SURVEY OF HIGHWAY CONSTRUCTION MATERIALS

IN THE TOWN OF GRANVILLE, ADDISON COUNTY, VERMONT

Prepared by

State of Vermont

Agency of Transportation

Materials Division

Engineering Geology Subdivision

Montpelier, Vermont

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Acknowledgments

This project acknowledges the surficial geological information obtained from Professor D. P. Stewart of Miami University, Oxford, Ohio and the bedrock information from the Centennial Geological Map of Vermont, C. G. Doll.

History

The Materials Survey Project was initiated in 1957 by the Vermont Department of Highways with the assistance of the Bureau of Public Roads to compile an inventory of highway construction materials in the State of Vermont. Previously, investigations for highway construction materials were conducted only as the immediate situation required and only limited areas were surveyed; thus, no overall picture of material resources was available. Highway contractors or resident engineers were required to locate the materials for their respective projects and the samples were tested by the Materials Division. The additional expense of exploration for construction materials resulted in higher construction costs being paid by the State. The Materials Survey Project was formed to minimize this factor by enabling the State and the contractors to use available information on material resources and to project cost estimates. Knowledge of locations of suitable materials is an important factor in planning 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 furnish information of particular use to contractors and construction personnel, and should be studied together for maximum benefit.

Enclosures

Included in this report are two surface-geology maps, one defining the location of tests on bedrock, the other defining the location of tests on

granular materials. These maps are based on 15-minute or 7-1/2-minute quadrangles of the United States Geological Survey enlarged or reduced to 1:31250 or 1" = 2604'. The various rock formations and types are delineated on the Bedrock Map of the township. This information is obtained from: Vermont Geological Survey Bulletins, Vermont State Geologist Reports, United States Geological Survey Bedrock Maps, Centennial Geological Map of Vermont, the Surficial Geologic Map of Vermont and other references.

The granular materials map shows areas of various types of glacial deposits (outwash, moraines, kames, kame terraces, eskers, etc.) which are potential sources of gravel and sand. This information was obtained primarily from a survey conducted by Professor D. P. Stewart of Miami University, Oxford, Ohio, who mapped the glacial features of the State of Vermont during the summer months from 1956 to 1966. Further information is obtained from the Soil Survey (Reconnaissance) of Vermont (conducted by the Bureau of Chemistry and Soils of the United States Department of Agriculture), available Soil Surveys of individual counties (by the Soil Conservation Service of the United States Department of Agriculture), Vermont Geological Survey Bulletins, United States Geological Survey Quadrangles, aerial photographs and other sources. The location of each test area is represented by a Map Identification Number.

This report contains data sheets with detailed information on each test taken in the Granular and Bedrock areas. Data is also used from an active card file compiled by the Materials Division over a period of years. Some cards are not used because they are incomplete or have unusable information on the location of the deposit.

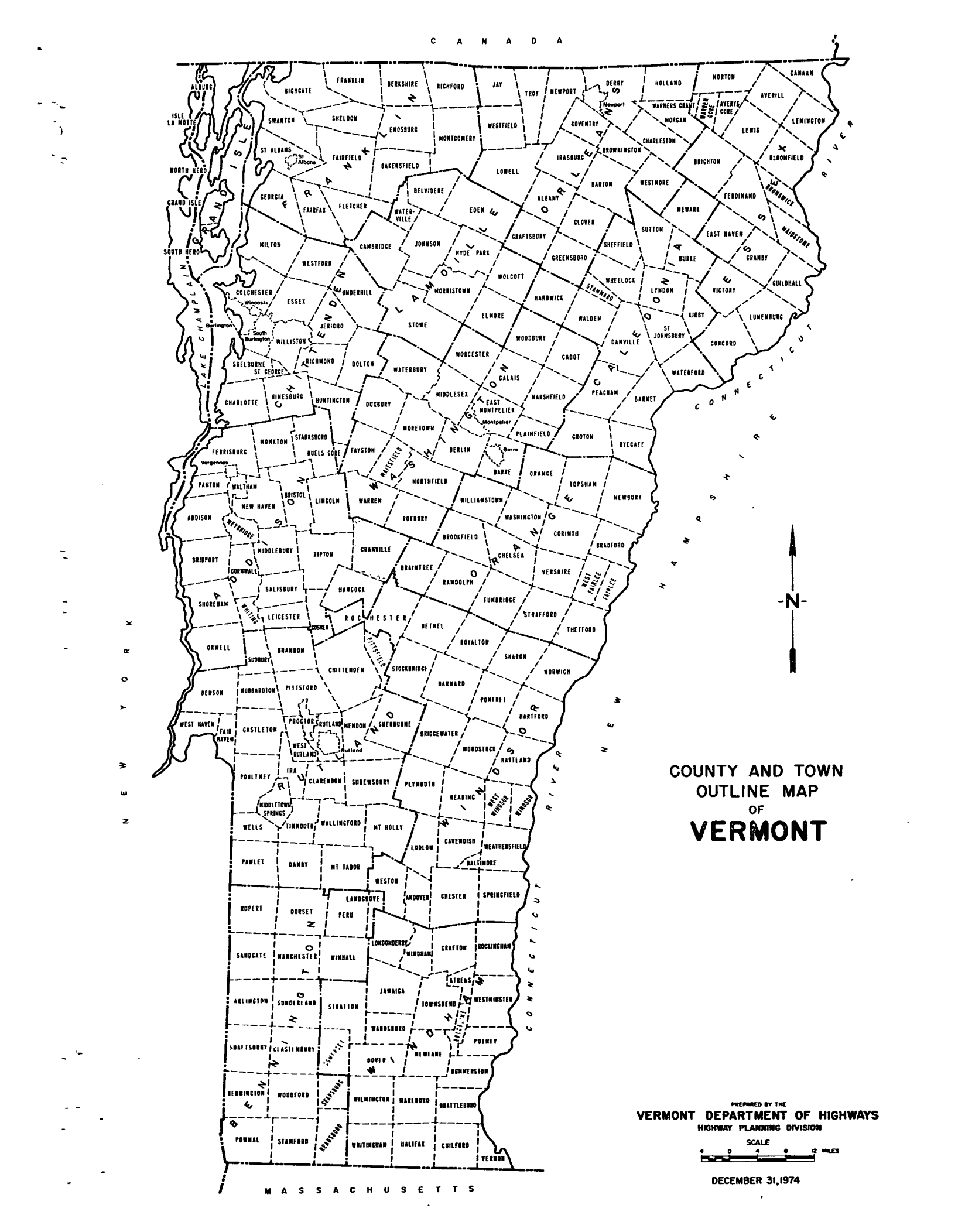
Work sheets containing more detailed information and a field sketch of the area, and laboratory test results are on file in the Materials Division of the Agency of Transportation, State of Vermont.

