SURVEY OF HIGHWAY CONSTRUCTION MATERIALS
IN THE TOWN OF FERRISBURG, ADDISON COUNTY, VERMONT

Prepared by

Engineering Geology Section, Materials Division
Vermont Department of Highways

in cooperation with

United States Department of Transportation
Federal Highway Administration

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Acknowledgments

The work of this Project was implemented with 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 Division and Mapping Section and the Materials Division.

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, Federal Highways Administration.

History

The Materials Survey Project was formed in 1957 by the Vermont Department of Highways with the assistance of the Federal Highway Administration. Its prime objective was to compile an inventory of highway construction materials in the State of Vermont. Originally, investigations for highway construction materials were conducted only as the immediate situation required and only limited areas were surveyed; thus, no over-all picture of material resources was available. Highway contractors or resident engineers were required to locate the materials for their respective projects and samples were tested by the Materials Division. The additional cost of exploration for construction materials was passed on to the State bringing about higher construction costs. The Materials Survey Project was established to eliminate or minimize this factor by enabling the State and the contractors to proceed with information on available material resources and to project cost estimates. 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 are used 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 together.

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'. Delineated on the Bedrock Map are the various rock formations and types in the township. This information was 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 covered by various types of glacial deposits (outwash, moraines, kames, kame terraces, eskers, etc.) by which potential sources of gravel and sand may be recognized. This information was obtained primarily from a survey conducted by Professor D. P. Stewart of Miami University, Oxford, Ohio, who 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), 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. The number and location of tests taken in each area represented by an Identification

Number is determined by the nature of the material or its topographic feature.

Also included in this report 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 an active card file compiled and updated by the Engineering Geology Section of the Materials Division over a period of years. Transfer of information from the cards to the data sheets was made and the location of the deposits was plotted on the maps. However, some cards in the file were not used because of incomplete or unidentifiable information on the location of the deposit. Caution should be exercised wherever this information appears incomplete.

Work sheets, containing more detailed information and a field sketch of the area represented by the Identification Number, and laboratory reports are on file in the Materials Division of the Vermont Department of Highways.

