SURVEY OF HIGHWAY CONSTRUCTION MATERIALS
IN THE TOWN OF SUTTON, CALEDONIA 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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The work of this Project was greatly implemented by the cooperation and assistance of many groups and individuals. The following were particularly helpful in carrying out the Project's objectives.

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

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

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

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

History

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

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

The sources of construction materials are located by this Project through ground reconnaissance study of maps and aerial photographs, and geological and physiographic interpretation. Maps, data sheets, and work sheets for reporting the findings of the Project were 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 conducted by Professor D. P. Stewart of Miami University, Oxford, Ohio, who had been mapping the glacial features of Vermont during the summer months since 1956. Further

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

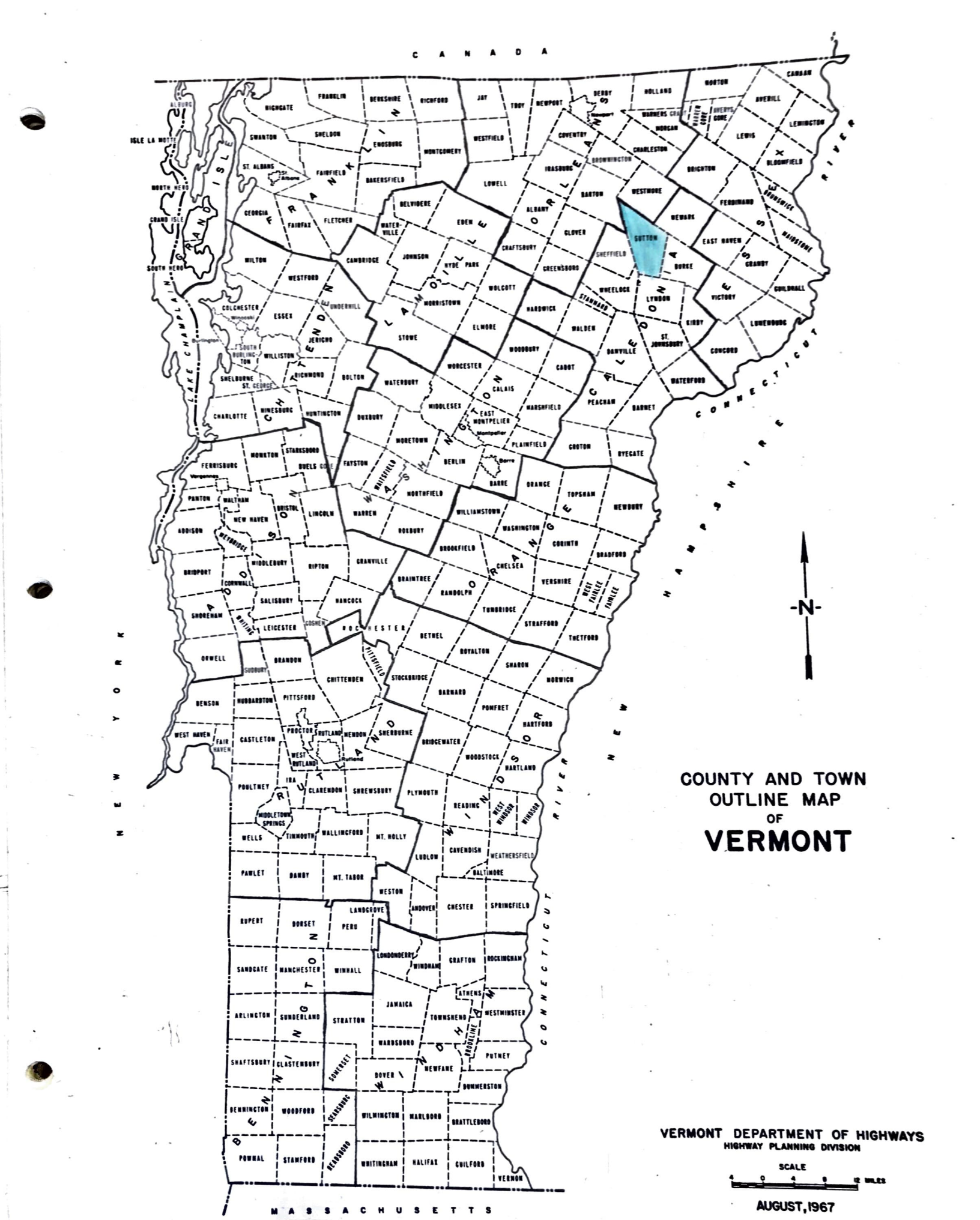
LOCATION

The town of Sutton is situated in the north northwest corner of Caledonia County, and lies in the Burke and Lyndonville Quadrangles. It is bounded by the town of Barton to the northwest, Sheffield to the west, Wheelock to the southwest, Lyndon to the south, Burke to the east, Newark to the northeast, and Westmore to the north. (See County and Town Map of Vermont on the following page.)

Sutton lies entirely within the Vermont Piedmont Physiographic Region. The town is rather hilly except in the northwest corner where Mt. Hor and Wheeler Mountain rise abruptly 500'-700' above the lower hills. Many of the lower hills are rolling and forested, and are separated by nearly flat valleys. Mt. Hor, 2, 648' is the highest elevation in town.

The divide between the St. Lawrence drainage basin to the north, and the Connecticut River drainage basin to the south, is at Summit. Air photographs show some stream valleys following fractures in the bedrock. Many ponds are chiefly the result of poor drainage impeded by glacial deposits.

Major drainage is south via Clark Brook and the West Branch of the Passumpsic River; southeast via Sutton River and Calendar Brook; and east via Bundy Brook. Calendar Brook at the Burke town line is the lowest point in Sutton at an elevation of 830'.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

AUGUST, 1967

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

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

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

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

Discussion of Rock and Rock Sources

It should be noted that information on the Rock Materials Map is somewhat simplified. (For a more detailed description of the respective rock formations see the Summary included in this report.)

Occasionally rocks belonging to the same formation and exhibiting similar characteristics (i.e. color, texture etc.) may produce different abrasion results due to different physical and chemical properties. Therefore, in no case should satisfactory test result of an area be construed to mean that the same formation even in the same area, will not later produce unsatisfactory material. This is especially true of metamorphic rocks.

Most of Sutton is underlain by rocks of the Eastern Vermont Stratigraphic Sequence according to the Centennial Geologic Map. The remainder is underlain by the younger rocks of the New Hampshire Plutonic Series.

The Waits River schist and limestone is the oldest formation in Sutton and underlies the eastern two-thirds of the town. There are scattered road-cuts in the Waits River formation about 0.5 mile from the northwest end of State Aid Highway No. 1, but the rock is too thin-bedded for use as crushed rock. The Gile Mountain schist and quartzite, slightly younger than the Waits River formation, is exposed on the steep, upper northeast slope of Norris Mountain. It was not sampled due to its inaccessibility. In general, rock other than the granitic bodies in the northwest corner of Sutton is concealed by either glacial till or dense vegetation.

