SURVEY OF HIGHWAY CONSTRUCTION MATERIALS

IN THE TOWN OF DOVER, WINDHAM COUNTY, VERMONT

prepared by

Engineering Geology Section, Materials Division

Vermont Department of Highways

in cooperation with

United States Department of Commerce

Bureau of Public Roads

Montpelier, Vermont

January, 1971

TABLE OF CONTENTS

Acknowledgements

The work of this Project was greatly implemented by the cooperation and assistance of many groups and individuals. The following were particularly helpful in carrying out the Project's objectives.

1. Various departments and individuals of the Vermont State Department of Highways, notably the Planning and Mapping Division and the Highway Testing Laboratory.

2. Professor D. P. Stewart of Miami University, Oxford, Ohio.

3. Professor C. G. Doll, Vermont State Geologist, University of Vermont, Burlington, Vermont.

4. United States Department of Commerce, Bureau of Public Roads.

History

The Materials Survey Project was formed in 1957 by the Vermont State Department of Highways with the assistance of the United States Bureau of Public Roads. Its prime objective was to compile an inventory of highway construction materials in the State of Vermont. Prior to the efforts of the personnel of the Survey as described in this and other reports, searches for highway construction materials were conducted only as the immediate situation required. Thus only limited areas are surveyed, and no overall picture of material resources was available. Highway contractors or resident engineers are usually required to locate the materials for their respective projects and have samples tested by the Highway Testing Laboratory. The additional cost of exploration for construction materials is passed onto the State in the form of higher construction costs. The Materials Survey Project was established to minimize or elimate this factor by enabling the State and its contractors to proceed with information

on materials sources available beforehand. Prior knowledge of locations of suitable material is an important factor in planning future highways.

The sources of construction materials are located by this Project through ground reconnaissance study of maps and aerial photographs, and geological and physiographic interpretation. Maps, data sheets, and work sheets for reporting the findings of the Project were designatd with their intended use in mind. These maps and data sheets were devised to furnish information of particular use to the contractor or construction man. For maximum benefit, the maps, data sheets, and this report should be studied simultaneously.

Inclusures

Included in this folder are two surface-geology maps, one defining the location of tests conducted on bedrock sources, the other defining the location of tests conducted on granular materials. These maps are derived from 15-minute or 7½-minute quadrangles of the United States Geological Survey enlarged or reduced to 1:31250 or 1" = 2604'. Delineated on the Bedrock Map are the various rock types of the area. This information was obtained from numerous sources: Vermont Geological Survey Bulletins, Vermont State Geologist Reports, United States Geological Survey Bedrock Maps, and the Centennial Geological Map of Vermont, as well as other references.

The granular materials map depicts areas covered by various types of glacial deposits (outwash, moraines, kames, kame terraces, eskers, etc.) by which potential sources of gravel and sand may be recognized. This information was obtained primarily from a survey conducted by Professor D.P. Stewart of Miami University, Oxford, Ohio, who had been mapping the glacial features of Vermont during the summer months since 1956. Further

information was obtained from the Soil Survey (Reconnaissance) of Vermont conducted by the Bureau of Chemistry and Soils of the United States Department of Agriculture, and from Vermont Geological Survey Bulletins, United States Geological Survey Quadrangles, aerial photographs, the Surficial Geologic Map of Vermont, and other sources. On both maps the areas tested are represented by Identification Numbers. Several tests are usually conducted in each area represented by an Identification Number, the number of such tests being more or less arbitrarily determined either by the the the character of the material or by the topography.

Also included in this folder are data sheets for both the Bedrock and Granular Materials Survey, which contain detailed information for each test conducted by the Project as well as information obtained from other sources, and including an active card file compiled by the Highway Testing Laboratory. The latter information was gathered over a period of years by many persons and consequently lacks the organized approach and detail required for effective use. The information on the cards varied widely in completeness. Transfer of information from the cards to the data sheets was made without elaboration or verification. When possible, the locations of the deposits listed in the card files have also been plotted on the maps; however, some cards in the file were not used because the information on the location of the deposit was incomplete or unidentifiable. Caution should be exercised wherever this information appears incomplete. This Project does not assume responsibility for the information taken from the card files.

