SURVEY OF HIGHWAY CONSTRUCTION MATERIALS

IN THE TOWN OF BETHEL, WINDSOR 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

Montpelier, Vermont

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Acknowledgments

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

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

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

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

4. The 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 over-all 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 material is passed on to 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, keeping in mind their intended use. 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 quadrangles of the United States Geological Survey enlarged 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; i.e., Vermont Geological Survey Bulletins, Vermont State Geologist Reports, United States Geological Survey Bedrock Maps, 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, 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, since 1956, has been mapping the glacial features of the State of Vermont during the summer months. 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 tested 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, including an active card file compiled by the Highway Testing Laboratory. It was readily apparent that 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 in the cards varied widely in completeness. Transfer of information from the cards to the Data Sheets was made without elaboration or verification. The locations of the deposits listed in the card files have also been plotted on the maps. However, caution should be exercised wherever this information appears incomplete. Some cards in the file were not used because the information on the location of the deposit was incomplete or unidentifiable. This project does not assume responsibility for the information taken from the card files.

Work sheets containing more detailed information of each test including a detailed sketch of each Identification Number Area are on file in the office headquarters of this Project, together with the respective Laboratory Reports.

Location

The town of Bethel is located in Windsor County in the central portion of the State. It is bounded on the north by the town of Randolph, on the east by the town of Royalton, on the south by the town of Stockbridge, and on the west by the town of Rochester.

It is in the Vermont Piedmont, a "plateau-like region" often described as a dissected and glaciated uplifted peneplain. Numerous streams and brooks have carved out steep valley walls. Drainage into the Third Branch of the White River, thence south into the main branch of the White River, which flows east and south into the Connecticut.

The highest elevation is in the southwest corner of the town on Mt. Olympus, which has an elevation of approximately 2500 feet. The lowest elevation, 550 feet, is found in the valley of the White River at the extreme east end of the town.

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; the 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, a summary is 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.

The rock types of the town of Bethel are predominantly schists with impure quartzites, limestones, granulite, gneiss and greenstones. The only rock which seems to have a good potential as a source of crushed rock is the quartz-monzonite which outcrops mostly in the northeast corner of the town. The largest body of this igneous rock is the site of the Bethel "Granite" quarries from which the "Bethel White Granite" has been quarried.

The greenstones in the western half of the town did not appear to be of the massive hard type which is found elsewhere in the State.

One of the interesting geologic features of the town is the rock which appears in the road-way cut on Vermont Route 107 just west of the junction with Vermont Route 12. This rock appears quite hard and massive but does not fit the bedrock mapping priviously done in the town. This is perhaps due to the fact that the road was realigned and the rock exposed after the mapping was done. The rock here fits the description of the Barnard formation which is mapped as being nearby, one half mile to the east.

Further information concerning rock and rock types in the town of Bethel is available from the Engineering Geology Section, Materials Division, Vermont Department of Highways.

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, when known are mapped. 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 again 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 Sources

The granular deposits of the town of Bethel are generally glacio-fluvial in origin consisting principally of kame terrace structure. These structures are confined to the principal stream valleys, no acceptable material having been located on the higher elevations.

Several river bars may prove to be dependable sources of material. These may be found at Identification Numbers 26 and 39.

It is possible that additional sources of acceptable material may be found other than those tested by the survey.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF BETHEL

Barnard Volcanic Member of the Missisquoi Formation - Fine-to medium-grained biotite gneiss, hornblende gneiss, and amphibolite.

Brackett Member of the Stowe Formation - greenstones composed dominantly of quartz, albite, epidote, chlorite and carbonate. The greenstone beds, which comprize the Brackett Member of the Stowe Formation, are present throughout the formation interstratified with the schists. These beds exceeding two hundred feet in thickness show a distinctive compositional banding with laminae between one-eight and one-half inch in thickness. The individual bands are massive and lack well-defined schistosity.

Cram Hill Formation - Composed of three principal interbedded rock types: (1) splintery greenish-gray phyllite, (2) greenstone, and (3) feldspathic quartz-biotite-sericite schist. Phyllite dominates in the northern part of the quadrangle. The greenstones are both massive and schistose.

Gile Mountain Formation - predominantly quartz mica schists and micaceous quartzites with argillaceous phyllite and phyllitic schists along the contacts with the Waits River formation.

Moretown Formation - The most distinctive and abundant rock type in the Moretown formation is a quartz-chloritic-albite sericite gramulite referred to as the "pinstripe" by students of Vermont Geology. Micaceous quartzites are also common. The granulite is characterized by thick granular laminae separated by paper-thin, darker colored micaceous partings and it is this feature which produces the effect described as "pinstripe". The granular laminae range from a fraction of an inch to one-half inch in thickness. This formation has also been called the Moretown Member of the Missisquoi Formation.

Northfield Formation - consists of gray slate, phyllite and minor interbedded crystalline limestone. The slates become less fissite to the south and grade into phyllites along the strike.

Ottauquechee Formation - Black carbonaceous phyllite or schist containing interbeds of massive quartzite commonly criss-crossed by veins of white quartz; quartzite is dark gray and carbonaceous, light gray or white; also includes light green quartz-sericite-chlorite phyllite or schist and sericitic quartzite.

Quartz Monzonite - Quartz, oligoclase, orthoclase, microcline, and muscovite with minor quantities of epidote, biotite, apatite, ilmenite, and zircon. Oligoclase is partially altered to kaolinite and sericite and the microcline is normally perthitic and fresh. The orthoclase is altered but shows good Carlsbad twinning. Quartz, for the most part, is clear and shows few to no strain shadows.

Shaw Mountain Formation - Chiefly tan to brown weathered quartzose limestone and calcareous quartzite characterized by specks of limonite after ankerite; locally underlain by quartz conglomerate and overlain by blue fossiliferous crystalline limestone; greenstone and quartz-sericite schist.

Stowe Formation - Quartz-sericite (muscovite-paragonite) -chlorite phyllite and schist; porphyroblasts of albite, garnet, chloritoid, or kyanite are common locally;

includes phyllitic graywacke north of Lamoille River. Schist contains abundant segregations of granular white quartz.

Waits River Formation (Westernband, called the Barton River Formation by Dr. Doll) - composed of the following interbedded rock types, in order of decreasing abundance: (1) Thick and thin bands of blue-gray recrystatized impure limestone which is quite often siliceous" (2) fine-grained black phyllites, (3) minor quartzites and micaceous quartzites.

Whetstone Hill Member of the Moretown Formation - Black sericite-garnet-biotite-quartz schist and phyllite.

Glossary of Selected Geologic Terms

Biotite - The mineral commonly known as black mica.

Calcareous - Consisting of or containing calcium carbonate. As combined with rock names indicates a considerable proportion, say 50 percent, of calcium carbonate together with an equal or predominant amount of the material indicated by the rock name.

Crystalline - Of or pertaining to the nature of a crystal; having a regular molecular structure.

Dike - A sheet-like body of igneous rock that fills a fissure in older rocks which it entered while in a molten condition. Varies from less than an inch in width and a few yards in length to thousands of feet in width and many miles in length. May radiate in groups from a center, or occur singly and isolated from other igneous bodies.

Granite - A granular, crystalline rock of predominantly interlocking texture, composed essentially of alkalic feldspars and quartz. Accessory minerals (chiefly micas, hornblende, or more rarely pyroxene) are commonly present.

