Louisa County on the south side of the Chesapeake and Ohio Railway, about two miles southwest of Gordonsville (Pl. 1, loc. 51).

The quarry is in the Everona limestone. At this locality the Everona is a fine-grained, medium-gray, thin-bedded limestone that

contains quartz and calcite veins and occasionally pyrite. The limestone is very platy in the northwestern part of the quarry but becomes more massive to the southeast. The rocks strike N60°E and generally dip about 70°SE; however, there are variations in dip because of local warping of the beds. The most prominent joint set strikes N30°W and is vertical. Overburden is 5 to 10 feet thick.

The quarry was opened in 1954. In August 1959 the quarry was 400 feet long, 200 feet wide and 40 feet deep. Production is at the rate of 100 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 23.3; absorption: .34; specific gravity: 2.78.

SUPERIOR STONE COMPANY—RED HILL QUARRY

The Red Hill quarry of Superior Stone Company is located in Albemarle County on the north side of Virginia Secondary Highway 708 one mile east of Red Hill (Pl. 1, loc. 53).

The quarry is in the Lovingston gneiss. The rock is medium-grained, light- to dark-gray, even-granular to porphyritic and is composed essentially of plagioclase feldspar, quartz and biotite. Epidote and pink microcline occur in small veins in places. Joints are widely spaced. One prominent joint set strikes N17°E and dips 80°SE. Another set that is vertical strikes N60°E. The quarry is developed on the southwestern slope of a mountain and the amount of overburden is usually less than five feet thick.

The quarry was opened in 1941 and in February 1958 was 300 feet long and 600 feet wide. The quarry face is about 600 feet at its highest point. Production is at the rate of 340 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 25.5; absorption: .44; specific gravity: 2.79.

TIDEWATER CRUSHED STONE COMPANY

The Tidewater Crushed Stone Company quarry is located in Richmond on the west side of the James River and just east of 9th Street Road (Pl. 1, loc. 55).

The quarry is in the Petersburg granite. Both a fine-grained, medium-gray variety and a medium-grained, pinkish variety are present in the quarry. The fine-grained variety is composed essentially of potash feldspar, quartz and biotite with some plagioclase feldspar. The medium-grained variety is composed essentially of potash feldspar and quartz, with some biotite, muscovite and plagioclase feldspar.

The rock is jointed but with no well-defined joint sets. Overburden is about 10 feet thick and consists of alluvial material, in which there are some rather large boulders.

The quarry was opened in February 1958 and in June 1958 was about 200 feet long, 150 feet wide and 17 feet deep. Production is at the rate of 150 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 45.7; absorption: 1.0; specific gravity: 2.68.

TREGO STONE COMPANY

The Trego Stone Company quarry is located in Greensville County on the east side of Virginia Secondary Highway 650, about two miles west of Skippers (Pl. 1, loc. 68).

The quarry is in the Petersburg granite (Geologic Map of Virginia, 1928). At this locality this rock is a fine-grained, even-textured granite, composed essentially of potash feldspar, quartz and biotite, with some plagioclase feldspar. Several prominent joint sets are exposed in the quarry. Vertical sets strike N70°W and N20°E. Another set strikes N65°E and dips 70°S. Overburden is 15 to 20 feet thick and consists of alluvial material, mostly clay and gravel.

The quarry was opened in 1927 and has been one of the leading producers of crushed granite in Virginia. In November 1957 the quarry was almost 5,000 feet long, 2,000 feet wide and about 100 feet deep. Production is at the rate of 350 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 20.8; absorption: .77; specific gravity: 2.67.

VIRGINIA STONE AND CONSTRUCTION COMPANY

The Virginia Stone and Construction Company quarry is located in Powhatan County on the east side of Virginia Secondary Highway 604 just north of the Powhatan-Amelia County line (Pl. 1, loc. 58).

According to the Geologic Map of Virginia (1928), the quarry is in granitized Wissahickon gneiss. At this locality the rock is a light-gray, fine-grained gneiss composed essentially of biotite, quartz, potash feldspar and plagioclase feldspar. The gneiss is locally garnetiferous and pyrite is common. Small pegmatities intrude the gneiss. The gneissic structure generally strikes N40°E but in places is folded. Joints are not well developed. One set strikes N10°E and dips 80°E. Near the surface closely spaced horizontal joints are present. Overburden is about 35 feet thick.

The quarry was opened in March 1957 and in February 1958 was 250 feet long, 200 feet wide and 45 feet deep. Production is at the rate of 130 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 31.0; absorption: .57; specific gravity: 2.77.

VIRGINIA TRAP ROCK CORPORATION

The Virginia Trap Rock Corporation quarry is located in Loudoun County on the west side of Virginia Secondary Highway 653, about three miles southeast of Leesburg (Pl. 1, loc. 39).

