SURVEY OF HIGHWAY CONSTRUCTION MATERIALS IN THE TOWN OF AVERILL, ESSEX COUNTY, VERMONT

Prepared by

Engineering Geology Section, Materials Division
Vermont Department of Highways

in cooperation with

United States Department of Transportation
Federal Highway Administration

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Acknowledgments

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

1. Various departments and individuals of the Vermont State Department of Highways; notably the Planning Division and Mapping Section and the Materials Division.

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

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

4. United States Department of Commerce, Federal Highways Administration.

History

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

The sources of construction materials are located by this Project through ground reconnaissance, study of maps and aerial photographs and geological and physiographic interpretation. Maps, data sheets and work sheets for reporting the findings of the Project are used to furnish information of particular use to the contractor or construction man. For maximum benefit, the maps, data sheets and this report should be studied together.

Enclosures

Included in this report are two surface-geology maps, one defining the location of tests on bedrock, the other defining the location of tests on granular materials. These maps are based on 15-minute or 7-1/2-minute quadrangles of the United States Geological Survey enlarged or reduced to 1:31250 or 1" = 2604'. Delineated on the Bedrock Map are the various rock formations and types in the township. This information was obtained from: Vermont Geological Survey Bulletins, Vermont State Geologist Reports, United States Geological Survey Bedrock Maps, Centennial Geological Map of Vermont, the Surficial Geologic Map of Vermont and other references.

The granular materials map shows areas covered by various types of glacial deposits (outwash, moraines, kames, kame terraces, eskers, etc.) by which potential sources of gravel and sand may be recognized. This information was obtained primarily from a survey conducted by Professor D. P. Stewart of Miami University, Oxford, Ohio, who mapped the glacial features of the State of Vermont during the summer months from 1956 to 1966. Further information is obtained from the Soil Survey (Reconnaissance) of Vermont (conducted by the Bureau of Chemistry and Soils of the United States Department of Agriculture), Vermont Geological Survey Bulletins, United States Geological Survey Quadrangles, aerial photographs and other sources. On both maps, the areas tested are represented by Identification Numbers. The number and location of tests taken in each area represented by an Identification

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

Also included in this report are data sheets for both the Bedrock and Granular Materials Survey, which contain detailed information for each test conducted by the Project as well as information obtained from an active card file compiled and updated by the Engineering Geology Section of the Materials Division over a period of years. Transfer of information from the cards to the data sheets was made and the location of the deposits was plotted on the maps. However, some cards in the file were not used because of incomplete or unidentifiable information on the location of the deposit. Caution should be exercised wherever this information appears incomplete.

