

SURVEY OF HIGHWAY CONSTRUCTION MATERIALS  
IN THE TOWN OF MANCHESTER, BENNINGTON 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

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### Acknowledgments

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 were 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 eliminate this factor by enabling the State and its contractors to proceed with information

on material 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 designed 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.

#### Inclosures

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 being conducted by Professor D.P. Stewart of Miami University, Oxford, Ohio, who has been mapping the glacial features of the State 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, 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 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.

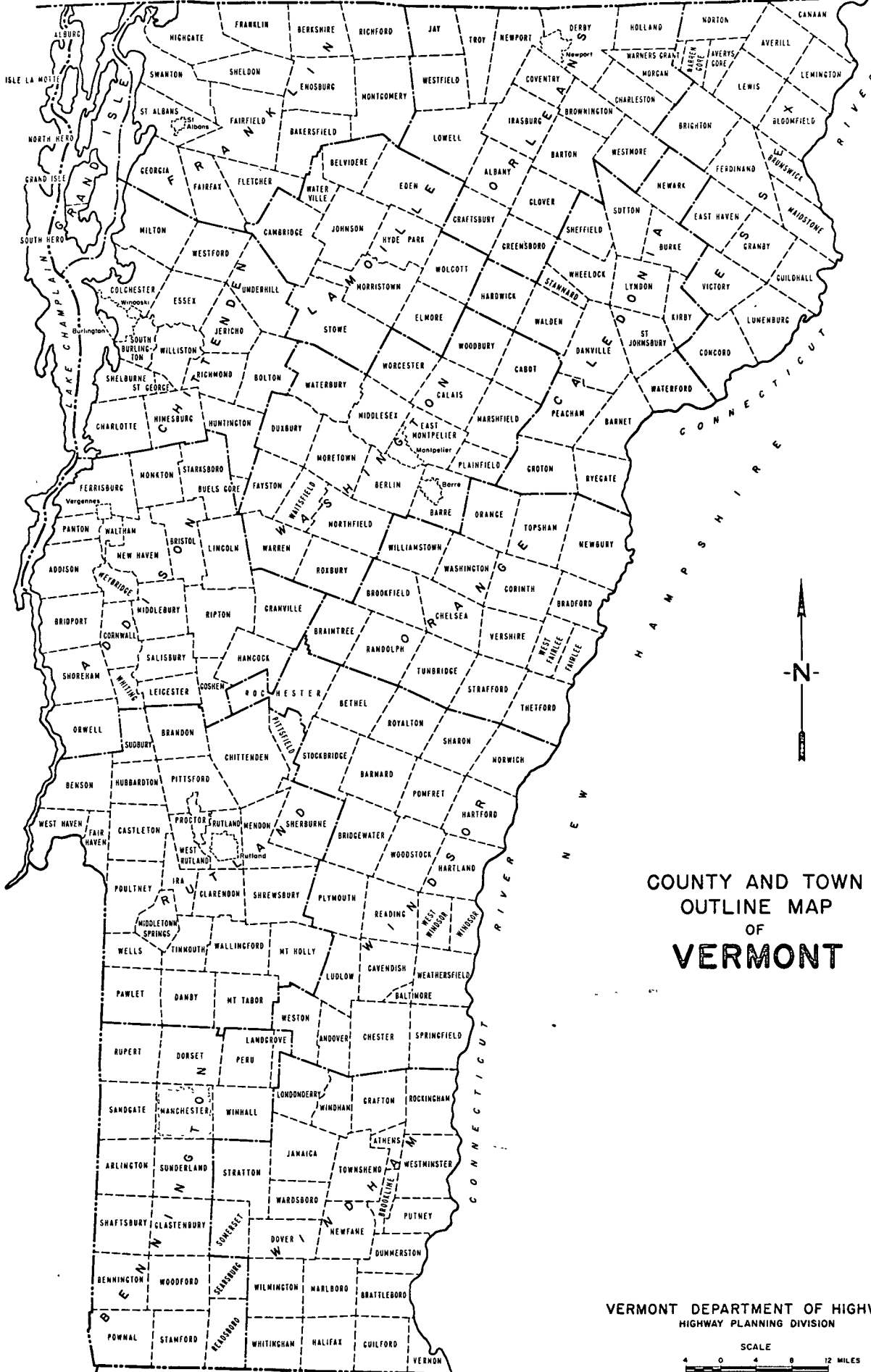
Work sheets contain more detailed information on each test and a detailed sketch of each Identification Number Area. The work sheets and laboratory reports are on file in the office headquarters of this Project.

## LOCATION

The town of Manchester is located in the north central part of Bennington County in the southwest section of the state. The town lies in the northeast part of the Equinox Quadrangle, and is north of Sunderland, west of Winhall, south of Dorset, and east of Sandgate. (See County and Town Outline Map of Vermont on the following page).

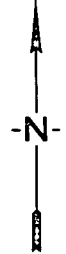
The Green Mountain Physiographic Region, underlain by pre-Cambrian metamorphic rocks, occupies the easternmost heights of Manchester. Swift streams cut the western scarp of these mountains which rise 1,500 to 2,000 feet above the floor of the Vermont Valley to the west. This two-to three-mile wide valley is underlain by the Valley Sequence of quartzites and carbonate rocks. Elevations in the valley vary from 600 to 1,000 feet. West of the valley the Taconic Mountains, consisting of the Taconic Sequence of slates and phyllites, rise 2,000 to 3,000 feet and reach a high of 3,816 feet at Mount Equinox.

Major drainage in Manchester is by the south flowing Batten Kill in the Vermont Valley. Tanner Brook, Lye Brook, Bourne Brook, Stony Brook, and West Branch are tributary streams entering the Vermont Valley from the Green Mountains and the Taconic Mountains. The Green River flows west and south along the west side of Equinox Mountain and enters the Batten Kill at West Arlington, after passing through Sandgate.

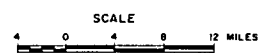


N E W Y O R K

COUNTY AND TOWN  
 OUTLINE MAP  
 OF  
**VERMONT**



VERMONT DEPARTMENT OF HIGHWAYS  
 HIGHWAY PLANNING DIVISION



AUGUST, 1967

## SURVEY OF ROCK SOURCES

### Procedure for Rock Survey

The routine employed by the project in the survey of possible sources of rock for highway construction is divided into two main stages: office investigation and field investigation. The first is conducted primarily during the winter months and comprises the mapping of rock types as indicated in various reference sources. Many different sources of information were utilized, as indicated in the bibliography. These references differ considerably in dependability due to new developments and studies contributing to the obsolescence of a number of reports. In addition, the results of samples taken by other individuals are analyzed, and the location in 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.



Discussion of Rock and Rock Sources

The rocks of Manchester are divided into three stratigraphic and structural sequences. The Taconic Sequence of slates and phyllites, with minor amounts of quartzite and carbonate rocks, upholds the Taconic Mountains on the west side of town, while the Valley Sequence of carbonate rocks and quartzites occurs between the Taconics and the Green Mountains.

The Taconic Sequence in Manchester outcrops only as the St. Catherine Formation, and has no exposures of rock types suitable for Sub-base of Crushed Rock, Item 204.

The Valley Sequence of quartzites and carbonates would be the most suitable source of Item 204 in Manchester. However, due to a mantle of glacial material there is very little readily accessible bedrock exposed. There is only a small, flooded marble quarry west of U. S. Route 7 and north of the Sunderland Town Line; southwest of the west end of Town Highway No. 36 on the Wilcox Dairy property. The rock in this 75-foot x 50-foot quarry is mapped as the Shelburne Marble, and is suitable for Item 204. A possible extension occurs to the west and northwest.

Also, there is a field north of Town Highway No. 23 near Barnumville, where the Dunham Dolomite outcrops, but the owner did not allow sampling. This rock appears to be good for Item 204 and the area could be easily developed. The lowest formation of the Valley Sequence, the Dalton Formation, is exposed on the east wall of Downer Glen in East Manchester just west of the Long Trail. This outcrop is the nearly vertical Prospect Rock, and is composed of a schistose quartzite with pebbles of feldspar and blue quartz. Any development of this source would need a road to the base of Downer Glen via Bourne Brook.

