SURVEY OF HIGHWAY CONSTRUCTION MATERIALS
IN THE TOWN OF NORTH HERO, GRAND ISLE 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
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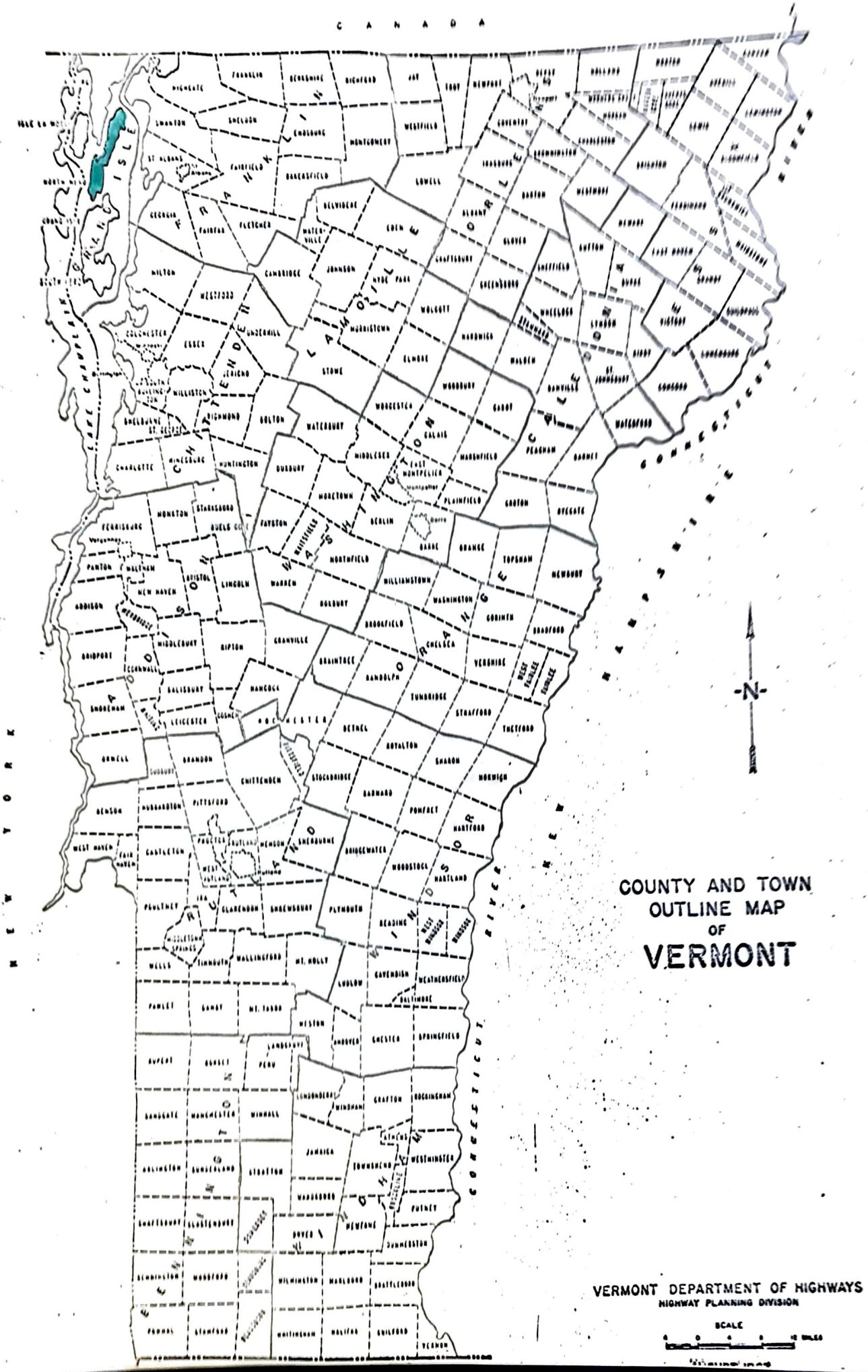
TABLE OF CONTENTS

LOCATION

The Town of North Hero is composed of North Hero, Butler, Knight, Hen, Dameas and Gull Islands and is located near the center of Grand Isle County in the northwest corner of the state. It is surrounded by Lake Champlain, but is connected by bridge to the Towns of Alburg on the north and Grand Isle on the south. (See County and Town Outline Map of Vermont on the following page.)