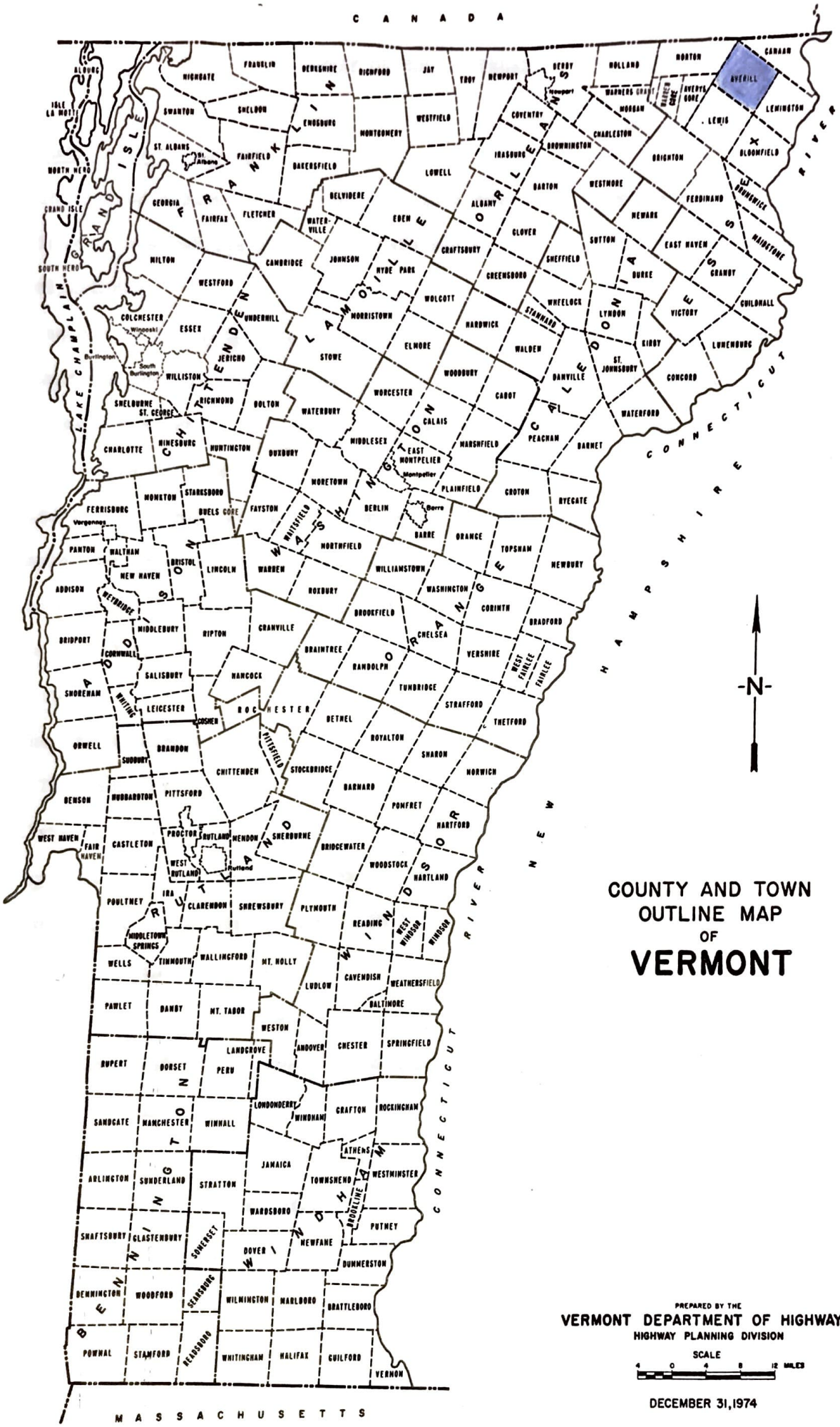
Work sheets, containing more detailed information and a field sketch of the area represented by the Identification Number, and laboratory reports are on file in the Materials Division of the Vermont Department of Highways.

LOCATION

The town of Averill is in the north-central part of Essex County in northeastern Vermont. It is bounded on the northeast by Canaan, on the southeast by Lemington, on the southwest by Lewis, on the west by Avery's Gore, and on the northwest by Norton. (See County and Town Outline Map of Vermont on following page).

Averill lies entirely within the Northeastern Highlands physiographic subdivision of the New England Upland. The topography in the town is one of rugged steep-sided mountains with gently sloping, marshy lowlands and narrow stream valleys. Elevations range from 2,972 feet on an unnamed peak on the southeast border, to less than 1,420 feet where the East Branch of the Nulhegan River crosses the Lewis Town Line in the south corner of town. There are 13 peaks over 2,220 feet in elevation. St. Regis Paper Co. owns most of the forests that cover nearly all of the town; Brown Co. owns some isolated woodlots.

More than one-half the drainage is southward via the East Branch of the Nulhegan River, or its tributaries. LaPointe, Spaulding, and Brouillard Brooks; and many unnamed brooks which drain the eastern slopes of Green Mountain. Some unnamed streams flow northeast into Canaan, and northwest into Averill Lake and thence into Norton. Alder Brook and the West Branch of Willard Stream flow eastward into Lemington. The three major lakes (Averill, Little Averill, and Forest) are in the north and northwest part of town. Marshes cover significant but scattered areas of town.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

PREPARED BY THE
VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

DECEMBER 31, 1974

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

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

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

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

Discussion of Rock and Rock Sources

The information on the Rock Materials Map (Plate II) is simplified. (For a more detailed description of the respective rock formations, see the summary included in this report.) In the summary, it is apparent that igneous and meta-sedimentary rocks comprise the lithology within the Town of Averill.