The quarry is in the Belmont Stock (Roberts, 1928, p. 44), one of the diabase or "trap rock" intrusives associated with the Triassic basin of northern Virginia. The diabase is medium-grained, dark-gray and composed essentially of augite and labradorite. Joints are well developed. One set, in which the joints are closely spaced, strikes N20°E and dips 85°W. Other sets strike N80°W and N20°W and dip 75°N and 85°E, respectively. Overburden is 15 to 20 feet thick and consists of residual soil that contains diabase boulders.

The quarry was opened in September 1957 and in January 1959 was 500 feet long, 200 feet wide and 40 feet deep. Production is at the rate of 200 tons per hour.

Physical test data are as follows: Los Angeles loss (500 rev.): 24.7-30.7; absorption: .67; specific gravity: 3.01.

A. C. WILSON STONE COMPANY

The A. C. Wilson Stone Company quarry is located in Patrick County on the north side of Virginia Secondary Highway 694, about one mile east of Patrick Springs (Pl. 1, loc. 61).

According to the Geologic Map of Virginia (1928), the quarry is in the Wissahickon schist. However, at this locality the rock is a fine-grained, dark-gray, metamorphosed sandstone (?) composed essentially of quartz, plagioclase feldspar, muscovite and cholrite, with some sericite and potash feldspar. The rock is very irregularly jointed. A prominent joint set strikes N55°E and dips 65°NW. Overburden is about 10 to 15 feet thick.

The quarry was opened in June 1955 and in December 1957 was 250 feet long, 150 feet wide and 80 feet deep. Production is at the rate of 1,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 29.6; absorption: .27; specific gravity: 2.81.

PRODUCERS IN THE COASTAL PLAIN PROVINCE

ALEXANDRIA SAND AND GRAVEL COMPANY

The Alexandria Sand and Gravel Company pit is located in Fairfax County on the south side of Virginia Secondary Highway 644, approximately 2½ miles east of Garfield (Pl. 1, loc. 70).

The pit is in a deposit of loamy gravel in the Brandywine terrace of Pleistocene age. This deposit, which is underlain by clay, has an average thickness of about 12 feet and is covered by several feet of loamy overburden. A few lenticular bodies of clay and sand are scattered throughout the pit. The coarsest material in the deposit consists mainly of subangular to subrounded cobbles ranging from 2 to 3 inches in diameter.

Physical test data are as follows: Los Angeles loss (500 rev.): 39.5; absorption: 1.7; specific gravity: 2.62.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	17.6	− 50 + 80	10.8
− 8 + 16	13.4	− 80 + 100	1.8
− 16 + 30	20.0	− 100 + 200	1.2
− 30 + 50	34.8	− 200	.4

BELVOIR SAND AND GRAVEL COMPANY

The plant of the Belvoir Sand and Gravel Company is located in Fairfax County on the west side of Virginia Secondary Highway 611, approximately one mile north of the intersection of U. S. Highway 1 and Virginia Secondary Highway 611. The company's pit is on the east side of U. S. Highway 1, approximately three miles south of the main plant (Pl. 1, loc. 74).

The pit is in the Brandywine terrace of Pleistocene age. At this location the terrace is composed mainly of loamy gravel that was deposited upon an irregular clay surface. Zones of clean, well-washed sandy gravel occur in the lower portion and thin layers of gravel cemented with iron oxide, lenticular bodies of blue clay, and lenses of cross-bedded sand are scattered throughout the deposit. The coarsest material in the deposit consists mainly of subangular to subrounded siliceous cobbles ranging from 2 to 3 inches in diameter. The deposit has