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

Igneous Rocks - Rocks formed by solidification of hot mobile rock material.

Kame - A conical hill of stratified drift, deposited at a glacial terminus by glacial streams flowing in or on the ice.

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

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 98 percent. Common impurities are clay and sand.

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

Moraine - An accumulation of drift with an initial topographic expression of its own built within a glaciated region chiefly by the direct action of glacier ice.

Outwash - Stratified drift that is stream built beyond the glacier; laid down by meltwater streams issuing from the face of the glacier ice.

Phyllite - A fine grained foliated metamorphic rock intermediate between the mica schists and slates, into which it may grade. It is usually light in color, but various darker shades, even black, are found.

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

Quartz-monzonite - A rock of granitic texture, intermediate in composition between granite and quartz diorite, which contains quartz and about equal amounts of the alkali and soda-lime feldspars.

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

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

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

Surface-Geology Map - A map showing areas of outcrop of geologic formations, both consolidated rocks and the unconsolidated sediments. Its scale is large enough that pits and quarries can be accurately shown and indexed.

Terrace - A plain, natural or artificial, from which the surface descends on one side and ascends on the other. Terraces are commonly long and narrow, and they border seas, lakes, or interior valleys. A terrace may be built by deposition of sediment from water, it may be cut by the breaking of waves on a shore or the sweeping of currents, or it may be formed by the dislocation of rocks in crustal movements. The descent from river terraces toward the river may be very abrupt, especially in arid regions, the ascent on the other side may be only that of an extensive alluvial slope.

Till - Unsorted drift, or the mixture of rock fragments and fine materials left by melting glaciers.

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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 Vermont Department of Highways).

Item 102A, Granular Borrow.

"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 per cent (10%) passing the No. 270 mesh sieve and shall show a color of not more than three and one-half ($3\frac{1}{2}$) as determined by the colorimetric test described in the A.A.S.H.O. 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 201A, Sub-base of Gravel.

"The gravel shall consist of material free from silt, loam, or clay. It shall be obtained from approved sources and meet the following requirements:

"Not less than forty (40) per cent 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 A.A.S.H.O. T-4.

"The stone portion of the gravel shall be uniformly graded from coarse to fine and the maximum size particles shall not exceed six (6) inches in diameter.

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

Minimum Per Cent of stone	Per Cent Passing Square Openings No. 100	Per Cent Passing Square Openings No. 270
40%	0-15	0-3
50%	0-15	0-4
60%	0-15	0-5

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

Item 202 Mod., Sub-base of Sand.

"The sand shall consist of material 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 A.A.S.H.O. T-27, shall meet the grading requirements set up in the following table:

Square Openings	Per Cent Passing
$1\frac{1}{2}$"	95-100
5/8"	85-100
No. 4	70-100
No. 100	0-18
No. 270	0-5

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

Item 204, Sub-base of Crushed Rock.

"The percent of wear shall not be more than eight (8) when tested by laboratory methods, using Method A.A.S.H.O. T-3."

BETHEL GRANULAR DATA SHEET NO. 1

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
1	1	1963	0-10	-	Yes	100	100	98.3	21.0 *20.6	9.0 *8.85	1½	-	Gran. Bor. (Sand)	Owner: Merton Smith. A series of knolls on a terrace-like formation. Apparently the knolls are the remnant of a lake deposit laid over a kame terrace. Test #1 in floor of small pit. Medium sand. Fails for Item 202 Mod., sub-base of sand. Has 20.6% passing #100 mesh; maximum allowed 18%. Has 8.85% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	2	1963	1-9.5	0-1	No	100	100	100	9.0	3.0	2½	-	Sand	Test #2 taken 25' from northeast edge of pit. Medium sand. Acceptable for Item 202 Mod., sub-base of sand.
	3	1963	3.5-9.5	0-1	No	100	100	100	20.0	3.0	1	-	Gran. Bor. (Sand)	Test #3 taken 260' northwest of test #2 adjacent to edge of meadow. 0-1' overburden, 1'-2' fine silt, 3.5'-9.5' fine to medium sand. Fails for Item 202 Mod., sub-base of sand. Has 20% passing #100 mesh; maximum allowed 18%. Acceptable for Item 102-A, granular borrow.
	4	1963	0.5-9	0-0.5	No	100	100	99.4	53.0	33.3	4	-	-	Test #4 on knoll 285' east of Test #3 and 300' northeast of Test #2. Fails for Item 102-A, granular borrow. Has 33.3% passing #270 mesh;

* Percentage of Total Sample.

BETHEL GRANULAR DATA SHEET NO. 2

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
														maximum allowed 10%. Has color of 4; maximum allowed 3½.
	5	1963	0.5-10	0-0.5	No	100	100	100	95.0	73.0	1	-	-	Test #5 on knoll 100' from Vt. Rt. 14. Fine sand and silt. Fails for Item 102-A, granular borrow. Has 73% passing #270 mesh; maximum allowed 10%.
2	1	1963	3.5-10	0-3.5	Yes	100	100	95.5	89.0	40.0	1	-	-	Owner: Perley Hackett. A medium-sized pit used for winter sand. Test #1 in floor of Pit. 0-3.5' sand, and silt, water. Fails for Item 102-A, granular borrow. Has 40% passing #270 mesh; maximum allowed 10%.
	2	1963	1.5-11	0-1.5	No	100	100	100	84.0	37.3	1	-	-	Test #2 taken 15' west of face of pit. 0-0.5' overburden, 0.5'-1.5' coarse sand, 1.5'-11' fine sand and silt. Fails for Item 102-A, granular borrow. Has 37.3% passing #270 mesh; maximum allowed 10%.
	3	1963	2-11	0-2	No	100	100	90.9	97.0	47.5	1	-	-	Test #3 taken 100' north of Test #2. 0-2' coarse sand, 2'-11' fine sand to silt. Fails for Item 102-A, granular borrow. Has 47.5% passing #270 mesh; maximum allowed 10%.
3	1	1963	0.5-10	0-0.5	No	100	100	100	68.0	40.0	1½	-	-	Owner: Wilfred Loura. Test

BETHEL GRANULAR DATA SHEET NO. 3

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 taken on top of sharp steep knoll. Water pipes to houses below knoll prevented further digging. A sandy-appearing knoll belonging to Perley Hackett lies to north but access could not be gained to this area. 0-0.5' overburden, 0.5'-1.5' silt, 1.5'-4' coarse to fine sand, 4'-10' fine sand and silt. Fails for Item 102-A, granular borrow. Has 40% passing #270 mesh; maximum allowed 10%.
4	1	1963	1-10	0-1	No	79.7	70.3	56.7	47.0	13.5	1	-	-	Owner: William Reitzel. A kame terrace formation around the nose of a hill. Test #1 may be too high to be in kame in attempt to avoid hay field. Till. Fails for Item 102-A, granular borrow. Has 13.5% passing #270 mesh; maximum allowed 10%.
	2	1963	1-7	0-1	No	100	100	99.3	99.0	97.3	-	-	-	Test #2 taken on knoll 450' north of Test #1. Silt clay. Fails for Item 102-A, granular borrow. Has 97.3% passing #270 mesh; maximum allowed 10%.
5	1	1963	0-10	-	Yes	-	-	- Report Missing-				-	-	Owner: Wyland Rix. A very small pit on top of knoll.