No samples were obtained in the town because heavy forests, and numerous streams and marshes prevented access to mountainous slopes. However, Brousseau Mountain, which straddles the Norton-Averill Town Line, was sampled as a possible rock source in the town of Norton. It lies in the Averill Granite, and yielded acceptable material for Crushed Rock for Sub-base.

The formations mapped as underlying Averill are listed from west to east: the undifferentiated granitic rocks of the New Hampshire Plutonic Series, the Gile Mountain phyllite or schist, the Gile Mountain phyllite. Several small zones of Gile Mountain hornblende schist are mapped near the center of Averill. A small body of Gile Mountain Formation. (Halls Stream member).

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

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

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

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

Discussion of Sand and Gravel Deposits

Results of this survey showed that known granular materials are scarce in Averill. There are no mapped sources; however, four pits owned by St. Regis Paper Co. were located and sampled along the camping and logging roads between Averill and Little Averill Lakes.

There is very little depth to the granular deposits as most of the material seemed to be of localized beach or delta origin and was found on bedrock close to the surface at elevations between 1,760 and 1,800 feet; however, Map Identification No. 1 appears to be a discontinuous esker.

The sources of Gravel for Sub-base, Item 704.05, are listed most favorable first: Map Identification No. 1 and 4.

The sources of Sand Borrow and Cushion, Item 703.03, are listed most favorable first: Map Identification No. 4 and 2.

Future development and logging may well give access to presently unknown granular sources in town.

Summary of Rock Formations in the Town of Averill

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

Gile Mountain Formation (Hall Stream Member): Highly feldspathic grit, probably volcanic; feldspar - chlorite - ankerite schist and amphibolite; all northeast of Nulhegan River.

Gile Mountain Formation Amphibolite: Hornblende-quartz-biotite-chlorite rock.

Undifferentiated Granitic Rocks of the New Hampshire Plutonic Series: Mostly granitic bodies emplaced during or slightly after the regional metamorphism. Sillimanite and locally cordierite occur near many contacts in northern part of state in small dikes and sills to narrow to show on map.

Glossary of Selected Geologic Terms

Amphibolite: A green to black, metamorphic rock with varying amounts of amphibole (i.e., tremolite, actinolite, hornblende, or arfvedsonite) and having some schistose structure.

Andalusite: A variously colored orthorhombic aluminum silicate, Al_2SiO_5, found in schistose rocks.

Ankerite: A carbonate mineral ($Ca\ CO_3 \cdot Mg,\ Fe,\ Mn\ CO_3$) which is intermediate between calcite, dolomite, and siderite.

Bedrock: Solid, undisturbed rock in place at the surface or just beneath surficial deposits.

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

Biotite: A platy silicate commonly known as black mica.

Calcareous: Pertaining to, or containing from 10- to 50- percent calcium carbonate ($Ca\ CO_3$).

Chlorite: A group of green, hydrous silicates of magnesium and iron, which may contain aluminum.

Cordierite: A blue silicate of magnesium, aluminum, and iron.

Dike: A sheet-like igneous rock that fills a fissure in older rocks while still in a molten state. It varies from less than an inch wide and a few yards long, 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.

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

Drift: A deposit of earth, sand, gravel and boulders, carried by glaciers (glacial drift), or by water flowing from glaciers (fluvioglacial drift). Large areas of North America and Europe are drift-covered in higher latitudes.

Feldspathic: Pertaining to or containing feldspar, one of the major rock-forming minerals.

Graywacke: Dark-colored, hard sandstone consisting of angular grains of quartz, feldspar, and rock fragments embedded in a fine, compact matrix of micas, clay minerals, and chlorite.

Hornblende: A common amphibole, usually black, brown or dark green. It occurs in igneous and metamorphic rocks as prismatic masses.

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

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

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

Outcrop: A part of a body of rock that appears, bare and exposed, at, or just below the surface.

Phyllite: A fine-grained, foliated metamorphic rock intermediate and gradational between the mica schists and slates. The foliation is caused by large amounts of potash mica (Sericite) which gives the rock its distinctive silvery appearance.

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

Schist: A crystalline metamorphic 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.

Sediments: All material deposited from water (streams, lakes or seas), wind, or ice.