A. Belvoir Sand and Gravel Company pit near Accotink, Fairfax County.

B. Superior Stone Company quarry near Gordonsville.

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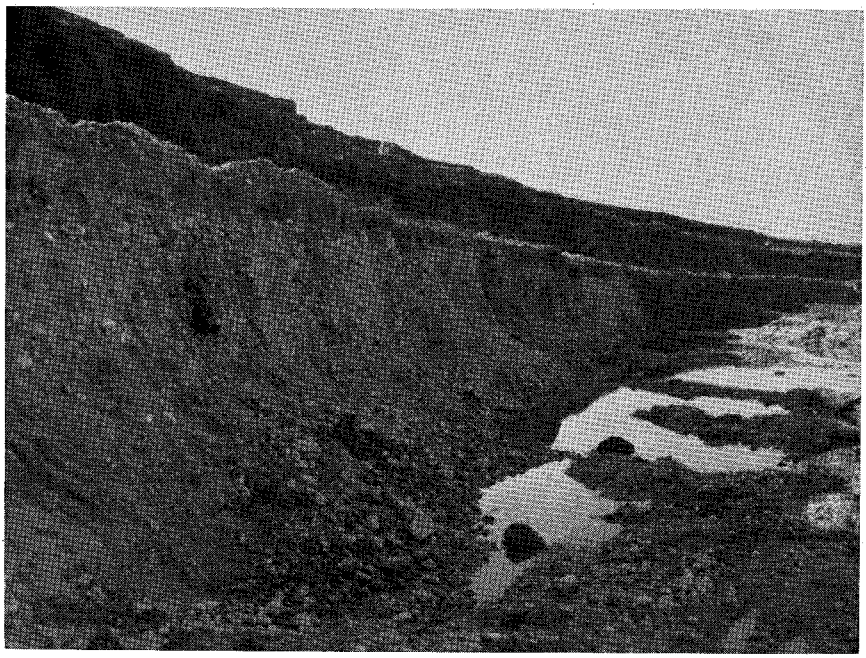
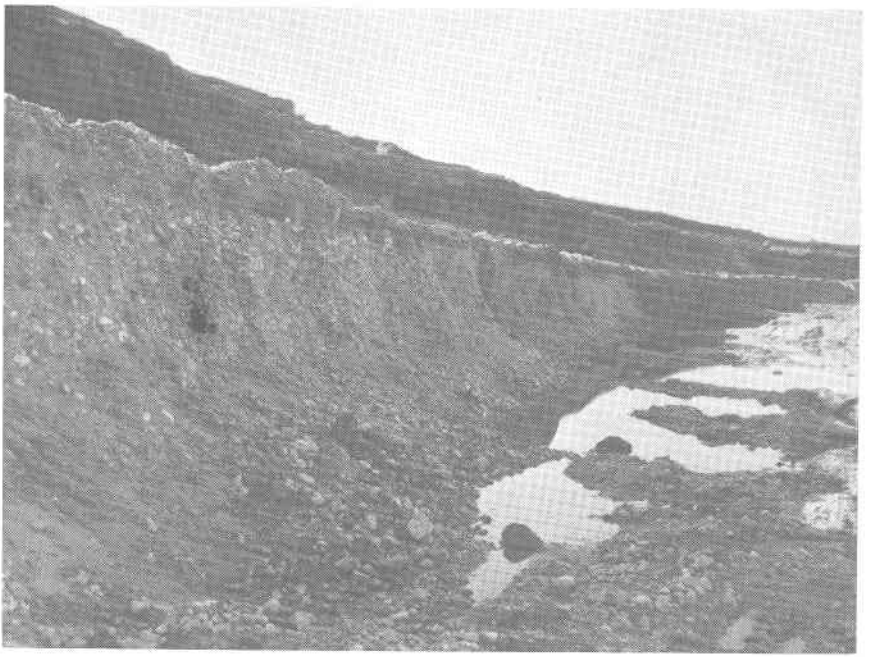


A. Massaponax Sand and Gravel Company pit near Fredericksburg, Spotsylvania County.

B. Large boulder of schist from the Massaponax Sand and Gravel Company pit near Fredericksburg, Spotsylvania County.



A. Massaponax Sand and Gravel Company pit near Fredericksburg, Spotsylvania County.

B. Large boulder of schist from the Massaponax Sand and Gravel Company pit near Fredericksburg, Spotsylvania County.

an average thickness of about 12 feet and is covered by several feet of loamy overburden.

This operation produces approximately 800 tons of sand and gravel per day.

Physical test data are as follows: Los Angels loss (500 rev.): 39.6-43.9; absorption: .83; specific gravity: 2.61.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	15.6	− 50 + 80	10.4
− 8 + 16	14.0	− 80 + 100	.8
− 16 + 30	16.8	− 100 + 200	.4
− 30 + 50	42.0	− 200	

BROWN CONSTRUCTION COMPANY

The Brown Construction Company pit is located in Westmoreland County on the east side of Virginia Primary Highway 205, approximately one mile south of Colonial Beach (Pl. 1, loc. 77).

The pit is in the Pamlico (?) terrace of Pleistocene age. The lower part of the deposit is composed of interbedded silts, sands, and gravels, whereas the upper part consists of pebbles scattered throughout a loamy matrix. Lenticular bodies of clay and gravel-filled pockets are scattered throughout the pit. The deposit, which varies from 3 to 8 feet in thickness, is underlain by blue clay and is covered by several feet of loamy overburden.

This operation produces approximately 200 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 33.0; absorption: .93; specific gravity: 2.56.

BRYAN ROCK AND SAND COMPANY

The Bryan Rock and Sand Company pit is located in Prince George County at the end of Virginia Secondary Highway 684 (Pl. 1, loc. 85).

The pit is in a deposit of sandy gravel, a major portion of which is below ground water level. The coarsest material utilized consists of subangular to subrounded siliceous cobbles averaging about 2 to 3 inches in diameter; however, boulders a foot or more in diameter are scattered throughout the deposit. The deposit has a miximum thickness of about 35 feet and is covered by loamy overburden up to 12 feet thick.

