SURVEY OF HIGHWAY CONSTRUCTION MATERIALS
IN THE TOWN OF SHEFFIELD, CALEDONIA COUNTY, VERMONT

prepared by

Engineering Geology Section, Materials Division
Vermont Department of Highways

in cooperation with

United States Department of Commerce
Bureau of Public Roads

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TABLE OF CONTENTS

Acknowledgments

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

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

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

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

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

History

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

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

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

Inclosures

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

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

1956. Further information was obtained from the Soil Survey (Reconnaissance) of Vermont conducted by the Bureau of Chemistry and Soils of the United States Department of Agriculture, and from Vermont Geological Survey Bulletins, United States Geological Survey Quadrangles, aerial photographs, and other sources. On both maps the areas tested are represented by Identification Numbers. Several tests are usually conducted in each area represented by an Identification Number, the number of such tests being more or less arbitrarily determined either by the character of the material or by the topography.

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

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

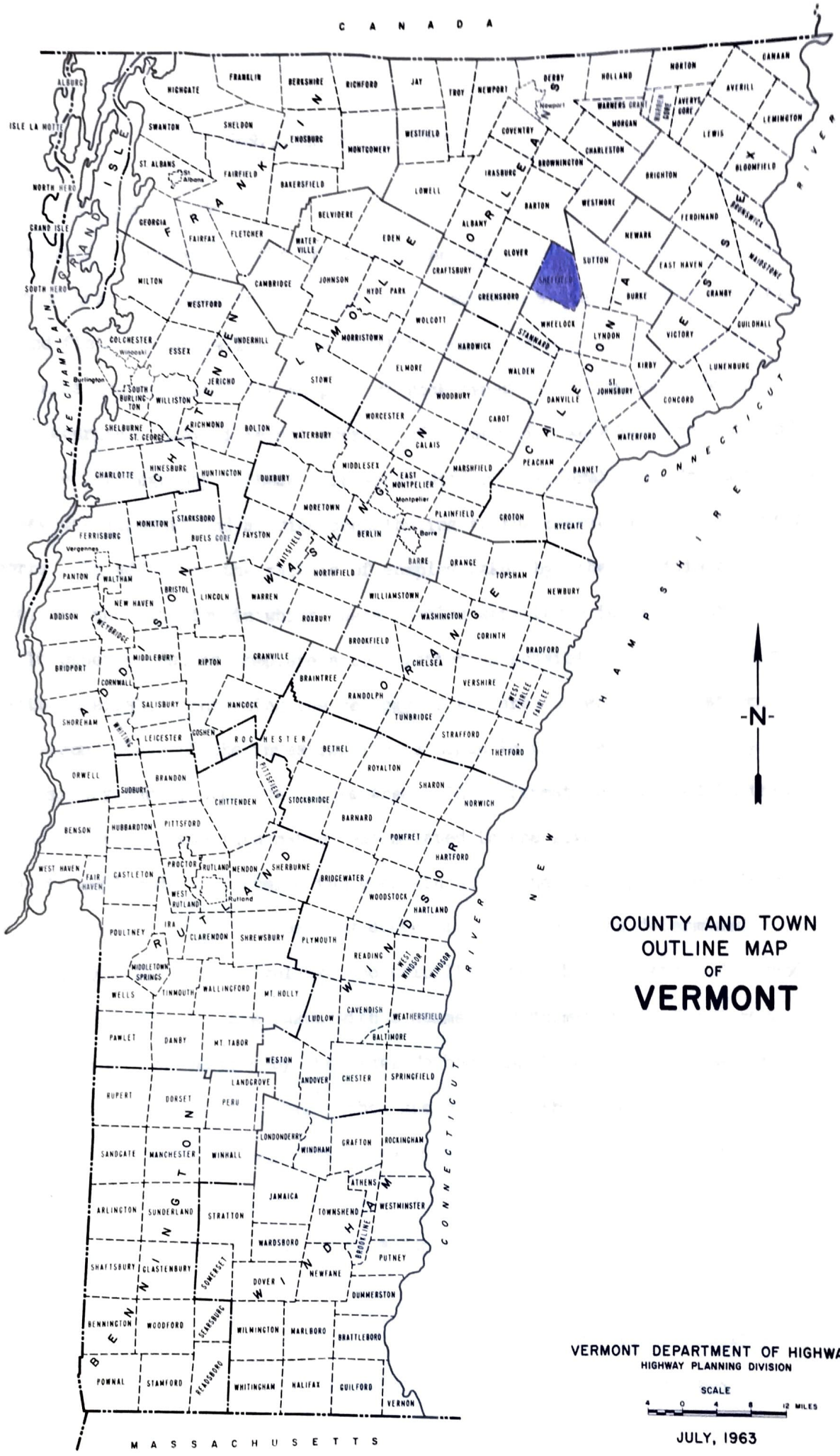
LOCATION

The Town of Sheffield is located in the northeast part of Caledonia County in the northeast part of the state. It is bounded on the north and northeast by the towns of Barton and Sutton,on the southeast and south by Wheelock Township, and on the west by the Town of Glover. (See County and Town Outline Map of Vermont on following page.)

Sheffield is in the Central Plateau Physiographic Region of Vermont merging to the extreme northeast with the Essex Mountain Region . In the north and northeast the township is characterized by steeply rolling or abrupt relief with many low mountains and narrow to broad irregular stream valleys. In the west and southwest a gently to moderately rolling high plateau rises gradually to the Wheelock hills to the south and drops off abruptly at the Sheffield-Glover Town Line to the Lamoille-Barton River Valley. Sheffield Heights is in the north part of this plateau-like area, while the terrain near Sheffield Square is characteristic.