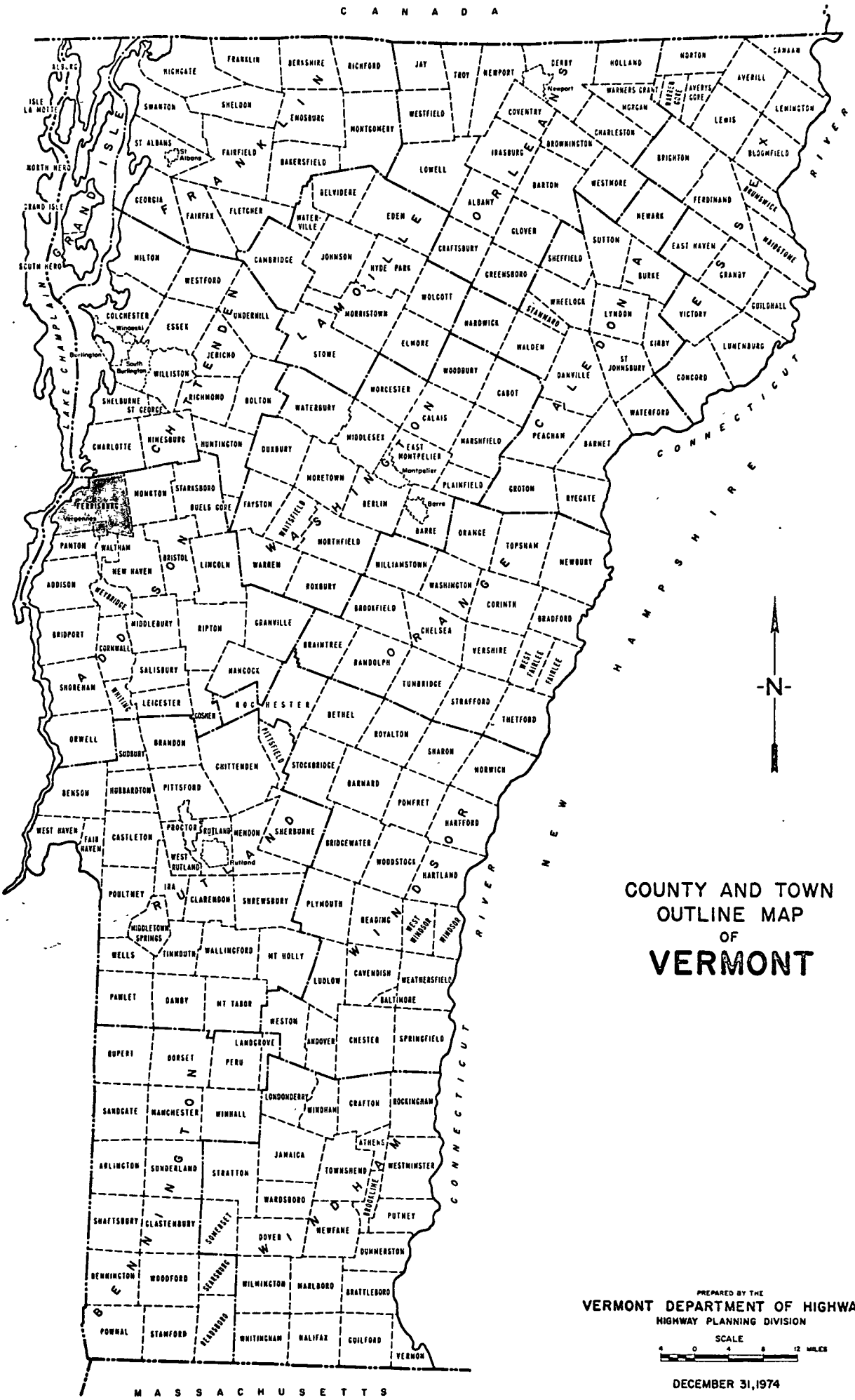
LOCATION

The town of Ferrisburg is in the northwest corner of Addison County in west-central Vermont. It is bounded on the north by Charlotte, on the east by Monkton, on the southeast by New Haven, on the south by Waltham, the City of Vergennes, and Panton, and on the west by Lake Champlain. (See County and Town Ouline Map of Vermont on following page.)

The town lies entirely within the Champlain Lowland physiographic subdivision, and has a gentle, undulating surface which rises from marshes to isolated ridges of low relief. Most of the western and central parts of town are covered by fine lake sediments with high amounts of clay.

Elevations range from 705 feet atop Shellhouse Mountain, in the northeast corner of town, to 95 feet at the surface of Lake Champlain.

Drainage is mostly north and northwestward into Lake Champlain via Otter Creek, Little Otter Creek, Mud Creek and Dead Creek; Lewis Creek and East Slang Creek flow westward, and South Slang and Goose Creek flow northeastward.



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

The field investigation is begun by making a cursory survey of the entire town. The information obtained from this preliminary survey, as well as that assimilated in the office investigation, is used to determine the areas where sampling will be concentrated. When a promising source has been determined by rock type, volume of material, accessibility, and adequate exposure and relief, chip samples are taken with a hammer across the strike or trend of the rock, 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 consequently may give a less satisfactory test result than fresh material deeper in the rock structure. When the rock is uniform, and the chip samples yield acceptable abrasion test results, the material source is included 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 included in this report.) In the summary, it is apparent that complex metamorphic and sedimentary rocks underlie the town.

The western and central three-quarters of town are underlain by many formations of limestone, marble, slate, shale, dolomite, and phyllite. The Crown Point member of the Chazy Limestone yielded acceptable Crushed Stone for Sub-base from quarries at Map Identification Nos. 1, 4, and 6 (City of Vergennes Quarry); the Orwell Limestone yielded acceptable material from a quarry at Map Identification No. 3; the Hortonville-Glens Falls formation yielded acceptable test results from a quarry at Map Identification No. 5. The Monkton Quartzite was sampled at Map Identification No. 2, and the Shelburne Limestone and Clarendon Springs Dolomite were sampled at Map Identification No. 7; both areas yielded acceptable material from undeveloped sources.

The sources are listed most favorable first: Map Identification Nos. 2, 6 (Quarry), 7, 3 (Quarry), and 4 (Quarry).

Many formations are buried below fine lake sediments and clays.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

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

The office investigation is conducted primarily during the winter months and comprises the mapping of potentially productive areas from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart proves to be particularly helpful when used in conjunction with other references such as soil-type maps, aerial photographs, and United States Geological Survey Quadrangles. The last two are used in the recognition and location of physiographic features indicating glacial deposits, and in the study of drainage patterns. 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 of materials from pit faces and other exposed surfaces. Test holes in pit floors and extensions are dug with a backhoe to a depth of approximately 11 feet to obtain samples which are submitted to the Materials Division where they are tested for stone abrasion by the AASHTO T-4 Method, and sieved for gradation.

Discussion of Sand and Gravel Deposits

Results of this survey showed that granular materials are scarce in Ferrisburg. There were several areas mapped as having sand, but inspection showed most of them were silt or silt-clay deposits, bedrock control, or contained housing, and no sampling was allowed.