Shoal: A sandbar or gravel bar that forms in shallow water; specifically, an elevation which is not rocky and on which there is a depth of water of six fathoms (36 feet) or less.

Sill: A tabular body of igneous rock which has been injected while molton between layers or foliations of rock. Sills have relatively great lateral extent as compared to thickness.

Sillimanite: A brown, grayish or pale green aluminum silicate, $Al_2 SiO_5$, forming in long, slender, and often fibrous crystals.

Staurolite: A brown to black, iron aluminum silicate, $HFeAl_5Si_2O_{13}$, occurring in prismatic crystals, often twinned in the form of a cross.

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

Weathered: Showing the effects of exposure to the atmosphere.

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

TABLE 704.05A - GRAVEL FOR SUB-BASE

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

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

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

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

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

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

TABLE 704.06A - CRUSHED STONE FOR SUB-BASE

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

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

PARTIAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION MATERIALS

Listed below are partial specifications for Highway Construction Materials as they apply to this report at date of publication. For a complete list of specifications see Standard Specifications for Highway and Bridge Construction, approved and adopted by the Vermont Department of Highways, January, 1972.

DIVISION 700 - MATERIALS

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

TABLE 703.03A - SAND BORROW AND CUSHION

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

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

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

TABLE 703.05A - GRANULAR BORROW

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

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

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

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

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

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

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

This material shall meet the requirements of the following table:

TABLE 704.06B - LEVELING MATERIAL

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

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

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

TABLE 704.07A - CRUSHED GRAVEL FOR SUB-BASE

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

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

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

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

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

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

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

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

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

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

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

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

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

silt, clay, and organic material.

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

TABLE 704.10A - GRAVEL BACKFILL FOR SLOPE STABILIZATION

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

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

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

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

TABLE 704.11A - GRANULAR BACKFILL FOR STRUCTURES

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

TABLE I

AVERILL GRANULAR DATA SHEET NO. 1

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
1	1	1975	0.5-13	0-0.5	Yes	97	86	73	56	11	7	19.5%	Gravel	Owner: St. Regis Paper Co. Area was composed of two pits in a heavily wooded logging area, 0.1 mile southwest of the main access road, 1.02 miles southeast of the Norton-Averill Town Line, and 2.0 mile southeast of the junction of the main access road and Vermont Route 114 in Norton. The features seemed to be either one long, discontinuous esker, or a line of several small eskers trending 1,100 feet nearly north-south. The northerly pit had water flowing from its floor into nearby chipping waste areas. The southermost esker extended south from a point 100 feet south of the pit. Its crest was 300 feet long, 50 feet wide, and from 35 to 50 feet high. Test No. 1 was on south face of south pit. Material was: 0.5'-6', coarse sand and pebbly sand; 6'-8', layer of 4" to 12" cobbles; 8'-13', interbedded and intergradational sand, coarse sand and pebbles. Test No. 1 represents a 400-foot extension south into wooded esker. The material was hard-packed near the surface, but caves very easily below the hard-packed zone. Most of the pit faces are heavily sloughed.

TABLE I

AVERILL GRANULAR DATA SHEET NO. 2

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
	2	1975	0-131	-----	Yes	83	81	65	45	16	10	19.5%	Granular Borrow (Gravel)	Test No. 2 was on east face of pit, 55 feet northeast of Test No. 1. Material was: 0'-13', gravel with some sand layers. Some 12-inch stones were noted.
	3	1975	0.5-13	0-0.5	Yes	82	75	61	49	14	9	23.2%	Gran. Borrow (Gravel)	Test No. 3 was on north face of southern pit, 225 feet north of Test No. 1. Material was: 0.5'-4', dusty, pebbly fine gravel; 4'-5', layer of cobbles; 5'-13', gravel with some layers of sand.
	4	1975	0-13	----	Yes	79	69	54	42	15	10	19.8%	Gran. Borrow (Gravel)	Test No. 4 was on southeast face of northern pit, 350 feet north-northeast of Test No. 3. Material was: 0'-13', boulders, cobbles and coarse gravel; bottoms on boulders and sloughed material. The floor is wet. The material got coarser to the north. There was an old, truck-mounted clam-shell on the floor of the southern pit.
2	1-A	1975	0.5-16	0-0.5	Yes	100	100	100	88	18	6	-------	Sand	Owner: St. Regis Paper Co. Area is a small bank in woods southeast of a small logging road, 0.05 mile north of access road to the western side of Little Averill Lake, 0.33 mile south and west of the junction of access road running eastward from the south end of Averill Lake. The bank is on the west edge of a wooded, flat-topped terrace which trends about