DETHEL GRANULAR DATA SHEET NO. 4

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				
														Pit depleted. Test #1 in floor. Silt. Apparently knoll had a cap of sandy gravel or pebbly sand which has been removed. Report missing.
6	1	1963	1-11	0-1	No	100	100	93.3	9.0 *8.4	3.15 *2.94	1½	-	Sand	Owner: Earl Farrington, Jr. A small terrace adjacent to White River. Test #1 taken 30' west of east entrance to meadow, 55' south of woods. 0-1' overburden, 1'-7' fine sand, 7'-11' coarse sand, coarse sand bottom. Acceptable for Item 202 Mod., sub-base of sand.
7	1	1963	1-11	0-1	No	100	100	95.1	46.0 *43.7	10.75 *10.21	3	-	-	Owner: Earl Farrington, Jr. A level meadow adjacent to White River in valley floor. Test #1 taken 125' west of woods 25' north of edge of river. 0-1' overburden, 1'-7' fine sand, 7'-11' pebbly sand, pebbly sand bottom. Fails for Item 102-A, granular borrow. Has 10.75% passing #270 mesh; maximum allowed 10%.
8	1	1963	1-11	0-1	No	100	100	100	91.0	32.5	1	-	-	Owner: Earl Farrington, Jr. A large level terrace. Test #1 in center of field. Sandy silt. Fails for Item 102-A,

* Percentage of Total Sample.

BETHEL GRANULAR DATA SHEET NO. 5

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
														granular borrow. Has 32.5% passing #270 mesh; maximum allowed 10%.
	2	1963	1-11	0-1	No	100	100	100	94.0	32.5	1½	-	-	Test #2 taken 240' west of Test #1. Sandy silt. Fails for Item 102-A, granular borrow. Has 32.5% passing #270 mesh; maximum allowed 10%.
9	1	1963	1-11	0-1	No	100	100	100	38.0	8.75	2	-	Gran. Bor. (Sand)	Owner: Robert Trask. A slightly rolling meadow in valley floor. Test #1 adjacent to pole #351-105 of the New England Telephone and Telegraph Co. Fine silty sand becoming medium sand towards bottom. Fails for Item 202 Mod., sub-base of sand. Has 38% passing #100 mesh; maximum allowed 18%. Has 8.75% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	2	1963	1-10	0-1	No	100	100	100	24.0	5.5	1½	-	Gran. Bor. (Sand)	Test #2 taken 135' east of pole #104, 160' north of fence, 35' west of edge of terrace. Fails for Item 202 Mod., sub-base of sand. Has 24% passing #100 mesh; maximum allowed 18%. Has 5.5% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.

BETHEL GRANULAR DATA SHEET NO. 6

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				
10	1	1963	1-10.5	0-1	No	100	100	100	98.0	85.0	1	-	-	Owner: Robert Trask. A large terrace. Test #1 taken 50' south of stone wall, 30' west of fence. 0-1' overburden, 1'-2.5' gravel, 2.5'-10.5' silt, silt bottom. Fails for Item 102-A granular borrow. Has 85% passing #270 mesh; maximum allowed 10%.
	2	1963	1-10	0-1	No	100	100	100	97.0	47.5	1	-	-	Test #2 under telephone line 60' south of pole #96, 110' north of property line fence. Silt. Fails for Item 102-A, granular borrow. Has 47.5% passing #270 mesh; maximum allowed 10%.
11	1	1963	3-11	0-3	Yes	100	100	100	99.0	35.0	1½	-	-	Owner: Roscoe Perkins. A small depleted pit. Test #1 in floor. 0-3' gravel fill, 3'-11' wet silt, silt bottom. Fails for Item 102-A, granular borrow. Has 35% passing #270 mesh; maximum allowed 10%.
12	1A	1963	0.5-4	0-0.5	Yes	-	-	38.9	23.0	15.0	5	23.8%	-	Owner: Wendell Allen. An extensive shallow pit, very scattered workings. Test #1 between pits. 0-0.5' overburden, 0.5'-4' dirty gravel, 4'-10' silt, silt bottom. Test #1A fails for Item 102-A, granular borrow. Has 15% passing #270

BETHEL GRANULAR DATA SHEET NO. 7

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
														mesh; maximum allowed 10%.
	1B	1963	4-10	-	Yes	100	100	100	97.0	70.0	1	-	-	Test #1B fails for Item 102-A, granular borrow. Has 70% passing #270 mesh; maximum allowed 10%.
	2	1963	4-10.5	0-4	Yes	100	96.1	75.9	12.0 *9.1	1.75 *1.32	1½	-	Sand	Test #2 in floor of northern most pit. 0-4' till, 4'-10' pebbly sand, pebbly sand bottom. Acceptable for Item 202 Mod., sub-base of sand.
	3	1963	2.5-10	0-2.5	Yes	100	100	100	95.0	42.5	1	-	-	Test #3 in floor of southern most pit. 0-2.5' dirty grave 2.5'-10' silt, silt bottom. Fails for Item 102-A, granular borrow. Has 42.5% passing #270 mesh; maximum allowed 10%.
	4A	1963	1-5	0-1	Yes	-	-	30.7	39.0	30.0	5	25.2%	-	Test #4 taken 70' west of southernmost pit. 0-1' overburden, 1'-5' gravel, 5'-10' silt, silt bottom. Test #4A fials for Item 102-A, granular borrow. Has 30% passing #270 mesh; maximum allowed 10%. Has color of 5; maximum allowed 3½.
	4B	1963	5-10	-	Yes	100	100	100	96.0	50.0	1	-	-	Test #4B fails for Item 102-A, granular borrow. Has 50% passing #270 mesh; maximum allowed 10%.
13	1	1963	0-5	-	Yes	-	-	31.6	21.0	10.75	2	22.0%	-	Owner: Woodrow Rogers. A small shallow pit with many soft flat stones. Face 6'.

* Percentage of Total Sample.

BETHEL GRANULAR DATA SHEET NO. 8

Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (FT)	Over-burden (FT)	Exist-ing Pit	Sieve Analysis % Passing					Color AASHO T-21	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						1½"	5/8"	#4	#100	#270				
	2	1963	2-7.5	-	Yes	-	-	42.0	12.0	3.75	1½	21.0%	Gravel	Dimensions of pit 60' north and south, 40' east and west. Test #1 in floor. 0-5' coarse gravel, 5'-7' silt, 7'-9' blue clay, blue clay bottom. Fails for Item 102-A, granular borrow. Test #2 in stripped area behind pit. 0-2' sandy silt, 2'-7.5' sandy gravel, 7.5'-10' silt, silt bottom. Acceptable for Item 201-A, sub-base of gravel.
14	1	1963	0-15	-	Yes	-	-	48.9	12.0	3.75	2½	-	Gran. Bor. (Grav.)	Owner: Harold Rogers. A very small pit, 50' by 50'. Flat, soft stones of many sizes. Fine matrix. Test #1 in face. Fails for Item 201-sub-base of gravel. Insufficient proper-sized stones in sample for wear test. Acceptable for Item 102-A, granular borrow.
	2	1963	0-8	-	Yes	-	-	42.6	35.0	17.0	1	34.4%	-	Test #2 in floor. Till. Fails for Item 102-A, granular borrow. Has 17% passing #270 mesh; maximum allowed 10%.
15	1	1963	0-4	-	No	-	-	27.9	7.0	3.5	2	19.8%	Gravel	Owner: Lee Fairchild. A gravel bar in the Gilead Brook. Stones mostly schist. Test #1 acceptable for Item 201-A, sub-base of gravel.