The plateau area is highly dissected by streams flowing northward at the Wheelock-Sheffield Town Line then eastward via Square Brook, and by eastward flowing Oregon Brook and its tributaries. Small streams at the Glover-Sheffield Town Line flow westward into the Barton River.

Drainage in the mountain area is mainly southward or southeastward via Nation Brook and numerous unnamed streams. North of Simpson Hill and Granby Mountain drainage is to the north.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

JULY, 1963

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

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

The second stage of the investigation is begun in the field by making a cursory preliminary survey over the entire area. The information obtained in this survey, together with the information assimilated in the first stage of the investigation, is employed to determine the areas in which the testing and sampling will be concentrated. When a promising source is encountered as determined not only by rock type but also by volume, accessibility, and the existence of a good working face, chip samples are taken with a hammer and submitted to the Highway Testing Laboratory for testing by the Deval Method (AASHO T-3). It is kept in mind that samples taken by the chip method are often in the weathered zone of the outcrop and consequently may show a less satisfactory test result than the fresh material deeper in the body of the rock structure. When deemed necessary, further samples are taken by drilling to a depth of approximately 3 feet and blasting across the strike or trend of the outcrop. When the material is uniform and satisfactory tests result from the chip samples, no further drilling, blasting, or sampling is done, and the material source is included as being satisfactory.

Discussion of Rock and Rock Sources

It will be observed that the information on the surface-geology bedrock map in regard to rock type is simplified. For a more detailed description of the respective rock formations, see the summary included in this report. It is apparent from this summary that each formation may not be composed of one distinct rock type but may be a complex mixture of rock types blending into one another. For this reason the data sheets may describe the rock tested as differing from the designation on the map.

Occasionally, rocks belonging to the same formation and exhibiting similar outward 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 results of an area be construed as meaning that the same formation, even in the same area, will not later produce unsatisfactory material. This is especially true of metamorphic rocks.

The rocks of the Town of Sheffield are mainly metamorphic phyllites or schists, quartzites and limestones belonging to the Gile Mountain and Waits River formations. The latter is well exposed in the stream at Sheffield Village, and both formations are exposed in scattered outcrops.

In general, the phyllites or schists appeared unsatisfactory for sub-base of crushed rock, and this lithology appeared so frequently interbedded with the more durable quartzites and limestones that only one exposure of metamorphic rocks was sampled.

This was Area No. 3 (see Table II and Plate II), located on the west side of Town Road No. 3, the so-called Duck Pond Road, immediately west of and above Duck Pond. At this location a talus block slope and a vertical face above the slope was sampled for sub-base of crushed rock. Quartzite, quartz schist or phyllite and granitic dike rock was included.

The granitic dike rock was exposed on the face in a 12 foot thick body angling from upper left to lower right. All rock appeared durable, broke satisfactorily and met abrasion requirements for the crushed rock.

The area is located a few hundred yards west of the proposed location of Interstate 91 and is reached by crossing a swamp and the inlet of Duck Pond and traversing a wooded hillside.

Two other areas in which granitic dike rocks or irregular granitic bodies have intruded rocks of the Gile Mountain formation were sampled. One, Area No. 2 is the west slope and top of Grays Mountain, located east of the proposed location of Interstate 91 in the vicinity of station 1718+00. Near the top of the 1872 foot mountain a granitic body of undetermined extent and thickness was sampled. Talus blocks from the exposed granite appear on the wooded west slope of the hill. The rock sampled met abrasion requirements for sub-base of crushed rock and would be a handy source for this item. Clearing the hillside and construction of a haul road would of course be required.

The second area, Rock Area No. 1 (an inactive Quarry), is located on Town Road No. 2 in the southwest corner of the township. Two separate exposures of abundant granitic dike rocks have been mapped in this vicinity. One exposure is partly in the Town of Wheelock. However, only large blocks scattered on a pasture hillside were seen by the materials survey party and no samples were taken.

The quarry and the north grout pile were sampled for sub-base of crushed rock and both samples met abrasion requirements for the item. The rock is a medium grained granite or granodiorite known as Sheffield Blue Granite. The quarry is about 5.6 miles west of the proposed location of Interstate 91 at Sheffield Village.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

The method employed by the project in the survey of possible sources of sand and gravel for highway construction is divided into two main stages: office investigation and field investigation. The office investigation is conducted primarily during the winter months and comprises the mapping of possible potentially productive areas as indicated from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart proves to be valuable, particularly when used in conjunction with other references such as soil-type maps, aerial photographs, and United States Geological Survey quadrangles. The last two are used in recognizing and locating physiographic features indicating glacial deposits and in studying drainage patterns. In addition, the location of existing pits are mapped when known. The locations in which samples were taken by other individuals are noted and mapped when possible.

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

Discussion of Sand and Gravel Deposits

The granular materials of the Town of Sheffield consist chiefly of poorly sorted gravels with occasional layers or lenses of clean sand. The gravels are composed of boulders, tabular cobble-size pieces, soft stones and much silt to clay which has filled in the voids between the stones.

Dr. D. P. Stewart has mapped these deposits as kame moraine materials deposited directly from the front and basal portions of glacial ice. The materials have been only partially sorted, re-worked and stratified. The deposits are a continuation of those tested in the Town of Wheelock.