The Mount Holly Complex of the Green Mountain Series is present in the southeast part of Manchester. However, it is accessible only by a logging road. The area would be hard to exploit due to thick tree cover and mountainous terrain.

## SURVEY OF SAND AND GRAVEL SOURCES

### Procedure for Sand and Gravel Survey

The method employed by the project in the survey of possible sources of sand and gravel for highway construction is divided into two main stages: office investigation and field investigation. 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<sup>2</sup> 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 recognizing and locating physiographic features indicating glacial deposits and in studying drainage patterns. In addition, the location of existing pits are mapped when known. The locations in which samples were taken by other individuals are noted and mapped when possible.

The second stage of the investigation is begun in the field by making a cursory preliminary survey over the entire area noting area which show physiographic features giving evidence of glacial or fluvial deposits. These locations are later examined by digging test pits with a backhoe to a depth of approximately 11 feet and then sampling the material. The samples are submitted to the Highway Testing Laboratory where they are tested for gradation and stone wear, the latter by the Deval Method (AASHO T-4-35).

Discussion of Sand and Gravel Deposits

The granular deposits in the town of Manchester occur as sands and gravels of ice-contact origin deposited as kame terrace, kame moraines, kames, eskers, and material deposited as proglacial outwash and fluvial gravels. Many ice-contact areas have been mapped in Manchester by D. P. Stewart. Map Identification Number 2 is a large pit in a deposit mapped as kame moraine, and has cemented, coarse, cobbly gravels which are acceptable for Sub-base of Gravel, Item 201. Map Identification Number 7, a commercial source owned by William E. Dailey, is mapped as an outwash deposit. These two are the biggest pits with acceptable construction material in town. Map Identification Number 24 should bear consideration as a source, due to the possible extent of the material to the northwest, north, and northeast. There are several areas which might be useful sources, such as Map Identification No. 4 mapped as kame moraine and having a steep inaccessible possible extension to the west; and Map Identification Number 5 also kame moraine, which seems to overlay good material and may extend eastward.

Some granular features which appear on maps or in aerial photographs, were found to be either depleted or in contact with bedrock, water, or silt or clay. Some owners did not allow samples to be taken. Several pits are either town-owned or private dumps, and were not sampled.

The most promising non-commercial sources in Manchester for Sub-base of Sand, Item 202 are Map Identification Numbers 2, 9, and possibly 24.

Further testing in the following areas is recommended because of the proximity to the proposed Arterial Route: Map Identification Numbers 10 through 21, and 24, 25, and 26.

## SUMMARY OF ROCK FORMATIONS IN THE TOWN OF LANCHESTER

Taconic Sequence

St. Catherine Formation - Purple, gray-green and variegated slate and phyllite containing minor interbeds of white to green quartzite; locally albitic.

Vermont Valley Sequence

Bascom Formation - Interbedded dolomite, limestone or marble, calcareous sandstone, quartzite, and limestone breccia; irregular dolomitic layers, thin sandy laminae, and slaty or phyllitic partings characterize limestone and marble at lower, middle, and upper parts of the Bascom respectively.

Shelburne Formation - Chiefly a white marble or gray limestone characterized by raised reticulate lines of gray dolomite on the weathered surface; includes Columbian marble of the marble quarries.

Clarendon Springs Formation - Fairly uniform, massive, smooth-weathered gray dolomite characterized by numerous geodes and knots of white quartz; quartz sandstone and irregular masses of chert are near the top.

Danby Formation - Interbedded quartzite and dolomite; white quartzite beds more than a foot thick, separated by 10 to 12 feet of dolomite in eastern areas.

Winooski Dolomite - Buff-weathered, pink, buff, and gray dolomite; beds four inches to 1 foot thick separated by thin, protruding, red, pink, green, and black siliceous partings.

Monkton Quartzite - Distinctively red quartzite interbedded with lesser buff and white quartzite and relatively thick sections of dolomite like that of the Winooski; the quartzites thin to the east and they become gray and phyllitic to the east and south.

Dunham Dolomite - Buff-weathered siliceous dolomite, pink and cream mottled or buff to gray on fresh surface; lower part is massive and upper part is sandy and resembles the Winooski Dolomite.

Cheshire Quartzite - Very massive, white to faintly pink or buff vitreous quartzite near the top in west-central and southwestern Vermont; predominantly a less massive-appearing mottled gray, somewhat phyllitic quartzite; dolomitic sandstone and conglomerate near the base of the formation in west-central Vermont apparently grades southward into the Dalton Formation.

Dalton Formation - Schistose quartzite containing pebbles of feldspar and blue quartz; impure dolomite containing pebbles of quartz and feldspar occurs locally; conglomerate common near the base.

Green Mountain Sequence

Mt. 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.

Carbonaceous - Containing carbon.

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

Crevasse Filling - A ridge of water-sorted material originally deposited in a large glacial crevasse or fissure and left standing after the ice melts.

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%, and magnesia 21.9%.

Esker - A long, narrow winding ridge of mixed sand and gravel deposited by a stream of meltwater flowing in a tunnel or crevasse in stagnant glacial ice.

Fluvial - Pertaining to streams.

Glaciolacustrine - A term used to denote formation by, or deposition in quiescent waters of glacial lakes.

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 terraces.

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

Kame Moraine - An accumulation of material deposited directly from the frontal portions of melting glacial ice and partly sorted by water action. Deposits may take the form of coalescent knolls, hummocks, ridges, etc.

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

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

Lithographic Stone - Fine-grained, compact and homogeneous limestone formerly used for engraving.

Marble - A soft, white rock being the metamorphic form of limestone in 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.

Outwash - Stratified sands and gravels that are stream-built beyond the glacier; deposited by meltwater streams issuing from the face of the glacial ice.

Phyllite - 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.

Pre-Cambrian - Pertaining to or designating all rocks formed prior to the Cambrian period. Prior to about 500,000,000 years ago.

Proglacial - Pertaining to the area beyond the outer limit of a glacier. That area which is the location of outwash deposits or glacial lake deposits.

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.

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.



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.
- Soils 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 in 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.
- A Handbook of Rocks, J. F. Kemp; June 1946; D. Van Nostrand Company, 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 Geology of the Equinox Quadrangle and Vicinity, Vermont; Philip C. Hewitt, Vermont Geological Survey Bulletin No. 18, 1961.

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 and 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 ( $3\frac{1}{2}$ ) as determined by the colorimetric test described in AASHTO 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 AASHTO 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 ( $\frac{2}{3}$ ) 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 ( $3\frac{1}{2}$ ) 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
$1\frac{1}{2}$ "	95-100
$\frac{5}{8}$ "	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 ( $3\frac{1}{2}$ ) 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

actual count from the sample submitted to the laboratory.

"The percent of wear shall not be more than 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 ( $3\frac{1}{2}$ ) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 1

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						
1	1	1967	1.5-6	0-1.5	Yes	100	100	88.3	4.4	2.5 2.2*	1½	---	Sand	Owner: Carlton B. Overton. Area is mapped as kame moraine and is 0.4 mile east of State Aid Highway No. 3 and 0.25 mile north of Town Highway No. 16. Area is small pit and pasture knoll just south of pasture road, and north of cornfield. A very limited westward extension exists. Pit is 110' x 90'. Test #1 is on west face of small pit and 50' south of pasture road. Mainly pebbly sand - bottoms in sandy silt.		
	2	1967	0-11	Stripped	Yes	100	100	97.0	32.0	10.0 9.7*	1	---	Gran. Borrow (Sand)	Test #2 taken 60' southeast from Test #1. Silt and sand interbedded and bottoms in silty sand.		
	3	1967	2-7	0-2	No	100	97.2	67.8	5.4	4.0 2.7*	1	---	Gran. Borrow (Sand)	Test #3 taken 60' south of Test #2 just south of electric fence on slope 10' below Test #2. Sandy pebbles, bottoming in pebbles.		
	4	1967	3.5-7	0-3.5	No	100	89.3	74.6	32.0	25.0 18.7*	1	---	---	Test #4 taken 66' southeast of second farm gate. Sand bottoms in silt.		
	5	1967	2.5-5	0-2.5	No	N	O	T	S	A	L	P	L	E	D	Test #5 taken on south edge of pasture knoll 150' south-southwest from Test #4. Bouldery silt. Sample not taken.
	6	1967	2-11	0-2	No	N	O	T	S	A	L	P	L	E	D	Test #6 taken in cornfield 180' southeast of Test #5. Silty clay. Not sampled.