LOCATION

The town of Granville is in easternmost Addison County in central Vermont. It is bounded on the north by Warren and Roxbury, on the east by Braintree and Rochester, on the south by Hancock, and on the west by Lincoln and Ripton. (See County and Town Outline Map of Vermont on the following page.)

The western half of the town is in the Green Mountain subdivision and the eastern half is in the Vermont Piedmont subdivision of the New England Upland physiographic region. Topography of the Green Mountains is characterized by steep-sided hills and mountains whereas the Vermont Piedmont has been described as a stream-dissected plateau with undulating to rough topography. Elevations range from 3,500 feet at the summit of Mount Cleveland in the northwest corner of town to less than 840 feet where the White River crosses the Hancock town line.

Major drainage is southward via the White River, its Third Branch, and other principal tributaries including: Alder Meadow, Batchelder, Backett, Deer Hollow, East Granville, Kendall, Patterson and Thatcher Brooks. Minor drainage is northward via Austin and Stetson Brooks into the Winooski River basin.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

PREPARED BY THE
VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

DECEMBER 31, 1974

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

The method 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 during the winter months and comprises the mapping and description of rock types perused from many reference sources, as acknowledged in the bibliography. These references differ considerably in dependability due to subsequent developments and studies that have contributed to the obsolescence of a number of reports. The results of samples taken by other individuals are analyzed, and their location is mapped when possible. As complete a correlation as possible is made of the available geological information concerning the area under consideration.

The field investigation is begun by making a cursory survey of the entire town. The information obtained from the preliminary survey, and that from the office investigation, is used to determine where sampling will be concentrated. When a promising source has been determined by rock type, volume of material, accessibility, adequate exposure and relief, chip samples are taken with a hammer across the strike or trend of the rock, and are submitted to the Materials Division for abrasion testing by the Deval Method (AASHTO T-3) and the Los Angeles Method (AASHTO T-96). Samples taken by the chip method are often within the weathered zone of the outcrop and thus may give a less satisfactory test result than fresh material from unweathered rock. When the rock is uniform, and the chip samples yield acceptable abrasion test results, the material source is listed in this report as being satisfactory.

Discussion of Rock and Rock Sources

The information on the Rock Materials Map (Plate II) is simplified. For a more detailed description of the respective rock formations see the Summary of Rock Formations included in this report.

Occasionally, rocks belonging to the same formation exhibiting similar characteristics (i.e., color and texture) produce different abrasion test results owing to differing physical properties or chemical compositions. Therefore, in no case should satisfactory test results obtained in one area be construed to mean that the same formation, even in the same area, will not later produce unsatisfactory material; this is particularly true of metamorphic rocks.

Complex metamorphic rocks comprise almost all of the bedrock lithology in Granville. From west to east the four major north-south trending formations are the Hazen's Notch chlorite schist, the Pinney Hollow quartzose schist (Rock Map Identification Nos. 1 and 2), Ottauquechee interbedded phyllite and quartzite (Rock Map Identification No. 3), and the Stowe phyllite and schist.

Rock Map Identification No. 1 was the only area having rock good enough to be considered as a source. Material at Rock Map Identification No. 2 barely passed the requirements for Item 704.06, and that of Rock Map Identification No. 3 failed. See Granville Rock Data sheets for particulars.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

The method used for conducting the 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 during the winter months and comprises the mapping of potentially productive areas from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart is particularly helpful when used with 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. The locations of existing pits are mapped, as are the locations in which samples were taken by other individuals.

