SURVEY OF HIGHWAY CONSTRUCTION MATERIALS

IN THE TOWN OF BALTIMORE, WINDSOR 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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The work of this Project was greatly implemented by the cooperation and assistance of many groups and individuals. The following were particularly helpful in carrying out the Project's objectives.

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

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

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

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

History

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

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

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

Inclosures

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

The granular materials map depicts areas covered by various types of glacial deposits (outwash, moraines, kames, kame terraces, eskers, etc.) by which potential sources of gravel and sand may be recognized. This information was obtained primarily from a survey conducted by Professor D. P. Stewart of Miami University, Oxford, Ohio, who had been mapping the glacial features of Vermont during the summer months since 1956. Further

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

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

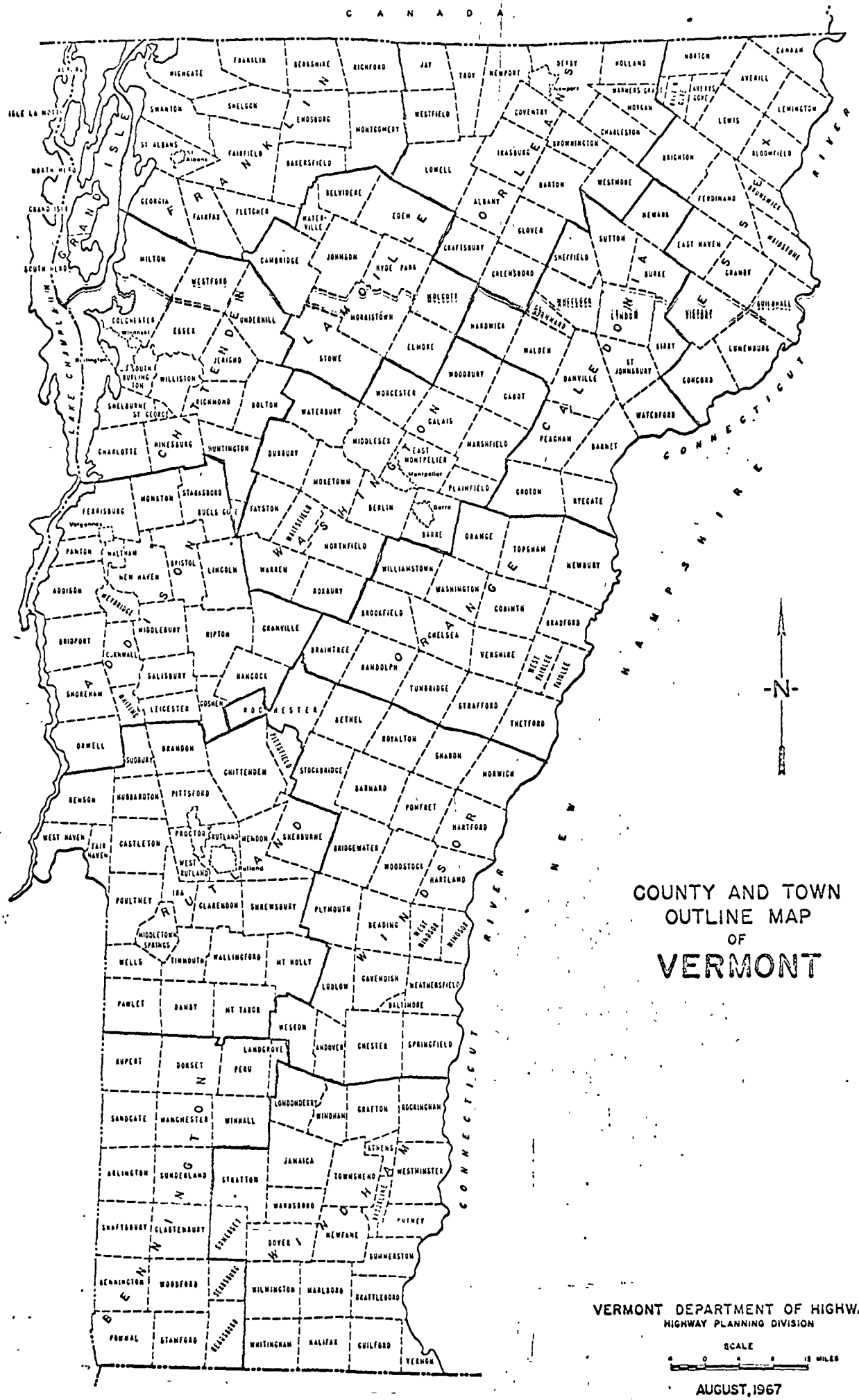
Work sheets contain more detailed information on each test and a detailed sketch of each identification Number Area. The work sheets and laboratory reports are on file in the office headquarters of this Project.

LOCATION

The town of Baltimore is situated in the southeast part of Vermont in the southern part of Windsor County. Baltimore is bounded on the north and northwest by Cavendish, on the south by Chester, and on the east by Weathersfield. (See County and Town Outline Map of Vermont on the following page.)