North Hero lies entirely in the Champlain Lowland Physiographic Region and has gently rolling hills. The highest elevation on the northern part of the island is 140 feet, on the southern part it is 170 feet and on Butler Island it is 174 feet. These elevations show a maximum relief of less than 85 feet above lake level. The island trends northeast-southwest and may have been highly influenced by crustal forces exerting pressure from the southeast.

Drainage is via many small unnamed streams.


CANADA
NEW YORK
NEW HAMPSHIRE
CONNECTICUT RIVER
LAKE CHAMPLAIN
ISLE LA MOTTE
NORTH HERO
GRAND ISLE
FRANKLIN
CHITTENDEN
LAMOILLE
ORLEANS
ESSEX
WASHINGTON
ORANGE
CALEDONIA
ADDISON
RUTLAND
WINDSOR
WINDHAM
BENNINGTON
-N-
COUNTY AND TOWN
OUTLINE MAP
OF
VERMONT
VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION
SCALE

Discussion of Rock and Rock Sources

The information on the Rock Materials Map is somewhat simplified. (For a more detailed description of the rock formations, see the Summary of Rock Formations included in this report.)

The northern half of North Hero Island and a small patch of the land along the south and east shores of Pelots Bay are underlain by the black, predominantly shaly Iberville Formation. The southeast edge of the northern half and most of the southern half are underlain by the calcareous black shale of the Stony Point Formation. Minor strips of the Iberville Formation are mapped along the west edge of Butler Island. Butler Island and a third of Knight Island are underlain by the gray to black argillite and chert of the Hathaway Formation. The remainder of Knight Island is underlain by the Iberville Formation. Dameas Island is underlain by the Stony Point Formation; however, only North Hero Island was sampled.

The Iberville Formation was sampled at Map Identification Nos. 1, 2, 3, 4 and 6; passing abrasion AASHTO T-96 test results were obtained from all areas and only Map Identification No. 4 contained large enough pieces for sampling and yielded a passing AASHTO T-3 test result.

The Stony Point Formation yielded passing abrasion test results for both AASHTO T-3 and T-96 at Map Identification No. 7, passing T-96 and failing T-3 results at Map Identification No. 5 and only a failing T-96 result at Map Identification No. 8.

The land surface is gently rolling with low relief and bedrock control is close to the surface.

The sources of Item 704.06, subbase of crushed rock, are listed most favorable first: Map Identification Nos. 4, 5 (both quarries) and 6 (a low scarp). All other areas consist of small, very shallow diggings or bulldozer-stripped low

outcrops. Map Identification Nos. 1, 2 and 4 were erroneously labeled as gravel pits on United States Geological Survey Maps.

SURVEY OF SAND AND GRAVEL SOURCES

Procedure for Sand and Gravel Survey

The survey of possible sources of sand and gravel for highway construction is divided into office and field investigations.

The office investigation is conducted primarily during the winter months and uses various sources of information to map potentially productive granular areas. Of these, the survey of glacial deposits mapped by Professor Stewart, soil-type maps, aerial photographs and United States Geological Survey Quadrangles are valuable sources; 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 in which samples were taken by other individuals are noted and mapped, as well as the sites of existing pits.

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

Discussion of Sand and Gravel Deposits

There are two small mapped granular areas on North Hero Island listed as beach gravels. The one on the northeast end of the island was not found and the other was along the southwest edge of the island where many cabins and cottages were built. There are three gravel pits listed on the map which the survey found to be small rock diggings.