BETHEL GRANULAR DATA SHEET NO. 9

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				
16	1	1963	0-6	-	Yes	-	-	24.4	12.0	4.5	3½	21.4%	Gravel	Owner: Raymond Smith. A very small pit in outwash. Flat soft stones. Unstratified. Test #1 in face. Acceptable for Item 201-A, sub-base of gravel.
17	1A	1963	1-6	0-1	No	-	-	26.2	8.0	2.0	2	20.8%	Gravel	Owner: Allan Randall. A large terrace containing drive-in theater. Apparently an old pit south of Test #1. Test #1 south of screen. 0-1' overburden, 1'-6' dirty gravel, 6'-10' sandy silt, sandy silt bottom. Test #1A acceptable for Item 201-A, sub-base of gravel.
	1B	1963	6-10	-	No	100	100	98.7	98.0	40.0	1	-	-	Test #1B fails for Item 102-A, granular borrow. Has 40% passing #270 mesh; maximum allowed 10%.
18	1A	1963	1-6.5	0-1	No	100	100	100	72.0	17.5	2½	-	-	Owner: Kenneth Ford. A large flat area of irregularly shaped meadows. Test #1 in west end of meadow adjacent to house. 0-1' overburden, 1'-6.5' sand, 6.5'-10.5' gravel, gravel bottom. Test #1A fails for Item 102-A, granular borrow. Has 17.5% passing #270 mesh; maximum allowed 10%.
	1B	1963	6.5-10.5	-	No	-	-	36.0	12.0	4.5	1½	26.2%	Gran. Bor. (Grav.)	Test #1B fails for Item 201-A, sub-base of gravel. Has wear of 26.2%; maximum

BETHEL GRANULAR DATA SHEET NO. 10

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
														allowed 25%. Acceptable for Item 102-A, granular borrow.
	2A	1963	1-6	0-1	No	100	100	97.9	30.0 *29.4	8.75 *8.55	1½	-	Gran. Bor. (Sand)	Test #2 taken 75' south of trees, 60' east of woods, in meadow south of that containing Test #1, 0-1' overburden, 1'-6' sand, 6'-10' gravel, gravel bottom. Test #2A fails for Item 202 Mod., sub-base of sand. Has 29.4% passing #100 mesh; maximum allowed 18%. Has 8.55% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	2B	1963	6-10	-	No	-	-	29.2	5.0	1.5	1½	21.8%	Gravel	Test #2B acceptable for Item 201-A, sub-base of gravel.
	3	1963	1-10	0-1	No	100	100	95.4	21.0 *20.0	6.0 *5.71	1½	-	Gran. Bor. (Sand)	Test #3 taken 325' east of Test #2, 90' south of hedgerow, 50' west of trees. Sand with sandy gravel bottom Fails for Item 202 Mod., sub-base of sand. Has 20% passing #100 mesh; maximum allowed 18%. Has 5.71% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
19	1	1963	0-10	-	Yes	100	100	100	96.0	72.5	1	-	-	Owner: Woodrow Rogers. A small pit. Clean but not properly stripped. Apparently this knoll contains sand and

* Percentage of Total Sample.

BETHEL GRANULAR DATA SHEET NO. 11

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 over silt. Test #1 in floor. Silt. Fails for Item 102-A, granular borrow. Has 72.5% passing #270 mesh; maximum allowed 10%.
	2	1963	0-10	-	Yes	-	-	51.4	9.0	1.0	1	20.8%	Gravel	Test #2 in face. Thin bands of gravel, silt sand. Acceptable for Item 201-A, sub-base of gravel.
20	1	1963	1-10	0-1	No	100	94.8	30.6	28.0 *22.6	8.3 *6.7	1½	-	Gran. Bor. (Sand)	Owner: Merrill Hamond. A small terrace of granular material. Test #1 taken 90' west of point along town road 60' north of house, 105' east of edge of terrace. 0-1' overburden, 1'-6' fine sand, 6'-10' pebbly sand, pebbly sand bottom. Fails for Item 202 Mod., sub-base of sand. Has 22.6% passing #100 mesh; maximum allowed 18%. Has 6.7% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	2	1963	1-10	0-1	No	100	100	97.8	30.0 *29.8	9.3 *9.1	2	-	Gran. Bor. (Sand)	Test #2 taken 15' east of edge of terrace, 100' north of edge of terrace. Sand with fine gravel bottom. Fails for Item 202 Mod., sub-base of sand. Has 29.8% passing #100 mesh; maximum allowed 18%. Has 9.1% passing #270 mesh; maximum allowed 5%.

* Percentage of Total Sample.

BETHEL GRANULAR DATA SHEET NO. 12

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
														Acceptable for Item 102-A, granular borrow.
21	1	1963	3-7	0-1	No	-	-	30.0	9.0	4.25	1½	26.6%	Gran. Bor. (Grav.)	Owner: Ella Jean Raberge. A series of terraces. Test #1 near south end of lower terrace. 0-1' overburden, 1'-3' silt, 3'-7' coarse gravel, 7'-8.5' silt, silt bottom. Fails for Item 201-A, sub-base of gravel. Has wear of 26.6%; maximum allowed 25%. Acceptable for Item 102-A, granular borrow.
	2	1963	1-8	0-1	No	-	-	40.4	10.0	3.75	2½	25.4%	Gran. Bor. (Grav.)	Test #2 north of Test #1 on same level. Coarse gravel. Fails for Item 201-A, sub-base of gravel. Has wear of 25.4%; maximum allowed 25%. Acceptable for Item 102-A, granular borrow.
	3	1963	1-6	0-1	No	-	-	42.5	4.0	2.0	2½	24.2%	Gravel	Test #3 in terrace above Test #2. 0-1' overburden, 1'-6' coarse gravel, 6'-10' silt, silt bottom with wet fine sand. Acceptable for Item 201-A, sub-base of gravel.
22	1A	1963	1-7	0-1	No	-	-	41.9	7.0	1.25	2	18.6%	Gravel	Owner: Hugh Batcheller. A series of terraces. Test #1 taken 125' east of Vt. Rt. 12 and on same level. 0-1' overburden, 1'-7' gravel, 7'-10' sandy silt, sandy silt bottom. Test #1A acceptable for Item 201-A,