The field investigation is begun by making a cursory survey of the entire town. All pits, and any areas that show evidence of glacial or fluvial deposition are noted, and later investigated by obtaining samples from pit faces and other exposed surfaces. Test holes in pit floors and extensions are later dug with a backhoe to a depth of approximately 11 feet to obtain material which is submitted to the Materials Division for gradation sieve analysis and AASHTO T-4 Method stone abrasion test.

Discussion of Sand and Gravel Deposits

Areas with the best potential for granular materials in the town of Granville occupy the valleys of the White River and its Third Branch. The Third Branch valley was probably the site of a post-glacial spillway. There is evidence that the White River valley south of Lower Granville village may also have been a spillway. According to Stewart and MacClintock, the White Rivery valley may have kame terraces north of the junction of Town Highway No. 7 with Vermont Route 100 and in the vicinity of Lower Granville village.

The kame terrace near Town Highway No. 7 is within the Granville Reservation, a natural wild area that has been placed in land trust to prevent exploitation. No property owner in the valleys south of Lower Granville allowed back hoe testing in their hay and corn fields, except at Map Identification No. 4, which is owned by the U. S. Forest Service.

Good gravel underlies a thick layer of silt-clay in the Third Branch valley (See Map Identification No. 1). Three pits were sampled in side valleys away from the major valleys. Map Identification No. 1 is a gravel pit adjacent to State Aid Highway No. 4 (West Hill road) which had formerly been used by the town. Pits at Map Identification Nos. 2 and 3 were recently opened for materials to upgrade Town Highway No. 17.

Only the material tested at Map Identification No. 4 meets the requirements for Item 704.05. However, additional testing is needed to determine the limits of this deposit.

Summary of Rock Formations in the Town of Granville

Hazens Notch Formation: Interbedded carbonaceous and non-carbonaceous quartz--sericite-albite- chlorite schist; grades to quartzite and gneiss.

Hazens Notch Formation: Chiefly albite-actinolite-chlorite-epidote greenstone; locally hornblende-epidote-chlorite amphibolite.

Mount Abraham Schist member of the Underhill Formation: Light gray sericite (muscovite-paragonite)-quartz-chloritoid rock with silvery sheen; prophyroblasts of magnetite are common and porphyroblasts of chlorite, chloritoid, garnet, and kyanite occur locally.

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 includes light green quartz-sericite-chlorite phyllite or schist and sericitic quartzite.

Pinney Hollow Formation: Pale green quartz-sericite (muscovite-paragonitic)-chlorite phyllite and schist with abundant magnetite, chloritoid phyllite and schist, quartz-sericite-albite-chlorite schist and rare beds of carbonaceous and schistose quartzite.

Pinney Hollow Formation: Greenstone and actinolitic greenstone.

Pinney Hollow Formation: Carbonaceous phyllite and schist.

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.

Stowe Formation Greenstone and Amphibolite: Epidote-albite-chlorite rocks contain actinolite and honrblende where more metamorphosed.

GLOSSARY OF SELECTED GEOLOGIC TERMS

Actinolite: A variety of amphibole, occurring in greenish bladed crystals or in masses.

Albite: The sodium end member of the plagioclase feldspar group, light-colored and found in alkali rocks.

Amphibolite: A metamorphic rock, the distinguishing characters of which are that they consist partly or largely of amphibole (i.e. tremolite, actinolite, hornblende or arfvedsonite), and that they possess a more or less pronounced schistose structure. Color varies from green to black.

Bedrock: The more or less solid, undisturbed rock in place either at the surface or beneath superficial deposits of gravel, sand, or soil.

Carbonaceous: Containing carbon.

Chlorite: A general designation for a group of green hydrous silicates of magnesium and iron, with or without aluminum.

Chloritoid: A brittle member of the mica mineral group.

Dissected: Cut by erosion into hills and valleys or into flat interstream areas and valleys.

Drainage: The manner in which the water of an area passes off by surface streams and rivers, or by subsurface channels.

Epidote: A mineral, calcium aluminum iron silicate that usually occurs in rocks as formless grains and masses. The color is usually some shade of green, pistachio-green or yellowish-green being the most characteristic.

Garnet: A brittle, more or less transparent, usually red silicate mineral that has a vitreous luster, occurs mainly in crystals but also massive and in grains and is common in gneiss and mica schist.

Gneiss: A term originally applied to a more or less banded metamorphic rock with the mineral composition of granite. As now employed it designates a foliated metamorphic rock with no specific composition implied, but having layers that are mineralogically unlike and consisting of interlocking mineral particles that are mostly large enough to be visible to the eye. Usually gneiss displays an alternation of granular minerals and tabular or schistose minerals with the rock tending to split along the planes where tabular or schistose minerals predominate.

Greenstone: A field name for rocks that have been so metamorphosed or otherwise so altered that they have assumed a distinctive color owing to chlorite, epidote, or actinolite.

Hornblende: A common member of the amphibole group of minerals. The color is usually black, dark-green or brown. The hardness is 5 to 6 and the specific gravity about 3.0. The mineral commonly occurs in prismatic masses and is found in both igneous and metamorphic rocks.