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1½"	5/8"	#4	#100	#270				
2	1	1967	1-10	0-1	Yes	90.8	79.2	58.2	5.0	2.0	1	17.2%	Gravel	<p>Owner: Dupree Brothers. Area is active pit with a large extension to the southwest up a rather steep knoll, and up a wooded knoll to the west. Area is 3.15 mile via pit road northwest of Vermont Route 30 and 1.0 mile north of U. S Route 7. Area is mapped as kame moraine. Pit floor has many cobble and boulder piles and sloughing occurs at foot of faces. Area is about 425' by 100'. Pit faces average 20' (between 4' and 40'). Some very large boulders on floor and in face. Test #1 taken on the pit face at extreme north end of area; north-east of very large boulders. Interbedded sand and gravel. Some sloughed material encountered.</p> <p>Test #2 on pit face at west end of area, 300' S30°W from Test #1. Sand with thin beds of pebbly silt. Bottoms in sloughed material.</p> <p>Test #3 is 25' south of Test #2 and was a face sample. Barely fails for Sub-base of Sand, Item 202. Has excess retained on the No. 4 sieve.</p> <p>Test #4 is 412' south from Test #1 and was a face sample</p>
	2	1967	3-14	0-3	Yes	100	100	99.1	6.9	1.0*	1	---	Sand	
	3	1967	3-16	0-3	Yes	100	94.9	67.0	2.0	1.0	1	---	Gran. Borrow (Sand)	
	4	1967	2-38	0-2	Yes	85.9	77.0	55.3	4.0	3.0	1	10.0%	Gravel	

\*Percentage of Total Sample

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 3

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	5	1967	0-10	Stripped	Yes	84.4	68.2	30.7	5.0	3.0	1	11.0%	Gravel	from south edge of pit. Interbedded sandy, cobbly gravel which is highly cemented. Test #5 is at north end of pit in floor beneath Test #1. Cobbly gravel bottoms in cobbles.
	6	1967	0-6.5	Stripped	Yes	93.9	70.0	30.2	4.0	2.0	1	9.0%	Gravel	Test #6 is a floor sample in northwest lobe of pit, 40' southwest of large boulder. Material is gravel from 0-6.5' and bottoms in silt. Beds dip to the east, so material should get better to the east.
	7	1967	0-14	Stripped	Yes	91.4	91.2	89.5	24.1	13.3 11.9*	1	---	---	Test #7 is a floor sample 40' east of Test #2. Material is interbedded sands and silts. Beds dip to the east, and test hole bottoms in silt.
	8	1967	0-4	Stripped	Yes	100	84.6	62.5	8.0	3.0	1	---	Gran. Borrow (Grav.)	Test #8 is a floor sample 10' north of Test #4, and 400' south of Test #1. Cobbly sands bottom in large boulders. Insufficient proper size stones were taken for percent of wear test.
	9	1967	3-13	0-3	No	90.6	79.3	64.4	7.1	3.0 1.9*	1	---	Gran. Borrow (Grav.)	Test #9 is 100' south of Test #4 and 170' west of pit road (near elm trees). It is on a pasture knoll which is part of the southwest extension of the pit. Test is at start of slope up from small level area between two knolls. Material is pebbly sands with some cobbles and is coarser at the bottom.

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
														Material could be screened for a good sand as test just barely fails for Sub-base of Sand, Item 202. Area seems to be a good source for Sub-base of Gravel, Item 201 and Sub-base of Sand, Item 202. Some screening would be needed. Many cobbles are present. Some silty beds and some very large boulders. Beds generally dip to the east. Area has a large extension to the southwest and west or northwest. Materials are well cemented in some areas; especially the south and southwest faces. Would consider this a good material location.
3	1	1967	8-0	10-8	Yes	83.5	71.1	43.5	9.0	6.5	1	17.0%	Gran. Borrow (Grav.)	Owner: Edward Squires. Feature is a pit, which is part of a kame terrace, but was mapped as a kame by Dr. Stewart. Pit is 275' along pit road from Town Highway No. 31, and 0.45 mile north of State Aid Highway No. 7. Pit is about 100' x 100'. Area is limited to the west by West Branch River, and to the north by a small stream. Some boulders seen.. Test #1 sampled on 10-foot face on north end of second level of pit. (Second level is about 4' above pit floor)

\*Percentage of Total Sample



TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	2	1967	0-4	Stripped	Yes	100	100	53.0	23.9	23.0	1	---	---	Test is 75' N20°E of pit road. Sandy gravel bottoms in gravelly boulders. Log of test: 10'-8' - overburden; 8'-5' - pebbly gravel; 5'-2' - cobbly gravel; 2'-0 - sandy, cobbly gravel. Test #2 is a floor sample below Test #1. Bouldery, pebbly silt and bottoms in bouldery silt with some pebbles. This deposit seems to be limited in depth.
	3	1967	0-2	Stripped	Yes	N O T S A M P L E D							Test #3 is in floor 55' S45°W from Test #2. Very large boulder or ledge at 2'. No sample was taken. Area and surrounding ledge was somewhat wet in lower portions, and as a whole, does not seem too promising.	
4	1	1967	2-12	0-2	Yes	71.1	52.5	22.1	5.0	5.0	1	7.2%	Gravel	Owner: Mrs. Cora West. Feature is mapped as a kame moraine. Area is an overgrown knoll with old pit cut. Feature has a west and a north-west extension. The extension was not tested due to steepness. Pit is about 300' long by 150' wide and heavily sloughed. Test #1 is the north end of pit and combined a face and floor sample (going to 6' below the pit floor).

\*Percentage of Total Sample

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 6

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
	2	1967	2-8	0-2	Yes	69.3	59.7	42.4	15.0	7.5	1	17.9%	Gran. Borrow (Grav.)	Test #2 is 110' south of Test #1 and was a floor sample. Log of hole: 0-2'- overburden; 2'-5'-gravel; 5'-8'-cobble sand. Bottoms in boulders. If area is developed to north-west and west, material might be pretty good. Owner is not too anxious to sell at the present time.
5	1	1967	1-15	0-1	Yes	81.4	67.8	46.5	6.0	2.5	1	14.6%	Gravel	Owner: Mrs. Alice Richardson. Area was sampled 0.05 mile east of Town Highway No. 18 and 0.15 mile south of State Aid Highway No. 7. Area is about 450' by 250' with a sloughed, overgrown, and boulder piled pit at east end of the field. Field is probably outwash, and the pit is mapped in kame moraine. Pit is about 350' by 50'. Pit faces are 15'-29' high. Test #1 is 330' S30°E from pit entrance. Log of hole: 0-1'-overburden; 1'-7'-sandy, cobble gravel; 7'-9.5' silt; 9.5' is the floor level; 9.5'-15'-sandy, pebbly gravel with some silt. The end of the sample is at 15', but hole was dug to 21' (15'-21'-silt; 15'-21' not sampled). Hole bottoms in silt.
	2	1967	2-11	0-2	No	82.5	60.7	32.6	14.0	6.0	1	21.6%	Gran. Borrow (Grav.)	Test #2 is 15' west of pit entrance and just south of field

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 7

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHTO T-21	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1½"	5/8"	#4	#100	#270				
	3	1967	5-11	0-5	No	83.1	51.9	31.2	22.0	11.0	1	20.6%	---	road. Log of hole: 0-2'-overburden; 2'-11'-sandy gravel. Bottoms in cobbly gravel. Material seems to get better with depth.
	4	1967	2-7	0-2	No	79.1	67.9	50.8	14.0	8.0	1½	19.8%	Gran. Borrow (Grav.)	Test #3 is in lowest part of the field, 380' S17°E from Test #1. Log of hole: 0-5'-topsoil; 5'-11'-gravelly sand with some loam. Material seems to get better with depth. Test #4 is 220' S40°W from Test #2. Log of hole: 0-2'-topsoil; 2'-7'-sandy pebbly gravel. Material seems to get better with depth. May bear looking into as a source, if owner or her estate decide to sell.
6	1	1967	0-6	Stripped	Yes	92.1	82.0	55.9	11.0	7.5	1	11.8%	Gran. Borrow (Grav.)	Owner: Edward J. Forrest Jr. Area is pit on southeast end of wooded knolls 0.15 mile north of State Aid Highway No. 7 and 0.30 mile west of Town highway No. 19. Pit is about 350' x 75'. Extension of the area appears to be to the west and northwest. Knolls were too steep to test. Material is generally cemented and seemed rather silty, even in gravels. Test #1 was on southwest face of southeast limb of knoll. Highly cemented cobbly sand occurred from 0-6'.