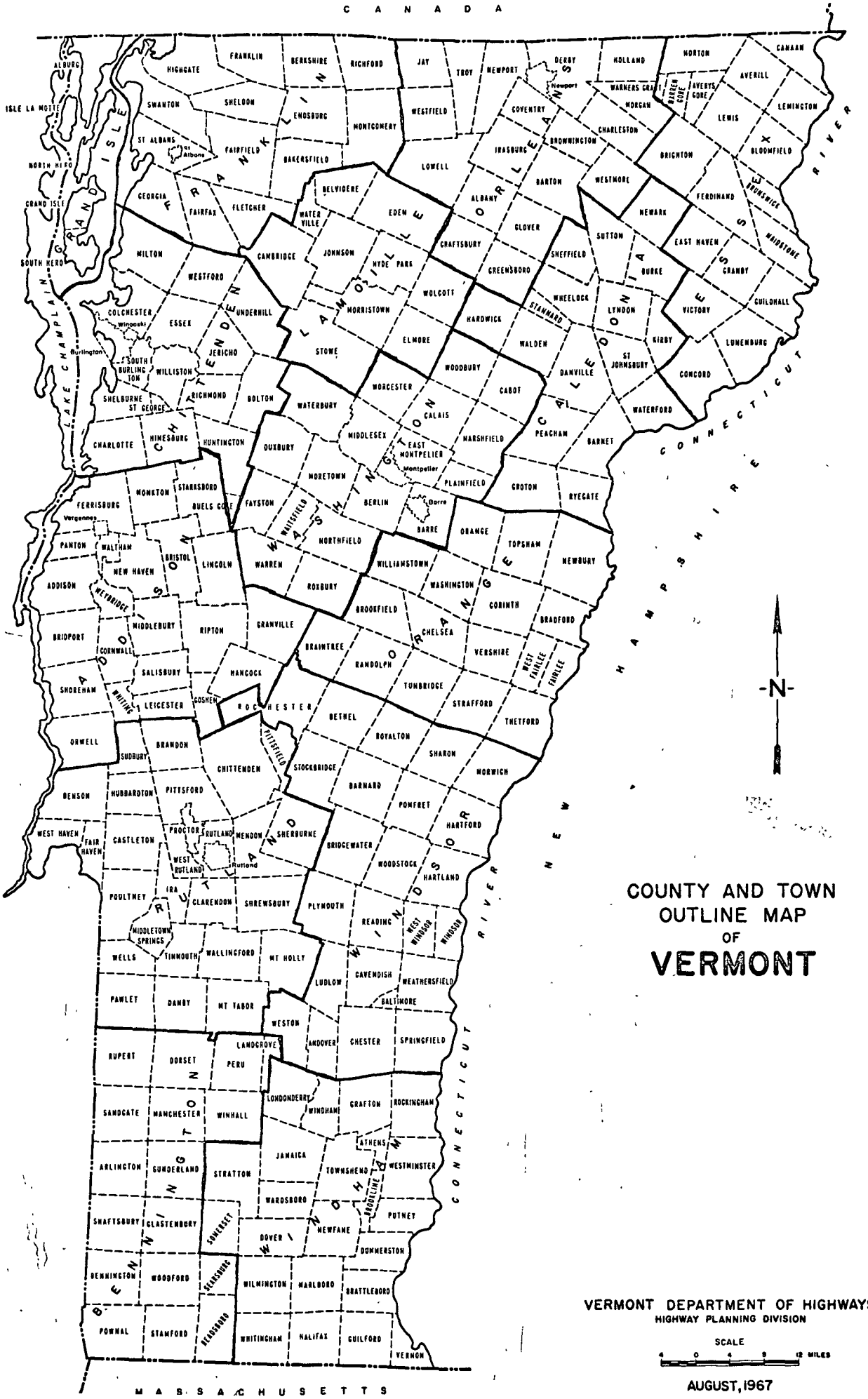
Work sheets contain more detailed information on each test and a detailed sketch of each identification Number Area. The work sheets and laboratory reports are on file in the office headquarters of this Project.

LOCATION

The town of Dover is situated in the south-central part of Vermont, and the west side of Windham County. The town lies in the north and northeastern part of the Wilmington Quadrangle, and is bounded by the towns of Wardsboro to the north, Newfane to the east, Marlboro to the southeast, Wilmington to the south, Searsburg to the southwest, Somerset to the west, and Stratton to the northwest. (See County and Town Outline Map of Vermont on the following page).

Dover lies within the Green Mountain Physiographic Region, and is underlain entirely by rocks of the Green Mountain Stratigraphic Sequence.

The major structural trend in Dover is about north-northwest and south-southeast. Elevations range from 3,556' on Mt. Snow (formerly Mt. Pisgah), to 1,040 on the Rock River near East Dover. Major drainage in the town is southerly by the north branch of the Deerfield River, and Blue, Ellis, Cheney, and Negus Brooks. Southeasterly to easterly drainage in the east part of Dover is by Rock River, and Taft, Adams, and Bemis Brooks.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

AUGUST, 1967

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

The routine employed by the project in a survey of possible sources of rock for highway construction is divided into two main stages; office and field investigations.

The office investigation is conducted primarilty during the winter months and comprises the mapping and description of rock types as indicated in various reference sources. Many different sources of information are utilized, as indicated in the bibliography. These references differ considerably in dependability due to new developments and studies that have contributed to the obsolescense of a number of reports. In addition, the results of samples taken by other individuals are analyzed, and the location at which these samples were taken is mapped when possible. In other words, as complete a correlation as possible is made of all the information available concerning the geology of the area under consideration.

The field investigation is begun by making a cursory preliminary survey of the entire area. The information obtained in the preliminary survey, together with the information assimilated in the office investigation, is employed to determine the areas where testing and sampling will be concentrated. When a promising source has been determined by rock type, volume of material, accessibility, and adequate exposure and relief, chip samples are taken with a hammer across the strike or trend of the rock. The samples are submitted to the Material Testing Laboratory for abrasion testing both by the Deval Method (AASHO T-3) and the Los Angeles Method (AASHO T-96). It should be kept in mind that the samples taken by the chip method are often within the weathered zone of the outcrop and consequently may give a less satisfactory test result than fresh material deeper in the rock structure. When the material is uniform and acceptable abrasion tests result from the chip samples, the material source is included in this report as being satisfactory.

Discussion of Rock and Rock Sources

The rocks of Dover lie entirely in the Green Mountain Stratigraphic Sequence according to the Centennial Geologic Map.

The Readsboro schist and Sherman marble members of the Cavendish formation; and the Hoosac schist underlie the western part of Dover, and nearly surround a long tongue of the older Mount Holly gneiss. A small body of the Hoosac amphibolite and greenstone is mapped just west of the north end of the Mount Holly gneiss.

East of the Readsboro schist the rocks become progressively younger. From west to east they are: the Turkey Mountain amphibolite and greenstone member of the Hoosac formation, the Hoosac schist; the Pinney Hollow schist, and the Chester amphibolite and greenstone member of the Pinney Hollow formation; the Ottauquechee phyllite and quartzite; the Stowe amphibolite and greenstone and the Stowe schist and phyllite; the Moretown quartzite, phyllite, and schist; and the eastern most body of rock in Dover which is the ultramafic dunite, peridotite and serpentinite.

