SURVEY OF HIGHWAY CONSTRUCTION MATERIALS

IN THE TOWN OF HOLLAND, ORLEANS COUNTY, VERMONT

Prepared by

Engineering Geology Section, Materials Division

Vermont Department of Highways

in cooperation with

United States Department of Transportation

Federal Highway Administration

Montpelier, Vermont

April, 1976

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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.

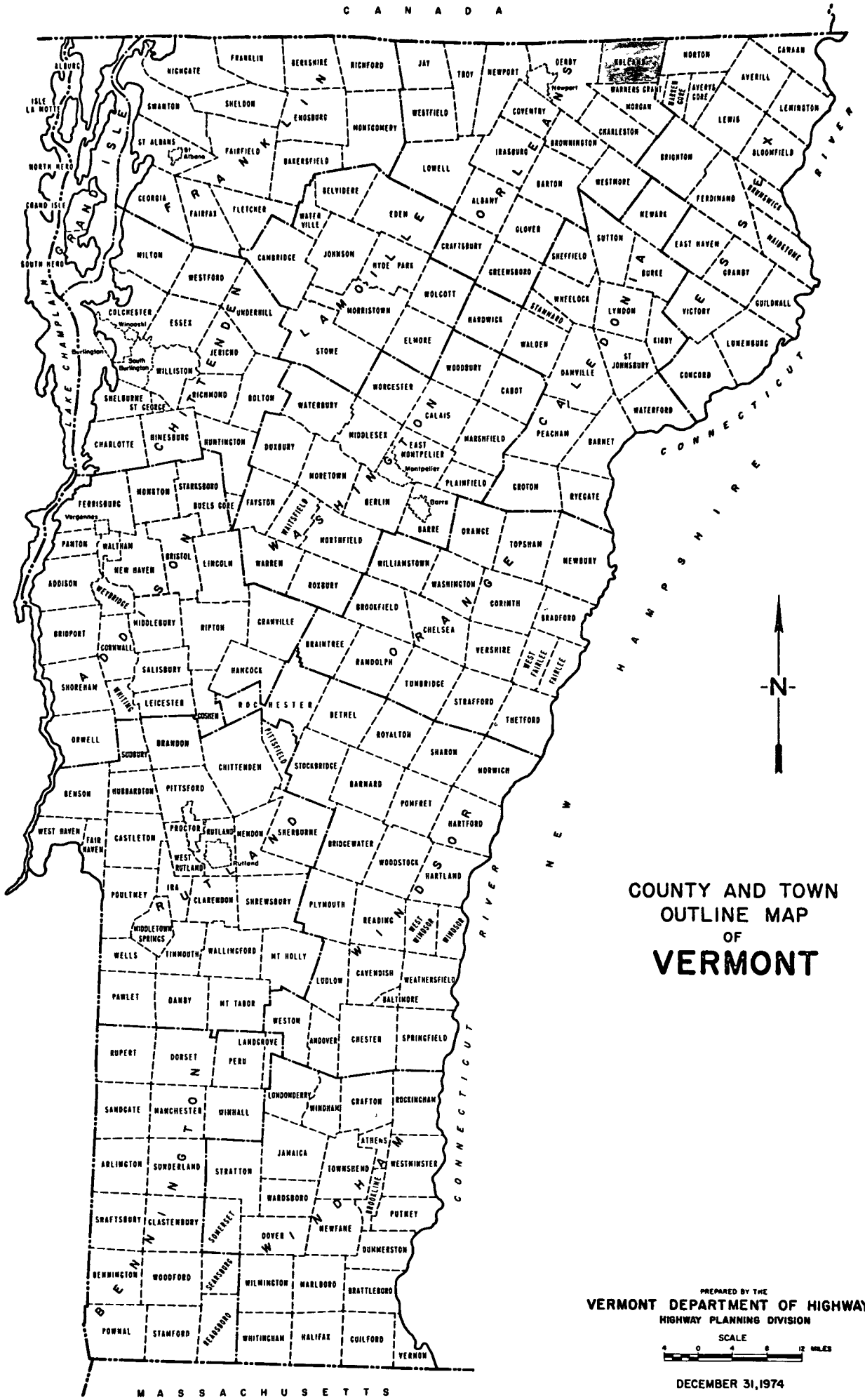
Work sheets, containing more detailed information and a field sketch of the area represented by the Identification Number, and laboratory reports are on file in the Materials Division of the Vermont Department of Highways.