Acknowledgements

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.

Inclosures

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 since 1956. 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.

Works 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.

Map Identification No. 1 is a depleted pit, with no extensions, at the south edge of the cemetery southeast of the junction of State Aid Highway No. 1 and Town Highway No. 5.

Granular material used in the town is presently drawn from Isle La Motte and Alburg.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF NORTH HERO

Hathaway Formation:

Gray to black argillite and bedded chert, with included blocks and fragments of chert, limestone, dolomite, sandstone and graywacke.

Iberville Formation:

Noncalcareous black shale interbedded with occasional dolomite beds and in the lower part with calcareous shale.

Stony Point Formation:

Predominantly calcareous black shale that grades upward into argillaceous and rare dolomite beds, in northwestern Vermont.

GLOSSARY OF SELECTED GEOLOGICAL TERMS

Argillite: An indurated rock, derived from siltstone, claystone or shale, that is intermediate between the rocks named and slate. Cleavage is approximately parallel to the bedding.

Bedding: The arrangement of rock or granular material in layers.

Bedrock: The more or less solid, undisturbed rock in place at the surface or beneath superficial deposits of gravel, sand or soil.

Bedrock Control: Land features which show bedrock on, or close to, the surface. Also used in describing part of the topography.

Calcareous: Pertaining to, or containing, calcium carbonate.

Chert: A hard, very dense, usually gray siliceous rock composed of micro-crystalline quartz and often associated with limestone.

Dolomite: A rock composed of dolomite (calcium magnesium carbonate, containing carbon dioxide, 47.7%; lime, 30.4% and magnesia, 21.9%).

Drainage: The manner by which water moves on the surface as streams, rivers and brooks; or under the surface, in channels.

Fissile: The tendency of some rocks to split into thin sheets, along bedding planes or cleavage planes, induced by fracture or flowage.

Graywacke: A general term applied to a dark, hard sandstone composed of angular grains of quartz, feldspar and rock fragments in a fine compact matrix of micas, clay minerals and chlorite.

Outcrop: The part of a body of rock that is bare and exposed. Often, the term applies to areas where the rock formation occurs just below the surface even though it is not actually exposed.

Scarp: A slope, usually steep, of any height.

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

Shale: A general term for lithified muds, clays and silts that tend to split into thin sheets along the bedding planes or along cleavage planes. Shale differs from mudstone, claystone and siltstone by having the pronounced tendency to split (fissility).

Slate: The homogeneous, metamorphic equivalent of shale, but so fine-grained that no mineral grains are visible. Slate splits so perfectly that it yields slabs having smooth surfaces.

Structural: Of, pertaining to, or resulting from the effects of folding or faulting of the earth's crust; tectonic; as structural ridges or valleys.

Tectonic: Pertaining to the rock structures and external forms resulting from the deformation of the earth's crust.

Water Table: The upper limit of the portion of the ground wholly saturated with water.

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Rouses Point, Vermont - New York Quadrangle: Geological Survey, United States Department of the Interior, 1966.

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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 in July, 1971.

DIVISION 700 - MATERIALS

Section 703, Soils and Borrow Materials

703.03 Sand Borrow and Cushion

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

Table 703.03A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Total Sample	Sand Portion
2"	100	
1½"	90-100	
½"	70-100	
No. 4	60-100	100
No. 100		0- 30
No. 200		0- 12

703.05 Granular Borrow

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

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

Table 703.05A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Total Sample	Sand Portion
No. 4	20-100	100
No. 200		0- 15

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

Section 704, Aggregate

704.05 Gravel for Sub-base

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

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

Table 704.05A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample	Sand Portion
No. 4	(20-60)	100
No. 100		0-18
No. 200		0- 8

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

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

704.06 Crushed Stone for Sub-base

Crushed Stone for Sub-base shall consist of clean, hard, crushed stone, uniformly graded, reasonably free from dirt, deleterious material, pieces which are structurally weak and shall meet the following requirements:

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

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

Table 704.06A - Gradation Requirements

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

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

(d) Thin and Elongated Pieces
Not more than 30 percent, by weight, of thin and elongated peices will be permitted.
Thin and elongated pieces will be determined on the material coarser than the No. 4 sieve.