Three pits in the Town of Sheffield were sampled. Two of these, Areas No. 1 and No. 2 are located outside of Dr. Stewart's mapped deposits. The material in these two pits resembles in structure and content the material in the kame moraine, and probably is of ice-contact origin. These pits are about depleted, having been used on Vermont Route 122 and town roads.

Area No. 8 is a pit located within the kame moraine and exposes pebbly sands and fine silty gravels with a few large boulders. The pit extension to the southeast is underlain by silty gravels overlying sands.

The area south of Sheffield Village was extensively sampled; no material met Highway Department specifications for sub-base of gravel, and only a few tests were of an acceptable sand. Only one area on the north side of Sheffield Village was sampled. Silt, rock fragments and ledge or boulders was encountered, and it appeared from field observations that no granular materials occur on the north side of the valley. However, excavations during construction of Interstate 91 may uncover more poorly sorted gravels in that area shown as part of Dr. D.P. Stewart's kame moraine.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF SHEFFIELD

Gile Mountain Formation - Gray quartz-muscovite phyllite or schist, interbedded and intergradational with gray micaceous quartzite. In Bulletin No. 8, The Geology of the Lyndonville Area, Vermont, the Gile Mountain formation is further described as gray quartz-sericite-biotite schists and impure silty biotite-quartzites.

Waits River Formation - Quartzose and micaceous crystalline limestone weathered to a distinctive brown earthy c st, interbedded and intergradational with gray, quartz-muscovite phyllite or schist. Also recrystallized quartzose limestone, phyllitic limesto , and calcareous phyllite.

Granitic Dike Rocks - Medium - to coarse-grained, light-gray to blue-gray granitic blocks and boulders.

GLOSSARY OF SELECTED GEOLOGIC TERMS

Alluvial - Pertaining to material carried or laid down by running water.

Calcareous - Pertaining to or containing calcium carbonate.

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

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

Fluvial - Pertaining to streams or stream action.

Igneous Rocks - One of the three great rock classes; those rocks which have cooled and solidified from a hot mobile solution of minerals, water, and gases either deep beneath or at the earth's surface.

Intrusive - Igneous rock which has cooled before reaching the earth's surface; contains small to large visible grains. Opposed to Extrusive which solidifies at the surface and contains small unrecognizable grains.

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

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

Limestone - A bedded sedimentary deposit consisting chiefly of calcium carbonate. The most important and widely distributed of the carbonate rocks. The percentage of calcium carbonate ranges from 40 percent to more than 90 percent. Common impurities are clay and sand.

Meta- - A prefix used before rock names to indicate that the minerals have been altered chemically and physically.

Metamorphic Rocks - Rocks that owe their distinctive characteristics to the transformation of pre-existing 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.

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

Schist - A metamorphic crystalline rock having a closely foliated structure and a tendency to split along approximately parallel planes.

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

Strike - The direction of a line formed by the intersection of a horizontal plane with a bedding plane, fault, slaty cleavage, or similar geological structure. It is at right angles to the dip.

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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 complete list of specifications see "Standard Specifications for Highway and Bridge Construction" approved and adopted by the Vermont Department of Highways 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 (9) inch 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 (40) percent 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 AASHO 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

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	$1\frac{1}{2}$"	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 than twenty (20) when tested by laboratory methods, using Method AASHO T-4, or more than thirty-five (35), when tested by AASHO Method T-96.

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

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

"The sand shall show a color of not more than three and one-half ($3\frac{1}{2}$) as determined by the colorimetric test described in the AASHO Method of Test, Designation T-21."

"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, 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

TABLE 1

SHEFFIELD GRANULAR DATA SHEET NO. 1

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
1	1	1966	4.5-10	0-4.5	Yes	71.6	65.4	54.5	23.0	9.8*	2½	---	Gran. Borrow (Grav.)	Owner: Lyle Day. This is a pit area located on Trout Brook northwest of Sheffield Village. Pits behind cemetery are depleted and two pits northwest of the cemetery are inactive. Test #1 dug on west side of old pit area on south side of field drive. Top 4.5' of hole was a silty and bouldery material with minor sand. From 4.5'-10' a silty gravel encountered. A few cobbles and a few boulders noted. Water enters hole at about 9'. Material had excess passing the #100 and #270 mesh sieves for Item 201. Insufficient proper size stones were included for wear test.
	2	1966	1.5-7	0-1.5	Yes	74.4	63.1	50.0	21.0	10.3*	1	31.3%	--	Test #2 dug in flat area between two pits north of field drive. Water shows in floors of all pits. Material is gravel, quite silty and with more stones than Test #1. Water flows in at 4.5'. Material has excess silt size for Items 201 and 105 and has excessive wear for Item 201.
	3	1966	N	O	T	S	A	M	P	L	E	D		Test #3 dug on knoll 90' west of upper pit. Phyllite hit at 2'. A water line parallel to the field drive crosses the field

*Percentage of Total Sample

TABLE 1 SHEFFIELD 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 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														and there would be very little material north of the field drive. This is not a recommended source for Granular Borrow. Has been used in the past for town roads, and on Vt. Rte.122. Deposit is poorly sorted material-may be kame moraine or a partially sorted till.
2	1	1966	N	O	T		S	A	M	P	L	E	D	Owner: Gilson Reynolds. Area is an old pit and adjacent hillside. Material is probably of kame moraine origin, being poorly sorted in part, and well stratified in places. Test #1 dug in edge of pasture just west of old shallow pit. Material is thin silty gravel over a heterogenity of angular stones, silt and minor sand. Was not sampled.
	2	1966	1.5-12	0-1.5	Yes	67.5	55.3	41.3	23.0	10.5 4.3*	1	39.2%	--	Test #2 taken on 6' southwest face of pit and continued in floor. From 6'-8' was fairly clean with rounded stones. Face and hole from 8'-12' consisted of silt, minor sand, and many sub-angular pebbles to boulders. Material has excess fines and excessive wear for Item 201.
	3	1966	0-10	Stripped	Yes	93.5	93.5	92.0	11.9	4.3 3.9*	1	---	Gran. Borrow (Sand)	Test #3 dug 90' east of pit on top of hillside slope. Material is stratified sand, coarse to fine, with pebbles.