Interbedded: Occurring between beds or lying adjacent and parallel to other beds usually of a different nature.

Intermittent Stream: A stream that is dry for more than three months per year.

Kame Terrace: An accumulation of stratified drift laid down chiefly by streams between a glacier and an adjacent valley wall.

Kyanite: An aluminum silicate mineral occurring usually in blue, thin-bladed crystals or crystalline aggregates.

Ledge: A shelf-like ridge or projection of rock, usually horizontal and much longer than high.

Lithology: The study of stones or rocks.

Magnetite: Iron ferrate Fe_3O_4, is a very common and widely distributed accessory mineral in rocks of all classes. It is distinguished chiefly by its strong magnetism, black color and streak, and 5.5-6.5 hardness. Its specific gravity is 5.16 to 5.18, and its luster, metallic.

Metamorphic Rocks: Rocks that owe their distinctive characteristics to the transformation of pre-existing rocks, either through intense heat or pressure or both.

Muscovite: An important member of the mica group of minerals, known also as white mica, potash mica, or isinglass.

Outcrop: A part of a body of rock that appears, bare and exposed, at the surface of the ground. In a general sense the term applies also to areas where the rock formation occurs next beneath the soil, even though it is not exposed.

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.

Piedmont: An area lying at the foot of mountains.

Porphyroblasts: Large crystals which have grown in place within the fine-grained groundmass of a metamorphic rock. They have been formed by heat, pressure and infiltrating solutions that occurred later than the rocks in which they form.

Post-glacial: After a given glacial epoch, especially the Pleistocene.

Quartz: Anhydrous crystalline silica, SiO_2. Quartz is the most common of minerals. It has a hardness of 7, specific gravity of 2.65, is colorless, white or vari-colored depending on impurities; its fracture is conchoidal and it crystallizes in the hexagonal system.

Quartzite: A firm, compact rock composed of grains of quartz so firmly united that fracture takes place across the grains instead of around them. A metamorphosed sandstone.

Schist: A crystalline rock with a secondary foliation or lamination based on parallelism of platy or needle-like grains. The name refers to the tendency to split along the foliation.

Schistosity: The property of a foliated rock by which it can be split into thin layers or flakes. The property of splitting may be due to alternating layers of differing mineral composition or to preferred orientation and parallelism of cleavage planes of the mineral.

Segregation: In the strict sense a "segregation" is a concentration of one or more minerals that have formed together during the crystallization of a molten rock. The term is often loosely used to designate magnetic deposits as contrasted with those formed by solutions or other means.

Sericite: A mineral very similar to, if not identical with, muscovite mica. It occurs in small flakes and scales in metamorphic rocks such as sericite schists and sericite gneisses.

Spillway Gravel: Outwash gravel deposited in a valley that was a spillway for a melting glacier.

Strike: The direction of a line formed by the intersection of a stratum with a horizontal plane.

Vein: A fissure in a rock filled by mineral matter. The mineral mass has well defined length, width, and depth and is clearly distinguishable in content and structure from the enclosing rock.

Water Table: The upper limit of the portion of the ground wholly saturated with water.

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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, March, 1976.

DIVISION 700 - MATERIALS

703.03 SAND BORROW AND CUSHION. Sand borrow shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the requirements of the following table:

TABLE 703.03A - SAND BORROW AND CUSHION

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE	SAND PORTION
2"	100	
1½"	90-100	
½"	70-100	
No. 4	60-100	100
No. 100		0- 30
No. 200		0- 12

703.05 GRANULAR BORROW. Granular borrow shall be obtained from approved sources, consisting of satisfactorily graded, free draining, hard, durable stone and coarse sand reasonably free from loam, silt, clay, or organic material.

The Granular Borrow shall meet the requirements of the following table:

TABLE 703.05A - GRANULAR BORROW

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE	SAND PORTION
No. 4	20-100	100
No. 200		0- 15

The maximum size stone particles of the Granular Borrow shall not exceed 2/3 of the thickness of the layer being spread.

704.05 GRAVEL FOR SUB-BASE. Gravel for Sub-base shall consist of material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the following requirements:

(a) Grading. The gravel shall meet the requirements of the following table:

TABLE 704.05A - GRAVEL FOR SUB-BASE

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE	SAND PORTION
No. 4	20-60	100
No. 100		0- 18
No. 200		0- 8

The stone portion of the gravel shall be uniformly graded from coarse to fine, and the maximum size stone particles shall not exceed 2/3 the thickness of the layer being placed.

(b) Percent of Wear. The percent of wear of the gravel shall be not more than 25 when tested in accordance with AASHTO T-4, or more than 40 when tested in accordance with AASHTO T-96.

704.06 CRUSHED STONE FOR SUB-BASE. Crushed stone for sub-base shall consist of clean, hard, crushed stone, uniformly graded, reasonably free from dirt, deleterious material, pieces which are structurally weak and shall meet the following requirements:

(a) Source. This material shall be obtained from approved sources and the area from which this material is obtained shall be stripped and cleaned before blasting.