The only source of rock suitable for Item 704.06, Crushed Stone for Subbase was sampled at Map Identification No. 1, and is the undifferentiated granitic rock of the New Hampshire Plutonic Series. The sample was taken from huge blocks below the talus slope at the south southeast base of Wheeler Mountain. Access is via the Blue Trail which leads northwest from Town Highway No. 15. The rock is a white, gray, or brown, fine- to coarse-grained granitic rock.

Some quartz veins were noted. The rock breaks sub-blocky to sub-angular.

When contacted in the summer of 1970, the owner said that he expected to sell his property very soon.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

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

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

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

Discussion of Sand and Gravel Deposits

The granular deposits in Sutton occur either as sands and gravels of ice-contact origin deposited as kame terraces, kame moraines, and kames; or material deposited in quiescent waters of post-glacial lakes. Some material may have been deposited as post-glacial fluvial gravel.

Several areas that were mapped by D. P. Stewart as being kame moraine or kame terrace in origin were sampled and noted to be shallow ablation till with bedrock control, or fluvial gravel. An unmapped area of good, clean pebbly sand was found at Map Identification No. 10 and is thought to be a lake sand deposited in the dammed, post-glacial overflow of Crystal Lake to the northwest in Barton.

Only two areas had material acceptable for Sub-base of Gravel, Item 201; and Item 704.05, Gravel for Sub-base. Probably the order of desirability due to volume or availabity would be Map Identification Numbers 6 and 12.

The gravel supply in Sutton is very limited and much sought after.

Sources of material acceptable for Sub-base of Sand, Item 202; and Item 703.03, Sand Borrow and Cushion, are located at Map Identification Numbers 1, 2, 3, and 14, all of which have pits; and 6, 8, 10, and 13, which do not have pits at present.

The following Map Identification Numbers are listed in order of volume: 10, 1, 2, 3, 13, 6, 8; Number 14 is very limited.

Sand is more plentiful than gravel in Sutton, but there are no large sources; Map Identification Number 10 is probably the greatest single source of sand in town and has about 100,000 cubic yards (estimated).

Several shallow, tiny ponds appear to have granular bottoms, but the only way to exploit this material would be by dragline or clamshell.

In the Granular Data Sheets in the column headed "Passes VHD Spec.," the writer used the old items; namely, Item 105, Granular Borrow; Item 201, Sub-base of Gravel; Item 202, Sub-base of Sand. In the "Remarks" column it is

noted where the material meets or fails to meet the requirements of the new specifications for: Item 703.05, Granular Borrow; Item 703.03, Sand Borrow and Cushion; and Item 704.05, Gravel for Sub-base. Where the 200-mesh sieve is used it is sometimes possible to determine if a material passes the old specifications (i.e. the amount passing the 270-mesh sieve) by the use of actual analysis or statistical data.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF SUTTON

Eastern Vermont Sequence

Gile Mountain Formation - Gray quartz - muscovite phyllite or schist, interbedded and intergradational with gray micaceous quartzite, calcareous mica schist, and locally quartzose and micaceous crystalline limestone like that of the Waits River Formation. The phyllite and schist commonly contains porphyroblasts of biotite, garnet, or staurolite, and locally, kyanite, andalusite, or sillimanite.

Waits River Formation - Gray quartzose and micaceous crystalline limestone weathered to distinctive brown earthy crust; interbedded and intergradational with gray quartz-muscovite phyllite or schist. Where more metamorphosed the limestones contain actinolite, hornblende, zoisite, diopside, wollastonite, and garnet; and the phyllite and schist, biotite, garnet, and locally andalusite, kyanite, or sillimanite.

New Hampshire Plutonic Series

Granitic Dikes - Gray granitic rock varying from fine- to coarse-grained. Width and extent of individual dikes not determined.

Granite - Undifferentiated granitic rock, light- to dark-gray, medium- to coarse-grained granodiorite to quartz monzonite.

GLOSSARY OF SELECTED GEOLOGIC TERMS

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

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

Calcareous - Pertaining to or containing calcium carbonate.

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

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

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

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 - Of or pertaining to rivers or river action. Produced by river action.

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

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

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

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

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.

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.

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

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

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

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Appendix I

PARTIAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION MATERIALS

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

Item 105, Granular Borrow

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

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

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

Item 201, Sub-base of Gravel

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

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

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

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

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

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

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

Item 202, Sub-base of Sand

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

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

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

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

Item 204, Sub-base of Crushed Rock

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

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

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

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

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

Item 205, Sub-base of Crushed Gravel

"Article 205.02 - Materials.

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

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

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

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

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

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

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

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

Item 207, Sub-base of Dense Graded Crushed Rock

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

"The rock shall meet the following requirements:

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

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

	Square Openings	Percent Passing
Grading	3"	100
	2"	80-100
	1¼"	50-75
	No. 4	30-55
	No. 100	3-10
	No. 270	0-6

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

PARTIAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION MATERIALS

Listed below are partial specifications for Highway Construction Materials items that will supercede the items currently in effect on July 1, 1971. The new items are included as an appendix to this report since the suitability of materials for construction is referred to the new items in many instances.

DIVISION 700 - MATERIALS

Section 703, Soils and Borrow 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 - Gradation Requirements

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, and organic material.

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

Table 703.05A - Gradation Requirements

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.

Section 704, Aggregate

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 - Gradation Requirements

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 AASHO T 4, or more than 40 when tested in accordance with AASHO 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 - Gradation Requirements

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 AASHO T 3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHO T 96.

(d) Thin and Elongated Pieces
Not more than 30 percent, by weight, of thin and elongated peices 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 - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample
1"	100
3/4"	90-100
1/2"	50- 90
No. 4	30- 70
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 - Gradation Requirements

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 AASHO T 4, or the crushed gravel a percent of wear of not more than 35 when tested in accordance with AASHO 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 - Gradation Requirements

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 AASHO T 3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHO 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 - Gradation Requirements

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 - Gradation Requirements

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

SUTTON GRANULAR DATA SHEET NO. 1

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
1	1A	1970	1-15	0-1	Yes	100	89.1	78.5	7.1	2.3 1.8*	1	---	Sand	Owner: Town of Sutton. Area is a pit north of Ronan's western most pit, and east of Bean Pond, north of U.S. Rte. No. 5. There is relatively little material left in area. Most of it is in the sand range, and what gravel there is, is limited to occasional beds. There is an island of material on the pit floor, just north of a wet spot near a sand pile. Testing beyond the top of pit revealed very limited extension. Area was mapped by D. P. Stewart as a kame moraine. Some beds suggest local deltaic origin, and dip to the southeast. Test #1A was a hand-shovel sample of north (highest) face. Log of Test: 0'-1', overburden; 1'-3', gravel; 3'-4.5', sand and silty sand; 4.5'-10', interbedded pebbly sand, silty sand and gravelly sand; 10'-13', sand; 13'-14', gravelly sand; 14'-15', sand and pebbly sand.
	1B	1970	15-28	---	Yes	100	89.3	81.6	1.6	0.9 0.7*	1	---	Sand	Test #1B was dug by hand-shovel below Test #1A. Log of Test #1B: 15'-17', fine gravel; 17'-20', sand; 20'-24', pebbly sand and sand; 24'-28', gravelly sand; test bottoms in sloughed material. The material is clean.