TABLE I

AVERILL 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 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
														northeastward; it has a gradual downslope to the northwest, the north, and the east. Test No. 1-A was upper part of face of bank. Material was: 0.5'-16', interbedded, hard-packed sand, pebbly sand and silt layers.
	1-B	1975	16-32	____	yes	100	100	100	95	23	8	--------	Sand	Test No. 1-B was below Test No. 1-A. Material was: 16'-26', interbedded, sand and pebbly sand layers; 26'-32', silty fine sand and sand layers. Area is 3.4 miles south of the junction of Vermont Route 114 and main logging access road.
3	1	1975	1-8	0-1	Yes	100	100	100	94	32	15	------	Gran. Borrow (Sand)	Owner: St. Regis Paper Co. Area is a tiny pit adjacent to the west side of main logging access road, 3.0 miles south of its junction with Vermont Route 114 in Norton. Pit was dug out for a little sand and now has plow parts and and dune buggy on floor. Test No. 1 was on west face of pit. Material was: 1'-8', hard-packed, interbedded sand and pebbly sand layers with some silt seams.
4	1	1975	0.5-16	0-0.5	Yes	100	100	94	81	9	4	------	Sand	Owner: St. Regis Paper Co. Area is a pit trending north-south 0.8 mile (map distance) south of Averill Lake, and 0.8 mile (Map

TABLE I

AVERILL 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 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
														distance) east of the north end of Little Averill Lake. Pit is 3.6 miles southeast of the junction of the main logging access road (west of Averill Lake) and Vermont Route 114 in Norton. Area is 0.61 mile east of junction of woods roads between Averill and Little Averill Lakes. The wooded, fairly flat feature seems to be a beach or broad, flat shoal formed when the immediate post-glacial lake level was higher than now. The shallow granular feature extends 1,000 feet southward in dense, woods which are marshy in places. Test No. 1 was on the southwest face of major lobe of pit. Material was: 0.5'-2', pebbly fine gravel; 2'-4', pebbly coarse sand; 4'-5', dark brown pebble layer; 5'-7', layer of compact, very hard-packed silty sand; 7'-16', interbedded sand, pebbly sand, and coarse sand. The zone of dark brown, rust-coated pebbles is quite hard-packed; this layer lies just above the very hard-packed sand. Overall, the sand looks good.
	2	1975	1-13	0-1	Yes	100	100	93	83	13	4	-------	Sand	Test No. 2 was on northwest face of major lobe of pit, 140 feet north-northwest of Test No. 1. Material was: 1'-3', partly cemented, pebbly fine gravel; 3'-5', pebbly;