(b) Grading. This material shall meet the requirements of the following table:

TABLE 704.06A - CRUSHED STONE FOR SUB-BASE

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE
4½"	100
4"	90-100
1½"	25- 50
No. 4	0- 15

(c) Percent of Wear. The percent of wear of the parent rock shall be not more than 8 when tested in accordance with AASHTO T-3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHTO T-96.

(d) Thin and Elongated Pieces. Not more than 30 percent, by weight, of thin and elongated pieces will be permitted.

Thin and elongated pieces will be determined on the material coarser than the No. 4 sieve.

(e) Filler. The filler shall be obtained from approved sources and shall meet the requirements as set up for Sand Cushion, Subsection 703.03.

(f) Leveling Material. The leveling material shall be obtained from approved sources and may be either crushed gravel or stone screening produced by the crushing process. The material shall consist of hard durable particles, reasonably free from silt, loam, clay or organic matter.

This material shall meet the requirements of the following table:

TABLE 704.06B - LEVELING MATERIAL

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE
3/4"	100
1/2"	70-100
No. 4	50- 90
No. 100	0- 20
No. 200	0- 10

704.07 CRUSHED GRAVEL FOR SUB-BASE. Crushed gravel for sub-base shall consist of material reasonably free from silt, loam, clay or organic matter. It shall be obtained from approved sources and shall meet the following requirements:

(a) Grading. The crushed gravel shall be uniformly graded from coarse to fine and shall meet the requirements of the following table:

TABLE 704.07A - CRUSHED GRAVEL FOR SUB-BASE

GRADING	Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE	SAND PORTION
COARSE	4"	100	
	No. 4	25- 50	100
	No. 100		0- 20
	No. 200		0- 12
FINE	2"	100	
	1½"	90-100	
	No. 4	30- 60	100
	No. 100		0- 20
	No. 200		0- 12

(b) Percent of Wear. The percent of wear of the parent gravel shall be not more than 20 when tested in accordance with AASHTO T-4, or the crushed gravel a percent of wear of not more than 35 when tested in accordance with AASHTO T-96.

(c) Fractured Faces. At least 30 percent, by weight, of the stone content shall have at least one fractured face.

Fractured faces will be determined on the material coarser than the No. 4 sieve.

704.09 DENSE GRADED CRUSHED STONE FOR SUB-BASE. Dense graded crushed stone for sub-base shall consist of clean, hard, crushed stone, uniformly graded, reasonably free from dirt, deleterious material and pieces which are structurally weak, and shall meet the following requirements:

(a) Source. This material shall be obtained from approved sources and the area from which this material is obtained shall be stripped and cleaned before blasting.

(b) Grading. This material shall meet the requirements of the following table:

TABLE 704.09A - DENSE GRADED CRUSHED STONE FOR SUB-BASE

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE
3½"	100
3"	90-100
2"	75-100
1"	50- 80
½"	30- 60
No. 4	15- 40
No. 200	0- 10

(c) Percent of Wear. The percent of wear of the parent rock shall be not more than 8 when tested in accordance with AASHTO T-3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHTO T-96.

(d) Thin and Elongated Pieces. Not more than 30 percent, by weight, of thin or elongated pieces will be permitted.

Thin and elongated pieces will be determined on the material coarser than the No. 4 sieve.

704.10 GRAVEL BACKFILL FOR SLOPE STABILIZATION. Gravel backfill for slope stabilization shall be obtained from approved sources, consisting of satisfactorily graded, free draining, hard, durable stone and coarse sand reasonably free from loam,

silt, clay, and organic material.

The gravel backfill shall meet the requirements of the following table:

TABLE 704.10A - GRAVEL BACKFILL FOR SLOPE STABILIZATION

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE	SAND PORTION
No. 4	20-50	100
No. 100		0- 20
No. 200		0- 10

The stone portion of the gravel backfill shall be uniformly graded from coarse to fine, and the maximum size stone particles shall not exceed 2/3 the thickness of the layer being placed.

704.11 GRANULAR BACKFILL FOR STRUCTURES. Granular backfill for structures shall be obtained from approved sources, consisting of satisfactorily graded, free draining granular material reasonably free from loam, silt, clay, and organic material.

The granular backfill shall meet the requirements of the following table:

TABLE 704.11A - GRANULAR BACKFILL FOR STRUCTURES

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves TOTAL SAMPLE	SAND PORTION
3"	100	
2½"	90-100	
No. 4	50-100	100
No. 100		0- 18
No. 200		0- 8