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	1C	1970	35-50	---	Yes	100		78.5	7.9		1½	---	Sand	The gravel layers are not thick enough to warrant a separate sample. Test #1C was sampled with hand-shovel and backhoe. Log of Test #1C: 0'-1', overburden; 28'-35', not able to reach; 35'-50', layers of sand, gravelly sand, and pebbly sand. Passing ½" sieve, 88.1%; passing #200 sieve, 4.2%. This sample meets the requirements for Sand Borrow, Item 703.03.
	2	1970	0.5-5	0-0.5	Yes	100		52.4	3.7		1	---	Gran. Borrow (Sand)	Test #2 was dug in floor, 20' S.25°E. of Test #1. Log of Test #2: 0'-0.5', overburden; 0.5'-5', gravelly sand. Water at 5'. Passing the ½" sieve, 64.5%; passing #200 sieve, 2.8%. This sample had excess #4 stone and ½" stone for Item 703.03, Sand Borrow and Cushion, and Item 202, Sub-base of Sand.
	3	1970	1-15	0-1	Yes	89.3	79.0	66.7	9.3	3.9 2.6*	1	---	Gran. Borrow (Sand)	Test #4 was dug by hand-shovel and backhoe on a 15-foot face, just northwest over a spur from Test #1. Log of Test #3: 0'-1', overburden; 1'-2', sand; 2'-6', gravelly and pebbly sand; 6'-7', fine sand; 7'-9', sand; 9'-11', fine gravel; 11'-15', sand and boulders.
	4	1970	1-6	0-1	Yes	60.4	45.3	26.4	15.0		1	27.2%	Gran. Borrow (Grav.)	Test #4 was dug in the floor, 30' northwest of Test #3. Log of Test #4: 0'-1', over-

* Percentage of total sample

SUTTON 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 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														burden; 1'-6', gravel. Test bottoms on boulders, and appears to be in a buried stream bed with a steep gradient which produced rounder, better-sorted material than that outside the stream bed, which was unsorted boulders and sand. The gravel is very localized. There is 8.2% passing the #200 sieve.
	5	1970		N O T	S A M P L E D									Test #5 was dug in a small clearing, 75' west of Test #4. Ledge at 2'. Not sampled.
2	1	1970	1-14	0-1	Yes	100	94.5	88.8	17.8	6.0 5.3*	1½	---	Gran. Borrow (Sand)	Owner: Michael Ronan. Area is a low-lying pit which is the western-most of Ronan's two pits. It is 0.07 mile north of U.S. Route No. 5 at a point 0.15 mile east of its junction with State Aid Highway No. 1. The pit is east and southeast of the town pit, and is mapped with the kame moraine by D. P. Stewart. East, beyond a small ridge trending northwest-southeast, the land slopes down to a small pond. There was no large extension of material noted. Test #1 was a hand-shovel sample of the northeast face. Log of Test: 0'-1', overburden; 1'-2', sand; 2'-3', pebbly sand; 3'-6', fine sand; 6'-12', medium sand; 12'-14', gray sand; 14'-18', sloughed material. There are some thin

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														layers of cobbles, and an occasional boulder.
	2	1970	0-11.5	---	Yes	100		63.1	4.2		1	---	Gran. Borrow (Sand)	Test #2 was dug atop face at south end of pit. Log of Test #2: 0'-2.5', gravel; 2.5'-3', silt layer; 3'-5', pebbly sand; 5'-8.5', gravelly sand; 8.5'-11.5', cobbly sand. Passing ½" sieve, 3.2%. This sample meets requirements for Item 703.03, Sand Borrow and Cushion.
	3	1970	2-11	0-2	Yes	100		62.9	6.9		1½	---	Gran. Borrow (Sand)	Test #3 was dug at base of southwest slope of partly wooded knoll, 100' N.18°E. of Test #2. Log of Test #3: 0'-2', overburden; 2'-4', sand; 4'-6', silt and clay; 6'-11', well-packed, pebbly sand with some rotted rock fragments, and a few cobbles. Water at 11'. Passing ½" sieve, 71.5%; passing #200 sieve, 4.9%. This sample meets requirements for Item 703.03, Sand Borrow and Cushion.
	4	1970	1-4	0-1	Yes	100		71.7	10.5	4.6 3.3*	1	---	Sand	Test #4 was dug in floor, 35' northwest of Test #2. Log of Test #4: 0'-1', overburden; 1'-2', sand; 2'-2.5', silt; 2.5'-4', sand. Test bottoms in water at 4'. Passing ½" sieve, 21.3%; passing #200 sieve, 6.8%.
	5	1970	11.5-22	0-1	Yes	100		69.7	15.3		1½	---	Gran. Borrow (Sand)	Test #5 represents face below Test #1 on lower southwest face. Sampled by backhoe and hand-shovel. Log of Test #5:

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														0'-1', overburden; 11.5'-13.5', pebbly sand; 13.5'-14', silt; 14'-16.5', pebbly sand; 16.5'-22', sand and silt layers. Passing ½" sieve, 79.9%, passing #200 sieve, 10.9%. This sample meets requirements for Item 703.03.
3	1A	1970	1-12	0-1	Yes	100	93.0	86.9	11.7	4.0 3.5*	1	---	Sand	Owner: Michael Ronan. Area is pit east of small pond, 0.5 mile north of U.S. Route No. 5, and 0.33 mile east of its junction with State Aid Highway No. 1. There is a wooded ridge to the northeast which trends about east-west, and may be a possible extension of usable material; however, it was impossible to get a backhoe in to sample. D. P. Stewart has mapped the area as being within a kame moraine. The pit has two levels. Test #1A was an hand-shovel sample on the 15-foot north face of the upper level. Log of Test #1A: 0'-1', overburden; 1'-3', pebbly sand; 3'-4', fine sand; 4'-6', sand; 6'-8', fine gravel; 8'-10', pebbly sand; 10'-12', coarse sharp sand.
	1B	1970	12-16	---	Yes	100		86.2	24.3		1	---	---	Test #1B was sampled by backhoe and hand-shovel below Test #1A. Log of Test #1B: 0'-1', overburden; 12'-14', coarse sharp sand; 14'-16', fine or