\*Percentage of Total Sample

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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						
	2	1967	1-5	0-1	Yes	N	O	T	S	A	M	P	L	E	D	Test #2 is 135' southwest of Test #1. Till occurred from 1'-5'. No sample was taken.
	3	1967	0-5	Stripped	Yes	N	O	T	S	A	M	P	L	E	D	Test #3 is a floor sample below Test #1. Pebbly clay occurs from 0-5'. No sample was taken. Usable material, if present, would have to come from the wooded knolls to the west and northwest of the pit areas. Other than that, the site isn't too good.
7	1	1967	2-15	0-2	Yes	82.5	72.0	39.4	4.0	2.0	1½	11.4%	Gravel	Owner: William E. Dailey, Inc. Area is a large pit in an outwash, 0.30 mile west from U. S. Route 7 and 0.50 mile south of Town Highway No. 23. There are many large boulder piles present and there are sloughed trees. The pit is 350' x 100', is the first pit on the right (north) past the scale house. Test #1 is the northwest face of the pit (middle lobe). The upper 8' is cobbly and lower 7' has smaller stones, ¼" - 1" size.		
	2	1967	N	O	T	S	A	M	P	L	E	D	Test #2 is 20' east of Test #1. When the floor test was taken, a very large boulder or ledge was encountered at 1'. No sample was taken.			
8	1	1967	0.5-11	0-0.5	Yes	65.5	48.7	34.1	15.0	6.3	1	12.8%	Gran. Borrow (Grav.)	Owner: Glover & Hayes Gravel Co. Area is small pit 0.15 mile		

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 9

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	2	1958	---	---	Yes	81.4	56.8	38.9	26.0	14.0	1½	10.0%	---	south of Town Highway No. 17 and 0.40 mile west of Town Highway No. 23 behind the Glover & Hayes office building. Area is flat, cleared top of knolls which drop to southeast. Mapped as kame moraine. Material may extend southwest and west into land owned by Orrin Beattie, which was not tested. (Too steep for bad weather testing). Test #1 is a floor sample at southwest end of field, 60' east of fence and 40' north of slope drop-off. Log of hole: 0-4'-gravel; 4'-11'-cobbly sand. There were a few 6" cobbles. Bottoms in sand with cobbles. There was 13% retained on the 3" screen and 15% retained on the 2" screen. Tests #2, #3, and #4 were taken by Callahan. Tests #2 and #3 located on the northwest side of the pit. Test #4 sampled from the 10 foot-face.
	3	1958	---	---	Yes	92.1	51.1	34.2	41.0	21.75	1	11.3%	---	
	4	1958	0-10	Stripped	Yes	79.1	64.9	46.0	14.0	7.5	1	15.0%	Gran. Borrow (Grav.)	
9	1	1967	0-8	Stripped	Yes	100	100	99.3	8.9	2.0*	1	---	Sand	

\*Percentage of Total Sample

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 10

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	2	1967	8-20	Stripped	Yes	100	100	99.7	18.9	3.0*	1	---	Gran. Borrow (Sand)	that the pit is nearly depleted, but that the area could still produce. Cobble piles noted on the pit floor. Pit is 0.20 mile northwest of Town Highway No. 21 and 0.35 mile north of Town Highway No. 23. Test #1 was taken from the east face of the pit. There was sand from 0-8'. Test hole bottoms in sand and some silt was noted.
	3	1967	0-15	Stripped	Yes	100	100	100	11.0	1.0*	1	---	Sand	Test #2 is a floor sample below Test #1. Test #2 barely fails for Sub-base of Sand, Item 202. Test #3 is 132' south of Test #2. Log of hole: -11'-fine sand; 11'-15'-cobble silt. This area is easily accessible.
10	1	1967	0-15	Stripped	Yes	100	100	99.2	30.8	3.0*	1	---	Gran. Borrow (Sand)	Owner: Sammy Greenburg. Area is mapped as kame morain. The pits are overgrown and have sloughing. Pits are located 0.45 mile north of Town Highway No. 17. Pit road is 150' east of Bridge #24. Southwest pit is about 350' by 50'. Possible extension may exist to the northwest. Some silt beds were noted. Test #1 is in northeast face of southwest pit. There is sand from 0-15'.
	2	1967	0-10	Stripped	Yes	100	100	98.2	7.8	2.0 1.9*	1	---	Sand	Test #2 is a floor sample just below Test #1. The sand looks

\*Percentage of Total Sample

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 11

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks		
						% Passing										
						1½"	5/8"	#4	#100	#270						
	3	1967	0-12	Stripped	Yes	100	100	98.4	52.2	7.0 6.9*	1	---	Gran. Borrow (Sand)	good and some silt was noted. Test #3 is in the upper floor of the northeast pit 375' N75°E from Tests #1 and #2. Log of hole: 0-5'-sand; 5'-12'-silt to clay. Test hole bottoms in silt to clay.		
	4	1967	0-3	Stripped	Yes	N	O	T	S	A	M	P	L	E	D	Test #4 is 120' S10°W and 18' below Test #3. Test #4 is in lower pit floor. Log of hole: 0-3'-silt to clay; 3'-?- water and silt to clay. No sample taken.
	5	1958	2-30	0-2	Yes	77.1	57.3	36.7	15.0	7.0	1	10.2%	Gran. Borrow (Grav.)	Tests #5 and #6 taken by F. Callahan. Test #5 sampled from the north face of pit. Test #6 sampled from the south face of the pit.		
	6	1958	2-30	0-2	Yes	88.3	50.8	26.4	28.0	11.5	1	11.0%	---			
11	1a	1967	2-12	0-2	Yes	75.3	65.9	47.3	10.0	5.5	1	18.2%	Gran. Borrow (Grav.)	Owner: Warren Chace. Area is pasture with pit at north end. Pit is 0.05 mile west of Town Highway No. 22 and 0.35 mile north of Town Highway No. 17. Pasture is 275' x 350' and irregularly shaped. Test #1a is the top south face of the pit. Log of hole: 0-2'-overburden; 2'-12'-fine gravel.		
	1b	1967	21-30	0-2	Yes	100	100	53.8	1.6	1.0 0.5*	1	---	Gran. Borrow (Sand)	Test #1b taken below Test #1a. There was sloughed material from 12'-21' and could not be reached. From 21'-30' was pebbly sand and at 30' is the pit floor.		