*Percentage of Total Sample

TABLE 1 SHEFFIELD 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 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	4	1966	N	O	T		S	A	M	P	L	E	D	Hole bottoms in ledge or boulders. Sand had excess 1½" stones for Item 202. Test #4 was dug 40' west of and below Test #3 on side hill. Material is unsorted with boulders, ledge fragments, small angular stones and silt, and was not sampled. Some material from this pit was used on Vt. Rte. 122 and on town roads in the subgrade. Not a recommended source for construction materials (Vt. Highway Dept. Spec's.)
3	1	1966	1-8	0-1	No	100	100	81.0	47.0	17.3 14.0*	1	---	--	Owner: Wendell Chesley. An area of pasture knolls southwest of the proposed location of I-91, and northwest of Millers Run. Area was designated by Dr. D. P. Stewart as kame moraine deposition. Only one test taken in vicinity of rock outcrops on pasture knoll. Material is silt, angular stones and ledge fragment. Had excess fines for Item 105.
4	1	1966	3.5-8.5	0-3.5	No	86.8	77.2	63.7	27.0	13.0 8.3*	1½	---	--	Owner: Clifford Berry. Area is west of Town Road #35 on the south side of Sheffield Village. Area is flat to gently rolling, and just south terrain rises steeply. Kame moraine deposits have been mapped here and in the vicinity

*Percentage of Total Sample

TABLE 1

SHEFFIELD GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														of Sheffield Village, and southeastward along Millers Run by Dr. D. P. Stewart. Test #1 taken west of small cemetery along tree and fence line. Material under 3.5' of unsorted silt and stones is a silty gravel with some boulders and sub-angular to sub-rounded stones. Material has too few stones and excess silt for Item 201, and has excess silt for Item 105. Insufficient proper size stones were included for the abrasion test.
	2	1966	4.5-9	0-4.5	No	88.8	69.7	56.1	29.0	14.8 8.3*	1	---	--	Test #2 in pasture on edge of town road. Top 4.5' of material is unsorted silt, stones and rock fragments. Is underlain by a silty gravel with soft stones; many cobbles and a few boulders were noted. Has excess fines for Items 201 and 105. Owner did not want field north of pasture tested. Pasture would not be source of Granular Borrow. Possibly material could be crushed for use on town roads. However, there would be many fines.
5	1	1966	1.5-10	0-1.5	No	87.9	87.9	70.2	11.9	7.0 4.9*	2	---	Gran. Borrow (Sand)	Owner: Arland Barber. Area is a large field between a large bend of Millers Run and Town Road #35. Kame moraine deposition gives area its

*Percentage of Total Sample

TABLE 1

SHEFFIELD 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					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														origin. Field is flat to gently rolling. Test #1 taken at east end of field above so-called "clay bank" on Millers Run. Bank is 40'-50' high and shows cobbles, pebbles, boulders, sands, silts and clays. Material is a gravelly sand, most stones under 1½", and with only a few +3" cobbles. Material had excess 1½" stones for Item 202.
	2	1966	8-18	0-2	No	100	100	66.1	11.9	5.5 3.6*	1	---	Gran. Borrow (Sand)	Test #2 was sampled from "clay bank" below Test #1. Material is interbedded layers of -2" pebbles, coarse to fine sands and thin layers of silty sand. Sample had excess retained on the #4 mesh sieve for Item 202- Is a gravelly sand.
	3	1966	3-10	0-3.	No	100	100	99.2	50.0	13.5*	1	---	--	Test #3 was dug near northeast corner of field near gully, and atop the "clay bank". Top 3' is silt to clay, and is underlain by stratified sand, silty sand, and silt. Material at 10' seemed somewhat coarser. Sample had excess passing the #100 and #270 mesh sieves for Items 202 and 105.
	4	1966	1.5-10	0-1.5	No	62.9	58.2	45.8	22.0	10.0 4.6*	2	---	Gran. Borrow (Grav.)	Test #4 was sampled 50' from town road at top of gully. Top 8' is a sandy gravel or silty gravel;below 8' stone content increases somewhat. Stones are

*Percentage of Total Sample

TABLE 1 SHEFFIELD GRANULAR DATA SHEET NO. 6

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														fairly well rounded. There are a few 6"-8" cobbles and some 3"-6" cobbles; some appear soft. Material had excess fines for Item 201, and insufficient proper-size stones were included for the wear test.
	5	1966	4-10	0-4	No	96.7	82.8	62.9	22.0	10.3 6.4*	1	---	--	Test #5 dug 140' east of and 6'-8' below elevation of Test #4 and is at top of gully. Top 4' is soil and silty sand with a few stones, goes to a gravell and silty sand and finally to a gravel below 10'. Few stones over 6" noted; most are in 3/4" to 2" range. There were too few stones and excess silt for Item 201, and excess silt for Item 105.
	6	1966	3-9	0-3	No	82.0	74.4	59.3	24.0	9.3 5.5*	1	---	Gran. Borrow (Grav.)	Test #6 dug 95' south of Test #4 at edge of town road. Top 3' is soil and a silty sand horizon going to gravelly sand and then to gravel. Fines appear silty and some soft stones noted. Only a few stone exceeed 6" Area would be source of granular borrow; and possibly some gravels would be uncovered by opening the area. Very likely a modification would be required on abrasion and fines.