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 6

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														silty sand; test bottoms at 16' in sand. Passing ½" sieve, 90.1%, passing #200 sieve, 13.2%. Material fails to meet requirements for Sand Borrow and Cushion, Item 703.03 because 13.2% passes the #200 sieve. The maximum allowed is 12.0%. Material passes for Granular Borrow, Item 703.05, but probably would not meet requirements for Granular Borrow, Item 105.
	2	1970	0-8	---	Yes	100	100	99.6	91.0		1	---	---	Test #2 was dug in floor of middle level, 20' S.45°W. of Test #1. Log of Test #2: 0'-4', very fine sand; 4'-8', silt, or silt-to-clay, with some cobbles and a few boulders. Bottoms in water at 8'. Passing #200 sieve, 80.5%. The sample fails to meet requirements for Sand Borrow and Cushion, Item 703.03, and Granular Borrow, Item 703.05 because of excess material passing the #200 sieve. The maximum allowed for sand is 12.0%, and for granular borrow is 15.0%.
	3	1970	1-11	0-1	Yes	100	100	99.2	16.7		1	---	Sand	Test #3 was dug in floor; 50' southwest of, and 6' below Test #2. Log of Test #3: 0'-1', strippings; 1'-3', sand; 3'-4', silt; 4'-6', sand; 6'-7', silt; 7'-8', sand; 8'-9', pebbly sand; 9'-11', silty sand; test bottoms

SUTTON GRANULAR DATA SHEET NO. 7

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														at 11' on boulders. Passing #200 sieve, 1.8%. This sample met requirements for Item 703.03.
	1	1970	2-6	0-2	Yes	100	100	65.4	10.5	4.8 3.1*	1½	---	Gran. Borrow (Sand)	Owner: Wallace Stevens. Area is an old, shallow pit in the northwest part of town, which lies south of the railroad tracks and north of an old house on State Aid Highway No. 1, 0.3 mile east of its junction with U.S. Route No. 5. The pit is very nearly depleted and is not being worked. There are many large rock fragments and boulders piled on the pit floor. Test #1 was dug by hand-shovel and backhoe on the southwest face, 120' southwest of pole (176 1004). Log of Test #1: 0'-2', overburden; 2'-6', pebbly sand; 6'-7', gravel, 7'-15', till and rotted rock fragments. The sample meets requirements for Sand Borrow and Cushion, Item 703.03. It failed for Sub-base of Sand, Item 202, because of an excess of stone.
	2	1970	0-10	---	Yes	100	100	89.0	71.1	23.[illegible]	1	---	---	Test #2 was dug in pit floor, 50' N.15°E. of Test #1. Log of Test #2: 0'-1', pebbly sand; 1'-2', fine gravel; 2'-3', pebbly sand; 3'-4', silt; 4'-6', fine gravel; 6'-10', silt. Fails because of excess passing

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														#100 and #200 sieves. Overall, this pit is not a very good source of granular materials.
5	1	1970	2-30	0-2	Yes	100	100	100	38.1		2	---	---	Owner: Walter Thornton (former William Chapple property). Area is an old C.C.C. pit which was hand-dug for winter sand. The area is just northeast of junction of Town Highway No. 5 with U.S. Route No. 5. The access is 0.05 mile east of the junction. Test #1 was dug by hand-shovel and backhoe on 30-foot north face. Passing #200 sieve, 14.8%. Log of Test 1: 0'-2', overburden; 2'-8', fine silty sand; 8'-21', alternating 3" to 6" bands of fine and silty sand; 21'-30', sand and silty sand seams. This sample meets the requirements for Granular Borrow, Item 703.05.
6	1	1970	1.5-9	0-1.5	No	47.9	38.8	32.3	16.0	7.9	1½	21.4%	Gravel	Owner: Everett Baird. Area is a large, rolling field with a small brook running west through it from near the Newark town line marker on Vt. Route No. 5A. Access is by field road just southeast of the brook. Test #1 was dug west of pasture knoll, 330' south of corner of tree line, at or very near

SUTTON GRANULAR DATA SHEET NO. 9

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														the Newark Town Line. Log of Test #1: 0'-1.5', overburden; 1.5'-5', gravel; 5'-9', fine gravel. There was coarse gravel to 5'. Water was reached at 5'.
	2	1970	1-10	0-1	No	60.1	46.3	37.4	10.0	4.7	3½	23.6%	Gravel	Test #2 was dug very close to town line at north end of field, and 75' east of corner of tree line. Log of Test #2: 0'-1', overburden; 1'-2', bouldery gravel; 2'-5', fine gravel; 5'-8', bouldery gravel; 8'-10', gravel. Sample did not include any of the many +6" boulders Material looks like it would need a crusher to prepare it for use. Tests #2 and #3 would also meet requirements for Item 704.05.
	3	1970	2-10	0-2	No	50.5	45.5	38.7	15.0	5.0	1		Gran. Borrow (Grav.)	Test #3 was dug 75' north of brook, 85' south of Vt. Route No. 5A, and S.60°W. of town line marker. Log of Test #3: 0'-2', overburden; 2'-5', coarse gravel with large boulders; 5'-7', gravel; 7'-8', sand; 8'-10', gravel. Water enters at 9'. This test probably would have passed on wear because the wears on Tests #1 and #2 were acceptable. Passing #200 sieve, 5.0%.
	4	1970	2-8	0-2	No	55.9	49.1	43.0	19.0		1½		Gran. Borrow (Grav.)	Test #4 was dug in unmowed field, 160' S.35°W. of Test #1. Log of Test #4: 0'-2', clayey overburden; 2'-3', fine gravel;

SUTTON GRANULAR DATA SHEET NO. 10

Lap Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														3'-4', sand layer; 4'-5', gravel; 5'-8', bouldery, coarse gravel. Water encountered at 7'. Some of the material was rather sticky. There were rotted rock fragments which indicates a slight amount of sorting and washing by the overflow from Lake Willougby during the post-glacial melting period. However, there was not enough water activity to produce a really good gravel. Passing the #200 sieve, 8.7%. This sample would not meet requirements for Item 704.05 either. There is excess passing the #100 and #200 mesh sieves.
	5	1970	1.5-9	0-1.5	No	100	100	47.1	6.0	2.9	3	---	Gran. Borrow (Grav.)	Test #5 was dug 135' S.35°E. of northwest section of field south of brook, and about 8' above the level of the brook. Log of Test #5: 0'-1.5', overburden; 1.5'-5', pebbly sand; 5'-9', fine gravel with boulders. Water at 7'.
	6	1970	2-8	0-2	No	48.3	40.4	33.3	13.0	4.6	3½	23.1%	Gravel	Test #6 was dug just east of tree-line, 375' S.40°E. of Test #5. Log of Test #6: 0'-2', overburden; 2'-4', fine gravel; 4'-8', coarse gravel; lots of water at 7'.
	7	1970	2-7	0-2	No	94.6	85.3	73.8	18.5	7.5 5.5*	3½	---	Gran. Borrow (Grav.)	Test #7 was dug 320' N.60°E. of Test #6. Log of Test #7: 0'-2', overburden; 2'-3', pebbly