LOCATION

The Town of Holland is in the northeast corner of Orleans County in northeastern Vermont. It is bounded on the east by Norton, on the southeast by Warner's Grant, on the south by Morgan, on the west by Derby, and on the north by Canada. (See County and Town Outline Map of Vermont on following page).

Holland lies entirely within the Vermont Piedmont physiographic sub-division of the New England Upland and has a topography of broad valleys and rounded hills. Elevations range from 2,337 feet atop Mt. John in the southeast corner of town, to 1,080 feet in the northwest corner of town, where Stearns Brook crosses the Canadian Border.

Major drainage in town is northwestward via Holland Brook, which originates at Holland Pond, and Stearns Brook; also westward via Orcutt Brook. Minor drainage is by numerous unnamed brooks.



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 underlying the Town of Holland. No samples were obtained in town because of low relief, and outcrops were masked by heavy woods or glacial drift; however, there is evidence of bedrock control close to the surface in many parts of town.

The formations mapped as underlying Holland are listed from west to east: the Waits River Formation (Barton River Member), the Gile Mountain Formation, and the undifferentiated granitic rocks of the New Hampshire Plutonic Series.

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 sources of granular material are scarce in Holland. There are two small areas mapped as kames, but neither material nor land-form was substantiated.

Eight pits were sampled, five had material which failed for Granular Borrow, Item 703.05; one failed for Gravel for Sub-base, Item 704.05; and two failed for Sand Borrow and Cushion, Item 703.03.

Glacial drift covers bedrock with a thin mantle, evidence being low faces in the pits and the presence of water on all pit floors.

Granular Material is drawn in from the Town of Derby.

Summary of Rock Formations in the Town of Holland

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.

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 the northern part of the state in small dikes and sills too narrow to show on map.

Waits River Formation (Barton River Member) - Interbedded siliceous crystalline limestone and sericite - quartz - chlorite phyllite in northern Vermont; diopsidic limestone and cordierite hornfels at contacts with granitic dikes and sills.

Glossary of Selected Geologic Terms

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

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 ($Ca\ C0_3$).

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.

Diopside: A pyroxene, $CaMg(SiO_3)_2$, found especially in contact metamorphic zones, and also in some schists and gneisses.

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.

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.

Hornfels: A very dense, dark, hard, sugary - grained rock that has been recrystallized by the heat of an adjacent igneous intrusion.

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.

Sericite: A mineral very similar to muscovite mica, occurring as small flakes and scales which often give metamorphic rocks a pearly luster on smooth surfaces.

Shoal: A sandbar or gravel bar that forms in shallow waters; 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 molten 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_2SiO_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.

Siliceous: Containing, pertaining to, or having some qualities or characteristics of silica (silicon dioxide, SiO_2).

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PARTIAL SPECIFICATIONS FOR HIGHWAY CONSTRUCTION MATERIALS

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

DIVISION 700 - MATERIALS

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

TABLE 703.03A - SAND BORROW AND CUSHION

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

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

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

TABLE 703.05A - GRANULAR BORROW

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

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

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

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

TABLE 704.05A - GRAVEL FOR SUB-BASE

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

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

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

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

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

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

TABLE 704.06A - CRUSHED STONE FOR SUB-BASE

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

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

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

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

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

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

This material shall meet the requirements of the following table:

TABLE 704.06B - LEVELING MATERIAL

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

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

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

TABLE 704.07A - CRUSHED GRAVEL FOR SUB-BASE

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

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

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

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

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

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

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

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

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

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

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

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

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

silt, clay, and organic material.