TABLE I

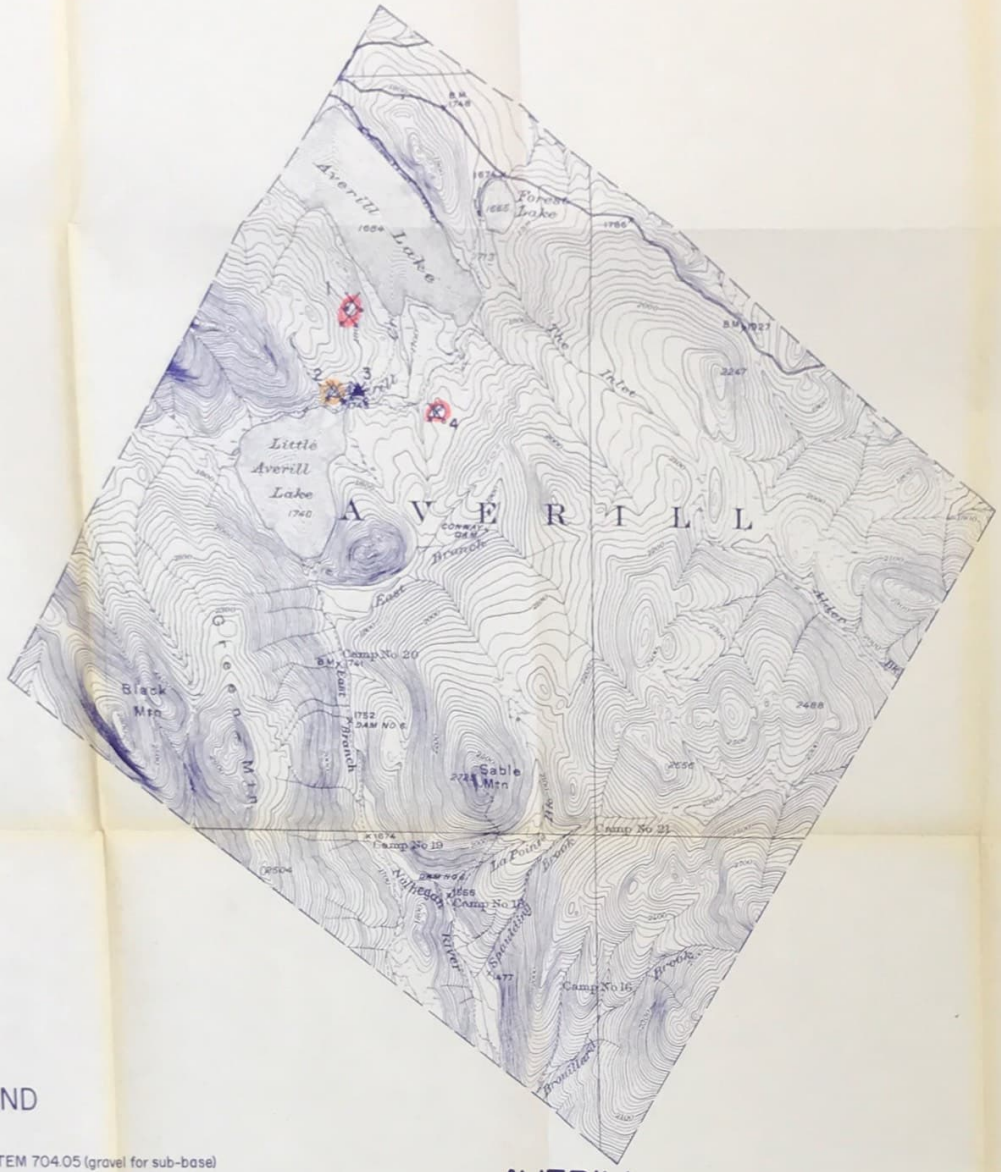
AVERILL GRANULAR DATA SHEET NO. 5

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
														5'-6', silty fine sand; 6'-8', sand and pebbly sand; 8'-10', sand and silty sand; 10'-13', interbedded sand, pebbly sand, and pebbly fine gravel. Material caves easily in gravelly sand zones.
	3	1975	1-14	0-1	Yes	85	83	70	58	8	4	23.9%	Gravel	Test No. 3 was on east face of major lobe of pit, 75 feet east of Test No. 1. Material was: 1'-3', silty fine sand; 3'-4', sand; 4'-13', pebbly fine gravel; 13'-14', sand. The stones were mostly granitic.
	4	1975	0.5-11	0-0.5	Yes	96	85	63	51	9	4	19.6%	Gravel	Test No. 4 was on northwest face of small lobe, 150 feet south of Test No. 1. Material was: 0.5'-4', fine pebbly gravel; 4'-9', gravel; 9'-11', pebbly sand interbeds. The presence of random pools of water and aquatic plants in the wooded extension to the south, indicates a shallow depth to bed-rock or silt -clay.