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 11

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	8	1970	1.5-9	0-1.5	No	67.1	51.5	38.6	16.0	6.4	1½	29.0%	Gran. Borrow (Grav.)	gravel; 3'-4', silty sand; 4'-5', sand; 5'-7', bouldery, very coarse gravel. Test #8 was dug near bridge across brook, 275' S.4°E. of, and 6' below Test #7. Log of Test #8: 0'-1.5', overburden; 1.5'-9', well-packed, fairly well-sorted, medium to coarse gravel with some boulders. No water was encountered even though test was below level of brook.
	9	1970	1-6	0-1	No	100	95.8	90.6	10.1	2.9 2.6*	2	---	Sand	Test #9 was dug in south part of field, 500' S.8°W. of Test #8. Log of Test #9: 0'-1', overburden; 1'-2', pebbly sand; 2'-6', sand with an occasional cobble. Water at 4'. The sides of test hole caved very easily. The bedding sloped away from the brook and suggested a small, localized deltaic deposit; then, possibly the banks got high enough to contain the stream in its present bed.
	10	1970	1-10	0-1	No	49.7	40.9	36.6	4.0	3.1	3½	22.3%	Gravel	Test #10 was dug 220' N.50° W. of Test #9. Log of Test #10: 0'-1', overburden; 1'-3', gravel; 3'-4', gravelly sand; 4'-8.5', gravel; 8.5'-10', gravelly sand; water at 8.5'.
	11	1970	2-9	0-2	No	69.0	55.9	44.7	12.0	5.0	3	---	Gran. Borrow (Grav.)	Test #11 was dug 300' N.11° E. of Test #10. Log of Test #11: 0'-2', overburden, 2'-3.5',

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 12

ap Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														gravel; 3.5'-4.5', sand; 4.5'-8', gravel; 8'-9', sand. Test bottoms in water and sand. Insufficient proper size stones were included for the wear test.
7	1	1970	1.5-10	0-1.5	No	79.9	77.8	77.8	20.2	4.0 3.8*	1½	---	Gran. Borrow (Sand)	Owner: Everett Baird. Area is a small mowed field, adjacent to the southwest side of Vt. Route No. 5A and the large field below and southwest of it, in the northeast corner of town. Test #1 was dug near trees and fence in small, narrow extension of large, low field. Log of Test #1: 0'-1.5', overburden; 1.5'-5', sand; there were several very large boulders at 5'; 5'-8', sand; 8', several large boulders; 8'-10', sand, with a few cobbles; water at 10'.
	2A	1970	1.5-6	0-1.5	No	91.1	88.7	77.5	7.0	3.0 2.3*	3½	---	Gran. Borrow (Grav.)	Test #2A was dug 260' S.23°W. of Test #1. Log of Test 2A: 0'-1.5', overburden; 1.5'-3', pebbly, brown sand; 3'-5', sand, with some thin layers of silt; 5'-6', fine sand. Material does not meet specifications for Sub-base of Sand, Item 202, but it does meet requirements for Item 703.03, Sand Borrow and Cushion.
	2B	1970	6-10	---	No	56.5	47.1	39.1	14.0	4.5	5	27.4%	---	Test #2B: 0'-1.5', overburden; 6'-10', gravel; water enters at 5.5'. Cobbly sand at 10'. There were some silt beds below

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 13

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														surface of water. The gravel in the hole was somewhat sticky in places. Material meets the new specifications for Granular Borrow, Item 703.05, but fails the color test under the old specifications for granular borrow.
	3	1970	1-9	0-1	No	100	100	46.7	33.0	9.1	1½	---	Gran. Borrow	Test #3 was dug in field, 120' S.80°E. of small bridge. Log of Test #3: 0'-1', overburden; 1'-3', fine sand; 3'-4', gravel; 4', water; 4'-9', gravel, sand and silt layers. The material was too sticky and mixed to be sampled as anything but granular borrow. But there could be gravel at a greater depth since the test bottomed in gravel and sand.
	4A	1970	1-4	0-1	No	79.1	76.8	74.2	43.0	16.9	1	---	---	Test #4A was dug in corner of field, 165' S.50°E. of, and 12' above Test #3. Log of Test 4A: 0'-1', overburden; 1'-4', fine sand with some pebbles and silt.
	4B	1970	4-8	---	No	45.1	34.8	27.3	19.0	8.9	1	---	Gran. Borrow (Grav.)	Test #4B: 4'-8', gravel mixed with silt. Water encountered at 5'.
	5A	1970	1-5	0-1	No	100	100	99.7	57.0	29.0	1	---	---	Test #5A was dug in corner of field, 180' N.62°E. of, and 10' above Test #4. Log of Test #5A: 0'-1', overburden; 1'-5', silty fine sand.

SUTTON GRANULAR DATA SHEET NO. 14

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	5B	1970	5-8	---	No	45.6	37.8	30.3	24.0	8.4	1	16.1%	Gran. Borrow (Grav.)	Test #5B: 5'-8', gravel. Water at 8'. One large boulder encountered at 6' in the east end of the test hole.
	6	1970		N O T	S A M P L E D									Test #6 was dug on top of small rise in south end of field, 435' S.40°W. of Test #5. Bedrock at 2'. Not sampled
	7	1970	1.5-9	0-1.5	No	63.4	53.3	43.8	18.0	6.7	2	28.7%	Gran. Borrow (Grav.)	Test #7 was dug at east base of small rise, 210' N.68°W. of Test #6. Log of Test #7: 0'-2', overburden; 2'-7', sandy gravel; 7'-9', cobbly gravel with several +24-inch boulders; 9', water.
	8	1970	1-9	0-1	No	48.2	42.4	36.0	26.0	8.7	5	---	Gran. Borrow (Grav.)	Test #8 was dug in southwest corner of field, 150' N.75°W. of Test #7. Log of Test #8: 0'-1', overburden; 1'-2', gravel; 2'-3', sand; there is a 2" seam of clay; 3'-4', sand; 4', gravel and water; 4'-9', water, sand, gravel, and silt. Insufficient proper size stones were included for the wear test.
	9	1970	1-10	0-1	No	100	100	94.1	29.0	11.8	1	---	---	Test #9 was dug in middle of field, 120' south of tree line, and 100' west of Vt. Route No. 5A. Access is just south of the junction of Town Highway No. 12 with Vt. Route No. 5A. Test #9 was dug in an area that was mapped as kame terrace. However, sample is mostly a rotted rock material with a sugary texture,

SUTTON GRANULAR DATA SHEET NO. 15

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														and a layered, varved-like appearance. One small pocket, one foot in diameter, of good clean sand was noted in the side of the hole. It is thought that it may be the remnant of a small, buried stream-bed. Log of Test #9: 0'-1', overburden; 1'-10', layers of rotted rock fragments. (Possibly a very slightly washed till.) Material does not meet the old specifications for granular borrow, but does meet the new specifications for Granular Borrow, Item 703.05.
8	1	1970	4-11	0-1.5	No	52.0	47.7	42.0	20.0		3½	31.0%	Gran. Borrow (Grav.)	Owner: Everett Baird. Area is a large rolling field, southwest of Vermont Route No. 5A, and south of Map Identification #7. It has a northwestward extension through a large, damp, uncut field to a tiny pit on a small wooded ridge near a marshy area. Test #1 was dug at top of slope in northwest corner of cut part of field. Log of Test #1: 0'-1.5', overburden; 1.5'-4', big boulders; 4'-11', bouldery coarse gravel; bottoms in sand. Due to size and amount of boulders not included in sample, the test results show material to be finer than is actually the case. Passing #200 sieve, 8.4%.