Baltimore lies within the Vermont Piedmont Physiographic Subdivision of the New England Upland. The topography varies from steep scarps on northeastward trending Hawks Mountain along the northwest border to gentle rolling hills in the remainder of the town. Elevations range from 2,089 feet on Hawks Mountain to about 675 feet at a point where the town line crosses an unnamed brook approximately one quarter of a mile north of the southeast corner of town.

Principal drainage is southward via Chandler Meadow Brook and Beaver Meadow Brook, which flow into Great Brook in Chester; and southeastward via two unnamed brooks which flow into Great Brook at North Springfield just before Great Brook empties into the Black River.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE

AUGUST, 1967

SURVEY OF ROCK SOURCES

Procedure for Rock Survey

The routine 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 primarilty during the winter months and comprises the mapping and description of rock types as indicated in various reference sources. Many different sources of information are utilized, as indicated in the bibliography. These references differ considerably in dependability due to new developments and studies that have contributed to the obsolescense 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. In other words, as complete a correlation as possible is made of all the information available concerning the geology of the area under consideration.

The field investigation is begun by making a cursory preliminary survey of the entire area. The information obtained in the preliminary survey, together with the information assimilated in the office investigation, is employed to determine the areas where testing and 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. The samples are submitted to the Material Testing Laboratory for abrasion testing both by the Deval Method (AASHO T-3) and the Los Angeles Method (AASHO T-96). It should be kept in mind that the 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 material is uniform and acceptable abrasion tests result from the chip samples, the material source is included in this report as being satisfactory.

Discussion of Rock and Rock Sources

It should be noted that information on the Rock Materials Map is somewhat simplified. (For a more detailed description of the respective rock formations, see the Summary included in this report.)

Occasionally, rocks belonging to the same formation and exhibiting similar characteristics (i.e., color, texture, etc.) may produce different abrasion results owing to different physical and chemical properties. Therefore in no case should satisfactory test results of an area be construed to mean that the same formation, even in the same area, will not later produce unsatisfactory material. This is especially true of metamorphic rocks.

The town of Baltimore is mostly underlain by rocks of the Mount Holly complex. A narrow band of rocks of the Cavendish Formation and the Readsboro Member of the Cavendish Formation occurs along the northeastern two-thirds of the Cavendish Town Line, and outcrop in places on Hawks Mountain. No rock samples were taken because none of these outcrops were accessible. At lower elevations the bedrock is mantled by glacial debris.

One hand sample was obtained from the Readsboro schist member of the Cavendish Formation, and one from the Mount Holly Complex. Both samples were taken from Hawks Mountain. The Mt. Holly gneiss would probably be a good source of rock but it is nearly inaccessible. The Readsboro schist appears to have too much foliation to be suitable for construction purposes, and it too, is nearly inaccessible.

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 possible potentially productive areas as indicated from various references. Of these references, the survey of glacial deposits mapped by Professor Stewart proves to be valuable, particularly when used in conjunction with other references such as soil-type maps, aerial photographs, and United States Geological Survey quadrangles. The last two are used in the recognition and location of physiographic features indicating glacial deposits and in the study of drainage patterns. In addition, the locations of existing pits are mapped when known. The locations in which samples were taken by other individuals are noted and mapped when possible.

The field investigation is begun by making a cursory preliminary survey of the entire town. All pits and other areas which show physiographic features that give evidence of glacial or fluvial deposition are noted. These locations are later investigated by obtaining samples of pit faces and other exposed materials. Test pits, dug with a backhoe to a depth of approximately 11 feet, are also sampled. The samples are submitted to the Materials Testing Laboratory where they are tested for gradation and stone abrasion, the latter by the Deval Method (AASHO T-4), and the Los Angeles Method (AASHO T-96).

Discussion of Sand and Gravel Deposits

Granular materials in Baltimore suitable for Highway Construction and related purposes consist mainly of glaciofluvial and related deposits.

Granular deposits are mapped by D.P. Stewart as occurring in two kame moraine areas; one is found between 860 and 1,030 feet, and the other between 960 and 1,200 feet. Granular materials were sampled outside Stewart's outline and occurred from about 750 to 1,070 feet. All granular deposits in town appear to be part of either kame moraines or closely related deposits. Some, such as individual kames and possibly coalescent kame ridges, are small local features; other deposits are more extensive.

Material suitable for Gravel for Sub-base was found only at Map Identification Nos. 2, 4, and 8 (all pits). No. 2 has a limited volume of material and may run into till or boulders at a shallow depth. No. 4 has pretty good gravel but it appears to be just a thin cap on part of a granular ridge. No. 8 is also very limited.

Material suitable for Sand Borrow and Cushion is found in decreasing amounts at Map Identification Nos. 10, 9, 7, 5, 4, 1, and 2. Nos. 5 and 9 do not have pits.