Six of the eight areas sampled are near the edge of Otter Creek in the southwest corner of town, the other two are nearly depleted pits in the northeast corner of town. Map Identification Number 1 yielded acceptable sand and gravel from a nearly depleted pit.

Map Identification Numbers 2, 3, 5, and 6 were pits having acceptable sand. Map Identification Numbers 7 and 8 had failing sand, and Map Identification Number 4 had failing granular borrow.

The sources are listed most favorable first: Map Identification Number 6, 5, 3, 1, and 2; are all pits with little material remaining, therefore, material is obtained from the towns of Hinesburg and Bristol.

Summary of Rock Formations in the Town of Ferrisburg

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 of lower, middle, and upper parts of the Bascom, respectively.

Chazy Limestone: Dark blue-gray, somewhat nodular and granular limestone with buff dolomite and shaly interbeds a fraction of an inch thick, and 2 to 4 inches apart.

Chazy Limestone (Crown Point member): Massive, characterized by abundant Maclurites magnus.

Chazy Limestone (Day Point member): Calcareous quartz sandstone and calcarenite; orange-weathered, dolomitic siltstones are common in eastern areas.

Chazy Limestone (Valcour Member): Dark gray calcarenite succeeded by medium- to light-gray, buff-weathered, silty, partly coquinal limestone.

Chipman formation (Bridport Dolomite member): Buff-to brown-weathered, sharply defined and laterally persistent beds of medium-bedded to massive, scored dolomite.

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

Cutting Dolomite: Massive, gray-weathered, nondescript dolomite with a finely laminated calcareous sandstone at base.

Danby formation: Interbedded quartzite and dolomite.

Glens Falls formation: Thin-bedded, dark blue, rather coarsely granular and highly fossiliferous limestone.

Hortonville formation: Black, carbonaceous and pyritic slate and phyllite, locally sandy; brown-weathered, limy beds are common near base.

Iberville formation: Non-calcareous black shale interbedded with occasional dolomite beds, and in the lower part with calcareous shale.

Monkton Quartzite: Distinctively red quartzite interbedded with lesser buff and white quartzite and relatively thick sections of dolomite like that of the Winooski.

Orwell Limestone: Smooth-ledged, sub-lithographic and lithographic, dove gray weathered limestone commonly cut by veins of white calcite; beds filled with fossil shell fragments are characteristic.

Shelburne formation: Chiefly a white marble or gray limestone characterized by raised reticulate lines of gray dolomite on the weathered surface.

Stony Point formation: Predominantly calcareous black shale that grades upward into argillaceous limestone and rare dolomite beds.

Whitehall formation: Similar to Shelburne, but with interbedded massive dolomite.

Winooski Dolomite: Buff-weathered, pink, buff, and gray dolomite; beds 4 inches to 1 foot thick separated by thin, protuding, red, pink, green, and black siliceous partings.

Glossary of Selected Geologic Terms

Argillaceous: Containing or consisting of clay. The term is commonly used with rock names to indicate the presence of clay; as, argillaceous limestone, argillaceous sandstone.

Bedding: The arrangement of rock or granular material in layers.

Bedrock: The more or less solid, undisturbed rock at the surface, or beneath deposits of soil.

Bedrock Control: Land features which show bedrock on, or close to, the surface; also used to describe part of the topography.

Breccia: A rock made up of consolidated angular rock fragments larger than sand grains. It is like conglomerate, except that most of the fragments are angular with sharp edges and unworn corners. The unconsolidated equivalent is rubble.

Calcareous: Consisting of, or containing from 10-to 50-percent of calcium carbonate ($CaCO_3$).

Coquinal: Rock consisting predominantly of whole or broken calcareous shells.

Drainage: The manner by which water moves on or beneath the earth's surface, in streams, rivers, brooks, and channels.

Geodes: A hollow nodule or concretion of stone lined with inwardly pointing crystals.

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

Lamina: A thin layer of stratified rock, 1 cm. or less in thickness.

Outcrop: The part of a body of rock that appears bare and exposed at the surface of the ground.

Phyllite: A fine-grained, foliated, metamorphic rock intermediate between the mica schists and slates into which it may grade. The foliation is caused by large amounts of potash mica (sericite) which gives the rock a distinctive silvery appearance.

Relief: The term used to designate the difference in elevation between the summits and lowlands of a particular region.

Shale: A term for lithified muds, clays and silts that tend to split into thin sheets along the bedding planes or along cleavage planes. Shale differs from mudstone, claystone and siltstone by having the pronounced tendency to split (fissility).