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

TABLE 704.10A - GRAVEL BACKFILL FOR SLOPE STABILIZATION

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

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

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

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

TABLE 704.11A - GRANULAR BACKFILL FOR STRUCTURES

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

TABLE I

HOLLAND 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	1-5	0-1	Yes	100	100	100	84	31	22	-----	----	Owner: Rodney Lyon. Area is overgrown, shallow, nearly depleted pit, 0.11 mile north of Town Highway No. 10, and 0.09 mile east of Town Highway No. 9. The floor was overgrown with many alders and tamaracks (trees found in wet areas), and the faces were sloughed and overgrown. Test No. 1 was on low face in center of east part of pit. Material was: 1'-2', sand; 2'-3', weathered rock fragments; 3'-4', sand; 4'-5', silty sand and silt -clay seams; bottoms on wet, soggy floor.
	2	1975	1-4	0-1	Yes	100	100	88	75	32	24	------	-----	Test No. 2 was on low face in north part of pit, 330 feet north of Test No. 1. Material was: 1'-3', silt and small rock fragments; 3'-4', dirty fine gravel or pebbly sand; bottoms at 4' on wet floor.
	3	1975	2-6	0-2	Yes	100	100	100	79	22	16	------	-----	Test No. 3 was on low north face in west lobe of shallow pit. Material was: 2'-6', dusty, pebbly sand or fine gravel. A nearby hole had water in it.
2	1	1975	1.5-5.5	0-1.5	Yes	100	88	76	62	21	15	------	Gran. Borrow (Sand)	Owner: Lionel Fortin. Area is a small, overgrown trash-strewn pit in southeast corner of

TABLE I

HOLLAND GRANULAR DATA SHEET NO. 2

ap dent. o.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
														hayfield, 0.25 mile east of Town Highway No. 9, and 0.1 mile south of its junction with Town Highway No. 16, No digging was allowed in meadow. Test No. 1 was on southeast face of pit. Material was: 1.5'-5.5', dusty fine, pebbly gravel; bottoms in sloughed material and vegetatio
	2	1975	1-5.5	0-1	Yes	100	100	100	81	24	17	-----	-----	Test No. 2 was on northeast face of pit, 60 feet north of Test No. 1. Material was: 1'-5.5' pebbly sand or very fine pebbly gravel; bottoms in sloughed material and vegetation.
3	1	1975	1-7	0-1	Yes			TEST		LOST				Owner: Bernard Daggett, former owner: Amalie LeMay. Area is a large, shallow, nearly depleted pit with wet floor, 0.43 mile east of Town Highway No. 8, and 0.5 mile north of its junction with Town Highways No. 15 and 16. Owner said there were springs in the area. Dense spruce woods lie west and east of area, and a logging road extends northward from northeast corner of pit. Test No. 1 was on southeast face of pit. Material was: 1'-3', dusty, fine gravel; 3'-5', deltaic pebbly sand; 5'-6', sand; 6'-7', silty sand; bottoms on silt -clay. Stones were very soft and crumbly; material had a lot of fines.

TABLE I

HOLLAND 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
	2	1975	1.5-8	0-1.5	Yes	88	88	78	65	16	11	------	Gran. Borrow (Gravel)	Test No. 2 was on north face of pit, 125 feet north-northwest of Test No. 1. Material was: 1.5'-4', dusty, fine, pebbly gravel; 4'-7', pebbly sand; 7'-8', sand; bottoms at 8' on sil clay floor. Borrow was being drawn from face which caves easily.
	3	1975	1-4	0-1	Yes	95	90	63	51	27	18	46.2%	-----	Test No. 3 was on east face in north end of pit, 450 feet north of Test No. 2. Material was: 1'-4', dusty, fine gravel; 4'-7', sloughed material and vegetation (not sampled).
4	1	1975	1-13	0-1	Yes	100	100	100	100	89	43	------	----	Owner: Raymond Dagesse. Area is a steep-faced, depleted pit on the northwest end of a terrace-pasture which slopes down unevenly to the northwest. Pit is limited by barbed-wire fences ato the southwest and southeast faces. The pit faces are over-grown with pines. Pit is south-east of the junction of State Aid Highway No. 1 and the east end of Town Highway No. 14. Test No. 1 was on south face of small west lobe of pit. Material was: 1'-5', silty sand or silt; 5'-8', fine sand; 8'-13', silty sand or silt; bottoms on sloughed material.