(e) Filler

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

(f) Leveling Material

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

This material shall meet the requirements of the following table:

Table 704.06B - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample
1"	100
3/4"	90-100
1/2"	50- 90
No. 4	30- 70
No. 100	0- 20
No. 200	0- 10

704.07 Grushed Gravel for Sub-base

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

(a) Grading

The crushed gravel shall be uniformly graded from coarse to fine and shall meet the requirements of the following table:

Table 704.07A - Gradation Requirements

Grading	Sieve Designation	Percentage by Weight Passing Square Mesh Sieves Total Sample	Sand Portion
Coarse	4"	100	
	No. 4	25- 50	100
	No. 100		0- 20
	No. 200		0- 12
Fine	2"	100	
	1½"	90-100	
	No. 4	30- 60	100
	No. 100		0- 20
	No. 200		0- 12

(b) Percent of Wear

The percent of wear of the parent gravel shall be not more than 20 when tested in accordance with AASHO T 4, or the crushed gravel a percent of wear of not more than 35 when tested in accordance with AASHO T 96.

(c) Fractured Faces

At least 30 percent, by weight, of the stone content shall have at least one fractured face.

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

704.09 Dense Graded Crushed Stone for Sub-base

Dense Graded Crushed Stone for Sub-base shall consist of clean, hard, crushed stone, uniformly graded, reasonably free from dirt, deleterious material and pieces which are structurally weak, and shall meet the following requirements:

(a) Source

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

(b) Grading

This material shall meet the requirements of the following table:

Table 704.09A - Gradation Requirements

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

(c) Percent of Wear

The percent of wear of the parent rock shall be not more than 8 when tested in accordance with AASHO T 3, or the crushed stone a percent of wear of not more than 40 when tested in accordance with AASHO T 96.

(d) Thin and Elongated Pieces

Not more than 30 percent, by weight, of thin or elongated pieces will be permitted.

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

704.10 Gravel Backfill for Slope Stabilization

Gravel Backfill for Slope Stabilization shall be obtained from approved sources, consisting of satisfactorily graded, free draining, hard, durable stone and coarse sand reasonably free from loam, silt, clay, and organic material.

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

Table 704.10A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Total Sample	Sand Portion
No. 4	20-50	100
No. 100		0- 20
No. 200		0- 10

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

704.11 Granular Backfill for Structures

Granular Backfill for Structures shall be obtained from approved sources, consisting of satisfactorily graded, free draining granular material reasonably free from loam, silt, clay, and organic material.

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

Table 704.11A - Gradation Requirements

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Total Sample	Sand Portion
3"	100	
2½"	90-100	
No. 4	50-100	100
No. 100		0- 18
No. 200		0- 8

TABLE I

NORTH HERO 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						Abrasion AASHTO T-4	Passes VHD Spec.	Remarks
						2"	1-1/2"	1/2"	#4	#100	#200			
1	---	---	---	---	Yes	----	----	---	NOT	SAMPLED		----	----	Owner: Joe Scandore. Area is a small depleted diggings southeast of the junction of Town Highway No. 5 and State Aid Highway No. 3. The low north face abuts the cemetery while the remainder of the area is wet floor and marsh. No material was available to sample.