This operation produces approximately 1,800 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 35.1; absorption: .57; specific gravity: 2.65.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
— 4 + 8	9.4	— 50 + 80	4.8
— 8 + 16	23.8	— 80 + 100	.8
— 16 + 30	36.0	— 100 + 200	.8
— 30 + 50	23.4	— 200	1.0

CARTER SAND AND GRAVEL COMPANY, INCORPORATED

The Carter Sand and Gravel Company, Incorporated pit is located in Henrico County, approximately one mile south of the junction of Evergreen Road and Virginia Primary Highway 33 (Pl. 1, loc. 81).

The pit is in a deposit of loamy gravel in the Sunderland terrace of Pleistocene age. Several zones of cross-bedded sand occur in this deposit, which was deposited upon an irregular clay surface. The coarsest material utilized consists of subangular to subrounded siliceous cobbles averaging from 2 to 3 inches in diameter. The deposit has an average thickness of approximately ten feet and is covered in places by several feet of loamy overburden.

This operation, which covers about forty acres, produces approximately 300 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 33.0; absorption: .91; specific gravity: 2.59.

COMMONWEALTH SAND AND GRAVEL COMPANY

The Commonwealth Sand and Gravel Company pit is located in Henrico County just east of Virginia Secondary Highway 632, approximately one mile southeast of the city limits of Richmond (Pl. 1, loc. 82.)

The pit is in a deposit of loamy gravel in the Sunderland terrace of Pleistocene age. Most of the deposit is below ground water level. The coarsest material utilized consists of subangular to subrounded siliceous cobbles averaging about two inches in diameter. The deposit varies from 8 to 25 feet in thickness and is covered by loamy overburden 13 to 25 feet thick.

The operation covers approximately two square miles and production is at the rate of 4,000 tons per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 31.6; absorption: .50; specific gravity: 2.63.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	11.6	− 50 + 80	14.4
− 8 + 16	11.6	− 80 + 100	2.8
− 16 + 30	19.8	− 100 + 200	2.4
− 30 + 50	36.8	− 200	0.6

DIAMOND CONSTRUCTION COMPANY

The Diamond Construction Company pit is located in Stafford County on the northeast bank of the Rappahannock River, approximately three miles southeast of Fredericksburg (Pl. 1, loc. 75).

The pit is in a deposit of loamy gravel in one of the lower Pleistocene terraces. The coarsest material utilized consists mainly of subangular to subrounded siliceous cobbles ranging from 2 to 3 inches in diameter; however, a number of boulders a foot or more in diameter are scattered throughout the deposit. This deposit varies from 7 to 13 feet in thickness and is covered by about one foot of loamy overburden.

This operation produces approximately 800 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 35.0; absorption: .37; specific gravity: 2.65.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	15.2	− 50 + 80	7.0
− 8 + 16	15.0	− 80 + 100	1.6
− 16 + 30	30.6	− 100 + 200	2.0
− 30 + 50	27.4	− 200	1.2

DYSON SAND AND GRAVEL COMPANY

The Dyson Sand and Gravel Company pit is located in Caroline County on the west bank of the Mattaponi River, approximately a quarter of a mile southwest of the junction of Virginia Secondary Highways 676 and 722 (Pl. 1, loc. 78).

The pit is in a deposit of interbedded sand and gravel in the Sunderland (?) terrace of Pleistocene age. The deposit varies in thickness from a few feet in the western part of the pit to about 12 feet in the eastern part and is covered by about two feet of loamy overburden.

This operation covers approximately five acres and produces 100 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 38.8-40.4; absorption: .44; specific gravity: 2.65.

FOX COMPANY

The Fox Company pit is located in King William County on the southwest bank of the Mattaponi River, approximately 1½ miles north of Aylett (Pl. 1, loc. 79).

The pit is in the Pamlico (?) terrace Pleistocene age. At this location the terrace consists of moderately well-sorted white sandy gravel, most of which occurs below the water level of the Mattaponi River. About 30 per cent of the deposit is composed of siliceous pebbles up to an inch in diameter, whereas the remaining 70 per cent consists of sand. This deposit, which is underlain by clay, has a maximum thickness of about 30 feet and is covered by up to three feet of loamy overburden.

This operation produces approximately 400 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 36.6; absorption: .57; specific gravity: 2.64.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	9.6	− 50 + 80	7.6
− 8 + 16	15.4	− 80 + 100	6.8
− 16 + 30	25.6	− 100 + 200	5.2
− 30 + 50	33.4	− 200	1.4

FRIEND SAND AND GRAVEL COMPANY (PRINCE GEORGE COUNTY)

The Prince George County pit of Friend Sand and Gravel Company is located just west of Virginia Secondary Highway 645, approximately three-fourths of a mile north of the city limits of Petersburg (Pl. 1, loc. 86).

The pit is in one of the lower Pleistocene terraces. The lower portion of the deposit is composed of intermixed sand, gravel, and clay

and the upper portion is composed of cross-bedded sand with a few intermixed pebbles and cobbles. The coarsest material utilized consists of subangular to subrounded siliceous cobbles averaging from 2 to 3 inches in diameter; however, a few boulders up to three feet in diameter are scattered throughout the deposit. The deposit is about 20 feet thick and is covered by several feet of loamy overburden.