BETHEL GRANULAR DATA SHEET NO. 13

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
	1B	1963	7-10	-	No	100	100	96.8	92.0 *89.0	50.0 *48.4	1½	-	-	sub-base of gravel. Test #1B fails for Item 102-A, granular borrow. Has 48.4% passing #270 mesh; maximum allowed 10%.
	2	1963	1-7	0-1	No	-	-	37.5	5.0	1.25	1	21.6%	Gravel	Test #2 northeast of Test #1 at edge of same terrace. Gravel with sandy silt in bottom. Acceptable for Item 201-A, sub-base of gravel.
23	1	1963	0.5-3	0-0.5	No	-	-	25.5	40.0	13.0	5	-	-	Owner: Mrs. Ann B. Noble. A level meadow which is apparently on a terrace. Test #1 taken 130' south of fence adjacent to Vt. Rte. 107, 210' west of stone wall. Till with ledge bottom. Fails for Item 102-A, granular borrow. Has 13% passing #270 mesh; maximum allowed 10%. Has color of 5; maximum allowed 3½.
24	1	1963	0.5-10	0-0.5	No	100	97.1	84.9	7.0	2.5	1	-	Sand	Owner: State of Vermont. A flat terrace containing stockpile of pea-stone. Test #1 on level above stockpile. Sand with sand bottom. Acceptable for Item 202 Mod., sub-base of sand.
	2	1963	4-9	0-0.5	No	-	-	38.3	4.0	1.0	1	15.3%	Gravel	Test #2 east of stockpile and adjacent to pole #444. 0-0.5' overburden; 0.5'-4' silt, 4'-9' coarse gravel,

BETHEL GRANULAR DATA SHEET NO. 14

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
														coarse gravel bottom. Acceptable for Item 201-A, sub-base of gravel.
25	1	1963	1-6	0-1	No	-	-	41.7	19.0	9.5	1	24.2%	Gran. Bor. (Grav.)	Owner: R.N. Rice. A flat-topped terrace. Owner not interested in sale. Test #1 taken 145' west of private road. 0-1' overburden, 1'-2.5' dirty gravel, 2.5'-6' coarse gravel, 6'-10' fine sand. Fails for Item 201-A, sub-base of gravel. Has 19% passing #100 mesh; maximum allowed 15%. Has 9.5% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	2	1963	2-8	0-0.5	No	-	-	44.9	5.0	1.0	1	21.6%	Gravel	Test #2 taken 200' southwest of Test #1. 0-0.5' overburden, 0.5'-2' fine sand, 2'-8' sandy gravel, 8'-11' fine sand, fine sand bottom. Acceptable for Item 201-A, sub-base of gravel.
26	1	1963	-	-	-	-	-	23.2	4.0	1.5	1	10.4%	Gravel	Owner: Manuel S. Miller. A large river bar of good gravel. Owner does not wish to sell. Test #1 acceptable for Item 201-A, sub-base of gravel.
27	1	1963	-	-	Yes	100	100	100	23.0	1.0	2½	-	Gran.	Owner: Town of Bethel. A

BETHEL GRANULAR DATA SHEET NO. 15

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
													Bor. (Sand)	very high face-100' estimated. Very difficult to sample due to extreme sloughing. Sample taken from material at base of face. There is a band of gravel showing in the face. **This is a very poorly** managed pit. It is improperly stripped. The high face necessitates benching. Test #1 fails for Item 202 Mod., sub-base of sand. Has 23% passing #100 mesh; maximum allowed 18%. Acceptable for Item 102-A, granular borrow.
28	1	1963	1-10	0-1	Yes	100	100	100	20.0	5.0	1	-	Gran. Bor. (Sand)	Owner; Town of Bethel. A very high granular terrace containing the town dump and several pits. Test #1 in floor of small pit at entrance to dump. 0-1' overburden, 1'-4' silt, 4'-6' sand, 6'-10' silt, silt bottom. Fails for Item 202 Mod., sub-base of sand. Has 20% passing #100 mesh; maximum allowed 18%. Acceptable for Item 102-A, granular borrow.
	2	1963	0-11	-	Yes	100	100	99.7	59.0	14.0	1	-	-	Test #2 taken 115' east of test #1. Uniform fine sand. Fails for Item 102-A, granular borrow. Has 14% passing #270 mesh; maximum allowed

BETHEL GRANULAR DATA SHEET NO. 16

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	1963	0-11	-	Yes	100	100	85.7	4.0 *3.43	1.0 *0.86	1	-	Sand	Test #3 east of Test #2. Acceptable for Item 202 Mod., sub-base of sand.
29	1	1963	1-6.5	0-1	No	-	-	33.3	10.0	3.5	3	24.4%	Gravel	Owner: Harold Turner. A large level terrace. Test #1 at south end of terrace. 0-1' overburden, 1'-6.5' excellent gravel, 6.5'-10' silt, silt bottom. Acceptable for Item 201-A, sub-base of gravel.
	2	1963	1-9	0-1	No	-	-	22.9	8.0	3.0	2½	20.8%	Gravel	Test #2 taken 500' northeast of Test #1, 50' west of edge of terrace. Gravel with gravel bottom. Acceptable for Item 201-A, sub-base of gravel.
	3	1963	1-9	0-1	No	-	-	37.9	5.0	2.5	2	26.0%	Gran. Bor. (Grav.)	Test #3 taken 450' northeast of Test #2, 40' from edge of terrace. Gravel with gravel bottom. Fails for Item 201-A, sub-base of gravel. Has wear of 26%. Acceptable for Item 102-A, granular borrow.
30	1	1963	1-4	0-1	Yes	-	-	39.5	21.0	7.5	3	21.4%	Gran. Bor. (Grav.)	Owner: Mrs. Jessie Putnam. A large pit in poor-condition. Poorly stripped; large piles of topsoil in pit. Dimensions of pit 530' north and south, 175' east and west. Extension to east. Test #1 in bottom at south west end of pit. Bony gravel

* Percentage of Total Sample.

BETHEL GRANULAR DATA SHEET NO. 17

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
														with ledge at 4'. Fails for Item 201-A, sub-base of gravel. Has 21% passing #100 mesh; maximum allowed 15%. Has 7.5% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	2	1963	3-9	0-1	No	-	-	22.0	28.0	7.0	1½	24.8%	Gran. Bor. (Grav.)	Test #2 east of pit, 175' south of barn, 75' west of town road. 0-1' overburden, 1'-3' silt, 3'-9' gravel, ledge bottom. Fails for Item 201-A, sub-base of gravel. Has 28% passing #100 mesh; maximum allowed 15%. Has 7% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	3	1963	2-9	0-1	No	-	-	41.1	4.0	2.0	1	22.4%	Gravel	Test #3 taken 100' east of pit face, 85' west of town road, 65' north of hedgerow. 0-1' overburden, 1'-2' silt, 2'-9' gravel, 9'-10' silt, silt bottom. Acceptable for Item 201-A, sub-base of gravel.
	4	1963	0-10	-	Yes	-	-	36.2	6.0	1.75	1	34.6%	Gran. Bor. (Grav.)	Test #4 in northeast face of pit. Face 17' high. Sampled 0-10'. Could not sample 10'-17'; badly sloughed. Sample fails for Item 201-A, sub-base of gravel. Has wear of 34.6%; maximum allowed 25%. Acceptable for Item 102-A, granular borrow.