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 13

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
														southwest direction from the pit. The field south of the pit does not offer much hope for good material. However, there may be a northward extension limited by buildings.
12	1	1967	1-12.5	0-1	No	100	100	100	69.0	26.0	1	---	---	Owner: Warren Chace. Area is pasture west of Town Highway No. 22, just south of Map Identification No. 11 and 0.15 mile north of Town Highway No. 17. This field seems to be the southward extension of Map Ident. No. 11. However, tests only showed a very fine material. Area is 200' x 250' and has several knolls. Test #1 is 100' from west fence line and 30' from north fence. Test is at highest knoll of field. There is fine silty sand from 1'-12.5'.
	2	1967	1-13.5	0-1	No	100	100	100	56.0	20.0	1	---	---	Test #2 is in the lowest part of the field 125' S25°E from Test #1. Log of hole: 0-10' - silty sand; 10'-13.5' - fine sand. Material gets coarser at the bottom. The area may have good material, but if so, it would only be found somewhere below 13.5'.
13	1	1967	1-8	0-1	No	93.5	82.3	66.6	9.0	4.5	1	12.8%	Gran. Borrow (Grav.)	Owner: Sammy Greenberg. Area is small esker-like feature composed of two small knolls end-to-end. They are bounded on the east by a marsh.

\*Percentage of Total Sample



TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 14

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				
	2	1967	1-12.5	0-1	No	85.4	76.6	69.0	37.0	13.0	1	---	---	and on the west by a marsh and a stream. Overall size is 440' by 110' by 18' high. The area is 0.05 mile north of Town Highway No. 17. Test #1 is 50' north of north face of a small pit at the south end of the feature, and is at the top of a small knoll. Log of hole: 1'-4'-gravel; 4'-5'-fine sand; 5'-8'-fine sandy gravel. Beds dip steeply to the east. Test #2 is 275' north of Test #1, and is on a high point of the northernmost of two knolls. Material is poorly sorted stony sand and fine sand. Log of hole: 1'-8'-sandy fine gravel; 8'-15.2'-silty, fine sand. Hole bottoms in boulders and is slightly moist.
14	1	1967	2.5-9	0-2.5	No	60.2	47.2	30.7	11.0	8.0	1	15.6%	Gran. Borrow (Grav.)	Owner: Sammy Greenberg. Area is a small level field about 250' by 450', and is just north of Town Highway No. 17 and just east of Dufresne Stream. Mowed part of the field is 2 acres which belong to Mr. Roth. Test #1 is on the west edge of the field. There is gravel from 2.5'-9'.
	2	1967	1-12	0-1	No	81.2	62.1	45.1	38.0	14.8	1	17.4%	---	Test #2 is 17' S12°W from the eastern of two dead trees and is in the northeast corner of the field(unmowed section).

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 15

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1 1/2"	5/8"	#4	#100	#270				
														Log of hole: 1'-6'-fine sand and stones; 6'-12'-gravel. The hole bottoms in gravel. A Few +6" cobbles were present. This area is very close to the approximate location of the proposed Arterial Highway. Extension may occur to the northeast and east up some other knolls.
15	1	1967	1-12	0-1	Yes	51.3	36.1	31.0	40.0	16.8	1	19.0%	---	Owner: Orrin Beattie. Area is knoll with a pit on the south end. This area is east of Dufresne Stream and Town Highway No. 24. The pit is about 400' southeast from the proposed location of the Arterial Highway, and is 15' high and 85' wide. This area was mapped as kame moraine. Test #1 is on the northwest face. Top 4' is a fine gravel and goes to sand with stones. Material is not well-sorted. There were quite a few 4"-6" sub-rounded cobbles. There are more stones below 10'. Further tests should be made due to granular nature of the material, and the close proximity to the proposed location of the Arterial Highway.
16	1	1967	1-9	0-1	Yes	100	87.4	61.3	12.3	7.3 4.5*	1	---	Gran. Borrow (Sand)	Owner: Orrin Beattie. Area is a knoll 550' south of Map Identification No. 15. Pit

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 16

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
														is 150' N20°E of a point 60' N85°W of Power Line Pole No. 37. The approximate location of the proposed Arterial Highway is about 625' northwest of the pit. This pit was mapped as kame moraine. The knoll is above the east side of Dufresne Stream. Further testing is warranted, because the area is close to the approximate location of the proposed Arterial Highway. Most stones were confined to the top layer, below which is a fine sand.
17	1	1967	2-18	0-2	Yes	52.6	49.9	42.9	18.0	7.3	1	14.0%	Gran. Borrow (Grav.)	Owner: Orrin Beattie(Charles Taylor Pit). Area is an open pit on the southwest end of a knoll which extends northeasterly and was mapped as kame moraine. The pit is 100' x 125' x 50' high, but a knoll extends 300' to the northeast. The pit is 0.75 mile north from the junction of Town Highway No. 24 and Vermont Route 11. Test #1 was taken from the southeast face of the top 18' of the pit. There are interbedded sands, silts, and cobbles from 2'-18'.
	2	1967	22-30	0-2	Yes	79.3	52.5	39.0	50.0	20.0	1	9.4%	---	Test #2 is taken from the southeast face of the pit below Test #1. Material from 18'-22'

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 17

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	3	1967	1-10	0-1	Yes	64.2	56.0	43.2	15.0	5.8	1	13.7%	Gran. Borrow (Grav.)	was sloughed. The material in Test #2 was a silty, cobbly gravel. Looks like there were too many fines. Test #3 is in the pit floor 30' west from Test #2. Barely fails for Sub-base of Gravel, Item 201. Log of hole: 1'-6'-sandy, cobbly gravel; 6'-10'-silt.
	4	1967	2-12	0-2	Yes	91.2	82.5	78.2	16.4	6.0 4.7*	1	---	Gran. Borrow (Sand)	Test #4 is on the west(lower) face of the pit. The test was taken southwest of the silty face in the pit. It is 135' S10°E from the fence post at the gate. Log of hole: 2'-8'-pebbly sand with cobbles; 8'-12'-cobbly sand. There was too much retained on the 1½" sieve. The approximate location of the Arterial Highway runs through the area.
	5	1958	---	---	Yes	84.7	75.8	55.5	13.0	6.75	1	9.2%	Gran. Borrow (Grav.)	Tests #5, #6, and #7 were taken by F. Callahan. Tests #5 and #6 were taken from the west end of the pit. Test #7
	6	1958	---	---	Yes	77.2	51.7	33.9	25.0	12.0	1½	9.8%	---	was taken in the upper level of the pit from the 30' face.
	7	1958	1-30	0-1	Yes	60.2	36.8	24.9	19.0	7.5	1	16.3%	Gran. Borrow (Grav.)	
18	1	1967	0-10	Stripped	Yes	100	100	99.9	16.0	4.0*	1	---	Sand	Owner: Mrs. B. J. Dow. Area is a pit 0.35 mile east from town highway (on pit road-just south of the Manchester Town Dump(pit). Area is 125' by 80', with possible extension

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 18

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
	2	1967	2-12	0-2	Yes	100	98.4	96.8	52.3	16.0 15.5*	1	---	---	to the east and northeast. Workings are on the south and southwest side of the knoll. Test #1 is from the southeast face of the pit. There is fine sand with silt present from 0-10'. Hole bottoms in fine sand. Test #2 is at the base of the face, 60' west of Test #1. Log of hole: 2'-4'-cobblely gravel; 4'-12'-sand. Material is too fine. However, further testing is warranted because the approximate location of the Arterial Highway lines are within 100' of the pit. The pit is being worked by a contractor who has a lease from the owner.
19	1	1967	2-10	0-2	Yes	87.4	72.4	62.0	30.0	9.0	1	19.6%	Gran. Borrow (Grav.)	Owner: Mrs. B. J. Dow. Area is a pit on a knoll with possible extension to the east and northeast. The pit is 0.25 mile north from Vermont Route 11, and 0.25 mile east from Town Highway No. 24. Area is the upper level of a large pit. (The lower level has thick beds of silt and is overgrown). Area is 150' x 75'. Test #1 is on the east face of the pit. There are interbedded sands, cobbles, and silts from 2'-10' Bottoms in sloughed material.