SUTTON GRANULAR DATA SHEET NO. 16

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	2	1970	4-10	0-1.5	No	40.0	32.0	25.0	16.0	5.4	1½	21.4%	Gran. Borrow (Grav.)	Test #2 was dug atop knoll 210' S.5°W. of Test #1. Log of Test #2: 0'-1.5', overburden; 1.5'-4', large boulders; 4'-10', bouldery coarse gravel; bottoms on bedrock or boulder. Passing #100 sieve, 16.0%; passing #200 sieve, 8.1%. This sample barely fails for Item 201 and Item 704.05, gravel items.
	3	1970	1-10	0-1	No	100	100	84.3	26.1	4.9 4.1*	2½	---	Sand	Test #3 was dug on the flats, 100' S.5°E. of, and 13' below Test #2. Log of Test #3: 0'-1', overburden; 1'-8', tan sand with some pebble lenses and silt; water at 8'; 8'-10', fine sand and silt; 10', very large boulders; ledge or large boulder at 11'.
	4	1970	1-6	0-1	No	64.6	47.6	35.2	3.0	0.7	1	27.8%	Gran. Borrow (Grav.)	Test #4 was dug in uncut field, 90' north of, and 14' below Test #1. Log of Test #4: 0'-1', overburden; 1'-6', dirty, rather fine gravel; much water flows in from north end of hole at 6'; 6'-7', fine pebbly gravel; 7'-8', coarse bouldery gravel; 8'-10', gravel.
	5	1970	3-4.5	0-3	No	100	94.2	85.6	66.0	22.7	1	---	---	Test #5 was dug in northeast section of field. Hole is below Tests #1-4, and material is finer which suggests that this test was further downstream from Tests #1-4. Test #5 was dug 240' S.50°W. of large elm in low stone wall.

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 17

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	6	1970	1-9	0-1	Yes	100	100	49.8	9.0	4.4	2	---	Gran. Borrow (Grav.)	Log of Test #5: 0'-3', overburden; 3'-4.5', layer of pebbles and silt; 4.5'-6', silt and water. Test #6 was dug on face of tiny pit. Pit is at southwest end of a low wooded ridge which may be a small esker. The top of the feature is about 25' above a marshy area to the west, and about 10'-15' above pit floor. The feature extends 250'-300' N. 35°E. and is about 50'-75' wide. Log of Test #6: 0'-1', overburden; 1'-3', brown sand; 3'-5', sand; 5'-6', boulders; 6'-7', fine gravel; 7'-9', sand and boulders. Boulders were large and not well-rounded. Some fine gravel noted, but overall, the material is a sand with a fairly high stone content which is not uniformly graded enough to pass for gravel.
9	1	1970	0.5-5	0-0.5	No	93.9	91.7	86.2	23.0	8.9	1½	---	Gran. Borrow	Owner: Harold Smith. Area is a slightly rolling, uncut 4-6 acre field which is on the southwest side of Vermont Route No. 5A, 0.3 mile southeast of its junction with Town Highway No. 11. Test #1 was dug 150' S.35°E. of shed near house. Log of Test #1: 0'-0.5', overburden; 0.5'-5', rotted rock fragments which range from sand- to boulder-size. Bedrock

SUTTON GRANULAR DATA SHEET NO. 18

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														at 5', with a slow seep of water at 5'.
10	1	1970	0-11	---	No	100	81.7	74.2	2.3	3.1 0.9*	2	---	Sand	Owner: Welcome Allard. Area is a large, flat field on the southwest side of U.S. Route No. 5, 0.45 mile northwest of its junction with Town Highway No. 7. This area was the former West Burke Dump. Area may be listed in old records as Sally's Pond, but it has dried up since. Test #1 was dug near southwest corner of field. Log of Test #1: 0'-2', fine gravel; 2'-2.5', sand seam; 2.5'-4.5', gravelly sand; 4.5'-11', sand.
	2	1970	0.5-11	0-0.5	No	100	100	83.1	7.5	2.3 1.9*	1½	---	Sand	Test #2 was dug 210' N.25°E. of Test #1. Log of Test #2: 0'-0.5', overburden; 0.5'-1', pebbly sand; 1'-3.5', fine gravel and coarse sand; 3.5'-5.5', pebbly sand; 5.5'-6.5', fine gravel; 6.5'-11', sand and pebbly sand layers.
	3	1970	0.5-11	0-0.5	No	100	100	77.6	3.1	1.1 0.8*	1½	---	Sand	Test #3 was dug near east edge of field, 160' north of Test #2. Log of Test #3: 0'-0.5', overburden; 0.5'-1.5', sand; 1.5'-6', pebbly sand with several small cobbles; 6'-11', sand. Passing #200 sieve, 1.8%. This sample meets requirements for both sand items, 202 and 703.03.
	4	1970	0-9	---	No	100	100	71.4	3.8		1½	---	Sand	Test #4 was dug near west edge of field, 320' N.80°W. of

* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 19

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	5	1970	1-11	0-1	No	100	82.7	73.3	2.9	1.0 0.7*	1½	---	Sand	Test #3. Log of Test #4: 0'-3.5', fine gravel and gravelly sand; 3.5'-4.5', sand; 4.5'-9', pebbly sand; test bottoms in water at 9'. Passing the ½" sieve, 82.6%; passing #200 sieve, 3.0%. This sample also meets requirements for both sand items 202 and 703.03. Test #6 was dug in the north-east corner of field, 180' N.60° E. of Test #5. Log of Test #6: 0'-1', overburden; 1'-2', sand; 2'-7', gravelly sand; 7'-10', sand; test bottoms in water at 10'. Passing ½" sieve, 91.9%; passing #200 sieve, 2.0%. This sample meets requirements for Item 202 and Item 703.03. This area is bounded on the west by a marshy zone with many dead tree stumps in the southern end. It was noted in all test holes that the beds are very close to horizontal. Perhaps the marsh is the remnant of Sally's Pond.
11	1	1970	1-5	0-1	No	83.3	78.1	73.6	37.0	12.7	1½	---	---	Owner: Steve Mitchell. Area is a pine-wooded ridge east of and above the old Cedar Grove Dance Hall on State Aid Highway No. 1, 0.27 mile northwest of its junction with Town Highway No. 45. The surface of the ridge has

*Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 20

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½	5/8"	#4	#100	#270				
														a granular appearance and is well-drained enough to support evergreen trees, but the feature is a ridge of glacial till with just a surface skin of granular material. Test #1 was dug in a small clearing on logging road about 0.15 mile northeast of the dance hall. Log of Test #1: 0'-1', sandy overburden; 1'-5', rotted rock fragments.
	2	1970	1-8	0-1	No	91.9	90.0	85.0	33.0	11.0	1½	---	---	Test #2 was dug in small clearing atop ridge and just south of logging road. Log of Test #2: 0'-1', fine silty overburden; 1'-8', clacial till. The till is composed of clay, silt; rocks which are partly weathered in situ, and rotted rock fragments. Overall, material is not good.
12	1	1970	1-5	0-1	No	43.1	29.7	19.2	4.0	2.8	1½	14.7%	Gravel	Owner: Steve Mitchell. Area is a long, narrow field west across State Aid Highway No. 1 from the old Cedar Grove Dance Hall, and 0.3 mile northwest of the junction of Town Highway No. 45 with State Aid Highway No. 1. The material in the low field is probably a river gravel. Test #1 was dug 115' S.80°W. of Cedar Grove Dance Hall. Log of Test #1: 0'-1', overburden; 1'-5', well-packed, bouldery coarse gravel; test bottoms at 5' on

SUTTON GRANULAR DATA SHEET NO. 21

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing ½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														very dense, sticky blue clay which has some angular pebbles and cobbles. There is a high calcium carbonate content in the clay. The bottom of the test was 3' above the level of the brook. Sample has just a few too many stones to meet new gravel specifications, Item 704.05, but meets requirements for Item 201.
	2	1970	1-4.5	0-1	No	51.4	42.6	32.7	47.0	13.0	1	---	---	Test #2 was dug near the narrow, south end of field, 275' S.35°E. of Test #1. Log of Test 2: 0'-1', overburden; 1'-4.5', coarse gravel; test bottoms at 4.5' in blue clay. This feature does not have much material in it, but could be a source for local use.
13	1A	1970	2-6	0-2	No	58.3	48.8	39.0	16.0	5.0	1½	29.1%	Gran. Borrow (Grav.)	Owner: Mrs. Frances LaBrozzi. Area is a field with small, shallow diggings, southwest of, and above Calendar Brook, 0.1 mile northwest of the southwest end of Town Highway No. 29. D. P. Stewart has mapped the area as pebbly sand, but its position suggests it is more likely a kame terrace. Test #1A was dug in the field 170' S.70°E. of fence opening in northwest end of field. Log of Test #1A: 0'-2', overburden; 2'-6', very fine gravel. Passing #200 sieve, 10.5%.

SUTTON GRANULAR DATA SHEET NO. 22

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	1B	1970	6-11	---	No	100	78.7	71.7	11.4	3.9 2.8*	1	---	Gran. Borrow (Grav.)	Test #1B: 6'-11', pebbly sand. Beds dip to the southeast.
	2	1970	0.5-8	0-0.5	Yes	58.3	48.3	37.3	13.0	4.0	1	34.0%	Gran. Borrow (Grav.)	Test #2 was dug in floor of shallow pit, 140' S.3°E. Test #1. Log of Test #2: 0'-0.5', overburden; 0.5' bouldery gravel; 3'-5', cobbly gravel; 5'-8', fine gravel; test bottoms in water at 8'. Passing #200 sieve, 6.5%.
	3	1970	0-11	---	Yes	100	76.8	68.1	9.5	3.4 2.3*	1	---	Gran. Borrow (Sand)	Test #3 was dug in floor of small diggings at north end of field, and just above Calendar Brook, 160' S.58°E. of, and 14' below Test #1. Log of Test #3: 0'-11', pebbly sand with a few small cobbles. Test bottomed in same. This sample had excess stone for Item 202, but it meets requirements for Item 703.03.
	4	1970	1.5-11	0-1.5	No	100	80.2	74.0	9.9	3.8 2.8*	1	---	Sand	Test #4 was dug in field, 260" S.40°E. of Test #1. Log of Test #4: 0'-1.5', overburden; 1.5'-3', sand; 3'-6', fine gravel; 6'-8', pebbly sand; 8'-11', sand.
	5	1970	0.5-9	0-0.5	Yes	61.6	52.1	43.4	19.0	5.8	1	---	Gran. Borrow (Sand)	Test #5 was dug in floor of diggings, 150' S.75°E. of Test #2. Log of Test #5: 0'-0.5, overburden; 0.5'-9', bouldery gravel; test bottoms at 9' in clay and some water. Passing #200 sieve, 11.9%. There were not enough proper sized stones