None of the rocks of the Hoosac, Pinney Hollow, Ottauquechee, Stowe, and Moretown formations are suitable for crushed rock due to platyness, a thin-bedding, poor cleavage, softness, inadequate exposure of good rock, or fracturing which yields thin, elongated, and sharp fragments. The best source of Sub-Base of Crushed Rock, Item 204 in Dover is the ultramafic rock area located at Map Identification No. 1, near the Newfane town line in the northeast part of town.

There are scattered outcrops of Mount Holly gneiss in the west part of town; however, they were not sampled due to either lack of size, or no permission to sample was obtained from the owner.

Besides the ultramafic rocks and certain parts of the Mount Holly gneiss, the only rocks which could possibly be considered for construction purposes in Dover, are the amphibolite and greenstones. However, there are no outcrops which had enough extent or relief, or thick enough beds to warrant a crushing operation.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

The method employed by the project in a survey of possible sources of sand and gravel for highway construction is divided into two main stages; office and field investigations.

The office investigation is conducted primarily during the winter months and comprises the mapping of possible potentially productive areas as indicated from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart proves to be valuable, particularly when used in conjunction with other references such as soil-type maps, aerial photographs, and United States Geological Survey quadrangles. The last two are used in the recognition and location of physiographic features indicating glacial deposits and in the study of drainage patterns. In addition, the locations of existing pits are mapped when known. The locations in which samples were taken by other individuals are noted and mapped when possible.

The field investigation is begun by making a cursory preliminary survey of the entire town. All pits and other areas which show physiographic features that give evidence of glacial or fluvial deposition are noted. These locations are later investigated by obtaining samples of pit faces and other exposed materials. Tests pits, dug with a backhoe to a depth of approximately 11 feet, are also sampled. The samples are submitted to the Materials Testing Laboratory where they are tested for gradation and stone abrasion, the latter by the Deval Method (AASHO T-4).

Discussion of Sand and Gravel Deposits

The granular deposits in Dover occur as fluvio-glacial sands and gravels which lie in a narrow, nearly north-south band north and northwest of West Dover. A small body of outwash is mapped about one mile west of East Dover. There is a local kame terrace deposit, which was not mapped by Dr. D. P. Stewart, just north of Goose City.

A small kame moraine or kame terrace feature occurs in the northeast part of Dover, and extends into Newfane, where most of the material is mapped.

Granular material is not only scarce in Dover, but what there is, is in great demand at premium prices by the various developers in the area. In general, the material in Dover is of poor quality, and only Map Identification Numbers 3 and 10 have any material which is acceptable for Sub-Base of Gravel, Item 201, and neither has a large amount.

There is only one occurence of material acceptable for Sub-Base of Sand, Item 202, and that is at the new pit at Map Identification No. 2, in the northeast part of Dover.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF DOVER

Green Mountain Sequence

Missisquoi formation (Moretown member) - Quartzite and quartz-plagioclase granulite in layers 1/8" to several inches thick, separated by pinstripe partings that contain muscovite, chlorite, epidote, biotite, and locally garnet, also greenish quartz-sericite-chlorite phyllite and schist, and minor carbonaceous phyllite.

Ultramafic Rocks - Dunite, peridotite, serpentinite, carbonate rock, talc-carbonate rock and steatite.

Stowe formation - Amphibolite and greenstone; epidote-albite-chlorite. Rocks contain actinolite and hornblende where more metamorphosed.

Stowe formation - Quartz-sericite (muscovite-paragonite)- chlorite phyllite and schist; porphyroblasts of albite, garnet, chloritoid, or kyanite are common locally. Schist contains abundant segregations of granular white quartz.

Ottauquechee formation - Black carbonaceous phyllite or schist containing interbeds of massive quartzite commonly criss-crossed by veins of white quartz; quartzite is dark gray and carbonaceous, light gray, or white; also including light green quartz-sericite-chlorite phyllite or schist, and sericitic quartzite. Schist contains abundant porphyroblasts of garnet and biotite from Ludlow, south.

Pinney Hollow formation (Chester member) - Thin-layered, ligniform amphibolite and hornblende schist.

Pinney Hollow formation - Pale green quartz-sericite (muscovite-paragonite)-chlorite phyllite and schist with abundant magnetite, chloritoid phyllite and schist, quartz-sericite-albite-chlorite schist, and rare beds of carbonaceous and schistose quartzite; garnet porphyroblasts common south of Ottauquechee River.

Hoosac formation (Turkey Mountain member) - Amphibolite and actinolitic greenstone characterized by oval, 1/8" to 3/8" spots, chiefly of epidote.

Hoosac formation - Quartz-sericite-albite-chlorite schist characterized by albite porphyroblasts - biotite and garnet porphyroblasts common southward; locally carbonaceous.

Hoosac formation - Amphibolite and actinolitic greenstone.

Cavendish formation (Readsboro member) - quartz-muscovite schist containing biotite or chlorite and characterized by conspicuous porphyroblasts of sodic plagioclase; less commonly quartz-muscovite-paragonite schist containing chlorite, garnet, or chloritoid; and locally kyanite (Gassetts schist).

Cavendish formation (Sherman member) - Buff dolomite; minor white to pink calcite marble.