BETHEL GRANULAR DATA SHEET NO. 18

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
31	1	1963	1-6.5	0-1	No	-	-	25.2	6.0	1.5	3	18.2%	Gravel	Owner: Eino Haikara. A medium sized terrace. Test #1 taken 97' east of power pole #414 & 20' from edge of terrace. 0-1' overburden, 1'-6.5' coarse gravel. Some stones over 6", 6.5'-10' silt, silt bottom. Acceptable for Item 201-A, sub-base of gravel.
	2	1963	1-9	0-1	No	-	-	34.7	4.0	1.5	2½	23.2%	Gravel	Test #2 under power line 250' southwest of Test #1, 30' south of pole #413. Layers of gravel, sandy gravel, pebbly sand. Acceptable for Item 201-A, sub-base of gravel.
32	1	1963	1-10	0-1	No	-	-	63.1	20.0	5.0	4	-	-	Owner: Louis Wilson. A large level meadow in valley floor. Test #1 at north end of meadow, 65' east of river bank. Sandy gravel, sandy gravel bottom. Insufficient proper-sized stones in sample for wear test. Fails for Item 102-A, granular borrow. Has color of 4; maximum allowed 3½.
	2A	1963	1-4	0-1	No	100	100	100	38.0	6.5	1	-	Gran. Bor. (Sand)	Test #2 south of Test #1. 0-1', 1'-4' silt, 4'-7' coarse gravel, coarse gravel and water in bottom. Test #2A fails for Item 202 Mod., sub-base of sand. Has 38% passing #100 mesh;

BETHEL GRANULAR DATA SHEET NO. 19

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
														maximum allowed 18%. Has 6.5% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	2B	1963	4-7	-	No	-	-	28.8	14.0	3.75	1½	12.0%	Gravel	Test #2B acceptable for Item 201-A, sub-base of gravel.
	3A	1963	1-7	0-1	No	100	100	100	57.0	15.0	1	-	-	Test #3 taken 500' south of Test #2. 0-1' overburden, 1'-7' sand, 7'-10' gravel, gravel and water in bottom. Test #3A fails for Item 102-A, granular borrow. Has 15% passing #270 mesh; maximum allowed 10%.
	3B	1963	7-10	-	No	-	-	49.3	10.0	3.5	1½	20.0%	Gravel	Test #3B acceptable for Item 201-A, sub-base of gravel.
33	1	1963	1-6	0-1	No	-	-	51.6	7.0	3.0	3½	25.0%	Gravel	Owner: Perry Longley. A series of granular knolls. Test #1 taken 150' west of edge of meadow, 125' north of brook. Sandy gravel with a few large boulders, silt bottom. Acceptable for Item 201-A, sub-base of gravel.
	2	1963	5-9.5	0-0.5	No	100	100	95.9	8.0 *7.67	1.0 *.96	1	-	Sand	Test #2 taken 200' northwest of Test #1 and adjacent to power pole #2. 0-0.5' overburden, 0.5'-3' silt, 3'-5' sandy gravel, 5'-9.5' sand, gravel bottom. Acceptable for Item 202 Mod., sub-base of sand.

* Percentage of Total Sample

BETHEL GRANULAR DATA SHEET NO. 20

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
34	1	1963	1-9	0-1	No	-	-	59.0	2.0	1.0	2	23.4%	Gravel	Owner: George Lynch. A small terrace containing several small shallow pits, surrounded by ledge and boulders. Test #1 taken 50' north of private road, 50' east of pine trees. Fine gravel with silt bottom. Acceptable for Item 201-A, sub-base of gravel.
35	1	1963	1-6	0-1	No	-	-	33.7	20.0	9.0	3	27.6%	Gran. Bor. (Grav.)	Owner: Louis Wilson. A small terrace of coarse gravel some stones over 6". Matrix powdery, yellowish brown. Apparently a shallow layer of coarse gravel over silt. Test #1 taken 15' west of fence, 27' south of fence. 0-1' overburden, 1'-6' coarse gravel, 6'-9' silt, silt bottom. Fails for Item 201-A, sub-base of gravel. Has 20% passing #100 mesh; maximum allowed 15%. Has 9% passing #270 mesh; maximum allowed 5%. Has wear of 27.6%; maximum allowed 25%. Acceptable for Item 102-A, granular borrow.
	2	1963	1-4	0-1	No	-	-	30.9	12.0	3.75	3½	29.8%	Gran. Bor. (Grav.)	Test #2 taken 100' west of test #1, 30' south of fence. 0-1' overburden, 1'-4' gravel, 4'-8' silt, silt bottom. Fails for Item 201-A,

BETHEL GRANULAR DATA SHEET NO. 21

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				
														sub-base of gravel. Has wear of 29.8%; maximum allowed 25%. Acceptable for Item 102-A, granular borrow.
36	1	1963	0-4	-	Yes	-	-	43.6	25.0	9.0	2½	32.2%	Gran. Bor. (Grav.)	Owner: Francis A. Duval. A small shallow pit with poor quality material-very coarse soft stones. Pit approximately 200' X 50', 6' face. Test #1 in floor. Coarse gravel, many stones over 6". Ledge bottom. Fails for Item 201-A, sub-base of gravel. Has 25% passing #100 mesh; maximum allowed 15%. Has 9% passing #270 mesh; maximum allowed 5%. Has wear of 32.2%; maximum allowed 25%. Acceptable for Item 102-A, granular borrow.
37	1A	1963	0-2.5	-	Yes	-	-	22.6	47.0	18.1	2	24.6%	-	Owner: Mrs. Loren Washburn. A small pit of very coarse gravel. Test #1 in bottom of pit. 0-2' coarse gravel with some stones over 6". 2'-10' fine silty sand, fine silty sand bottom. Test #1A fails for Item 102-A, granular borrow. Has 18.1% passing #270 mesh; maximum allowed 10%.
	1B	1963	2.5-10	-	Yes	-	-	99.5	91.0 *90.5	46.0 *45.8	1	-	-	Test #1B fails for Item 102-A, granular borrow.

* Percentage of Total Sample.

BETHEL GRANULAR DATA SHEET NO. 22

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
	2A	1963	0-3.5	-	No	-	-	32.9	5.0	2.0	2	23.8%	Gravel	Has 46% passing #270 mesh; maximum allowed 10%. Test #2 in woods just east of pit. 0-3.5' fine gravel, 3.5'-7' medium sand, coarse gravel bottom. Test #2A acceptable for Item 201-A, sub-base of gravel.
	2B	1963	3.5-7	-	No	100	100	100	3.0	1.0	1½	-	Sand	Test #2B acceptable for Item 202 Mod., sub-base of sand.
38	1A	1963	1-5	0-1	No	100	100	100	37.0	9.5	1	-	Gran. Bor. (Sand)	Owner: Rood Memorial Park. A large flat meadow in valley bottom. Test #1 taken 120' west of Chimney, 30' east of Chimney, 85' south of road. 0-1' overburden, 1'-5' fine sand, 5'-10' coarse gravel, coarse gravel bottom. Test #1A fails for Item 202 Mod., sub-base of sand. Has 37% passing #100 mesh; maximum allowed 18%. Has 9.5% passing #270 mesh; maximum allowed 5%. Acceptable for Item 102-A, granular borrow.
	1B	1963	5-10	-	No	-	-	36.4	4.0	1.25	1	17.6%	Gravel	Test #1B acceptable for Item 201-A, sub-base of gravel.
39	1	1963	-	-	No	-	-	22.4	3.0	1.25	1	14.0%	Gravel	Owner: Everett Perkins. A large river bar. Test #1 acceptable for Item 201-A, sub-base of gravel.