\*Percentage of Total Sample

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 19

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	2	1967	0-10	Stripped	Yes	100	100	100	34.0	11.0*	1	---	---	Test #2 is a face sample 125' N20°W from Test #1. Material is fine sand and is well packed. Bottoms in fine sand down to 10'.
	3	1967	0-8	Stripped	Yes	100	100	100	19.0	5.0*	1	---	Gran. Borrow (Sand)	Test #3 is 30' N45°W from Test #2. There is fine sand down to 8'. Barely fails with too much passing the #100 sieve.
	4	1967	3-11	0-3	Yes	82.0	61.7	37.9	15.0	8.0	1	10.8%	Gran. Borrow (Grav.)	Test #4 is 50' S45°E from Test #3. Log of hole: 0-3'-sand; 3'-11'-sandy, cobbly gravel. Further testing is recommended because the approximate location of the Arterial Highway is near Tests #2, #3, and #4; and Test #1 is 100' southeast of the approximate location of the Arterial Highway. This area is leased by the same contractor as in Map Identification No. 18. (Check with Mrs. Dow.)
20	1	1967	N	O	T	S	A	M	P	L	E	D		Owner: Charles B. Vaughan. (However, new owner may be Mr. Halevi.) Area is a pit 0.40 mile east of Town Highway No. 24 and 0.15 mile north from Vermont Route 11. Pit is overgrown and has sloughed material and boulders. Rather boney digging. Extent seems to be to the northeast with a lesser one to the northwest (towards Mrs. Dow's pits:

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 20

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	2	1967	N	O	T	S	A	M	P	L	E	D	Map Identification No. 19). Tests are 450' to 650' south-east of the approximately location of the Arterial Highway, so further tests should be made. Area is 450' x 135'. Test #1 is north face of the pit. Not sampled. There is pebbly sand from 2'-5'. Hole bottoms in boulders. Test #2 is on the pit floor 20' south of Test #1(boulders). Not sampled.	
	3	1967	2-12	0-2	Yes	94.0	80.3	73.2	19.0	7.3 5.3*	1	---	Gran. Borrow (Sand)	Test #3 is a floor sample at the base of the slope 175' S45°E from Test #2. Log of hole: 0-2'-overburden; 2'-6'-cobbles; 6'-12'-stony sand. Barely fails for Sub-base of Sand, Item 202.
	4	1967	2-14	0-2	Yes	86.3	70.4	55.6	2.0	1.0	1	12.8%	Gravel	Test #4 is the pit floor below the west face, 128' southwest from Test #3. There is sandy gravel from 2'-14'.
	5	1958	2-20	0-2	Yes	82.3	45.5	27.8	36.0	16.25	1	9.4%	---	Tests #5 and #6 taken by Callahan from the 20' face of the
	6	1958	2-20	0-2	Yes	64.0	38.7	20.3	29.0	13.5	1	9.9%	---	pit center.
	7	1961	2-40	0-2	Yes	91.3	70.8	38.5	13.0	5.0	1½	16.4%	Gravel	Tests #7 and #8 taken by Callahan. Test #7 taken on the 40' face of the west side of the
	8	1961	---	0-2	Yes	93.6	73.0	40.6	13.0	5.5	1½	12.8%	Gran. Borrow (Grav.)	Pit. Test #8 taken at the pit center on the north side.
21	1	1967	N	O	T	S	A	M	P	L	E	D	Owner: Wm. H. Morse Const. Co. Inc. Area is large open pit, mostly	

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 21

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
	2	1967	0-5	Stripped	Yes	57.0	45.0	30.5	4.0	1.0	1	---	Gran. Borrow (Grav.)	stripped. Pit faces are 8'-12' high. Area is 0.15 mile south from the junction of Town Highway No. 48 and Vermont Route 11. Many places where material has been dozed and piled up from the floor, have a very high silt content. Pit area appears near exhaustion. Some extension to the east and northeast is possible. Area is about 850' x 400'. Test #1 taken on the pit floor at the southwest (and lowest) part of pit. Log of hole: 0-2'-cobbles; 2'-water. Not sampled. Test #2 is 185' S50°E from Telephone Pole No. (105 16-2) in the floor just west of the east face of the north part of the pit. There is sandy, cobbly gravel from 0-5'. Hole bottoms in silt. There was insufficient proper size stone included for the wear test.
22	1	1967	1-30	0-1	Yes	95.2	75.3	42.1	23.0	11.0	2	15.2%	---	Owner: The Equinox House Inc. Area is a pit in a feature mapped as kame moraine. The pit is located 0.25 mile north of Town Highway No. 29 between the 14th green and the 15th tee. The only possible extension (allowable) would be to the east and northeast. The pit is

\*Percentage of Total Sample



TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 22

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1½"	5/8"	#4	#100	#270				
	2	1967	0-11	Stripped	Yes	73.0	52.4	39.8	35.0	6.3	1	8.8%	Gran. Borrow (Grav.)	100' x 100'. Test #1 is on the south face of the pit. There is sandy cobbly gravel from 1'-30'. Hole bottoms in sloughed material. Test #2 is in the pit floor below Test #1. There was sandy, silty gravel from 0-11'. The area does not look too promising for either the type, or the amount of the material.
23	1	1967	N O T S A N I P L E D											Owner: The Equinox House Inc. The area is a small pit on the north side of Town Highway No. 29. The area was very silty throughout, and was depleted. Did not sample. The area is about 0.18 mile west from the approximate location of the Arterial Highway.
24	1	1967	2-25	0-2	Yes	80.4	60.9	46.0	10.0	4.0	1½	17.0%	Gravel	Owner: The Equinox House Inc. The area is the Airport Pit just off Airport Road, 0.11 mile south of Town Highway No. 29 and east of State Aid Highway No. 6. This area is just east of a very small depleted pit (Amaden Pit). Pit is 250' x 200'. There is possible extension of the feature to the northwest, north and northeast. The pit is in the southern corner of a terrace. Test #1 is the north face near the east end of the pit. There are

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 23

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
	2	1967	N	O	T	S	A	M	P	L	E	D		sandy cobbles from 2'-25' and test hole bottoms in slough. Test #2 taken in pit floor below Test #1. There was water at 2' and did not sample.
25	1	1967	2-10	0-2	Yes	85.9	60.2	23.5	30.0	16.8	1	11.4%	---	Owner: Eugene Bushee. Area is a pit mapped as part of a kame terrace. This pit is 90' east of State Aid Highway No. 6 just north of Town Highway No. 34. The pit is 200' x 150'. There seems to be a rather limited extent of the feature to the northeast and the south. The south extent (south of Beattie's pit) is owned by Riker, who refused to allow testing on his property. The boundary between the Bushee pit and the Beattie pit (to the south), is an east-west line drawn from several dead trees on a ridge rising to the south and southeast of Bushee's pit. Test #1 is 90' east of State Aid Highway No. 6 and is a floor sample at the foot of the east face of the pit. There is well-cemented sandy gravel from 2'-10'. Test hole bottoms in boulders.
26	1	1967	3-26	0-3	Yes	100	91.9	86.6	19.9	3.0 2.6*	1	---	Gran. Borrow (Sand)	Owner: Orrin Beattie. This area is a southward extension of Map Identification No. 25 and is at the southwest

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 24

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
	2	1967	4-12	0-4	Yes	78.2	47.8	20.7	30.0	15.0	1	6.6	---	part of wooded knoll, and is about 100' x 200'. Test #1 is 226' S45°E from the "Sugarhouse Lane" signpost (Town Highway No. 34), and is in the south-east face (and floor) of the pit. The test is 12' above and 14' below the pit floor. There is stony sand from 3'-26'. Test #2 is 92' north of Test #1 and is in the pit floor at the base of a small spur. There is cobbly gravel from 4'-12'. The area is not too promising.
27	1	1967	1.5-6	0-1.5	Yes	100	100	58.7	17.6	17.3 10.2*	1	---	---	Owner: James R. McCooey, Sr. The area is mapped as kame terrace. The feature is a rather small terrace with a pit at the southeast part. The feature is bounded by bedrock on the west and north. The pit seems nearly depleted, and is about 175' x 75'. Strippings are near the edge of the pit. The pit is located in a wooded hillside sloping gently to the southeast. The area is 0.40 mile west on pit road from U. S. Route 7 at a point just south of the Weathervane Motel. Test #1 is the west face at the north end of the pit. Log of hole: ill-sorted silty sand with stones for about 6' on 12'