Mount Holly Complex - Mainly fine- to medium-grained biotitic gneiss, locally muscovitic, and in western areas chloritic; massive and granitoid in some localities, fine-grained or schistose and compositionally layered in others; also

abundant amphibolite and hornblende gneiss, and minor beds of mica schist, quartzite, and calc-silicate granulite; includes numerous small bodies of pegmatite and gneissoid granitic rock.

GLOSSARY OF SELECTED GEOLOGIC TERMS

Alluvial - Pertaining to material carried or deposited by running water.

Breccia - A rock consisting of consolidated angular rock fragments larger than sand grains. There may be fault, talus, and volcanic breccia.

Calcareous - Pertaining to or containing calcium carbonate.

Carbonate Rocks - Rocks composed of the molecule CO_3 combined with calcium, magnesium, etc. Includes limestones and dolomites.

Delta - A predominantly alluvial deposit built by a stream entering the sea or other body of water. Usually it has the form of the Greek letter delta.

Dolomite - A rock consisting predominantly of the mineral calcium magnesium carbonate (dolomite), containing carbon dioxide 47.7%, lime 30.4% magnesia 21.9%.

Dunite - A granitoid igneous rock, belonging to the peridotites, consisting chiefly of olivine with a little chromite or other spinel.

Gneiss - Originally meaning a more or less banded metamorphic rock with the mineral composition of granite. The term now designates a foliated metamorphic rock with no specific composition implied, but having layers that are mineralogically unlike and consisting of particles visible to the eye. Usually gneiss displays an alternation of granular mineral and schistose minerals with the rock tending to split along the schistose bands.

Ice Contact - Refers to sediments which have accumulated in contact with stagnant or wasting glacial ice. They assume the varied topographic forms expressed by eskers, kames, and kame terrace.

Kame - A conical hill of generally poorly stratified drift deposited in contact with glacial ice by streams flowing in or on the ice.

Kame Terrace - Stratified sands and gravels deposited by streams between a glacier and an adjacent valley wall.

Kame Moraine - An accumulation of material deposited directly from the frontal portion of the glacial ice and partially sorted by water action. The deposits may take the form of coalescent knolls, hummocks, and ridges.

Limestone - A bedded sedimentary rock consisting chiefly of calcium carbonate. The most important and widely distributed of the carbonate rocks.

Marble - A soft, white rock being the metamorphic form of limestone which the calcium carbonate (calcite) is recrystallized and the calcite crystals are overgrown and interlocked with additional calcite. Commercially it is a trade name applied to any carbonate rock of good color and texture and hard enough to take a polish.

Metamorphic Rocks - Rocks that owe their distinctive characteristics to

the transformation of preexisting rocks through intense heat or pressure or both.

Peridotite - An igneous rock of very low silica content having a granitic texture and composed mainly of olivine with or without pyroxene, amphibole, and mica. Feldspar is absent or present only in small amounts. A characteristic feature of peridotite is the tendency to alter to the dark-green rock serpentinite.

Pyllite - A fine-grained, foliated metamorphic rock intermediate between the mica schists and slates into which it may grade. The foliation is made possible by the development of a large amount of potash mica, sericite, which also gives the rock a distinctive silvery appearance.

Physiographic - Pertaining to the physical divisions of the earth.

Quartzite - A compact metamorphic rock composed of quartz grains so firmly cemented that fracture takes place across the grains and the cementing material with equal ease.

Serpentinite - A rock which is essentially an impure form of the mineral serpentine in which there are varying amounts of olivine, pyroxene, amphibole, and pyrite. It is derived mainly from primary rocks rich in olivine.

Siliceous - Containing or pertaining to silica (silicon dioxide, SiO_2).

Slate - A very fine-grained homogeneous metamorphic rock which splits smoothly along parallel cleavage planes and yields roughly similar slabs.

Till - An unsorted, unstratified, and unconsolidated heterogeneous mixture of clay, silt, sand, gravel, and boulders deposited directly by glacial ice.

Ultramafic - Pertaining to igneous rocks that have a low percentage of silica (less than 45%), virtually no quartz and feldspar, and corresponding high percentage of iron, magnesium, and calcium. Rocks included are peridotite, limburgites, pyroxenites, magnetites. These rocks may occur as independent dikes and sheets or in segregations in larger igneous bodies. Same as ultrabasic.

BIBLIOGRAPHY

A survey of the glacial geology of Vermont being conducted by D. P. Stewart, the partial results of which are published in Vermont Geological Survey Bulletin No. 19; 1961.

Soil Survey (Reconnaissance) of Vermont, W. J. Latimer; 1930; Bureau of Chemistry and Soils, United States Department of Agriculture.

Soil Exploration and Mapping; 1950; Highway Research Board, Bulletin 28.

Survey of Highway Aggregate Materials of West Virginia; December, 1959; Engineering Station, West Virginia University, Morgantown, West Virginia.

Materials Inventory, Bangor Quadrangle, South Half; September, 1959; University of Maine.

Glacial Geology and the Pleistocene Epoch, R. F. Flint; 1947; John Wiley and Sons, Inc.

Rock and Rock Minerals, L. V. Pirsson; June, 1949; John Wiley and Sons, Inc.

Glossary of Selected Geologic Terms, W. L. Stokes and D. J. Varnes; 1955; Colorado Scientific Proceedings, Vol. 16.

Centennial Geologic Map of Vermont, C. G. Doll; 1961.

The Green Mountain Anticlinorium in the vicinity of Wilmington and Woodford Vermont; James William Skehan, S. J.; Vermont Geological Survey Bulletin No. 17; 1961.

The Surficial Geology and Pleistocene History of Vermont; David P. Stewart and Paul MacClintock; Vermont Geological Survey Bulletin No. 31; 1969.

Wilmington Quadrangle, Vermont; Geological Survey, United States Department of the Interior; 1954.