BETHEL GRANULAR DATA SHEET NO. 23

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				
40	1A	1963	0-4	-	Yes	-	-	37.8	17.0	5.0	3	22.6%	Gran. Bor. (Grav.)	Owner: Millard Tozier. A wide terrace containing a number of small shallow pits. Test #1 in bottom of pit. 0-4' gravel, 4'-9.5' fine wet sand, fine wet sand bottom. Test #1A fails for Item 201-A, sub-base of gravel. Has 17% passing #100 mesh; maximum allowed 15%. Acceptable for Item 102-A, granular borrow.
	1B	1963	4-9.5	-	Yes	100	100	100	99.3	76.0	-	-	-	Test #1B processed by Soils Lab. 100% passing #40 mesh 99.3 " #100 " 86.0 " #200 " 76.0 " #270 " Soil type A-4. Fails for Item 102-A, granular borrow. Has 76% passing #270 mesh; maximum allowed 10%.
	2	1963	0-10.5	-	No	100	100	100	98.3	87.0	-	-	-	Test #2 taken 160' east of Test #1. Sample processed by Soils Lab. 100% passing #40 mesh 98.3 " #100 " 92.3 " #200 " 87.0 " #270 " Soil type A-4. Fails for Item 102-A, granular borrow. Has 87% passing #270 mesh; maximum allowed 10%.
	3A	1963	0-4.5	-	No	-	-	48.1	17.0	10.5	4	26.2%	-	Test #3 taken 25' west of private road at point 195' south of spring house, 75'

BETHEL GRANULAR DATA SHEET NO. 24

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
														east of power pole. 0-4.5' gravel, 4.5'-8.5' fine sand, fine sand bottom. Test #3A fails for Item 102-A, granular borrow. Has 10.5% passing #270 mesh; maximum allowed 10%. Has color of 4; maximum allowed 3½.
	3B	1963	4.5-8.5	-	No	100	100	100	87.0	40.0	1	-	-	Test #3B fails for Item 102-A, granular borrow. Has 40% passing #270 mesh; maximum allowed 10%.
41	1	1963	1-9.5	0-1	No	-	-	19.0	9.0	3.5	1½	25.0%	Gravel	Owner: H.R. Fowler. A series of terraces. Test #1 taken 140' south east of power pole #375, 60' from log crib. Coarse gravel with some stones over 6". Acceptable for Item 201-A, sub-base of gravel.
	2	1963	1-10	0-1	No	-	-	25.9	3.0	1.0	1½	22.6%	Gravel	Test #2 taken 50' north of farm road at a point 400' along road from Test #1. Coarse gravel with some stones over 6". Acceptable for Item 201-A, sub-base of gravel.
	3	1963	1-11	0-1	No	-	-	39.0	10.0	3.5	3½	19.6%	Gravel	Test #3 in meadow on lower level. Gravel with sandy gravel bottom. Acceptable for Item 201-A, sub-base of gravel.
42	1	1963	1-8	0-1	No	-	-	26.6	7.0	3.0	3½	20.0%	Gravel	Owner: Preston Rand. A large terrace containing

BETHEL GRANULAR DATA SHEET NO. 25

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
														small pit. Test #1 about midway across meadow from road, 125' west of fence. Coarse gravel with coarse gravel bottom. Acceptable for Item 201-A, sub-base of gravel.
	2	1963	0.5-8	0-0.5	No	-	-	35.3	3.0	1.5	3½	22.8%	Gravel	Test #2 taken 335' south-west of Test #1, 25' north-west of fence. 0-0.5' over-burden, 0.5'-8' coarse gravel, 8'-10' silt, silt bottom. Acceptable for Item 201-A, sub-base of gravel.
	3	1963	1-7	0-1	No	-	-	26.4	7.0	2.75	2	18.8%	Gravel	Test #3 taken 400' south-west of Test #2. Coarse gravel with coarse gravel bottom. Acceptable for Item 201-A, sub-base of gravel.
43	1	1963	0-4	-	Yes	-	-	33.7	5.0	2.25	5	24.4%	-	Owner: Fred Perron. A fairly large pit of flat stones and dirty matrix. Stones mostly schist. Pit badly cluttered, and sloughed. Dimensions of pit 100' X 100'. Face 18' high Test #1 in face. Possible to sample only upper 4' due to sloughing. Fails for Item 102-A, granular borrow. Has color of 5; maximum allowed 3½.

BETHEL GRANULAR DATA SHEET NO. 26

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
44	1	1963	0-10	-	Yes	-	-	68.3	30.0	9.25	3½	-	Gran. Bor. (Grav.)	Owner: Randall Washburne. A medium-sized pit; dimensions of lower level 70' north and south, 80' east and west. Material either outwash or sandy till. Sharp drop to road on south side. Extension to west. Test #1 in face of lower level. Sample may possibly contain slumped material. Stones mostly schist-soft flat. Fails for Item 201-A, sub-base of gravel. Has 68.3% passing #4 mesh; maximum allowed 60%. Has 30% passing #100 mesh; maximum allowed 15%. Has 9.25% passing #270 mesh; maximum allowed 5%. Insufficient proper-sized stones in sample for wear test. Acceptable for Item 102-A, granular borrow.
	2	1963	0-9	-	Yes	-	-	72.9	34.0	10.0	3	-	Gran. Bor. (Grav.)	Test #2 in face of upper level. Material same as lower level with addition of numerous large angular stones of schist. Upper level more extensive than lower but very poorly managed with numerous piles of rejected material. Fails for Item 201-A, sub-base of gravel. Has 72.9% passing #4 mesh; maximum