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 25

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (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				
														face; 0-1.5'-overburden; 1.5'-6'-silty sand with stones. Bottoms in silt to clay. Area does not seem to be too promising for granular materials. Probably shallow covering over bedrock.
28	1	1967	1-8	0-1	Yes	100	94.3	80.6	25.8	17.0 13.7*	1	---	---	Owner: James R. McCooey Sr. Area is a small pit in a feature mapped as kame terrace and is located 500' southwest of Map Identification No. 27. The pit is just south of a northeasterly-trending outcrop of bedrock. The area is 0.30 mile east of U. S. Route 7 on the access road to Map Identification No. 27. There is little or no extension due to ledge. Pebbly silty sands go to silty sand and silt half-way down an 11-foot face. One pebble gravel lens noted. Test #1 taken on the north face of the pit. There is pebbly, silty sand, silty sand or silt and stones from 1'-8'. Bottoms in silt and cobbles. Material does not look good.
29	1	1967	2-12	0-2	Yes	100	100	95.7	38.3	19.0 18.2*	1	---	---	Owner: Ronald Jeancon (Bradley pit). Area is a small, overgrown pit 1 mile south from the junction of State Aid Highway No. 4 and State Aid Highway No. 6 and

\*Percentage of Total Sample

TABLE I

## MANCHESTER GRANULAR DATA SHEET NO. 26

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						% Passing								
						1 1/2"	5/8"	#4	#100	#270				
	2	1959	2-10	0-2	Yes	73.6	46.0	35.0	10.0	3.8	1	9.2%	Gravel	250' west of State Aid Highway No. 4. Area may extend northward along wooded knoll. Pit is rather sloughed, and is 100' x 75'. Vertical height of the face is 35'. Test #1 is in the floor at the base of the north face of the pit, 180' north from State Aid Highway No. 4. Some cobbles are on the pit face above the test, but mostly sandy silt. There is sandy silt from 2'-12'. Hole bottoms in sandy silt. Material in pit does not look too good. Tests #2 and #3 taken by F. Callahan. Test #2 taken on the south side of the pit on the 10' face. Test #3 taken on the north side of the pit on the 10' face.
	3	1959	2-10	0-2	Yes	62.1	43.8	35.4	7.0	3.0	1	9.8%	Gravel	
30	1	1967	1-12	0-1	Yes	87.9	76.3	53.6	10.0	3.5	1	10.2%	Gran. Borrow (Grav.)	

\*Percentage of Total Sample

TABLE I

MANCHESTER GRANULAR DATA SHEET NO. 27

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Overburden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1 1/2"	5/8"	#4	#100	#270				
														Log of hole: 0-1'-overburden; 1'-7'-pebbly sand; 7'-11'-sandy gravel; 11'-12' stony fine sand. Hole bottoms in stony fine sand. Test barely fails on excess passing the #270 sieve. A few 4"-7" cobbles were noted. Area warrants further testing.

\*Percentage of Total Sample

TABLE I  
Supplement

MANCHESTER PROPERTY OWNERS - GRANULAR	Map Ident. No.
Beattie, Orrin	15, 16, 17, 26
Bushee, Eugene	25
Chace, Warren	11, 12
Dailey, William E., Inc.	7
Dow, B. J. (Mrs.)	18, 19
Dupree Brothers	2
Equinox House, The	22, 23, 24
Forrest, Edward J., Jr.	6
Glover and Hayes Gravel Co.	8
Greenberg, Sammy	10, 13, 14
Jeancon, Ronald	29
Jobson, E. R.	9
McCooey, James R., Sr.	27, 28
Morse, William H. Const. Co., Inc.	21
Overton, Carlton B.	1
Richardson, Alice (Mrs.)	5
Squires, Edward	3
Vaughan, Charles B.	20
West, Cora (Mrs.)	4
Wilcox Dairy	30

TABLE II

## MANCHESTER ROCK DATA SHEET NO. 1

Map Ident. No.	Field Test No.	Year Field Tested	Rock Type	Exist-ing Quarry	Method of Sampling	Abrasion AASHO T-3	Remarks
1	1	1967	Marble	Yes	Chip	5.8%	<p>Owner: Wilcox Dairy.</p> <p>A very small quarry located about 150' southwest from a barn on rental property, south of the end of Town Highway No. 36. This quarry is water-filled and has several large blocks near it. The size of the hole is 75' x 50'. Test #1 was taken from the north face of the hole. Some of the marble was gray to white and rather sugary textured. There is also a marble breccia, which is a mixture of red, pink, white, and very light buff. This rock is mapped by Dr. Doll as the Shelburne Marble. Overall, the rock seems to be fairly hard, and has an angular to hackly fracture. Some closely folded and highly fractured beds were noted. A positive acid test indicates a high carbonate content. The only extent would be to the west and the northwest along the trend of the hill. There is a small prospect to the northwest across a partly wooded field about a quarter of a mile from Test #1. Unable to test, but the rock looked like it would pass for Sub-base of Crushed Rock, Item 204. Further tests should be taken to determine the amount of rock available. This rock is noted by Philip C. Hewett, writing in the Vermont Geologic Survey Bulletin No. 18, as the Dyer Quarry Breccia, and the area may be known locally as the Dyer Quarry.</p>



TABLE II  
Supplement

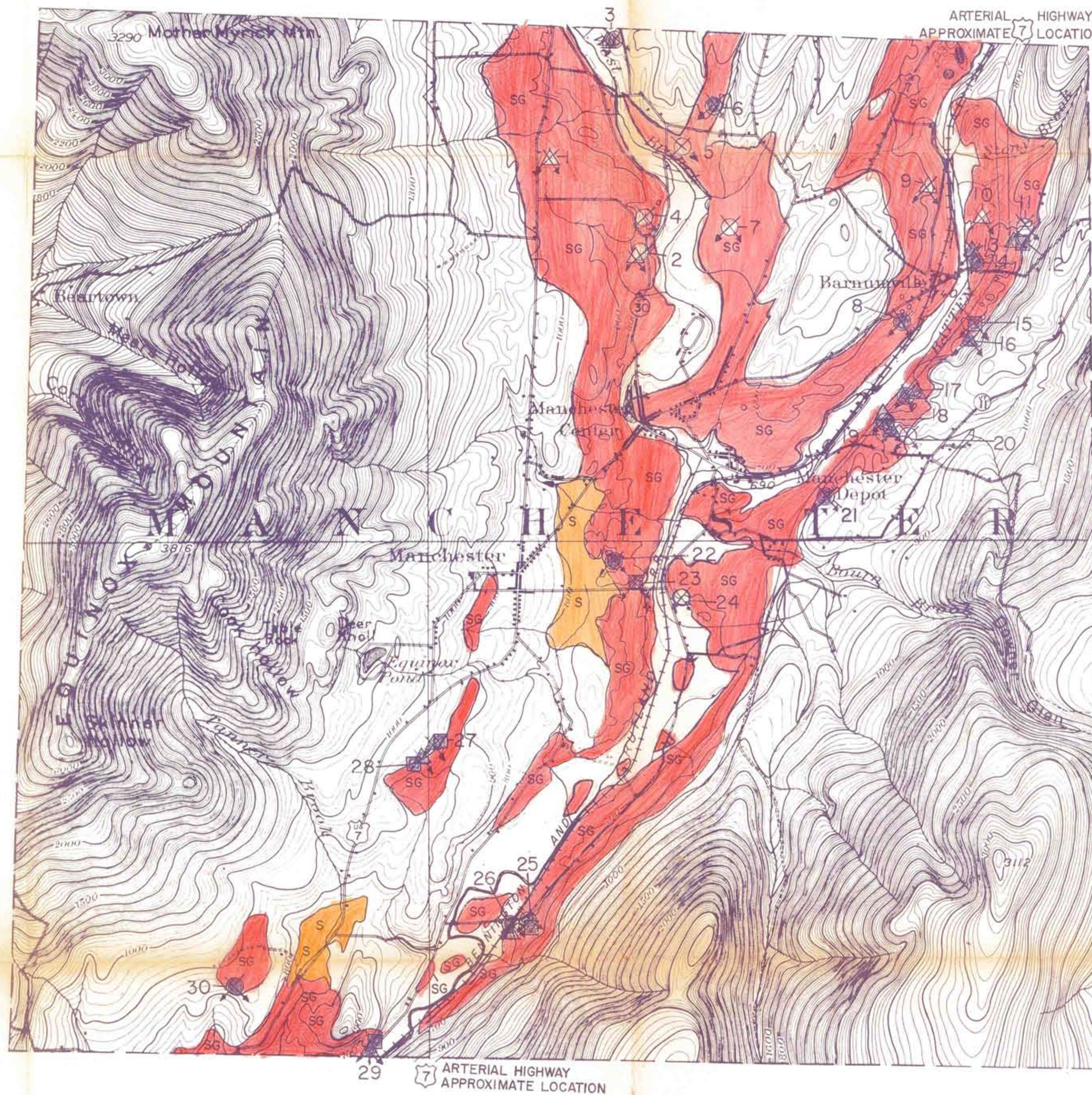
MANCHESTER PROPERTY OWNERS - ROCK

Map Ident. No.