This operation produces approximately 1,200 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 35.0; absorption: 1.45; specific gravity: 2.60.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	8.4	− 50 + 80	6.4
− 8 + 16	19.6	− 80 + 100	.8
− 16 + 30	33.6	− 100 + 200	.6
− 30 + 50	30.4	− 200	.2

FRIEND SAND AND GRAVEL COMPANY (SURRY COUNTY)

The Surry County pit of Friend and Company is located on the south bank of Chippoak Creek, approximately one mile north of Cabin Point (Pl. 1, loc. 87).

The lower part of this deposit, which occurs below water level, consists of sandy gravel. The upper portion is composed of pebbles scattered throughout a loamy matrix and contains discontinuous stringers of white sand and lenses of cross-bedded sand. The coarsest material utilized consists of subangular to subrounded siliceous pebbles, most of which are under 2½ inches in diameter; however, a few large cobbles are scattered throughout the deposit. The deposit varies from 4 to 15 feet in thickness and is covered by up to five feet of loamy overburden.

Physical test data are as follows: Los Angeles loss (500 rev.): 40.7; absorption: .77; specific gravity: 2.61.

FRIEND SAND AND GRAVEL COMPANY (SUSSEX COUNTY)

The Sussex County pit of Friend and Company is located just north of Virginia Primary Highway 40, approximately 2½ miles west of Stony Creek (Pl. 1, loc. 88).

The pit is in a deposit that consists mainly of sandy gravel, most of which occurs below the water level of Stony Creek. However, the

portion of the deposit that is above water is composed of gravel in a loamy matrix. The coarsest material utilized consists of subangular to subrounded siliceous cobbles averaging about two inches in diameter; however, a few boulders of granite and quartzite a foot or more in diameter are scattered throughout the deposit. The deposit varies from 4 to 20 feet in thickness and is covered by loamy overburden 6 to 8 feet thick.

This operation produces approximately 1,100 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 40.7; absorption: .23; specific gravity: 2.61.

HILLTOP SAND AND GRAVEL COMPANY

The Hilltop Sand and Gravel Company pit is located in Fairfax County just north of the junction of Virginia Secondary Highways 611 and 613 (Pl. 1, loc. 73).

The pit is in the Sunderland terrace of Pleistocene age. The lower portion of this deposit is composed of loamy gravel that was deposited upon an irregular clay surface. The coarsest material in this part consists of subrounded siliceous cobbles, most of which are under three inches in diameter. The upper portion of the deposit consists of subangular to subrounded siliceous pebbles in a loamy matrix. Lenticular bodies of clay and zones of cross-bedded sand are scattered throughout the entire deposit and a large lenticular body of sand occurs near the southeastern edge of the pit. The deposit varies from 10 to 35 feet in thickness and is overlain in places by up to 8 feet of loamy overburden.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	13.4	− 50 + 80	7.8
− 8 + 16	14.0	− 80 + 100	1.2
− 16 + 30	24.8	− 100 + 200	1.2
− 30 + 50	37.0	− 200	0.6

MASSAPONAX SAND AND GRAVEL COMPANY

The main plant of the Massaponax Sand and Gravel Company is located east of U. S. Highway 17, approximately four miles south of Fredericksburg, Spotsylvania County (Pl. 1, loc. 76).

The Company has a large pit next to the plant and a smaller pit on the west side of U. S. Highway 17. Both pits are in the Wicomico (?) terrace of Pleistocene age.

The basal portion of the deposit in the large pit is composed of sandy gravel. The coarsest material utilized from this part of the deposit consists of subangular to subrounded siliceous cobbles, most of which are under three inches in diameter; however, boulders a foot or more in diameter are found (Pl. 10B). The basal portion of the deposit is overlain by loamy gravel. The coarsest material in this part consists of subangular to subrounded siliceous cobbles, most of which are also under three inches in diameter. This portion contains lenticular bodies of cross-bedded sand, discontinuous stringers of clay, and a few zones of loamy gravel cemented with iron oxide. The upper part of the deposit consists mainly of subangular to subrounded siliceous pebbles in a loamy matrix; however, it contains zones of cross-bedded sand. The pebbles are concentrated in thin discontinuous bands and pockets scattered throughout the loamy gravel.

The small pit is in a deposit of loamy gravel. The coarsest material consists of subangular to subrounded siliceous pebbles, most of which are under 2½ inches in diameter. The thickness of this deposit varies from 8 to 10 feet.

The plant produces 2,000 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 34.5; absorption: .16; specific gravity: 2.62.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	6.8	− 50 + 80	9.2
− 8 + 16	16.6	− 80 + 100	1.8
− 16 + 30	29.2	− 100 + 200	2.4
− 30 + 50	33.2	− 200	.8

MODERN SAND AND GRAVEL COMPANY

The Modern Sand and Gravel Company pit is located in Fairfax County on the north side of Virginia Secondary Highway 635, approximately one mile northwest of Hayfield (Pl. 1, loc. 72).