TABLE I

SUPPLEMENT

NORTH HERO PROPERTY OWNER - GRANULAR

	Map Identification No.
Scandore, Joseph	1

TABLE II

NORTH HERO ROCK DATA SHEET NO. 1

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	REMARKS
1	1-A	1974	Shale and Dolomite	No	Chip (Random Pieces)	---	26.1%	Owner: Vermont Department of Forest and Parks. Area is a shallow diggings in a flat field and erroneously labeled as a gravel pit on U.S. Topographic Maps. The access is east of State Aid Highway No. 3, 0.13 mile north of the junction of State Aid Highway No. 3 and Town Highway No. 5. Rock exposures of 1 to 2 feet high, and wet spots show randomly on the field. Test No. 1A was from stockpiled shale at north end of diggings.
	1-B	1974	Shale and Dolomite	No	Chip (Random Pieces)	---	25.7%	Test No. 1B was from pile of large blocks of shale south of Test No. 1A. Some material has been used by the Department of Forest and Parks for roads. The rock is thin-bedded (1" to 2"), black shale of the Iberville Formation, and breaks into sharp, thin and elongated fragments due to foliation. The foliation was 40° from the bedding plane and yielded no pieces thicker than 1/2". Occasional pieces of dolomite were included in the sample and may be the reason for passing abrasion results from this rock.
2	1	1974	Shale and Dolomite	No	Chip (Random Pieces)	---	22.3%	Owner: Roger Poquette Former Owner: Ensign Curtis. Area is a low diggings in pasture south of State Aid Highway No. 1, 0.5 mile west of the junction of State Aid Highways No. 1 and 3. The rock is black, thin-bedded, fragile shale of the Iberville Formation, and breaks into sharp, thin and elongated pieces.

TABLE II

NORTH HERO ROCK DATA SHEET NO. 2

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	REMARKS
								The area is a flat field with 4 foot relief where a bulldozer scraped below the gently sloping surface and exposed many small, soft rock fragments. This area was erroneously labeled as a gravel pit on U.S. Topographic Maps. Development of this area as a rock source would be limited by topography.
3	1	1974	Shale and Dolomite	No	Chip (Random Pieces)	---	23.5%	Owner: Paul Quintin. Area is an old, shallow land-fill in flat field, 0.25 mile west of curve in State Aid Highway No. 1 and 1.06 mile south of the junction of State Aid Highways No. 1 and 3. The area is a low, rounded outcrop with the overburden stripped from it and 30' x 90' with 2 to 4 foot relief. Water is on the floor 4 feet below the field surface. The rock is in the Iberville Formation and is a dark fissile shale with a 4 to 6 inch band of buff weathered dolomite. The rock weathers and breaks into a layer of thin, long fragile laths which cover the surface. Development of this area as a rock source would be limited by topography.
4	1-A	1974	Shale and Dolomite	Yes	Chip	6.0%	16.4%	Owner: Ellsworth Poquette. Area is a large flat pasture with a quarry in the north end. The quarry is 0.25 mile south of U.S. Route 2 and the access is 0.42 mile west-northwest of the junction of U.S. Route 2 and Town Highway No. 6. This area was erroneously labeled as a gravel pit on the U.S. Topographic Maps. The rock is in the Iberville Formation and is soft dark shale. The quarry has a minor 5 foot upper wall and a major 10-15 foot lower wall. The floor of the quarry

NORTH HERO ROCK DATA SHEET NO. 3

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	REMARKS
								conforms to the bedding plane which is nearly horizontal. There are two sets of nearly vertical joints; one is east-west, the other is north-south. The fissility of the rock trends north-northeast and south-southwest and shows crustal compression from the southeast. The extension of the quarry would be to the south, southwest and southeast. Test No. 1A was from the south wall of the lower level of the quarry.
	1-B	1974	Shale and Dolomite	Yes	Chip	7.1%	19.1%	Test No. 1B was from the east wall of the lower level of the quarry. Water was noted on random parts of the field and quarry. This area is probably the most promising rock source in North Hero.
5	1-A	1974	Calcareous Shale	Yes	Chip	9.3%	21.5%	Owner: State of Vermont. Area is a small quarry west of the north end of Private Road No. 12 and 2.32 miles north-northeast of the junction of State Aid Highway No. 2 and Town Highway No. 8. The quarry consists of a 10 to 15 foot high rock wall 60 feet southwest of small house. The possible extension would be north-northwest along a narrow, low, wooded ridge along the west side of a small woods road. The rock is the Stony Point Formation calcareous shale. It is dark blue-gray on fresh surfaces and weathers to a buff or tan. The beds trend N.15°E. and dip 70° to the east and are from 1 to 4 inches thick. Although