Appendix I

PARTIAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION MATERIALS

Listed below are partial specifications for Highway Construction Materials as they apply to this report at date of publication. For a complete list of specifications see Standard Specifications for Highway and Bridge Construction, approved and adopted by the Vermont Department of Highways in April, 1964.

Item 105, Granular Borrow

"Article 105.02 - Materials. The granular borrow shall be obtained from approved sources and shall consist of satisfactorily graded, free-draining, hard durable stone and coarse sand practically free from loam, silt, clay, and organic matter.

"The sand portion (material passing the No. 4 screen) shall have not more than ten percent (10%) passing the No. 270 mesh sieve and shall show a color of not more than three and one-half (3½) as determined by the colorimetric test described in AASHO Method of Test, Designation T-21.

"When used in connection with fine grading or in fills where piling is to be driven, the granular material shall all pass the nine-inch (9") square-opening screen."

Item 201, Sub-base of Gravel

"Article 201.02 - Materials. The gravel shall consist of material reasonably free from silt, loam, clay or organic matter. It shall be obtained from approved sources and meet the following requirements.

"Not less than forty percent (40%) stone shall be retained on No. 4 sieve.

"The percent of wear shall be not more than twenty-five (25) when tested by laboratory methods using Method T-4 or more than forty (40) when tested by AASHO Method T-96.

"The stone portion of the gravel shall be uniformly graded from coarse to fine, and the maximum-size particles shall not exceed two-thirds (2/3) of the layer being spread.

"The sand portion, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Minimum Percent of Stone	Percent Passing Square Openings No. 100	Percent Passing Square Openings No. 270
40	0-15	0-3
50	0-15	0-4
60	0-15	0-5
70	0-15	0-6

"The sand shall show a color of not more than three and one-half (3½) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

Item 202, Sub-base of Sand

"Article 202.02 - Materials. The sand shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and meet the following requirements:

"The sand, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Square Openings	Percent Passing
1½"	95-100
5/8"	80-100
No. 4	70-100
No. 100	0-18
No. 270	0-5

"The sand shall show a color of not more than three and one-half (3½) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

Item 204, Sub-base of Crushed Rock

"Article 204.02 - Materials. The materials for sub-base, filler, and sand cushion shall be obtained from approved sources and meet the following requirements:

A - Crushed Rock. "The crushed rock shall be uniformly graded, crusher-run material and shall be free from dirt. The ledge from which this material is obtained shall be stripped and cleaned before blasting. Conical stockpiling, or any other method of stockpiling which causes segregation of aggregates, will not be permitted.

"The crushed rock, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Square Openings	Percent Passing
4"	95-100
1½"	25-50
No. 4	0-15

"The percent of wear shall not be more than eight (8) when tested by laboratory methods using Method AASHO T-3 or more than forty (40) when tested by AASHO Method T-96."

Item 205, Sub-base of Crushed Gravel

"Article 205.02 - Materials.

A - Crushed Gravel. "The crushed gravel shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and produced by a crusher adjusted to deliver a product uniformly graded from coarse to fine.

"When tested by laboratory methods using Method AASHO T-27, it shall meet the grading requirements as set forth below:

		Square Openings	Percent Passing
Sub-base of Crushed Gravel	Coarse-Graded Item 205-A	4"	100
		No. 4	25-50
	Fine-Graded Item 205-B	1½"	95-100
		No. 4	30-60

"At least thirty percent (30%) by weight of the stone content of the crushed gravel, that is, the material retained on the No. 4 screen, shall have a minimum of one (1) fractured face as determined by actual count from the sample submitted to the laboratory.

"The percent of wear shall not be more that twenty (20) when tested by laboratory methods using Method AASHO T-4 or more than thirty-five when tested by AASHO Method T-96.

B - Sand. "The sand content of the crushed gravel, that is the material passing the No. 4 screen, when tested by laboratory methods using Method AASHO T-27, shall meet the grading requirements set up in the following table:

Square Openings	Percent Passing
No. 100	0-18
No. 270	0-8

"The sand shall show a color of not more than three and one-half (3½) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

Item 207, Sub-base of Dense Graded Crushed Rock

"Article 207.02 - materials. The crushed rock shall consist of granular fragments of hard, durable rock, of uniform quality throughout, reasonably free from thin or elongated pieces, soft or disintegrated rock, dirt or other objectionable matter."

"The rock shall meet the following requirements:

" The percent of wear shall be not more than eight (8) when tested by laboratory methods, using Method AASHO T-3, or more than forty (40), when tested by AASHO Method T-96."

"When tested by laboratory methods, using Method AASHO T-27, the material shall meet the requirements set up in the following table:

	Square Openings	Percent Passing
Grading	3"	100
	2"	80-100
	1½"	50-75
	No. 4	30-55
	No. 100	3-10
	No. 270	0-6

"The dense graded rock shall be homogeneous and shall be produced and manipulated in such a manner as to prevent segregation before material is spread on the prepared subgrade, or at other locations."