*Percentage of Total Sample

TABLE 1 SHEFFIELD GRANULAR DATA SHEET NO. 7

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 AASHO Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
6	1	1966	1.5-7.5	0-1.5	No	56.7	50.8	40.9	26.0	12.0 4.9*	1	---	--	Would be source for gravel for town roads. Owner: Arland Barber. Area is east side of north sloping fields east of Town Road #35 and south of Millers Run. It is within a few rods of the south edge of kame moraine deposition in the valley of Millers Run. Test #1 was dug about 75' west of property line fence and about 100' north of small brook which probably flows along the south edge of granular deposits in the kame moraine. Material is a silty gravel, on the coarse side with many 2"-4" stones and some +6" cobbles. Stones are sub-rounded to sub-angular, and some seem soft. Goes to a black water-bearing sand at 8.5'. Material had excess material passing the #100 and #270 mesh sieves for Items 201 and 105. Insufficient stones were included for the wear test.
	2	1966	6-9.5	0-1.5	No	100	100	94.9	20.9	6.3 6.0*	1	---	Gran. Borrow (Sand)	Test #2 dug 150' northwest of and a few feet above elevation of Test #1. Top 6' is a coarse silty gravel with a few small boulders; it resembles material in Test #1, and was not sampled. From 6'-9' is a bedded series of light to dark,

*Percentage of Total Sample

TABLE I SHEFFIELD GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														fine to coarse pebbly sands with water flowing in at 9'. Sand had excess very fine sand and silt for acceptance as Item 202.
	3	1966	3.5-9.5	0-1.5	No	100	97.9	84.6	16.1	4.0 3.4*	1	---	Sand	Test #3 was dug near gateway between Barber and Ham properties, about 100' northeast of and 6' below elevation of Test #1. Top 3.5' is gravel, going thence to a light gray-brown sand becoming moist at 5.5'. Water flows in at 7.5', and here sand is dark colored and pebbly. Hole stopped at 9.5' in coarse pebbly wet sand. Material meets VHD specifications for Item 202. Area would be a possible source of Granular Borrow, and possibly a modified gravel. Some Item 202 sands also a possibility. Pit may encounter water anywhere below 6'.
7	1	1966	1-7.5	0-1	No	80.1	71.6	57.2	18.0	8.3 4.8*	1	---	Gran. Borrow (Grav.)	Owner: Alston Ham. Area is slightly rolling field south of Miller's Run and west of a small brook. Access is 0.50 mile from Vt. Route 122 via Town Road No. 38. Area is one of kame moraine deposition. Test #1 dug near Ham-Barber property line near southwest corner of field. This part of area is terrace-like and is about 15' above

*Percentage of Total Sample

TABLE I

SHEFFIELD GRANULAR DATA SHEET NO. 9

Map. Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														field to east. Material is a gravel with sub-rounded stones, some of which are soft. Particle size varies from large cobble to silt. At 7.5' fine sand comes in. Sample had excess passing the #100 and #270 mesh sieves for Item 201. Insufficient proper size stones were included for the wear test. Indication were that the stones would be soft.
	2	1966	3.5-8	0-1.5	No	100	95.1	85.7	31.7	12.8 11.0*	1	---	--	Test #2 also dug on west edge of field on terrace 150' north of Test #1. 2' of gravel underlies 1.5' of soil. Hole sampled from 3.5' to 8'. Material is a pebbly sand with many silt layers. Looks like ice-contact deposition in that silt layers are of irregular dip and thickness unlike lake deposition. Sample had excess fines for sub-base of sand or Granular Borrow.
	3	1966	1.5-8	0-1.5	No	49.6	43.7	37.6	23.0	8.3 3.0*	1	---	Gran. Borrow (Grav.)	Test #3 dug at edge of terrace 55' east of Test #1. Elevation is only 2'-3' above that of test #1. Material is a coarse silty gravel with a few 8"-12" cobbles and many +4" cobbles. Stones are sub-rounded to sub-angular; some are tabular, and many seem

*Percentage of Total Sample

TABLE I SHEFFIELD GRANULAR DATA SHEET NO. 10

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remakrs
														soft. Stones over 6" make up 25% of material. At 8' material is a coarse to fine pebbly sand with silt layers. Sample had excess silt and fine sand for Item 201.
	4	1966	1.5-10.5	0-1.5	No	77.3	62.5	50.9	22.0	8.8 4.5*	1½	30.0%	Gran. Borrow (Grav.)	Test #4 dug 90' north of and about 4' below elevation of Test #3 at edge of terrace. Materials a gravel with a few +6" cobbles and many 3"-6" cobbles. Stones are sub-rounded. Goes to a gravelly sand, below 6' and continues to depth. Fines are on the very fine sand side. Sample rejected for Item 201 because of excess fines and excessive wear. Owner did not want tests dug in field below terrace. Possibly material is sandy since bottom of holes on terrace become sandy. Pockets of acceptable gravel may be found on terrace if area is opened.
8	1	1966	1.5-11	0-1.5	Yes	100	100	80.1	9.6	3.8 3.0*	1	---	Sand	Owner: Alston Ham. Area is pit and terrace extending south southeast from pit toward Town Road No. 38. Area is mapped within Dr. Stewart's kame moraine. Test #1 dug on east face near north end of pit. About 9' of interbedded coarse to fine sands with a few pebbles encountered. Water and a pebble gravel hit at 11'.