Slate: A homogeneous metamorphic rock, so fine-grained that no mineral grains can be seen. Slate splits with a foliation so perfect, that it yields slabs having plane surfaces almost as smooth as the cleavage planes of minerals; hence, this variety of foliation is termed slaty cleavage.

Water Table: The upper surface of a zone of saturation, except where the surface is formed by an impermeable body.

Weathered: Showing the effects of exposure to the atmosphere.

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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, January, 1972.

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

FERRISBURG 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	1975	0.5-5	0-0.5	Yes	100	100	100	94	27	13	--------	Gran. Borrow (Sand)	Owner: Oscar Jewell. Area is a nearly depleted pit in a bed-rock control woods, 0.19 mile southwest of Town Highway No. 14 and 0.64 mile south of its junction with Town Highway No. 15. The floor of pit was wet. Test No. 1 was on north face. Material was: 0.5'-1', pebbly fine gravel; 1'-3', pebbly silty sand and fine sand; 3'-4', silty sand; 4'-5', silty fine sand; bottoms at 5' silt-clay and water.
	2	1975	1-11	0-1	Yes	100	100	100	90	27	7	--------	Sand	Test No. 2 was on southwest face, 100 feet south of Test No. 1. Material was: 1'-11', fine sand with random small stones; bottoms in sand and water.
	3	1975	1-10	0-1	Yes	92	75	64	52	9	6	19.1%	Gravel	Test No. 3 was on face south of water in south end of pit. Material was: 1'-10', gravel or fine gravel; bottoms at 10' on water. No backhoe sampling was allowed, and owner would not sell any material.
2	1	1975	0-3	-----	Yes	100	100	100	95	46	19	-------	------	Owner: August Jerger, Jr. Area is a shallow remnant of a pit in bedrock control pasture, 0.2 mile west of Town Highway No. 14, and 0.89 mile south of its junction with Town Highway No. 15.

TABLE I

FERRISBURG 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
														Test No. 1 was in low east face. Material was: 0'-3', silty sand; bottoms in water.
	2	1975	1-7	0-1	Yes	100	100	100	96	30	6	--------	Sand	Test No. 2 was gulley on bank at west edge of pit. Material was: 1'-7', sand; bottoms in water. Owner did not want any backhoe testholes dug in his pasture or pit. No material was for sale.
3	1	1975	1-6	0-1	No	100	100	100	100	16	12	-------	Sand	Owner: Vermont Dept. of Fish and Game. (Land was formerly owned by Weeks School.). Area is tree and bush-covered field with a long. shallow excavation 100 feet west of Town Highway No. 8, and 0.79 mile south of its junction with Town Highway No. 19. The excavation was the result of top soil being taken for use at the Weeks School. Test No. 1 was at north end of field, 40 feet west of Town Highway No. 8. Material was: 1'-6', sand; bottoms at 6' on blue-gray, moist silt-clay.
	2	1975	1-4	0-1	No	100	100	100	100	42	33	-------	------	Test No. 2 was near tree line in south end of field, 700 feet south of Test No. 1. Material was: 1'-

TABLE I

FERRISBURG GRANULAR DATA SHEET NO. 3

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
														4', silty sand; bottoms at 4' on moist silt-clay. Excavated area was very soupy. Southwest corner of field was being used as a dump.
4	1	1975	1-3	0-1	No	100	100	100	94	45	26	------	-----	Owner: Weeks School. Area is a bus covered field west of planted pine access is 0.82 mile south of the junction of Town Highways No. 8 and 19. Test No. 1 was in over-grown field 0.07 mile west of Town Highway No. 8. Material was: 1'-3', silty sand; bottoms at 3' on wet silt-clay.
5	1	1975	1-5	0-1	Yes	100	100	100	97	17	9	-------	Sand	Owner: Orville Danyou. Area is a second-growth woods with a small clearing and tiny pit, 0.1 mile west of Town Highway No. 8, 1.02 miles south of its junction with Town Highway No. 19. Test No. 1 was in small depression at edge of woods northeast of pit. Material was: 1'-5', sand; bottoms on silt-clay and water.
	2	1975	1-4	0-1	Yes	100	100	100	100	23	7	--------	Sand	Test No. 2 was in small clearing, 150 feet southwest of Town