TABLE I

HOLLAND GRANULAR DATA SHEET NO. 4

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Existing Pit	Sieve Analysis % Passing						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
5	1	1975	1-6	0-1	Yes	100	100	100	92	67	55	------	-----	Owner: Lawrence Judd. Area is a pasture with two small excavations near lower, west end, 0.3 mile west of State Aid Highway No. 2, and 0.02 mile north of its junction with Town Highway No 33. Test No. 1 was on face of small eastern excavation. Material was: 1'-6', silt with soft, random, angular rock fragments. The floor was wet.
6	1	1975	0-6	------	Yes	100	100	96	85	22	15	-----	Gran. Borrow (Sand)	Owner: Robert Wheeler. Area is inactive, nearly depleted, shallo pit in cedar swamps, 0.06 mile southwest of State Aid Highway No. 1, and 0.06 mile southeast of its junction with Town Highway No. 17. Cedar swamp was being logged off and stockpiled in pit. Material from pit was used to shore up the logging road. The area lies with in 0.1 mile south of the new school and gym. The pit is near the top of a slight, gently rounded feature which drops off to marshes within 100 feet. Test No. 1 was on face near south end of small pit. Material was: 0'-6', pebbly sand; bottoms on wet floor.

TABLE I

HOLLAND 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						Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
7	1	1975	2-11	0-2	Yes	100	100	86	72	29	21	-----	-------	Owner: Angela Roberts. Former owner was Norbert Bearegard. Area is a triangular, shallow, wet, depleted and overgrown pit with beaver pond to the west, woods to the east, a pond to the south, and the Gordon Daggett property to the north. Pit is 0.25 mile east of State Aid Highway No. 2 and 0.52 mile north of its junction with Town Highways No. 32 and 35. Access was by foot along edge of wet cornfield, across a washed-out culvert, and through Daggett's land. Test No. 1 was on east-south-east face in south lobe of pit. Material was: 2'-11', dirty silt with some angular, rotted rock fragments; bottoms on sloughed material and vegetation.
	2	1975	1-5	0-1	Yes	100	94	86	73	30	22	-------	------	Test No. 2 was on northeast face of pit. Material was: 1'-2', silt and rock fragments; 2'-5', dirty gravel; bottoms in sloughed material and vegetation.
8	1	1975	2-19	0-2	Yes	100	100	100	83	45	32	-----	------	Owner: Lyndol Ames. Area is pit on west side of small over-grown field, 0.2 mile northwest of State Aid Highway No. 2. The access is 0.75 mile north of the Morgan Town Line. Access was steep and rocky thrown-up town road and needed a culvert over a