NORTH HERO ROCK DATA SHEET NO. 4

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	REMARKS
								there is a lot of jointing, the rock appeared good and there are many jetties and lake-front walls built from this formation. Test No. 1A was taken along the west wall of quarry.
	1-B	1974	Calcareous Shale	Yes	Chip	9.6%	21.0%	Test No. 1B was taken along the south wall of quarry.
6	1-A	1974	Shale	No	Chip	---	22.1%	Owner: Deschene and Chause. Area is a long 5 to 10 foot scarp south of Private Road No. 16 and Cary Bay. Extension would be below ground level to the east. The rock, of the Iberville Formation, is a black, non-calcareous shale which breaks into fragile, thin and elongated splintery pieces. Nearly vertical joint sets are east-west and northwest-southeast forming steps on the scarp. The beds are from paper-thin to 3 inches but intense, closely-spaced fracturing yields 1/8" pieces. This area is close to the contact between the Iberville and Stony Point shales. Test No. 1A was taken along the north part of the ridge.
	1-B	1974	Shale	No	Chip	---	24.5%	Test No. 1B was south of Test No. 1A.
7	1-A	1974	Calcareous Shale	No	Random Pieces	6.7%	23.3%	Owner: Deschene and Chause. Area is a small (30' x 90') diggings scraped down to a low rounded rock exposure, southeast of the junction of Private Roads No. 5 and 16. Development would be limited by low relief, nearby roads and houses. The rock is the Stony Point calcareous shale and breaks more blocky than shale, making it the more calcareous portion of the formation.

TABLE II

NORTH HERO ROCK DATA SHEET NO. 5

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHTO T-3	Abrasion AASHTO T-96	REMARKS
	1-B	1974	Calcareous Shale	No	Random Pieces	7.3%	31.2%	Test No. 1A was random pieces from low rounded exposure. Test No. 1B was random pieces from low rounded exposure.
8	1	1974	Shale	No	Chip	---	60.4%	Owner: Fred Sieffert. Area is a small ridge which has been dug for material, east of abandoned railroad right-of-way and south of Private Road No. 25 (east of Town Highway No. 8). Test No. 1 was from the south face of low shaly ridge. The exposed rock is very crumbly and shatters into small, thin and elongated pieces. It is very fissile and breaks like a slate. This material would not be a good source for subbase of crushed stone.

TABLE II

SUPPLEMENT

NORTH HERO PROPERTY OWNERS - ROCK

	Map Identification No.
Deschene and Chause	6, 7
Poquette, Ellsworth	4
Poquette, Roger	2
Quintin, Paul	3
Sieffert, Fred	8
State of Vermont	1, 5

LEGEND

- GRAVEL, ACCEPTABLE FOR SEC. 704.05 (gravel for sub-base)
- GRAVEL, DEPLETED OR NOT ACCEPTABLE FOR SEC. 704.05
- SAND, ACCEPTABLE FOR SEC. 703.03 (sand borrow and cushion)
- SAND, DEPLETED OR NOT ACCEPTABLE FOR SEC. 703.03
- GRANULAR BORROW, SEC. 703.05
- MATERIAL NOT ACCEPTABLE FOR SEC. 703.05
- EXISTING PIT
- SAND & GRAVEL DEPOSIT
- SAND DEPOSIT
- 3 IDENTIFICATION NUMBER (refer to data sheets)