TABLE I

DOVER GRANULAR DATA SHEET NO. 1

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
1	1	1970	1-5.5	0-1	Yes	63.8	54.2	40.5	6.0	2.1	1	27.9%	Gran. Borr. (Grav.)	Owner: Arvin Hescock. Area is a granular feature mapped as a kame moraine and located in the northeast corner of Dover. Present access is by Adams Hill Road, Newfane, but owner would probably let equipment across his land which is east of Town Highway No. 31. There is a small diggings at the northeast base of a wooded slope. The slope was inaccessible to the backhoe because of trees. Test #1 was dug in flat area north northeast of small diggings, 165' N.75°W. of Town Line. Some cobbles and gravel in top foot of test. A three-foot bank, representing only a small area, was included with backhoe sample. From 1', to 2.5' below floor level, was stony sand, over angular boulders or bedrock.
	2	1970	2.5-10.5	0-2.5	Yes	79.2	64.6	37.5	9.0	3.4	1	29.0%	Gran. Borrow (Grav.)	Test #2 was dug by hand-shovel and backhoe on 10.5' foot face at base of north northeast slope of ridge, and 80' S.25°W. of Test #1. The top 2' or 2.5' is roots and overburden. From 2.5'-6.5' is stony sand. The bottom 3.5' or

TABLE I

DOVER GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														4' is a good looking, stratified gravel. The bottom is hardpacked silt and stones.
	3	1970	1.5-5.5	0-1.5	No	100	100	62.9	39.0	16.3	1	----	----	Test #3 was dug on hillside, 150' west southwest of Test #2, and 115' northwest of the rounded ridge that extends south southwest from the pit, and which appears to be the granular feature. Material in Test #3 is unsorted silt and stones, with very little sand. A sample was taken from pile for negative information. Material is probably glacial till. The top of ridge is about 15'-18' above top of pit face. Till shows at about 250' south southwest of Test #2.
2	1	1970	3-12	0-2	Yes	58.6	53.5	43.9	37.0	10.8	1	23.8%	--	Owner: Charles Turner. Area is not mapped as a granular feature, but sampling showed it to be a kame terrace from a local ice tongue. Pit was newly opened in 1970 on east side of Town Highway No. 19. Material is a poorly sorted, silty, cobbly gravel over pebbly sand and fine sand. Test #1 was dug by hand on northeast face of upper level of new pit. Log of Test #1:

TABLE I

DOVER GRANULAR DATA SHEET NO. 3

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				0'-2', overburden; 2'-3', not reached; 3'-9', sandy gravel; 9'-12', pebbly sand; bottoms in fine sand. Vague bedding dips to the south.
	2A	1970	1-9.5	0-1	No	76.6	65.1	47.7	27.0	4.1	1½	29.4%	Gran. Borrow (Grav.)	Test #2A was dug by backhoe at southeast end of logging road above pit and about 600' from top of pit. Log of Test #2A: 0'-1', overburden; 1'-4', gravel; 4'-5', sand; 5'-9.5', gravel. Some lenses of sand noted. Beds dip slightly about S.20°W., and seem to be the result of kame terrace slumping.
	2B	1970	9.5-11	---	No	100	80.8	63.2	6.3	1.7	1½	----	Gran. Borr. (Sand)	Test #2B. Log: 0'-1', overburden; 9.5'-11', sand with pebbles.
	3	1970	1.5-11.5	0-1.5	No	100	97.0	87.1	11.3	2.9 2.5*	1	---	Sand	Test #3 was dug in thinly wooded area, 55' S75°W. of a point 250' from the top of the pit. Sand was at east end of test hole, gravel was in west end of hole, but could not be sampled due to the slope of the hill, and a lot of caving of the sides of the test hole. Log of Test #3: 0'-1.5', overburden; 1.5'-11.5', sand, with pebbles; test bottoms in bouldery gravel.
	4A	1970	2-6	0-2	No	100	73.9	59.6	18.0	5.8	1	---	Gran. Borrow (Grav.)	Test #4A was dug 115' N.70°

* Percentage of total sample

TABLE I

DOVER GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														of Test #3. Log of Test #4A: 0'-2', overburden; 2'-6', gravelly sand; test bottoms in sand.
	4B	1970	6-10	----	No	100	52.9	47.5	23.3	11.5 5.5*	1	---	---	Log of Test #4B: 0'-2', overburden; 6'-10', well-packed sand with some pebbles and an occasional cobble. Test #5 was dug at end of access road, 330' from pit. Log of Test #5: 0'-1.5', overburden; 1.5'-6.5', fine gravel; 6.5'-9.5', gravelly sand; test bottoms in same.
3	1	1970	1-6.5	0-1	No	58.8	43.9	27.5	12.0	4.0	1	24.0%	Gravel	Owner: Mrs. Edith Holland. Area is a low, slightly rolling field cut by Taft Brook on the south side of Town Highway No. 23. Area is mapped as outwash. Test #1 was dug in horse pasture, 55' northwest of brook, and 45' southeast of fence, in line with house. Log of Test #1: 0'-1', overburden; 1'-2', gravel; 2'-3', clay seam; 3'-4', gravel; 4'-5', clay seam; 5'-6.5', gravel. Water enters from below 5'. Material is a poorly sorted, somewhat well-packed gravel, with flat and tabular, to angular stones.

* Percentage of total sample

TABLE I

DOVER GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	2	1970	1-7	0-1	No	60.7	47.9	35.2	23.0	6.8	1½	27.0%	Gran. Borrow (Grav.)	The gravel does not appear very much worked by water. Test #2 was dug 75' south southeast of brook, 135' south of Test #1. Log of Test #2: 0'-1', overburden; 1'-3.5', silty sand with stones; 3.5'-7', gravel, with water at 5'. Test bottoms in gravel. Material looks like it would be good for town roads if it were crushed.
	3	1970	2-8.5	0-2	No	58.4	46.6	32.8	18.0	4.6	1	24.1%	Gran. Borrow (Grav.)	Test #3 was dug in pasture, 165' east of Test #2. Log of Test #3: 0'-2', overburden; 2'-8.5', gravel, which was finer than that in test #1 & #2. Water seeps in below 4.5', but not as rapidly as in the other test holes.
4	1	1970	2.5-17	0-2.5	Yes	100	82.4	68.8	13.8	2.7 1.9*	1	----	Gran. Borrow (Sand)	Owner: Philip Wooten. Area is pit south of State Aid Highway No. 1, and 0.1 mile west of Town Highway No. 28. Owner is letting his land grow back to its wild state, so only a hand sample was taken. Test #1 was in face of southwest corner of pit, 75' S.40°W. of high line. Log of Test: #1: 0'-2.5', over-