TABLE I

FERRISBURG GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
														Highway No. 8 Material was: 1'-4', sand; bottoms at 4' on silt-clay and water.
	3	1975	1-4	0-1	Yes	100	100	100	98	9	5		Sand	Test No. 3 was in low northeast face of small pit. Material was: 1'-4', sand; bottoms at 4' on silt-clay and water.
6	1	1975	1-6	0-1	Yes	100	100	100	100	24	10		Sand	Owner: Orville Danyou. Area is a small pasture with pit at its west edge, 0.07 mile west of Town Highway No. 8, and 110 feet south of its junction with Town Highway No. 43. Only one backhoe test hole was allowed in the area near pit. Test No. 1 was in the southwest corner of pasture just south of low, wet pit. Material was: 1'-6', sand and fine sand; bottoms at 6' on silt - clay and water.
	2	1975	1-6	0-1	Yes	100	100	100	100	15	8		Sand	Test No. 2 was on south face. Material was: 1'-6', sand; bottoms at 6' on silt-clay and water.
7	1	1975	1-4	0-1	No	100	100	100	95	18	13		Gran. Borrow (Sand)	Owner: Rollin Atkins. Area is a cornfield northeast of Town

TABLE I

FERRISBURG GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
														Highway No. 8, and 0.8 mile northwest of its junction with Town Highway No. 42. Test No. 1 was near center of west edge of cornfield, 45 feet north-west of Telephone Pole No. 6. Material was: 1'-4', sand; bottoms at 4' on silt-clay. The owner allowed only one backhoe test-hole.
8	1	1975	2-8	0-2	No	100	100	100	100	53	23	-------	-----	Owner: Lawrence DeLorme. (Former owner: Alan Clark). Area is a scrubby, second-growth woods, 0.15 mile northeast of State Aid Highway No. 3, and 0.28 mile north of Panton Town Line. Test No. 1 was in small fenced-in area, 150 feet northeast of trailer. Material was: 2'-4', sand; 4'-8', silt-clay.
	2	1975	0-3		No	100	100	100	83	26	16	--------	------	Test No. 2 was in small clearing i woods east of trailer. Material was: 0'-3', silt-clay.
	3	1975	1-8	0-1	No	100	100	100	78	24	14	--------	Gran. Borrow (Sand)	Test No. 3 was in small clearing at east end of wooded terrace, northeast of Test No. 2. Material was: 1'-8', sand; 8'-10', silt-clay.

Table I
Supplement

FERRISBURG PROPERTY OWNERS - GRANULAR

	Map Identification No.
Atkins, Rollin	7
Danyou, Orville	5,6
DeLorme, Lawrence	8
Jerger, August Jr.	2
Jewell, Oscar	1
Vermont Dept. of Fish and Game	3
Weeks School	4

Table II

FERRISBURG ROCK DATA SHEET NO. 1

Map 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	1975	Limestone	Yes	Chip	3.6%	26.0%	Owner: Mrs. Linda Steady. (Former owner: Chester Hawkins). Area is a rock exposure with low relief on the west side of Little Otter Creek near its mouth. A very small quarry or prospect remains, but there is not enough relief or extent to consider this area a major rock source. Access is 0.37 mile northeast of the curve on Town Highway No. 19, and 2.85 miles northwest of the junction of Town Highways No. 8,19, and 35, and State Aid Highway No. 5. The rock is mapped as being the Crown Point member of the Chazy Limestone. It breaks either blockily, or into shattery sharp-edged, tabular pieces; this shaly characteristic may be just a surface (weathering) effect which becomes more massive with depth. The rock is a blue-gray to gray limestone, with tan seams running obliquely through the zones which yielded most of the sharp-edged pieces. The rock was nearly horizontal so only a slight thickness could be obtained. Test No. 1-A was a 150-foot sample representing a 30-foot thickness, and extended westward from the low scarp at the edge of the creek, to the wall of the small quarry. Scattere outcrops were sampled.
	1-B	1975	Limestone	Yes	Chip	3.8%	21.8%	Test No. 1-B was a 150-foot sample along the surface of the low outcrop southwest of Test No. 1-A. This sample represents 30-feet of thickness because of nearly horizonta beds which dip south or southeast 10^{o} to 15^{o}. The owner would sell material.
2	1-A	1975	Quartzite	No	Chip	1.2%	18.4%	Owner: Lawrence Gebo. Area is along the wooded western base of Shellhouse Mountain, in the northeast corner of town. There is good relief and ample material. A haul road could be built west across a brook and marsh to Town Highway No. 23 (Buckwheat Road), if a right-of-way southward across A. Jerger's land could not be obtained.