The pit is in a deposit of loamy gravel in the Brandywine (?) terrace of Pleistocene age. The coarsest material in the deposit consists, for the most part, of subangular to subrounded siliceous cobbles ranging from 2 to 3 inches in diameter. A few thin layers of gravel cemented with iron

oxide occur in the upper part, and small lenticular bodies of sand are scattered throughout the deposit. The deposit varies from 15 to 25 feet in thickness and is covered by several feet of loamy overburden.

This operation, which covers approximately 50 acres, produces about 1,600 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 38.0; absorption: 2.7; specific gravity: 2.56.

NORTHERN VIRGINIA CONSTRUCTION COMPANY

The Northern Virginia Construction Company pit is located in Fairfax County just west of the intersection of Virginia Primary Highway 350 and Virginia Secondary Highway 648 (Pl. 1, loc. 69).

The pit is in a deposit of loamy gravel in the Brandywine terrace of Pleistocene age. Lenticular bodies of clay and sand are scattered throughout the deposit. The coarsest material consists mainly of subangular to subrounded siliceous cobbles ranging from 2 to 3 inches in diameter. This deposit, which is underlain by clay, has a maximum thickness of about 12 feet and is covered by several feet of loamy overburden.

This operation produces approximately 1,200 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 36.3; absorption: .87; specific gravity: 2.58.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentae Retained on
− 4 + 8	10.4	− 50 + 80	5.4
− 8 + 16	21.4	− 80 + 100	0.6
− 16 + 30	32.4	− 100 + 200	0.8
− 30 + 50	28.1	− 200	0.4

SOUTHERN MATERIALS COMPANY, INCORPORATED (CHESTERFIELD COUNTY)

The Chesterfield County plant of Southern Materials Company, Incorporated is located on the west bank of the James River approximately two miles east of the intersection of U. S. Highway 1 and Virginia Secondary Highway 613 (Pl. 1, loc. 84). The company has three pits in the terraces along the James River.

The pit nearest the plant is in a deposit of sandy gravel and is below the water level of the James River. The coarsest material in this deposit

consists, for the most part, of subangular to subrounded siliceous cobbles ranging from 2 to 3 inches in diameter; however, a few boulders a foot or more in diameter are found. This deposit, which is underlain by clay, ranges from 4 to 25 feet in thickness and is covered by sandy overburden about 14 feet thick.

The pit north of the main plant is in a deposit of sandy gravel, which was deposited upon an irregular clay surface, and is below the water level of the James River. The coarsest material consists mainly of subrounded siliceous cobbles ranging from 2 to 3 inches in diameter. This deposit has a maximum thickness of about 25 feet and is covered by sandy overburden about five feet thick.

The third pit is located on the north bank of the James River approximately 1¾ miles north of the junction of Virginia Secondary Highways 618 and 619. This pit is in a deposit of loamy gravel. The coarsest material consists, for the most part, of subrounded siliceous cobbles ranging from 2 to 3 inches in diameter; however, a few boulders a foot or more in diameter are scattered throughout the deposit. The deposit is covered by sandy overburden about seven feet thick.

The plant produces approximately 4,000 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 30.6; absorption: .54; specific gravity: 2.64.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	6.2	− 50 + 80	8.2
− 8 + 16	15.2	− 80 + 100	1.6
− 16 + 30	33.2	− 100 + 200	1.6
− 30 + 50	33.8	− 200	.2

SOUTHERN MATERIALS COMPANY, INCORPORATED (HENRICO COUNTY)

The Henrico County plant of Southern Materials Company, Incorporated is located at Curles Neck Plantation on the eastern bank of the James River (Pl. 1, loc. 83).

The company is dredging a deposit of sandy gravel from the James River. The coarsest material consists mainly of subangular to subrounded siliceous cobbles ranging from 2 to 3 inches in diameter; however, a few boulders a foot or more in diameter are scattered throughout the deposit. This deposit, which is underlain by clay, ranges from 18 to 35 feet in thickness and is covered by sandy overburden about six feet thick.

This operation produces approximately 4,000 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 30.6; absorption: .54; specific gravity: 2.64.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	5.0	− 50 + 80	6.8
− 8 + 16	14.4	− 80 + 100	1.0
− 16 + 30	36.6	− 100 + 200	1.2
− 30 + 50	34.4	− 200	.6

VIRGINIA SAND AND GRAVEL COMPANY

The Virginia Sand and Gravel Company has pits on both sides of Virginia Primary Highway 236, approximately a quarter of a mile east of Lincolnia, Fairfax County (Pl. 1, loc. 71).