BETHEL GRANULAR DATA SHEET NO. 27

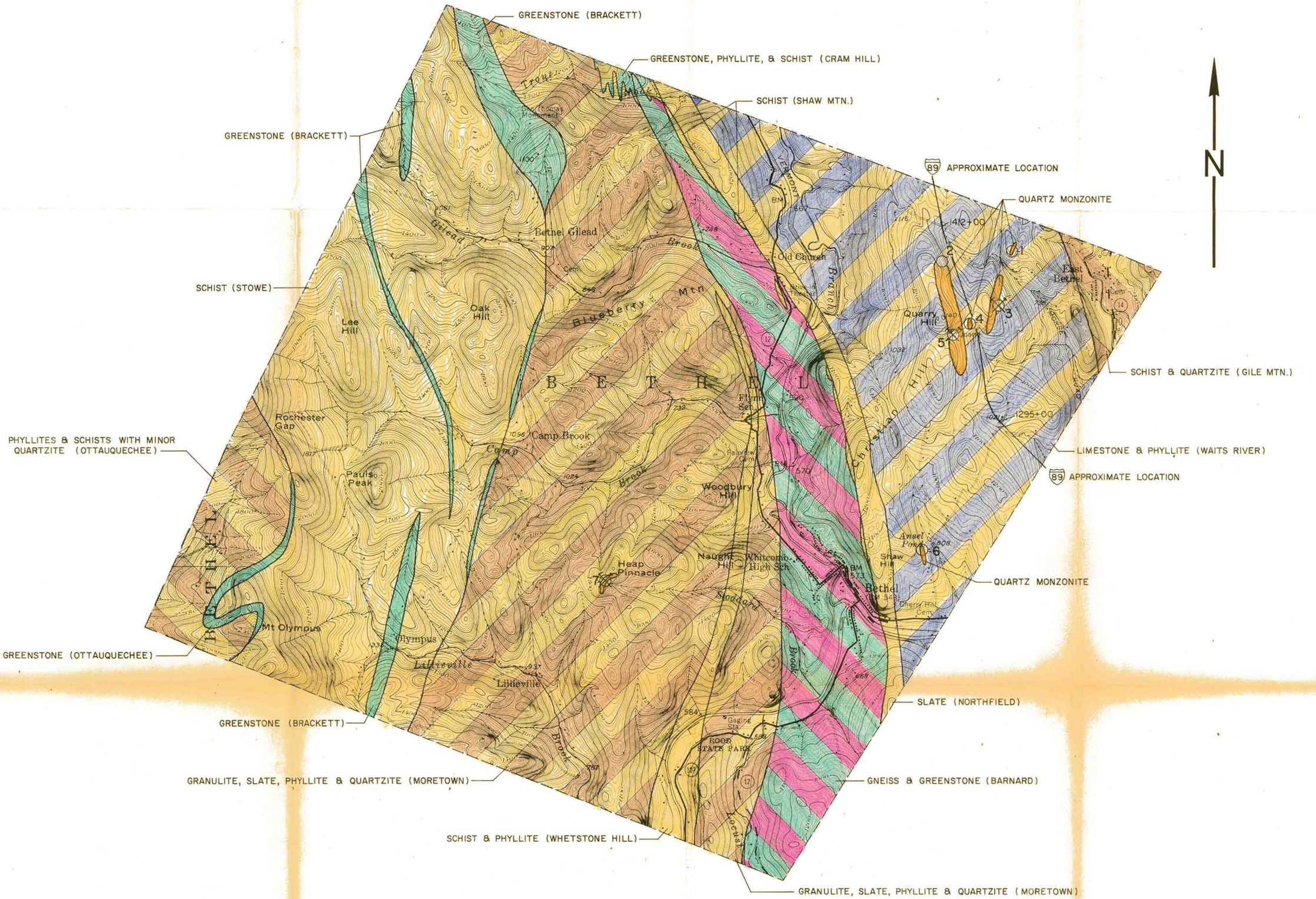
Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (FT)	Over-burden (FT)	Existing Pit	Sieve Analysis % Passing 1½"	5/8"	#4	#100	#270	Color AASHO T-21	Abrasion AASHO T-4-35	Passes WHD Spec.	Remarks
														allowed 60%. Has 34% passing #100 mesh; maximum allowed 15%. Has 10% passing #270 mesh; maximum allowed 5%. Insufficient proper-sized stones in sample for wear test. Acceptable for Item 102-A, granular borrow.

BETHEL ROCK DATA SHEET NO. 1

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHO T-3	Distance Between Samples (FT)	Remarks
1	1	1963	Quartz-Monzonite	No	Chip	3.0	77' across outcrop	Owner: Lewis Speed. A small ridge (365' X 77') of white quartz-monzonite in pasture along old road. Maximum relief was 15' to 20'. Schist outcrops on both sides of quartz-monzonite. Only apparent extension of material would be down below surface of surrounding rock. Both tests were taken across trend of outcrop.
	2	1963	Quartz-Monzonite	No	Chip	3.7	50' across outcrop	Test No. 1 was 100' north of south end of outcrop and Test #2 was 100' north of Test #1. Unweathered samples difficult to obtain due to smooth surface of rock. This would appear to be a poor source for crushed rock due to the small quantity available above ground.
2	1	1963	Quartz-Monzonite	No	Chip	4.8	150' across outcrop	Owner: Rock of Ages Corp. This is the northern end of the largest quartz-monzonite body in the town. (See Ident. No. 5). Both tests were taken along a section from station 1381 + 00 of the Median Centerline, I 89. Test #1 extends from 700' to 850' left.
	2	1963	Quartz-Monzonite	No	Chip	4.8	150' across outcrop	Test #2 extends from 850' to 1000' left of station 1381+00. The two tests cover the apparent width of the outcrop. The northern extent of the outcrop was some 200' north of the tests. Maximum relief was 80'-100'.
3	1	1963	Quartz-Monzonite	Yes	Chip	3.6	Random	Owner: Merton Smith. (Rock of Ages owns mineral rights and Right-of-Way up trail.) This is a good sized outcrop some 3500' long and 400'-500' wide. The relationship to the larger body where the Woodbury and Ellis Quarries are located is not known but the rock looks very similar to the Bethel White Granite quarried there. Rock for both tests was chipped at random from weathered grout pile. Near two small quarry holes. This area is all wooded-quarries have not been worked for years.
	2	1963	Quartz-Monzonite	Yes	Chip	3.8	Random	

BETHEL ROCK DATA SHEET NO. 2

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHO T-3	Distance Between Samples (FT)	Remarks
								Outcrop is located approximately from 2000' right of Station 1366+50 to the centerline at Station 1337+50. This would appear to be an idea area for Crushed rock source if it were available.
4	1	1963	Quartz-Monzonite	No	Chip	2.8	-	Owner: Rock of Ages Corp. This is a small outcrop of the "Bethel granite" located just west of the I 89 centerline. Both tests were taken along a section from station 1321+50. Test #1 starts at the east edge of the outcrop 310' left of Station 1321+50 and extends to 370' left. Test #2 is from 370' to 425' left. The rock extends to a point approximately 510' left of this station. This would appear to be a good source of rock for crushing.
	2	1963	Quartz-Monzonite	No	Chip	4.0	-	
5	1	1963	Quartz-Monzonite	Yes	Chip	3.2%	-	Owner: Rock of Ages Corporation. Known as "Woodbury Quarry". Samples taken from grout pile at crusher site. Rock is a quartz monzonite with "chestnuts" of biotite. Known in the granite industry as "Bethel White Granite". The quarry is sporadically operated as a source of monumental stone and aggregates. Test #3 taken by D.P. Stewart.
	2	1963	Quartz-Monzonite	Yes	Chip	3.0%		
	3	1958	Quartz-Monzonite	Yes	Chip	5.0%		
6	1	1963	Quartz-Monzonite	No	Chip	2.4%		Owner: Earl Tewksbury. Owner does not wish to sell. A small outcrop 125' wide and 1300' long.
	2	1963	Quartz-Monzonite	No	Chip	2.0%		
7	1	1963	Quartz-Monzonite	No	Chip	3.4%		Owner: Town of Bethel. Former Quimby Quarry on Heap Pinnacle. Scattered outcrops consisting of small dikes and sills. Quarry site is a small dike 6'-10' wide, 20'-25' long. Hole is 10' deep. Small grout pile on side hill at head of Stoddard Brook.
	2	1963	Quartz-Monzonite	No	Chip	3.2%		



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)

BETHEL

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1964

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

ROCK

WINDSOR COUNTY VT. HWY. DISTRICT NO. 5

REVISIONS

DATE							
BY							

LEGEND

- ○ GRAVEL, ACCEPTABLE FOR ITEM 201-A (sub-base of gravel)
- ◉ GRAVEL, DEPLETED OR NOT ACCEPTABLE FOR ITEM 201-A
- △ SAND, ACCEPTABLE FOR ITEM 202 (sub-base of sand) Mod.
- ▲ SAND, DEPLETED OR NOT ACCEPTABLE FOR ITEM 202 Mod.
- □ GRANULAR BORROW, ITEM 102-A
- ▨ MATERIAL NOT ACCEPTABLE FOR ITEM 102-A
- ✕ EXISTING PIT
- SG SAND & GRAVEL DEPOSIT
- S SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

BETHEL

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1964

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

GRANULAR

WINDSOR COUNTY VT. HWY. DISTRICT NO. 5

REVISIONS

DATE							
BY							