Table II

FERRISBURG ROCK DATA SHEET NO. 2

Map 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 rock is a quartzite which varies from the characteristic reddish-purple of the Monkton formation, to a light-to-dark green to gray-green(almost like an un-oxidized Monkton Quartzite). The rock varied from nearly sub-vitreous to coarse-grained. The area would make a good source for a crushed-rock operation, and is 0.3 mile north of Town Highway No. 14 and 0.65 mile east of its junction with Town Highway No. 23. There was no distinct bedding, and the slopes were very slippery and treacherous. Test No. 1-A was a 75-foot sample southward along the base of ledge, 200 feet north of A. Jerger's stone wall.
	1-B	1975	Quartzite	No	Chip	1.8%	22.6%	Test No. 1-B was a 75-foot sample southward from Test No. 1-
3	1-A	1975	Limestone	Yes	Chip	2.4%	26.0%	Owner: Gerald W. Hatch. Area is a quarry on a wooded, rocky slope 0.25 mile west of Town Highway No. 41, 0.54 mile south of its junction with Town Highway No. 39. Rock was stock-piled on the quarry floor for use at Button Bay State Park. The rock is mapped as being just above the contact between the Orwell formation on the east, and the Valcour member of the Chazy Limestone, on the west. There was 50-feet of thickness represented by the tests, and there seems to be an adequate amount of material. The rock broke from blocky, to sub-angular, to tabular and plat. The beds strike N 15° E. and dip 30° to the east. Some solution channels and cavaties are roughly parallel to the strike. Three joint sets were noted: One is parallel to the bedding plane, one is vertical and perpendicular to the strike, and the other is vertical and parallel to the strike. Test No. 1-A was a 50 foot sample from the northwest corner of the quarry.

Table II

FERRISBURG ROCK DATA SHEET NO. 3

Map 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-B	1975	Limestone	Yes	Chip	3.3%	20.2%	Test No. 1-B was a 50 foot sample from the southwest corner of the quarry, 175 feet south of Test No. 1-A.
4	1	1975	Limestone	Yes	Chip	3.1%	20.5%	Owner: H.E. Bodette. (20 acres of land was for sale 10/29/75). Area is a small quarry on the northeast end of a rocky knoll. 0.5 mile south of Town Highway No. 31 and 0.05 mile east of its junction with Town Highway No. 44. The wooded knoll is 600 feet long, 300 feet wide, and its summit is 80 feet above the quarry floor. The rock is massive, dark gray (on a fresh surface), tan-to light-gray weathered limestone. The only bedding was in a fine-grained portion of the weathered zone.Some sharp-edge pieces were noted, however the rock seemed quite good overall. Test No. 1 was a 25-foot sample taken across thickness of the beds (height of quarry wall.)
	2	1975	Limestone	No	Chip	3.1%	23.6%	Test No. 2 was a 150-foot sample of scattered outcrops, and represents an 80-foot thickness of beds. This test extends from just west of the quarry, south along the ridge to the summit.
5	1	1975	Limestone	Yes	Chip	3.4%	20.3%	Owner: Karl Field. Area is a rocky knoll with two small quarries, 0.02 mile south of Town Highway No. 34, and 0.20 mile east of its junction with U.S. Route 7. The rock had a tendency to break in sharp-edged, tabular pieces. Test No. 1 was in the north quarry and represents 25 feet of thickness. The rock is a limestone of the Glens Falls formation.
	2	1975	Phyllite & Slate	Yes	Chip	4.8%	20.4%	Test No. 2 was in the low quarry at south end of rocky knoll. Rock is a slate and phyllite of the Hortonville formation.

Table II

FERRISBURG ROCK DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	Remarks
6	1-A	1975	Limestone	Yes	Chip	4.4%	21.2%	Owner: City of Vergennes. Area is an old quarry, 0.11 mile northeast of State Aid Highway No. 6,(Green Street), and 0.09 mile north of the Waltham Town line. The bedding was obscure so the samples may be along, or across, the strike. The rock varies from an easily shattered, slaty limestone, to a dolomite-limestone which breaks blockily. The 75-foot high quarry wall is vertical.
	1-B	1975	Limestone	Yes	Chip	3.7%	23.2%	Test No. 1-B was a 100-foot sample taken along the base of the southeast wall. There is a high voltage power line passing over the quarry extension 75 feet southwest of the southeast wall, and may influence future development.
7	1-A	1975	Limestone & Marble	No	Chip	4.4%	36.8%	Owner: Earl Bessette. Area is high rocky pasture 0.33 mile west of Town Highway No. 56 (Lime Kiln Road), in the extreme southeast corner of town. The western series of outcrops is the Shelburne Limestone and marble (Test No. 1-A and No. 1-B); the eastern series of outcrops is the Clarendon Springs Dolomite (Test No. 2-A and No. 2-B). The high rocky pasture would supply a major amount of mater Access is good and development should not encounter many problems. Test No. 1-A was a 75-foot sample taken at the west end of western outcrops.
	1-B	1975	Limestone & Marble	No	Chip	4.1%	39.0%	Test No. 1-B was a 75-foot sample taken at the east end of western outcrops.