The pits are in the Brandywine terrace of Pleistocene age. At this location the terrace consists of loamy gravel that is covered by 2 to 10 feet of loamy overburden. The coarsest material consists mainly of subangular to subrounded siliceous cobbles ranging from 2 to 3 inches in diameter. The deposit contains lenticular bodies of clay, lens-like bodies of cross-bedded sand, and a few thin layers of pebble-size gravel interbedded with layers of pebble and cobble size. The average thickness of the deposit is about 20 feet.

Physical test data are as follows: Los Angeles loss (500 rev.): 48.0; absorption: 1.25; specific gravity: 2.58.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	13.8	− 50 + 80	5.4
− 8 + 16	17.4	− 80 + 100	1.0
− 16 + 30	29.6	− 100 + 200	1.2
− 30 + 50	30.6	− 200	1.0

WEST SAND AND GRAVEL COMPANY, INCORPORATED

The West Sand and Gravel Company, Incorporated plant is located in the eastern part of Richmond at 2801 Rady Street (Pl. 1, loc. 80). The company has two sand and gravel pits in Henrico County.

The company has one pit in the Sunderland terrace on the east side of U. S. Highway 360, approximately one mile from the main plant. The terrace, which is of Pleistocene age, is composed mainly of loamy gravel, which was deposited upon an irregular clay surface. The coarsest material consists of subangular to subrounded siliceous cobbles, most of which are under two inches in diameter. The deposit contains lenticular bodies of white sand and olive-green clay and a few zones of loamy gravel cemented with iron oxide. The upper six feet of this deposit are composed of cross-bedded sand that contains a few intermixed pebbles. The thickness of the deposit ranges from 12 to 17 feet.

The other pit is located south of the junction of Virginia Secondary Highways 601 and 647 and is in a deposit of loamy gravel in the Sunderland terrace. The coarsest material in the deposit consists of subangular to subrounded siliceous cobbles, most of which are under three inches in diameter. Lenticular bodies of blue clay are scattered throughout the loamy gravel. This deposit averages about seven feet in thickness and is overlain by several feet of loamy overburden.

The plant produces about 3,500 tons of sand and gravel per day.

Physical test data are as follows: Los Angeles loss (500 rev.): 41.1; absorption: .91; specific gravity: 2.62.

Sieve analysis of sample from stockpile

Sieve Size	Percentage Retained on	Sieve Size	Percentage Retained on
− 4 + 8	4.8	− 50 + 80	5.8
− 8 + 16	11.4	− 80 + 100	1.0
− 16 + 30	33.2	− 100 + 200	1.4
− 30 + 50	42.2	− 200	.2

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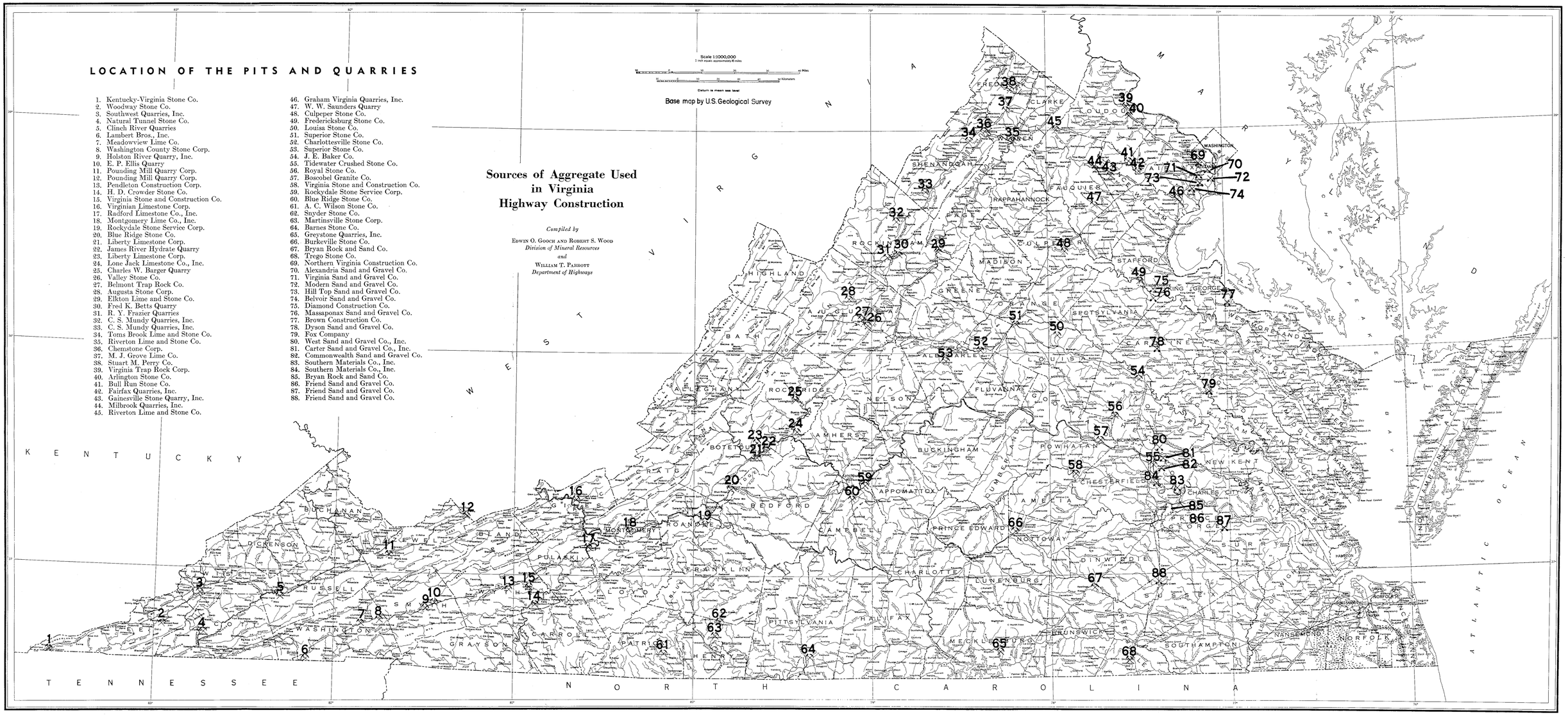
VIRGINIA DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, Commissioner of Mineral Resources and State Geologist