*Percentage of Total Sample

TABLE I

SHEFFIELD GRANULAR DATA SHEET NO. 11

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.	Remakrs
						1½"	5/8"	#4	#100	#270				
	2A	1966	1-11	0-1	Yes	69.4	54.8	40.5	19.0	7.5 3.0*	1	24.6%	Gran. Borrow (Grav.)	Sample met requirements for Item 202, but face is near edge of terrace slope so little extension is possible. Test #2A taken from top of west face. Material is a gravel with a few +6" cobbles. A few soft stones and large angular ledge fragments seen in face. Sample had excess fines for Item 201.
	2B	1966	11-23	0-1	Yes	100	100	81.0	25.9	10.5 8.5*	1	---	Gran. Borrow (Sand.)	Test #2B taken from lower face. Material is fine sand with some coarse sand pockets or stringers, silt layers, and rock fragments and boulders with silt-sand washed in around the stones. Probably ice-contact. Sample had excess very fine sand and silt for Item 202
	3	1966	1-8	0-1	Yes	100	100	82.0	26.2	22.5 18.4*	1½	---	--	Test #3 sampled 40' west of west face in an attempt to hit gravel extension of top of west face. Material is silt with rock fragments and boulders, unacceptable for Items 202 and 105. Gravels may lie at greater depths.
	4	1966	1-6	0-1	Yes	58.6	45.6	34.1	22.0	10.0 3.4*	1	37.2%	Gran. Borrow (Grav.)	Test #4 dug at top of south face and material in top 6' sampled, and is a rather stony gravel, but with few +4" cobbles Stones are well rounded. Test #5 was a composite taken from

*Percentage of Total Sample

TABLE I SHEFFIELD GRANULAR DATA SHEET NO. 12

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				
	5	1966	1-11	0-1	Yes	78.3	67.0	50.8	19.0	9.3 4.7*	2	29.6%	Gran. Borrow (Grav.)	1-11' and includes the top gravels and an underlying bed of coarse black pebbly or gravelly sand. Tests #4 & #5 had excess fines and excessive wear for Item 201.
	6	1966	1-6	0-1	No	60.4	48.4	35.5	18.0	8.3 2.9*	1	35.4%	Gran. Borrow (Grav.)	Test #6 dug in flat terrace 70' south of west edge of pit. Material is a coarse gravel with a few 6"-10" cobbles and many 4"-6" cobbles. Many stones are shale or phyllite, break tabular. Sand like bottom of Test Hole #4 underlies gravel.
	7	1966	1-4.	0-1	No	70.7	54.4	36.0	22.0	7.5 2.7*	1	26.1%	Gran. Borrow (Grav.)	Test #7 dug on east side of terrace 150' south of pit face. Material is a gravel somewhat finer and with harder stones than other tests. It had excess fines and excessive wear for sub-base of gravel. Material went to sand at 4.5'. Contact between sand and gravel rises toward the surface south from the pit. All gravels have excess fines for Item 201.
	8	1966	9.5-22.5	0-1.5	Yes	100	100	87.6	21.0	7.8 6.8*	1	---	Gran. Borrow (Sand)	Test #8 taken from south face of pit below gravels. Material sampled probably represents those sands below Tests #4-7 encountered south of the pit. Sample came from beds of coarse pebbly sand with lenses of silt, silty sand with coarse

*Percentage of Total Sample

TABLE I

SHEFFIELD GRANULAR DATA SHEET NO. 13

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 AASHO Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
														sand layers and cross-bedded silty sands, pebbly sands and sands with scattered stones. Composite is a silty sand with excess fines for Item 202.
9	1	1966	1-5	0-1	No	83.9	67.4	48.8	14.0	6.5 3.2*	3	32.0%	Gran. Borrow (Grav.)	Owner: Alston Ham. Area is continuation of terrace which is south of Pit(Area #8). Test #1 dug on north side of swale, southeast of owner's barn and near east end of terrace. This terrace is above the Miller's Run alluvial plain, and is part of Dr. Stewart's kame moraine. Material is a fine gravel with a few soft and tabular pieces. Goes to a fine light colored sand at 5'.
	2	1966	1-5	0-1	No	63.0	48.0	34.8	25.0	10.0 3.5*	3½	25.3%	Gran. Borrow (Grav.)	Test #2 dug about 300' southeast of Test #1 across swale. Material down to 5' is a coarse gravel with may +4" cobbles, and with excess silt for Item 201. Sample had barely excessive wear for subbase of gravel. Goes to sand at 5'. Extension of material represented by test holes would be westward along terraces toward buildings.