Table II

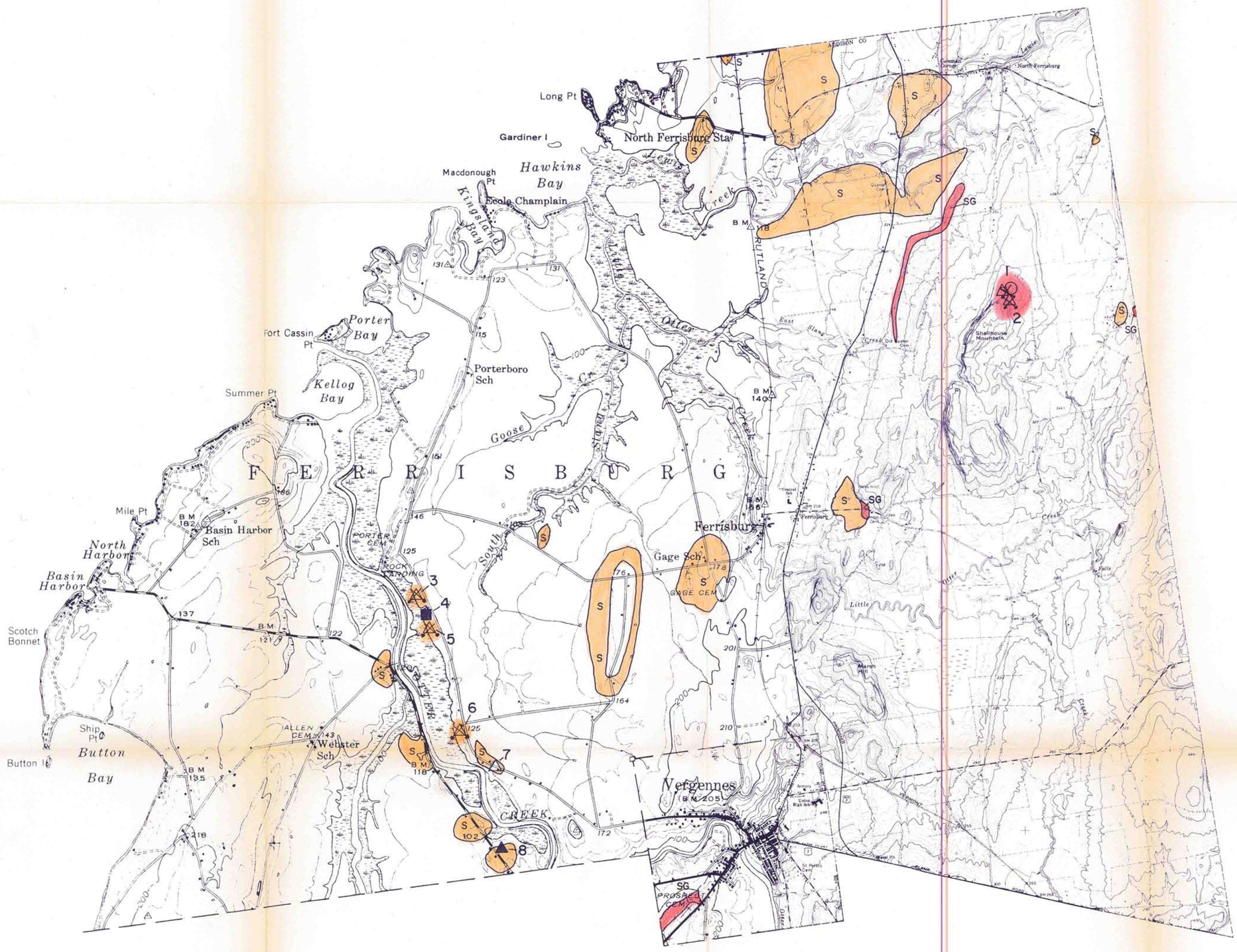
FERRISBURG ROCK DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	Remarks
	2-A	1975	Dolomite	No	Chip	2.8%	24.6%	Test No. 2-A was a 75-foot sample of scattered exposures, 300 feet east of Test No. 1-B.
	2-B	1975	Dolomite	No	Chip	4.6%	25.3%	Test No. 2-B was a 75-foot sample of scattered exposures east of Test No. 2-A.