LOCATION OF THE PITS AND QUARRIES

1. Kentucky-Virginia Stone Co.
2. Woodway Stone Co.
3. Southwest Quarries, Inc.
4. Natural Tunnel Stone Co.
5. Clinch River Quarries
6. Lambert Bros., Inc.
7. Meadowview Lime Co.
8. Washington County Stone Corp.
9. Holston River Quarry, Inc.
10. E. P. Ellis Quarry
11. Pounding Mill Quarry Corp.
12. Pounding Mill Quarry Corp.
13. Pendleton Construction Corp.
14. H. D. Crowder Stone Co.
15. Virginia Stone and Construction Co.
16. Virginian Limestone Corp.
17. Radford Limestone Co., Inc.
18. Montgomery Lime Co., Inc.
19. Rockydale Stone Service Corp.
20. Blue Ridge Stone Co.
21. Liberty Limestone Corp.
22. James River Hydrate Quarry
23. Liberty Limestone Corp.
24. Lone Jack Limestone Co., Inc.
25. Charles W. Barger Quarry
26. Valley Stone Co.
27. Belmont Trap Rock Co.
28. Augusta Stone Corp.
29. Elkton Lime and Stone Co.
30. Fred K. Betts Quarry
31. R. Y. Frazier Quarries
32. C. S. Mundy Quarries, Inc.
33. C. S. Mundy Quarries, Inc.
34. Toms Brook Lime and Stone Co.
35. Riverton Lime and Stone Co.
36. Chemstone Corp.
37. M. J. Grove Lime Co.
38. Stuart M. Perry Co.
39. Virginia Trap Rock Corp.
40. Arlington Stone Co.
41. Bull Run Stone Co.
42. Fairfax Quarries, Inc.
43. Gainesville Stone Quarry, Inc.
44. Milbrook Quarries, Inc.
45. Riverton Lime and Stone Co.
46. Graham Virginia Quarries, Inc.
47. W. W. Saunders Quarry
48. Culpeper Stone Co.
49. Fredericksburg Stone Co.
50. Louisa Stone Co.
51. Superior Stone Co.
52. Charlottesville Stone Co.
53. Superior Stone Co.
54. J. E. Baker Co.
55. Tidewater Crushed Stone Co.
56. Royal Stone Co.
57. Boscobel Granite Co.
58. Virginia Stone and Construction Co.
59. Rockydale Stone Service Corp.
60. Blue Ridge Stone Co.
61. A. C. Wilson Stone Co.
62. Snyder Stone Co.
63. Martinsville Stone Corp.
64. Barnes Stone Co.
65. Greystone Quarries, Inc.
66. Burkeville Stone Co.
67. Bryan Rock and Sand Co.
68. Trego Stone Co.
69. Northern Virginia Construction Co.
70. Alexandria Sand and Gravel Co.
71. Virginia Sand and Gravel Co.
72. Modern Sand and Gravel Co.
73. Hill Top Sand and Gravel Co.
74. Belvoir Sand and Gravel Co.
75. Diamond Construction Co.
76. Massaponax Sand and Gravel Co.
77. Brown Construction Co.
78. Dyson Sand and Gravel Co.
79. Fox Company
80. West Sand and Gravel Co., Inc.
81. Carter Sand and Gravel Co., Inc.
82. Commonwealth Sand and Gravel Co.
83. Southern Materials Co., Inc.
84. Southern Materials Co., Inc.
85. Bryan Rock and Sand Co.
86. Friend Sand and Gravel Co.
87. Friend Sand and Gravel Co.
88. Friend Sand and Gravel Co.