*Percentage of Total Sample

TABLE I
Supplement

SHEFFIELD PROPERTY OWNERS - GRANULAR	Map Ident. No.
Barber, Arland	5, 6
Berry, Clifford	4
Chesley, Wendell	3
Day, Lyle	1
Ham, Alston (L. THOMPSON)	7, 8, 9
Reynolds, Gilson	2

TABLE II

SHEFFIELD
ROCK DATA SHEET NO. 1

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHO T-3	Remarks
1	1	1966	Granite	Yes	Chip	3.8%	Owner: Sheffield Blue Granite Company. This is a quarry with grout piles on the east side of Town Road No. 2 in the southwest corner of the township. The Quarry is located in an area where granitic dike rocks have been mapped. (See Plate II) Test #1 was a random sample of medium-grained and equi-granular granite or granodiorite taken from the grout pile north of the quarry. The rock is uniformly hard and met abrasion requirements for Item 204, Sub-base of Crushed Rock. Test #2 was sampled at random from the working face at the northeast end of the quarry and from a narrow ledge about 60' from the end. The rock appeared very hard and uniform, and met abrasion requirements for Item 204. The quarry was flooded at the time sampled: a 4 foot deep pond at the northeast end, and somewhat deeper water in the 180 foot long southwest portion. A narrow ledge separates the two parts of the quarry. An immense grout pile is on the south side of the quarry. Samples of this material were not taken, since there was no reason to suspect its properties were drastically different from those of Tests No. 1 and 2. ~~There may be reluctance on the part of the trustees to sell rock from this quarry for use on construction projects, since the rock has been used for building stone.~~ The quarry is located about 5.5 miles southwest of the Interstate Project in Sheffield Village.
	2	1966	Granite	Yes	Chip	2.8%	
2	1	1966	Granite	No	Chip	2.8%	Owner: Charles Richardson Area is summit and west slope of Grays Mountain, located about 0.75 mile northeast of the Bickford School. The sample was taken about 400 to 500 yards east of the proposed location of Interstate 91 near station 1718+00. According to Dennis, 1956 (Vermont Geological Survey No. 8), the mountaintop consists of granitic dike rock. Extensive granite block talus on the west slope was noted by the materials survey party, and bedrock occurs near the summit, extending at least 300 feet along the ridge. One sample of granitic rock was taken from a prominent exposure