Table II
Supplement

FERRISBURG PROPERTY OWNERS - ROCK

	Map Identification No.
Bessette, Earl	7
Bodette, H.E.	4
Field, Karl	5
Gebo, Lawrence	2
Hatch, Gerald W.	3
Steady, Mrs. Linda	1
Vergennes, City of	6



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)

FERRISBURG

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1976

GRANULAR MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

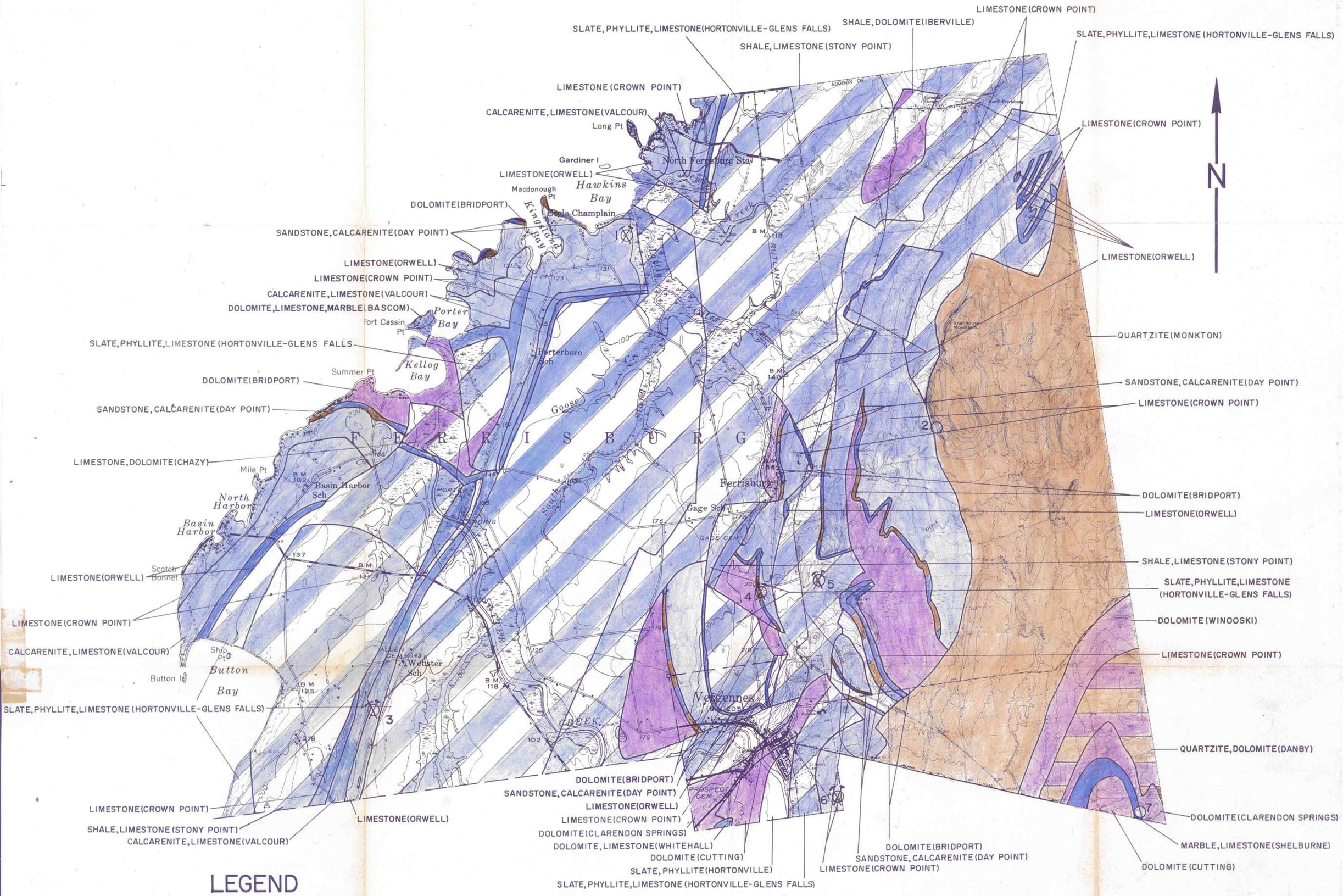
NOTE: BASED ON U.S.G.S. TOPOGRAPHIC MAPS

PLATE I GRANULAR

ADDISON COUNTY VT. HWY. DISTRICT NO. 5

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)

FERRISBURG

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1976

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

PLATE II

ROCK

ADDISON COUNTY VT. HWY. DISTRICT NO. 5

REVISIONS

DATE							
BY							