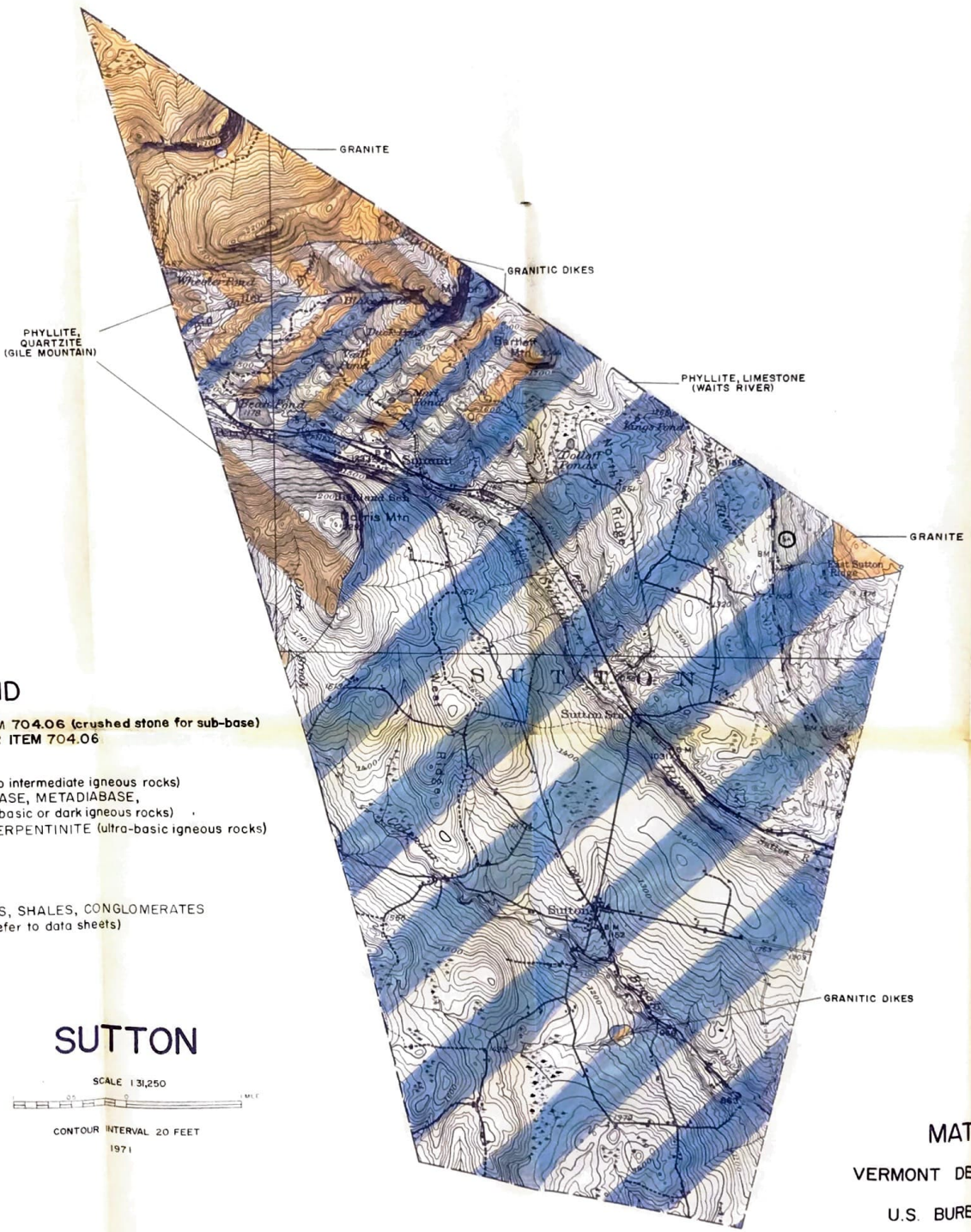
* Percentage of total sample

SUTTON GRANULAR DATA SHEET NO. 23

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				
	6	1970	1-10	0-1	Yes	100	100	64.0	30.0	13.8	1	---	---	included for wear test. Test #6 was dug on southwest face of pit, 50' southwest of Test #5. Log of Test #6: 0'-1', overburden; 1'-2', pebbly sand; 2'-10', rotted rock fragments; test bottoms in same. This is the reason for pit ending where it does.
14	1	1970	1.5-12	0-1.5	No	100	95.0	87.7	13.2	2.3	1½	---	Sand	Owner: Robert G. Simpson. Area is tiny bank or pit, north of State Aid Highway No. 1, 0.05 mile west of the Burke Town Line. There may be an extension up a wooded slope which trends N.25°W., but heavy underbrush covered signs of material. A large, weathered boulder is in the north face of pit, and lies over sand and under a thin cap of gravel. This may have been due to ice-rafting. The area is small and very localized. Owner did not want sampling with backhoe. Test #1 was a hand-shovel sample of northwest face. Log of Test #1: 0'-1.5', overburden; 1.5'-3', fine sand; 3'-6', pebbly sand; 6'-12', medium sand; test bottoms in same. There is a drain trench just south of the face which indicates a downward limit of the material.

TABLE II
Supplement

Sutton Property Owners - Rock	Map Identification No.
Wheeler, Karl	1



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)

SUTTON

SCALE 1:31,250

CONTOUR INTERVAL 20 FEET

1971

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

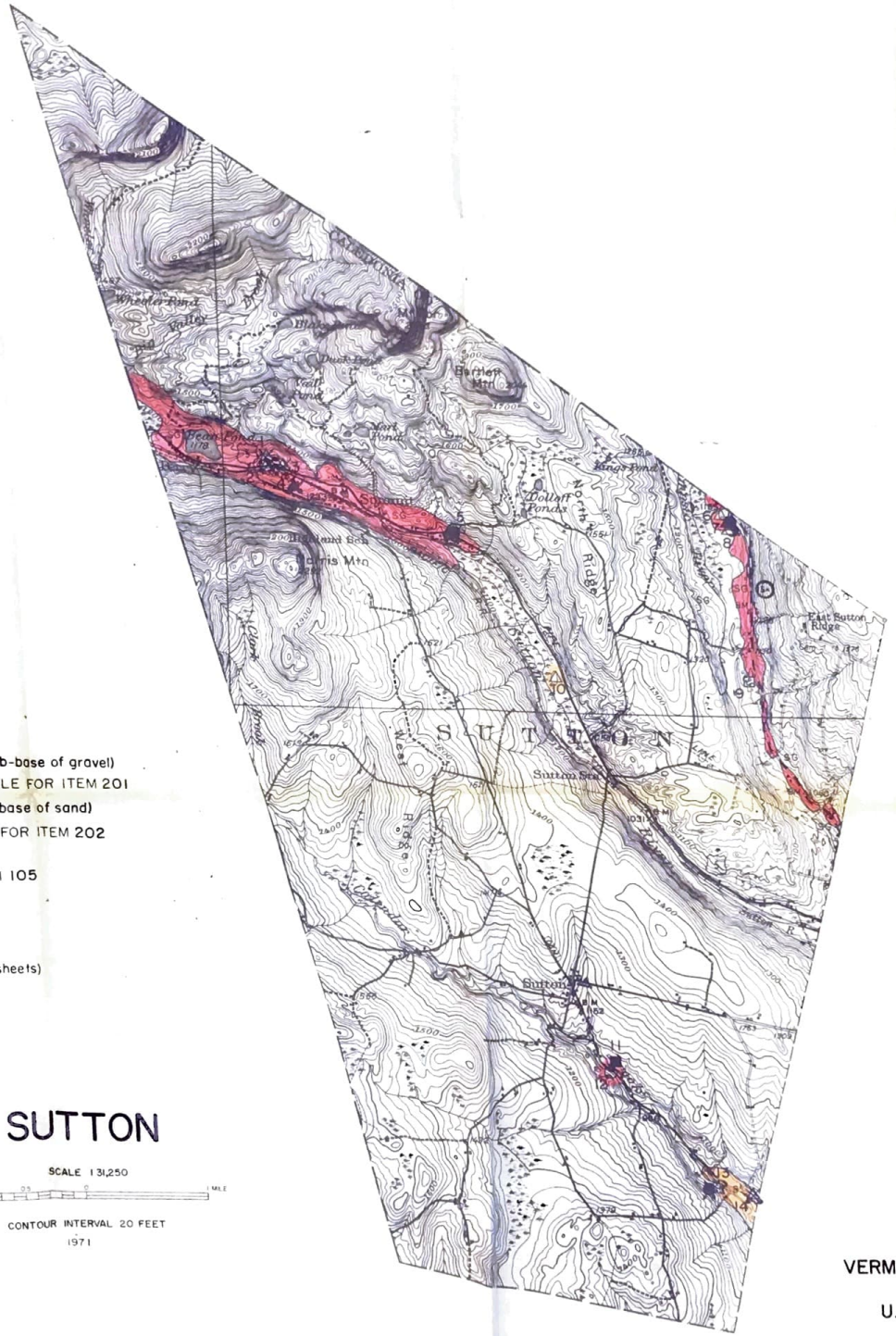
CALEDONIA COUNTY VT. HWY. DISTRICT NO. 7

REVISIONS

DATE						
BY						

PLATE II

ROCK



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
- (36) SAND & GRAVEL DEPOSIT
- (3) SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

SUTTON

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1971

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

CALEDONIA COUNTY

VT. HWY. DISTRICT NO. 7

REVISIONS

DATE						
BY						