*Percentage of Total Sample

TABLE I

DOVER GRANULAR DATA SHEET NO. 6

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														burden; 2.5'-7', pebbly coarse sand; 7'-8', gravel; 8'-17', interbedded brown and gray sands; sample bottoms on gravelly sand. Pit floor is silty and wet in places.
5	1	1970	1-14	0-1	Yes	95.8	69.0	21.5	22.0	15.5	----	----	----	Owner: John J. Woodcock, Jr. Area is a pit which is not in an area mapped as granular. Pit is north across State Aid Highway No. 4 from the large pit at Map Identification No. 6, and 0.05 mile west of bridge no. 16. The pit has many angular rocks in semi-consolidated clay binder. There is 20' of moist slough at bottom of north face. Runoff gulleys are closely spaced on pit faces which is indicative of low granular content. Test #1 was a hand shovel sample of west face. Log of Test #1: 0'-1', overburden; 1'-14', mostly a silt-clay with some angular pebbles and stones.
	2	1970	1.5-14	0-1.5	Yes	100	100	63.0	40.0	12.6	1½	----	----	Test #2 was a hand-shovel sample on north face of pit. Log of Test #2: 0'-1.5', overburden; 1.5-14', clay with some angular stones. From 14'-34' was a silty, wet pile of

TABLE I

DOVER GRANULAR DATA SHEET NO. 7

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														sloughed material. The material is a glacial till. There seems to be an extension to the north and northwest, but it probably is the same poor material.
6	1	1970	0.5-6.5	0-0.5	Yes	53.4	49.2	37.0	14.0	6.0	2	40.2%	Gran. Borrow (Grav.)	Owner: Jasper Howe. Area is a large sprawling pit with many junked cars, located south of State Aid Highway No. 4 and extending to Wilmington Town Line. It is 250' west of Ellis Brook. The area is southwest of Bridge No. 16. Test #1 was a hand-shovel sample on face in south corner of pit. Log of Test #1: 0'-0.5', overburden, 0.5'-6.5', gravel over gravelly sand; bottoms in gravel.
	2A	1970	1-4	0-1	Yes	68.6	50.7	32.7	10.0	3.3	1½	35.8%	Gran. Borrow (Grav.)	Test #2A was a hand-shovel sample on face in northwest corner of pit. Log of Test #2A: 0'-1', overburden; 1'-4', gravel; bottoms in fine sand.
	2B	1970	4-8	---	Yes	100	97.5	97.5	34.1	5.3 5.2*	1½	---	Gran. Borrow (Sand)	Test #2B was a hand-shovel sample. 0'-1', overburden; 4'-8', sand over silty sand; Test bottoms in silty sand

*Percentage of Total Sample

TABLE I

DOVER GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHC T-21	Abrasion AASHC T-4-35	Passes VHD Spec.	Remarks
														and boulders.
	3	1970	0-5	---	Yes	100	100	57.5	32.0	11.2	1	---	---	Test #3 was dug in floor near north end of pit, 315' south of State Aid Highway No. 4, and 200' west of access road west of Ellis Brook. Log of Test #3: 0'-3', sand and silt-clay seams; 3'-5', looks like a till with some of the fines washed out. Test bottoms in same, plus water.
	4	1970	2-6.5	0-2	Yes	100	100	92.6	36.0	7.2	1½	---	Gran. Borrow (Sand)	Test #4 was dug by backhoe atop west face of pit, 390' southwest of Test #3, and at the base of the slope up to the woods. Log of Test #4: 0'-2', overburden; 2'-3', sand; 3'-6.5', till which has been slightly water-worked. Test bottoms on bedrock at 6.5'. Below 3.5' is well-packed, unsorted, angular and till-like weathered rock.
7	1	1970	0-11	---	Yes	100	100	47.2	41.0	7.6	1½	---	Gran. Borrow	Owner: Jasper Howe. Area is a pit in glacial till on a wooded hill above west side of large sprawling pit near Wilmington town line. The material was used for the airport fill. Test #1 was a hand-shovel sample at northeast corner of face. Material is 0'-13', sandy till with angular pebbles and boulders. There are many boulders or blocks lying around.

TABLE I

DOVER GRANULAR DATA SHEET NO. 9

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
8	1	1970	1-10	0-1	No	100	100	52.7	21.0	7.9	1½	---	Gran. Borrow	Owner: Jasper Howe. Area is a small bank just east across the narrow Deerfield River from the town sand pile on Vermont Route 100, 0.25 mile north of the Wilmington town line. The bank rises 10' above a low fluvial terrance. There is a wooded hillside 35' to the east which might contain granular material, but which is inaccessible to the backhoe. Test #1 was a hand-shovel sample on the west face of bank. Log of Test #1: 0'-1', overburden; 1'-3', granvel; 3'-10', clay with some angular pebbles and stones. With exception of possible material upslope, this area is not a good source.
9	1	1970	0.5-8	0-0.5	Yes	69.3	60.9	44.9	8.0	2.3	1½	26.8%	Gran. Borrow (Grav)	Owner: Larry Edwards. Area is an old, shallow pit southwest of the junction of Vermont Route 100 and the south end of Town Highway No. 8. Test #1 was dug by hand-shovel and backhoe, and represents an area of 55' x 100', north of pit. Log of Test #1: 0'-0.5', overburden; 0.5'-8', well-packed gravel which bottoms in same, but the floor has many wet spots.
	2	1970	0-5	---	Yes	100	100	86.0	16.0	6.5	1	---	Gran. Borrow	Test #2 was dug in floor, 40' S70°E. of Test #1. Log of Test