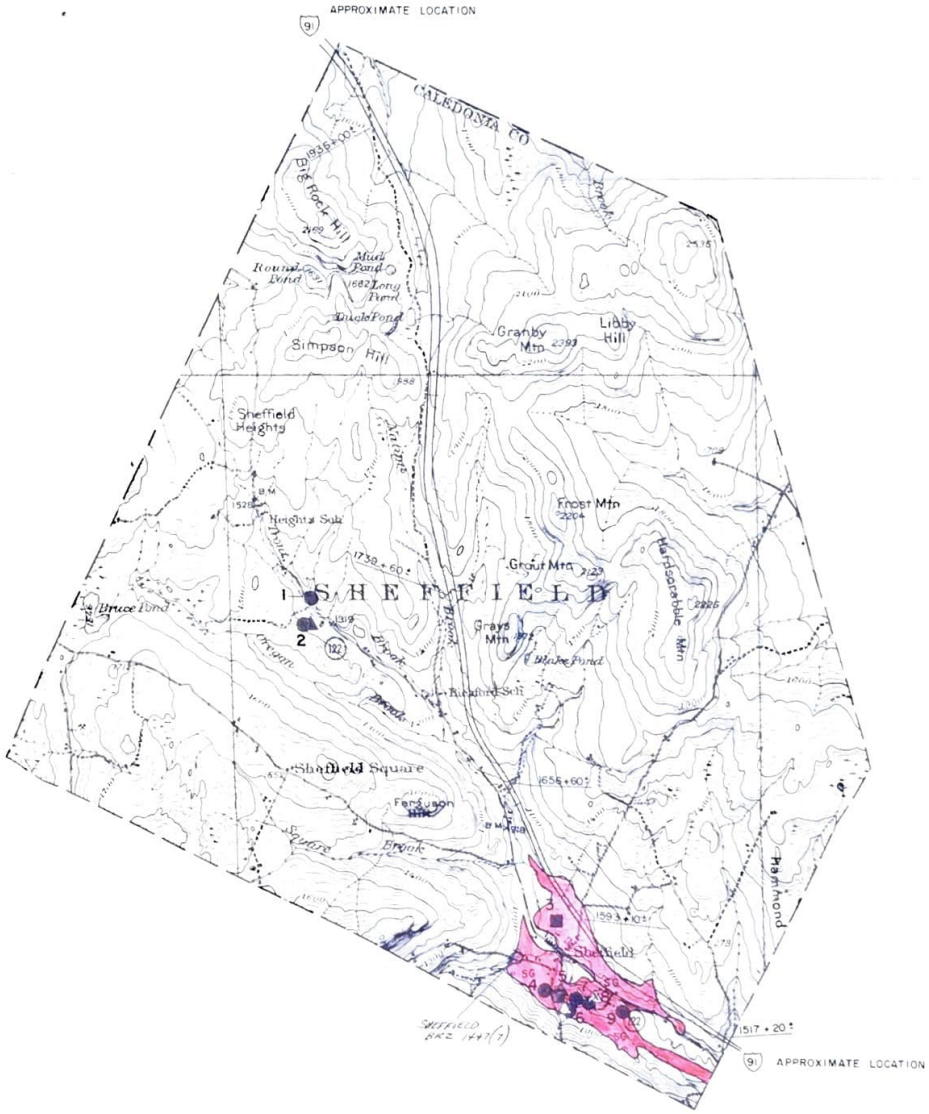
TABLE II

SHEFFIELD
ROCK DATA SHEET NO. 2

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Exist-ing Quarry	Method of Sampling	Abrasion AASHO T-3	Remarks
							south-southwest of the summit. It met abrasion requirements for Sub-base of Crushed Rock, Item 204. The mountaintop and slope has second growth hardwood through which a skid road leads up from the pasture beside the Interstate line to the vicinity of the granite.
3	1	1966	Quartzite Phyllite Granite	No	Chip	2.8%	Owner: Frederick Daley, Jr. and Maurice Fitzgerald. This is a high vertical face and talus pile west-southwest of Duck Pond, about 300 yards west of Town Road No. 3. Access is across alder swamp and inlet brook of Duck Pond and up wooded slope to the foot of the face. Test #1 was a random sampling of the block talus pile. Rock types included quartzite, quartz schists or phyllites, granitic dike rock and contact rock, which was very hard and highly metamorphosed. The rock broke satisfactorily and met abrasion requirements for Sub-base of Crushed Rock.
	2	1966	Quartzite Phyllite Granite	No	Chip	3.6%	Test #2 was taken on vertical face which is 40 feet to 50 feet high above the top of the talus slope. A 12 foot thick granitic or aplitic dike cuts the face from upper left to lower right and was included in the sample. The sample taken consisted mainly of quartzite, granitic rock and contact rock with only minor phyllite or quartz schists. It was difficult to obtain fresh samples, which may account for the somewhat higher wear than Test #1. The sample met abrasion requirements for Sub-base of Crushed Rock. Were this face developed, there would be the probability that undersirable material with high wears, and which broke tabularly or splintery, would be encountered from time to time. This would be due to the presence of the phyllite and/or quartz schists.

TABLE II
Supplement

SHEFFIELD PROPERTY OWNERS - ROCK	Map Ident. No.
Richardson, Charles	2
Sheffield Blue Granite Co.	1



N

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

SHEFFIELD

SCALE 1:31,250

CONTOUR INTERVAL 20 FEET

1967

GRANULAR MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

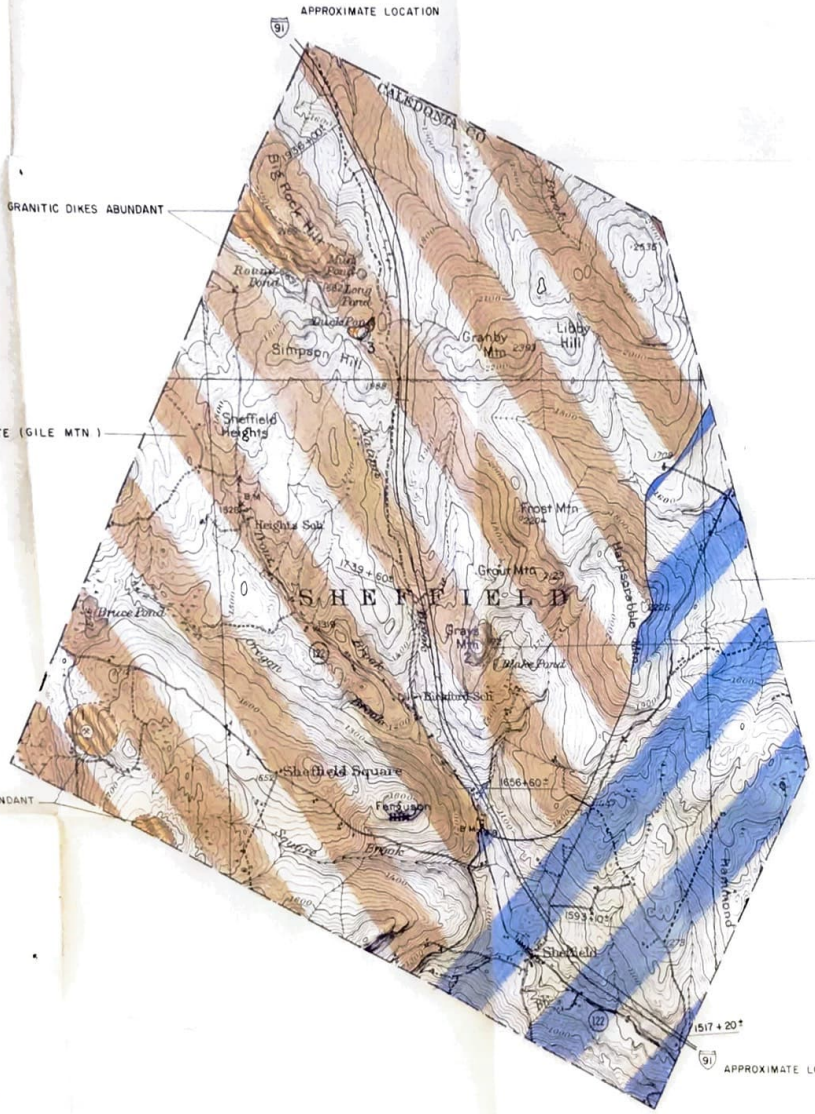
NOTE BASED ON U.S.G.S. TOPOGRAPHIC MAPS

PLATE I

GRANULAR

CALEDONIA COUNTY VT. HWY. DISTRICT NO. 7

REVISIONS | DATE



LEGEND

- ROCK, ACCEPTABLE FOR ITEM 204 (sub-base of crushed rock)
- ROCK, NOT ACCEPTABLE FOR ITEM 204
- 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)

SHEFFIELD

SCALE 1:31,250

CONTOUR INTERVAL 20 FEET

1967

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 11

ROCK

CALEDONIA COUNTY VT. HWY. DISTRICT NO. 7

REVISIONS

DATE						
BY						