N

NORTH HERO

SCALE 1:31,250

CONTOUR INTERVAL 10 FEET

1974

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

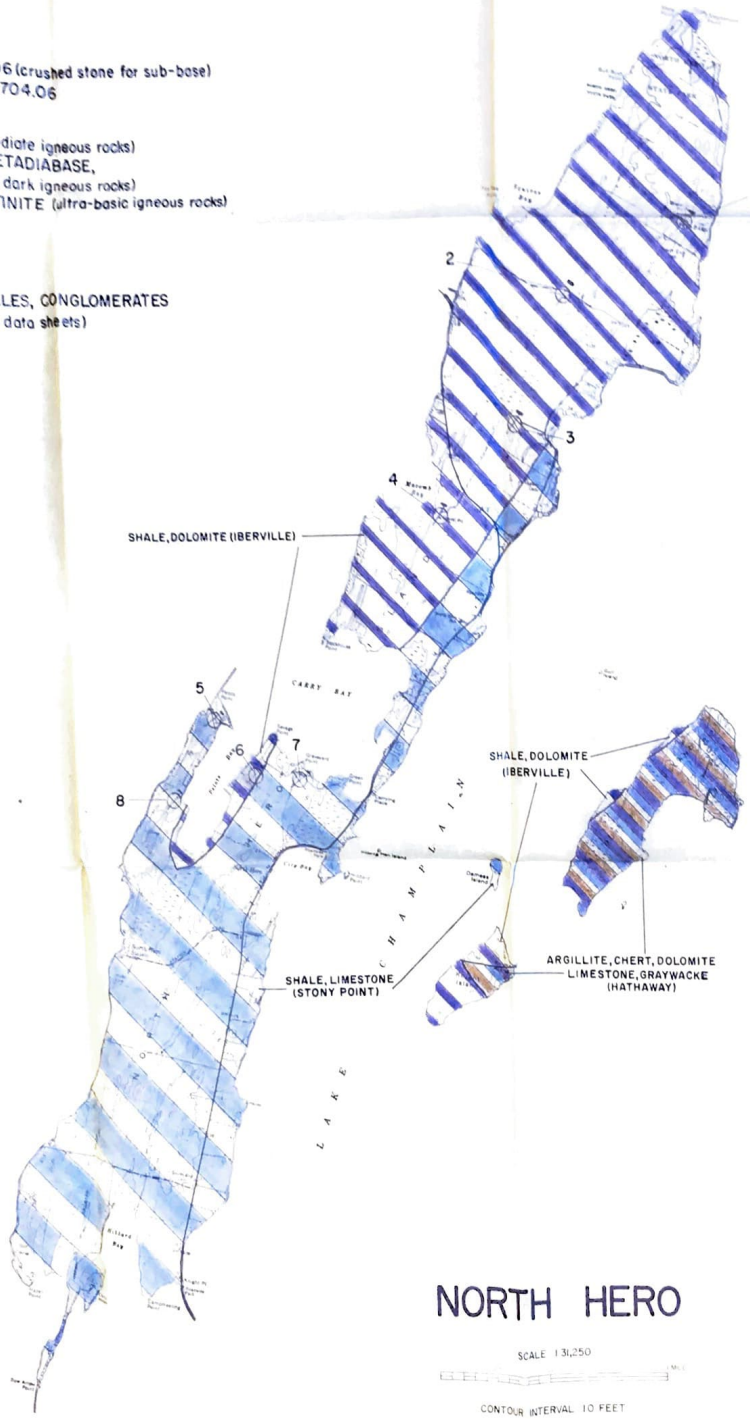
GRAND ISLE COUNTY VT. HWY. DISTRICT NO. 8

REVISIONS

DATE						
BY						

LEGEND

- ROCK, ACCEPTABLE FOR SEC. 704.06 (crushed stone for sub-base)
- ROCK, NOT ACCEPTABLE FOR SEC. 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)



N

NORTH HERO

SCALE 1:31,250

CONTOUR INTERVAL 10 FEET

1974

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

GRAND ISLE COUNTY VT. HWY. DISTRICT NO. 8

REVISIONS

DATE						
BY						