TABLE I

DOVER GRANULAR DATA SHEET NO. 1C

Map Ident No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Tosses VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														#2: 0'-5', glacial till, with water seeping in at 3'. Bottoms in till.
	3	1970	3-10	0-3	Yes	73.8	61.5	50.3	40.0	12.0	1	26.5%	---	Test #3 was on the 12-foot face, 230' S10°E. of Test #2. Log of Test #3: 0'-3', overburden (strippings); 3'-4', sand and stones; 4'-8', well-packed gravel and big boulders; bottoms in same. Pit floor has many large boulders and much water.
	4	1970	0.5-4	0-0.5	No	100	100	74.4	28.3	13.2 9.8*	1	---	---	Test #4 was dug on upper level, 300' S70°W. of workshop. Log of Test: 0'-0.5', overburden; 0.5'-4', sand with pebbles and an occasional cobble. Bottoms in till at 4'.
10	1	1970	0-6.5	---	Yes	61.2	50.5	34.7	12.0	3.4	2½	22.8%	Gravel	Owner: Dover Hills Corp. Area is a small pit, river bar and pasture on the east side of Town Highway No. 8 and both sides of Blue Brook, 1.9 miles north of Vermont Route No. 100. There is a 6- to 8-foot bank on east side of brook, and a 6-foot bank on a higher level, 145' N65°E. of the Brookside Pit. The upper bank has a probable extension of about 100' eastward to a wooded slope. The terrain slopes to the southeast, and the material probably extends a maximum of 125' northwest and southeast of the upper level bank. This area is mapped

* Percentage of total sample

TABLE I

DOVER GRANULAR DATA SHEET NO. 11

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														as a fluvial gravel. The material is mainly schistose, rounded tabular constituents with some boulders. Test #1 was dug by backhoe in small diggings near old shed. Log of Test #1: 0'-6.5', well-nested, bouldery, coarse gravel which appears to be dipping slightly to the south (downstream). There is 15-20% boulder content. Test bottoms on bouldery, coarse gravel and water.
	2	1970	1-6.5	0-1	Yes	100	100	55.9	12.0	4.9	1	---	Gran. Borrow	Test #2 was dug by backhoe on a 6.5-foot face, 75' east of Blue Brook. Log of Test #2: 0'-1', overburden; 1'-6.5', unsorted and unstratified, slightly washed till, with angular rocks.
	3	1970	0.5-7	0-0.5	Yes	75.9	60.8	42.0	11.0	2.8	1	21.6%	Gravel	Test #3 was dug in floor, 20' west of Test #2. Log of Test #3: 0'-0.5', overburden; 0.5'-3.5', fine gravel; 3.5'-7', gravel. Bottoms in same. Water at 5.5'.
	4	1970	1.5-6	0-1.5	No	100	100	43.8	11.0	4.1	1½	---	Gran. Borrow	Test #4 was dug on face of small terrace, 145' N65°E. of Test #3. Log of Test: 0'-1.5', overburden; 1.5'-6', till. Even though the test results look pretty good, the material was unsorted and unstratified.

TABLE I
Supplement

Dover Property Owners - Granular	Map Ident. No.
Dover Hills Corp.	10
Edwards, Larry	9
Hescock, Arvin	1
Holland, Mrs. Edith	3
Howe, Jasper	6, 7, 8
Turner, Charles	2
Woodcock, John J. Jr.	5
Wooten, Philip	4

TABLE II

DOVER ROCK DATA SHEET NO. 1

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHO T-3	
1	1	1970	Serpentinite Dunite	No	Chip	1.9%	Owner: Louis Rossner. Area is an exposure on a small wooded hill, about 400' south of so-called "Davis Road", which is east of Town Highway No. 3 in the northeast part of Dover. The bridge on "Davis Road" which crosses Adams Brook is unsafe. The south and southeast faces of the hill rise 75' vertically above a swamp. The north and northwest slopes are gentle. Test #1 was taken in a 20-foot wide zone for 80' north-south over the top of hill. The rock is a buff-weathered serpentinite, or serpentinized dunite. The fresh surface is gray-green. The rock is fine-grained, dense, and very hard. It varies from massive to somewhat foliated in places, due possibly to flow structure. It breaks correspondingly blocky-angular, to sharp-tabular. AASHO-T-96 is 13.0%.
	2	1970	Serpentinite Dunite	No	Chip	2.8%	Test #2. The traverse is 60' west of, and 15'-30' below Test #1, and progresses in a more westerly direction than does #1. The relief on the northwest slope is 30'-40'. There is a major joint system which trends N.10° W. and dips 70° to the west. Another joint system strikes N. 60° E., and is nearly vertical. There are other minor joints which cause considerable breakage in the rock. This breakage is not blocky, but angular and rather thin, and is probably the result of flow structure. In a few places, the rock was highly serpentinized and displayed a hint of the development of a slip fiber. The rock is a buff- to gray-weathering, green to gray serpentinite or serpentinized dunite. It is dense and fine-grained, with some lamination due to serpentinization; and breaks angular and sub-blocky, to sharply tabular. AASHO-T-96 is 14.3%.

TABLE II
Supplement

Dover Property Owners - Rock	Map Ident. No.
Rossner, Louis	1