Table I
Supplement

AVERILL PROPERTY OWNERS - GRANULAR

	Map Identification No.
St. Regis Paper Co.	1, 2, 3, 4



N

LEGEND

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

AVERILL

SCALE 1:31,250

CONTOUR INTERVAL 20 FEET

1976

GRANULAR MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

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

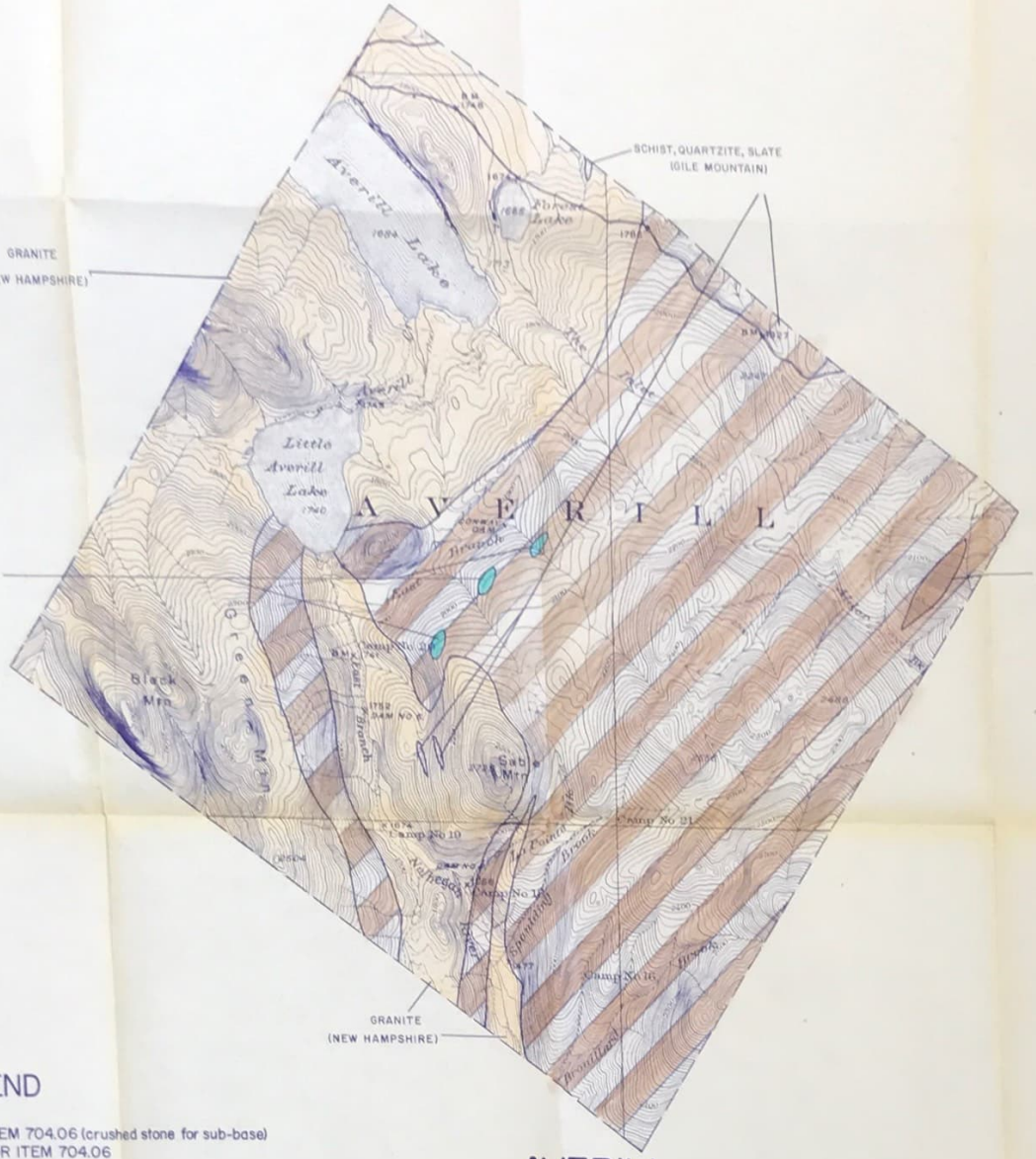
PLATE 1

GRANULAR

ESSEX COUNTY VT. HWY. DISTRICT NO. 9

REVISIONS

DATE						
BY						



LEGEND

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

AVERILL

SCALE 1:31,250

CONTOUR INTERVAL 20 FEET

1976

ROCK MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

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

PLATE II

ROCK

ESSEX COUNTY VT. HWY. DISTRICT NO. 9

REVISIONS

DATE						
BY						