TABLE I

HOLLAND GRANULAR DATA SHEET NO. 6

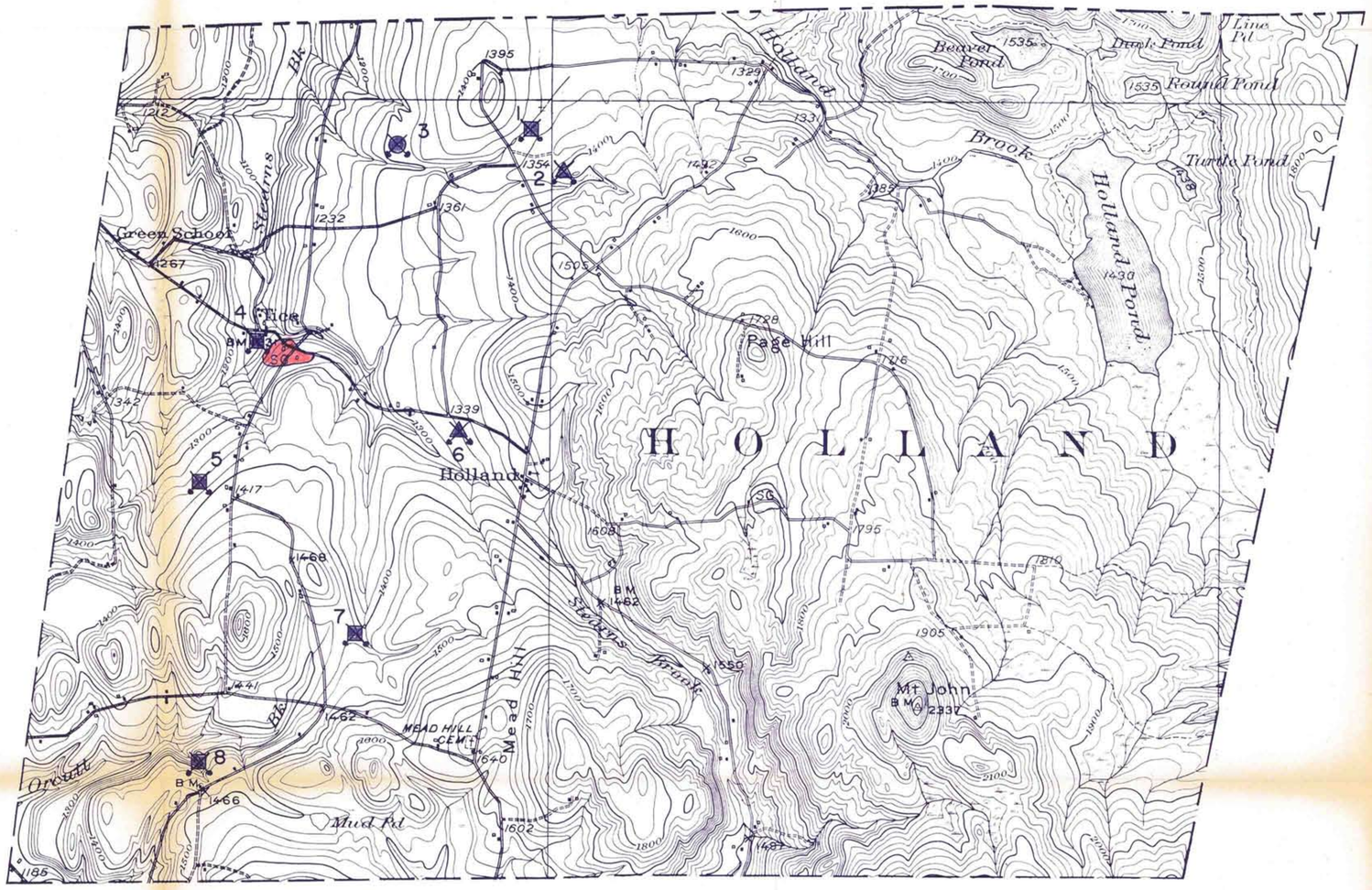
Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1-1/2"	1/2"	#4	#100	#200	Abrasion AASHTO T-4-35	Passes VHD Spec.	Remarks
														small brook. The field seems to be a lobe or modified terrace which slopes down in all directio Test No. 1 was on east face of pit at west side of field. Material was: 2'-8', rotted rock fragments; 8'-14', poorly worked gravel; 14'-19', gray fine silt (somewhat like rock flour); bottoms on sloughed material and vegetation.

Table I
Supplement

Holland Property Owners - Granular

	Map Identification No.
Ames, Lyndon	8
Dagesse, Raymond	4
Daggett, Bernard	3
Fortin, Lionel	2
Judd, Lawrence	5
Lyon, Rodney	1
Roberts, Angela	7
Wheeler, Robert	6

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
- SG SAND and GRAVEL DEPOSIT
- S SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