TABLE I

GRANVILLE 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 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
1	1	1977	15-22	0-15	Yes	93	59	35	25	59	41	50.7%	----	Owners: H. Pierce and J. Tobey. Area is an inactive gravel pit north of Town Highway No. 4 0.53 mile west of Vermont Route 100. Pit was over-grown with small birches and there wa a stockpile of crushed gravel on the floor. The upper 15 feet of the face was buried in sloughings and the back hoe could only reach seven feet high. Test No. 1 was in lower north face of pit. Material is: 0-15" (not sample 15'-22', dusty gravel with silt-clay. Less than two percent of the stones were coarser than 4" and not included in sample.
2	1-A	1977	3-9	0-3	Yes	67	60	43	27	18	13	38.4%	Granular Borrow (Gravel)	Owners: Victor and Dorothy Butz. Area is an inactive pit with wet floors, north of a brook crossing To Highway No. 17, 0.32 mile south of it junction with Town Highway No. 5. Test No. 1-A was in the upper north face of pit. Material is: 0'-3', overburden; 3'-9', silty fine gravel with a few angular 3"+ stones.
	1-B	1977	9-13	---	Yes	97	80	58	41	30	22	35.6%	----	Test No. 1-B was below Test No. 1. Material is: 9'-13', silty gravel.
	2	1977	0.5-4	0-0.5	Yes	81	58	43	26	22	16	40.2%	----	Test No. 2 was in upper southeast face of pit. Material is: 0'-0.5',

TABLE I

GRANVILLE GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
														overburden; 0.5'-4', silty fine grave with a few angular 3"+ stones.
	3	1977	0-8	---	Yes	100	88	62	42	15	10	36.4%	Granular Borrow (Gravel)	Test No. 3 was in pit floor. Materia is: 0'-8', silty gravel.
3	1	1977	2-8	0-2	Yes	75	72	62	48	32	23	---	---	Owners: Victor and Dorothy Butz. Area is an inactive pit south of a brook crossing Town Highway 17 0.36 mile south of its junction with Town Highway No. 5. Test No. 1 was in northeast face of t pit. Material is: 0'-2', overburden 2'-8', coarse to medium silty gravel. More than 5% of the stones were more than 4" and not included in sample.
	2	1977	0-4	---	Yes	92	92	82	67	47	36	---	---	Test No. 2 was in floor of pit. Material is: 0'-4', coarse to medium gravel; bottom, bedrock or boulder.
4	1	1977	3-6	0-3	No	94	76	46	32	5	3	20.2%	Gravel	Owner: U. S. Forest Service. Area is south end of a field, U. S. Tract #887, that is bounded on the west by Vermont Route 100, and on the south by Albee Brook. Test No. 1 was near the southeast corner of the field, 440' east of Vermont Route 100.

TABLE I

GRANVILLE 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 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
														Material is: 0'-3', overburden; 3'-6' sandy medium gravel; bottom, same and water.
	2	1977	2-8	0-2	No	95	73	60	48	39	26	---	---	Test No. 2 was near the center of the south edge of the field, 150' east of Vermont Route 100. Material is: 0'-2 overburden; 2'-8', silty fine-medium gravel; bottom, same.
3	1	1977	4-5.5	0-4	No	-	RESULTS	NOT	AVAILABLE					Owner: J. L. Williams (formerly the Webb farm). Area is a field bounded on the north and east by the Third Branch of the White River, the south by Sandusky Brook, and the west by Vermont Route 12-A. The owner allowed only one tes hole and chose its location. Test No. 1 was at the east edge of the field in the bed of an intermit-tent stream, N45°E of the owner's house. Material is: 0.5'-4.0', overburden; 4.0'-5.5', sandy, medium to coarse, loosely consolidated gravel that caves easily; bottom, same. The water table was at 4 feet (the silt-clay, gravel interface).

TABLE I
Supplement

GRANVILLE PROPERTY OWNERS - GRANULAR	Map Identification No.
Butz, Victor and Dorothy	2, 3
Pierce, H. and Tobey, J.	1
United States Forest Service	4
Williams, J. L.	5