Wilcox Dairy

1

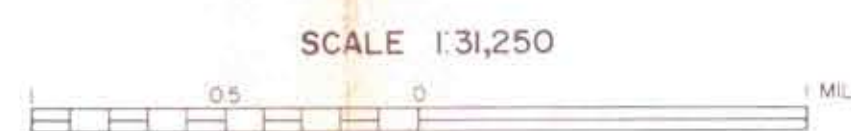




LEGEND

- GRAVEL, ACCEPTABLE FOR ITEM 201 (sub-base of gravel)
- GRAVEL, DEPLETED OR NOT ACCEPTABLE FOR ITEM 201
- △ SAND, ACCEPTABLE FOR ITEM 202 (sub-base of sand)
- ▲ SAND, DEPLETED OR NOT ACCEPTABLE FOR ITEM 202
- GRANULAR BORROW, ITEM 105
- MATERIAL NOT ACCEPTABLE FOR ITEM 105
- ✕ EXISTING PIT
- SG SAND & GRAVEL DEPOSIT
- S SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

MANCHESTER



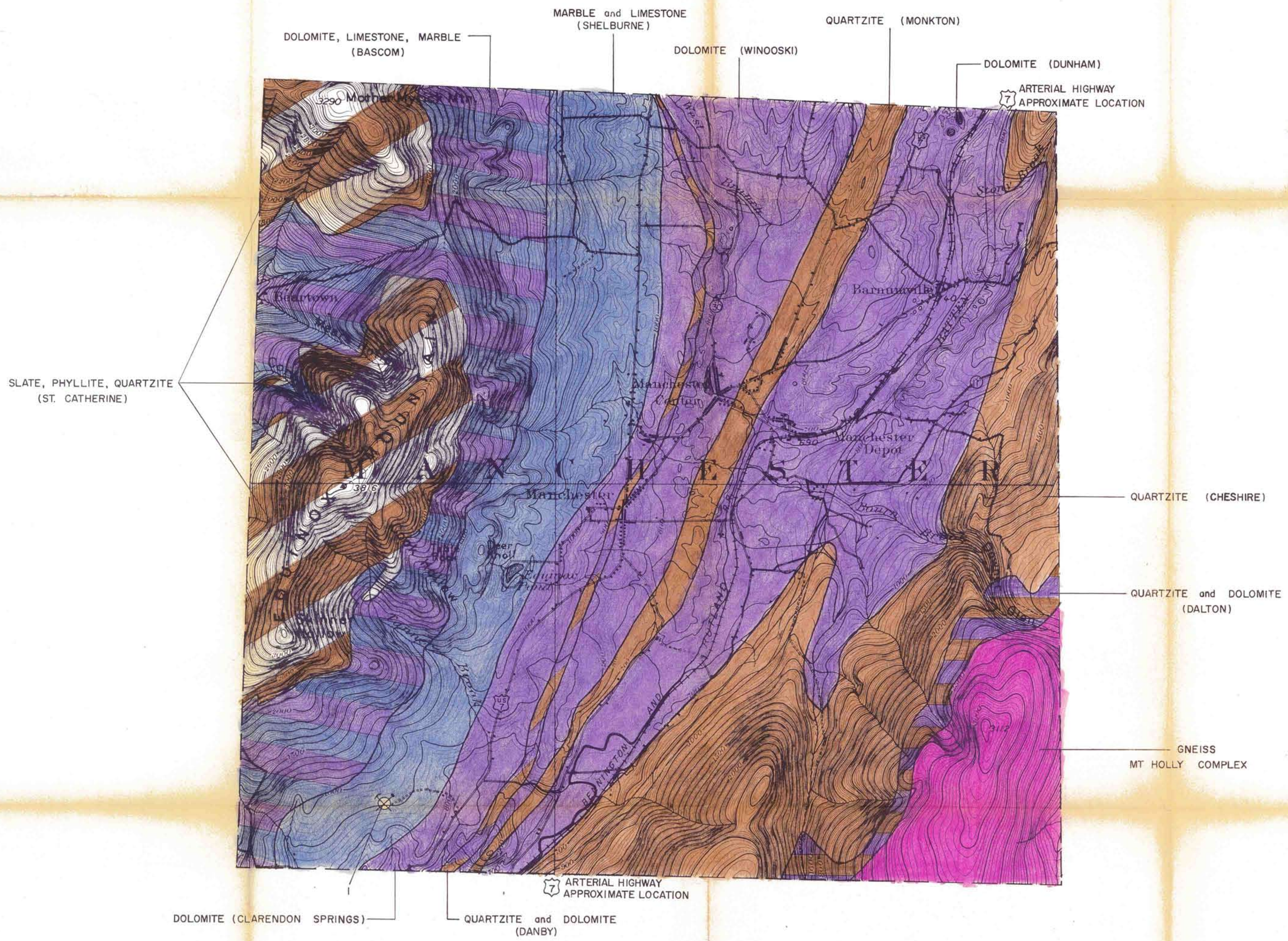
CONTOUR INTERVAL 20 FEET

1968

GRANULAR  
 MATERIALS MAP  
 BY  
 VERMONT DEPARTMENT OF HIGHWAYS  
 IN COOPERATION WITH  
 U.S. BUREAU OF PUBLIC ROADS

NOTE: BASED ON U.S.G.S. TOPOGRAPHIC MAPS

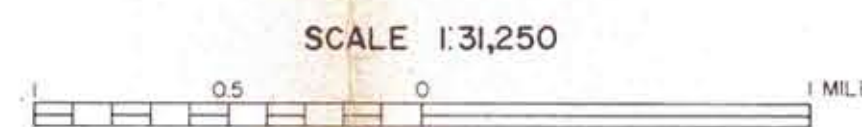




LEGEND

- ROCK, ACCEPTABLE FOR ITEM 204 (sub-base of crushed rock)
- ROCK, NOT ACCEPTABLE FOR ITEM 204
- ⊗ EXISTING QUARRY
- Orange box GRANITE TO DIORITE (light to intermediate igneous rocks)
- Green box AMPHIBOLITE, GABBRO, DIABASE, METADIABASE, GREENSTONE, TRAP DIKES (basic or dark igneous rocks)
- Red box PERIDOTITE, PYROXENITE, SERPENTINITE (ultra-basic igneous rocks)
- Purple box GNEISS
- Blue box QUARTZITE
- Brown box DOLOMITE
- Dark brown box MARBLE, LIMESTONE
- White box with black outline SCHISTS, SLATES, PHYLLITES, SHALES, CONGLOMERATES
- 3 IDENTIFICATION NUMBER (refer to data sheets)

MANCHESTER



CONTOUR INTERVAL 20 FEET

1968

ROCK  
MATERIALS MAP  
BY  
VERMONT DEPARTMENT OF HIGHWAYS  
IN COOPERATION WITH  
U.S. BUREAU OF PUBLIC ROADS

NOTE: BASED ON U.S.G.S. TOPOGRAPHIC MAPS

DATE					
BY					