HOLLAND

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1976

GRANULAR MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

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

PLATE I GRANULAR

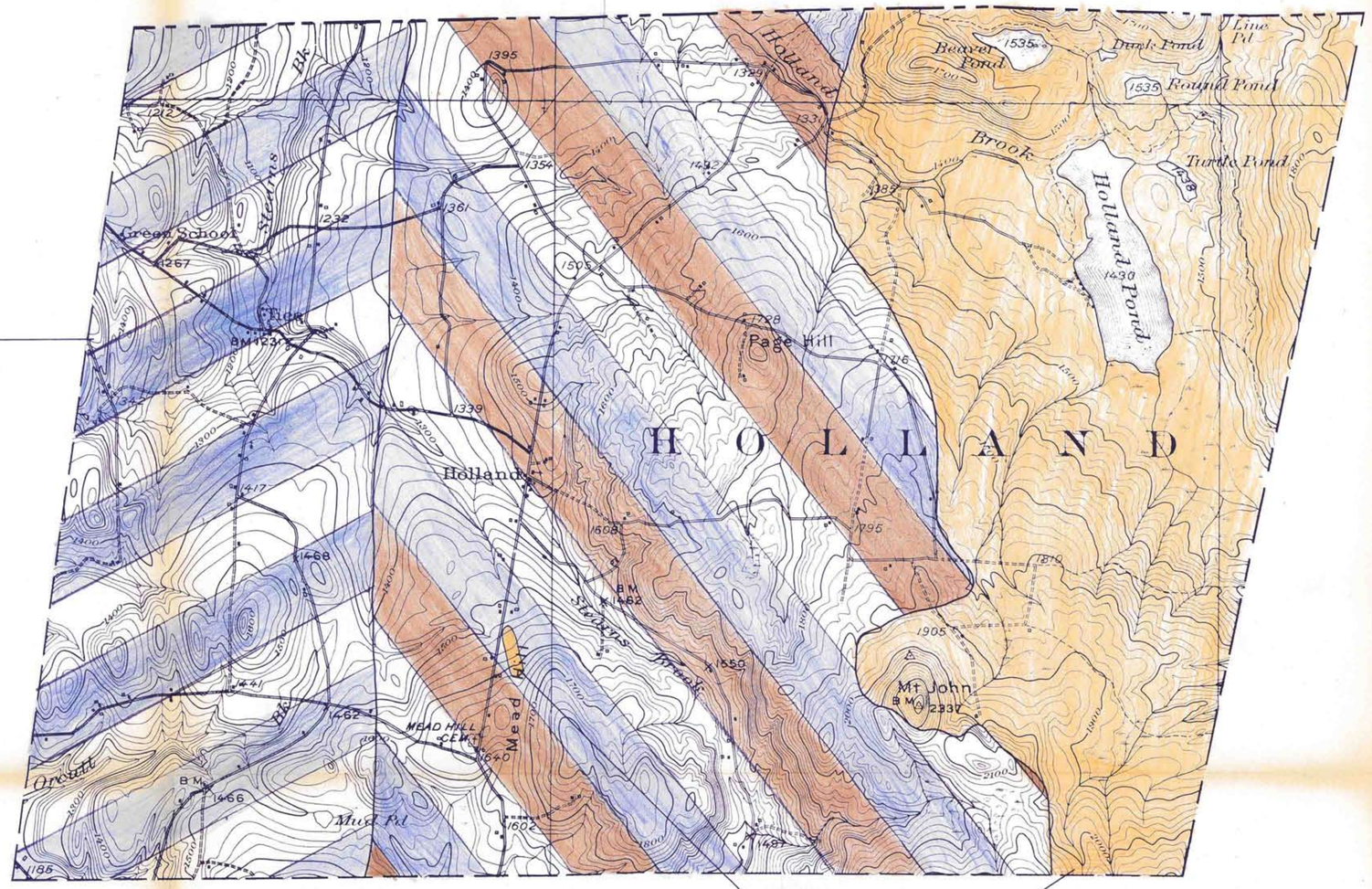
ORLEANS COUNTY VT. HWY. DISTRICT NO. 9

REVISIONS

DATE						
BY						

SCHIST, QUARTZITE, LIMESTONE
(GILE MOUNTAIN)

PHYLLITE, LIMESTONE
(BARTON RIVER)



GRANITE
(NEW HAMPSHIRE)

LEGEND

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

HOLLAND

SCALE 1:31,250

0.5 0 1 MILE

CONTOUR INTERVAL 20 FEET

1976

ROCK MATERIALS MAP

BY

VERMONT DEPARTMENT OF HIGHWAYS

IN COOPERATION WITH

U.S. BUREAU OF PUBLIC ROADS

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

PLATE II

ROCK

ORLEANS COUNTY VT. HWY. DISTRICT NO. 9

REVISIONS

DATE						
BY						