TABLE II GRANVILLE ROCK DATA SHEET NO. 1

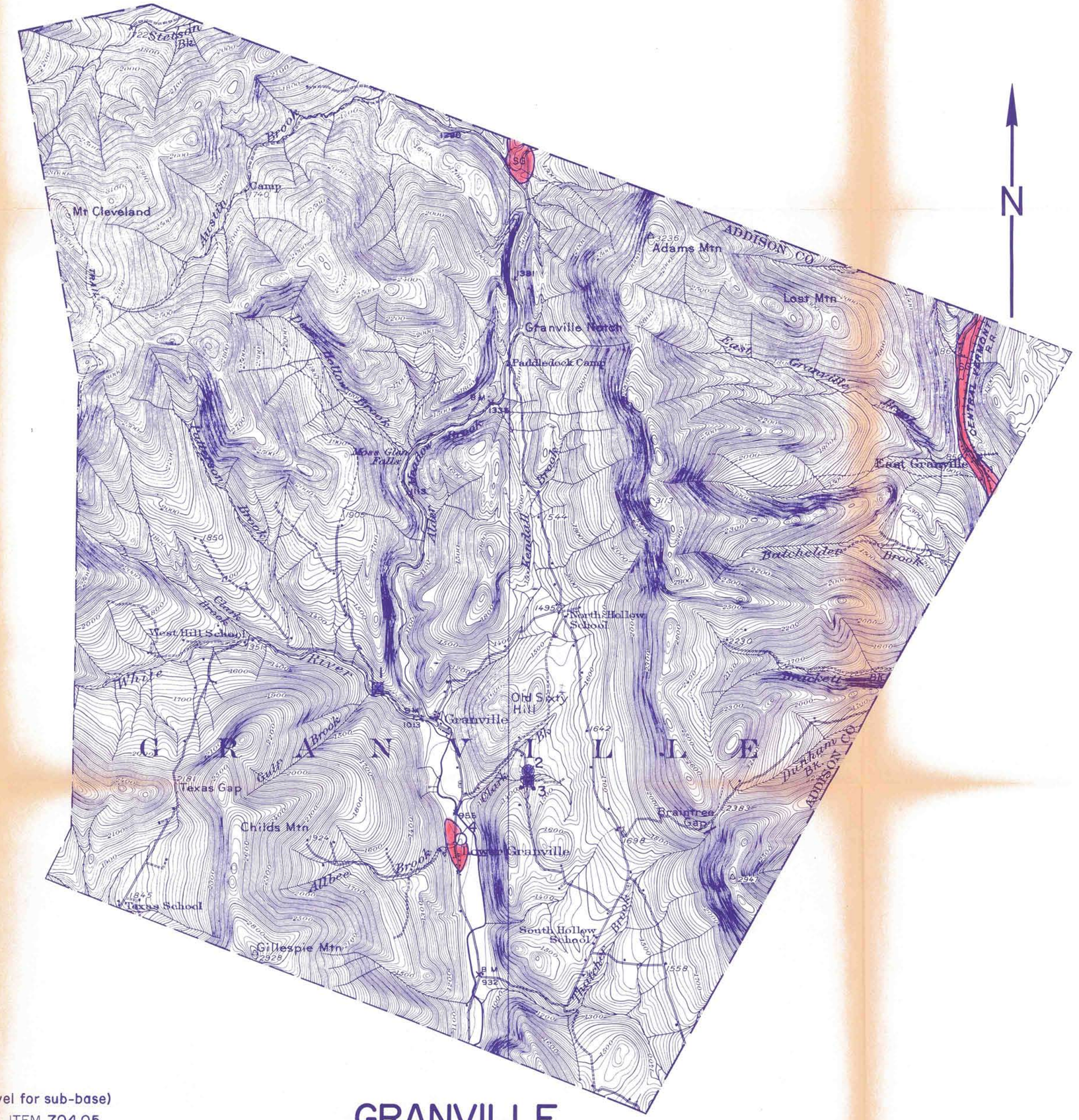
Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	Remarks
1	1-A	1977	Schist	No	Chip	9.0%	39.8%	Owner: Sherwood H. Sargeant. Area is in woodland southwest of a sharp bend in Town Highway No. 16 0.19 mile west of its junction with Vermont Route 100. Steeply eastward dipping ledges of the Pinney Hollow schist were sampled. There is adequate room for a staging area at the east end of Test No. 1-A. Test No. 1-A was sampled westward from a point 50' south upslope across the strike of the schistosity. Material is a very dense, tough clorite schist. The tests are separated by a north-northeast trending gully which is filled with rubble.
	1-B	1977	Schist	No	Chip	8.7%	41.9%	Test No. 1-B was offset 75' north of Test 1-A. It was continued for an additional 75' westward at the foot of another, north-west trending, outcrop.
2	1	1977	Schist	No	Chip	-	38.0%	Owner: Clarence Maston. Area is on the wooded southwest slope of Old Sixty Hill and was reached by an old logging road, south of a barn on Town Highway No. 5 0.1 mile north of its junction with Town Highway No. 17. Access would require 0.3 mile of road improvement. Ledges trending N10°E are exposed for 100' N and 27' E-W with 20 feet of relief. Test No. 1 was a random sample of detached material along the western base of the exposure, 150 feet west of a gully.
3	1-A	1977	Schist	No	Chip	-	41.6%	Owner: Clarence Maston. Area is composed of southeast trending outcrops in woodland northeast of the "Oxbow" on Town Highway No. 10, 0.42 mile east of its junction with Town Highway No. 3.

TABLE II GRANVILLE ROCK DATA SHEET NO. 2

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	Remarks
								The Ottauquechee schistose quartzite slopes steeply upward for more than 150 feet above the road. There is a parking area north of the bend in the road that would be adequate for a staging area. Test No. 1-A was taken from the highway 75 feet northeastward up slope and across the strike of the schistosity.
	1-B	1977	Schist	No	Chip	13.4%	48.8%	Test No. 1-B continued northeastward for an additional 75' up slope.

TABLE II
Supplement

GRANVILLE PROPERTY OWNERS - ROCK	Map Identification No.
Maston, Clarence.	2, 3
Sargeant, Sherwood H.	1



LEGEND

- ○ GRAVEL, ACCEPTABLE FOR ITEM **704.05 (gravel for sub-base)**
- ● GRAVEL, DEPLETED OR NOT ACCEPTABLE FOR ITEM **704.05**
- △ SAND, ACCEPTABLE FOR ITEM **703.03 (sand borrow and cushion)**
- ▲ SAND, DEPLETED OR NOT ACCEPTABLE FOR ITEM **703.03**
- □ GRANULAR BORROW, ITEM **703.05**
- ■ MATERIAL NOT ACCEPTABLE FOR ITEM **703.05**
- EXISTING PIT
- SG SAND & GRAVEL DEPOSIT
- S SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

GRANVILLE

SCALE 1:31,250

1 0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1978

GRANULAR MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

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

PLATE I

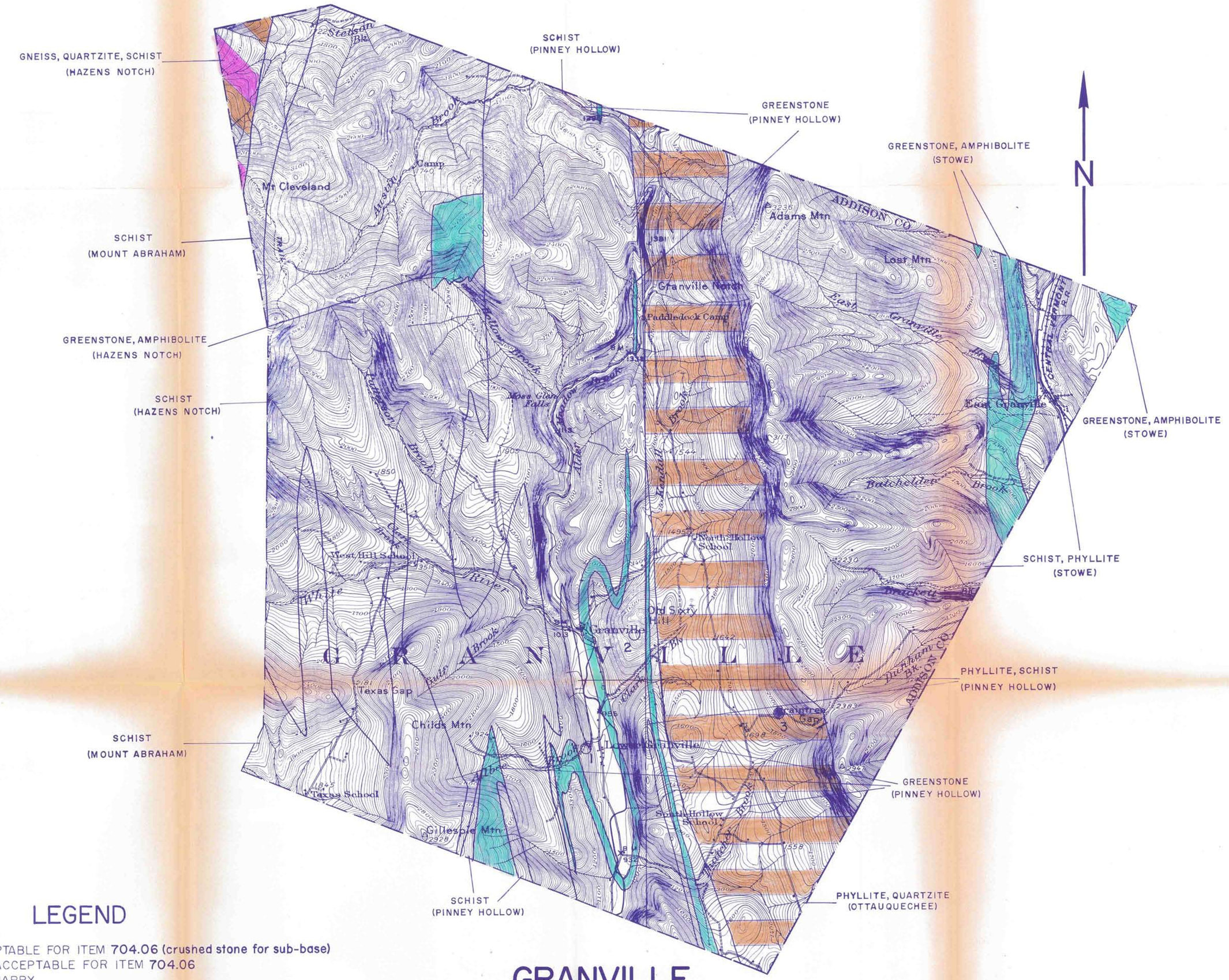
GRANULAR

ADDISON COUNTY

VT. HWY. DISTRICT NO. 4

REVISIONS

DATE						
BY						



LEGEND

- ROCK, ACCEPTABLE FOR ITEM 704.06 (crushed stone for sub-base)
- ROCK, NOT ACCEPTABLE FOR ITEM 704.06
- EXISTING QUARRY
- GRANITE TO DIORITE (light to intermediate igneous rocks)
- AMPHIBOLITE, GABBRO, DIABASE, METADIABASE, GREENSTONE, TRAP DIKES (basic or dark igneous rocks)
- PERIDOTITE, PYROXENITE, SERPENTINITE (ultra-basic igneous rocks)
- GNEISS
- QUARTZITE
- DOLOMITE
- MARBLE, LIMESTONE
- SCHISTS, SLATES, PHYLLITES, SHALES, CONGLOMERATES
- 3 IDENTIFICATION NUMBER (refer to data sheets)

GRANVILLE

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1978

ROCK MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

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

PLATE II

ROCK

ADDISON COUNTY VT. HWY. DISTRICT NO. 4

REVISIONS

DATE						
BY						