Apparently, the post-glacial melt water had insufficient volume at this elevation to distribute the granular materials as extensively as it did farther downstream where increased river volume and decreased slopes allowed greater deposits to be formed.

It was noted that many of the stones in the tested materials were of gneiss from the Mount Holly Complex.

SUMMARY OF ROCK FORMATIONS IN THE TOWN OF BALTIMORE

Readsboro Member (Cavendish Formation): Quartz-muscovite schist containing biotite or chlorite and characterized by conspicuous porphyroblasts of sodic plagioclase; less commonly quartz-muscovite-paragonite schist containing chlorite, garnet, or chloritoid, or, in Chester Dome, quartz-muscovite-paragonite schist containing garnet, staurolite, and locally kyanite (Gassetts schist).

Cavendish Formation: Buff dolomite; minor white to pink calcite marble; actinolitic and diopsidic marbles and beds of actinolite diopside granulite common to the Chester dome.

Mount Holly Complex: Mainly fine- to medium-grained biotitic gneiss, locally muscovitic massive and granitoid in some localities, fine-grained or schistose and compositionally layered in others; also abundant amphibolite and hornblende gneiss and minor beds of mica schist, quartzite and calc-silicate granulite, includes numerous small bodies of pegmatite and gneissoid granitic rock.

GLOSSARY OF SELECTED GEOLOGIC TERMS

Aeolian - Pertaining to wind. Designates rocks and soils whose constituents have been carried and laid down by atmospheric currents.

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

Glaciofluvial - A term used to denote formation by or relation to streams within, upon or emerging from glacial ice.

Gneiss - Originally meaning a more or less banded metamorphic rock with the mineral composition of granite. The term now designates a foliated metamorphic rock with no specific composition implied, but having layers that are mineralogically unlike and consisting of particles visible to the naked eye.

Granitoid - A term applied to those igneous rocks having the characteristic texture of granite. The mineral grains may be fine or coarse but are nearly uniform in size.

Ice-contact - Refers to sediments which have accumulated in contact with stagnant or wasting glacial ice. They assume the varied topographic forms expressed by eskers, kames, and kame terraces.

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

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

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

Kame Terrace - Stratified sands and gravels deposited by streams between a glacier and an adjacent valley wall.

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

Porphyroblasts- The large crystals in some metamorphic rocks which are set in a matrix of finer grains. They resemble igneous rocks, but the crystals have grown in place through the action of heat, pressure or infiltrating solutions, rather than crystalizing from a melt, and occur later than the rocks they are part of.

Till - An unsorted, unstratified and unconsolidated heterogenous mixture of clay, silt, sand, gravel and boulders deposited directly by glacial ice.

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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 703.03, 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
	4"	100	
Coarse	No. 4	25- 50	100
	No. 100		0- 20
	No. 200		0- 12
	2"	100	
	1½"	90-100	
Fine	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

BALTIMORE 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 AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
1	1	1971	0.5-11	0-0.5	Yes	100	100	99	96	28	9	-----	Sand	Owner: Mrs. D.E. Weir. Area is small pit southeast of the south end of Town Highway No. 4. Possible extension of pit would be to the northeast about 100 feet in a slightly rolling field. Test #1 was a hand shovel sample of the northwest face of the pit, 65' S30°E. of old barn. Log of Test: 0-0.5', overburden; 0.5'-2', pebbly sand; 2'-2.5', fine sand; 2.5'-8', sand; 8'-8.5', silt seam, 8.5'-11', sand; test bottoms on pebbly sand or gravelly sand layer at floor level. Permission to sample with a backhoe was not received before the weather ended the sampling program for the winter.
2	1A	1971	0.5-10.5	0-0.5	Yes	83	69	54	42	15	8	23.8%	Gravel	Owner: Mrs. Margaret B. Hammond. Area is a pit in a possible kame moraine, and is about 0.3 mile northeast of State Aid Highway No. 1 near Mrs. Hammond's house. The area is bounded on the east by the Weathersfield Town Line. The access road and a culvert over a brook would have to be improved before area could be exploited further. Test #1A was a hand shovel sample of the top of north face of pit and represents the possible north extension. The beds show the slumping and

BALTIMORE 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"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														poor stratification typical of ice-contact deposition. Log of Test #1A: 0-0.5', overburden; 0.5'-10.5', silty well-packed gravel; test bottoms in silt. Most of the stones were in the 2"-4" range.
	1B	1971	10.5-18	0-0.5	Yes	100	100	100	100	73	53	-----	------	Test #1B was a backhoe sample of the lower part of the north face. There is poorly stratified ice-contact bedding in this sample. Log of Test #1B: 10.5'- 18', sand with silt-clay seams; test bottoms at 18' in fine sandy silt.
	2	1971	1-4	0-1	Yes	100	100	100	100	71	46	----	------	Test #2 was dug in floor, 40' south of Test #1B. Log of Test #2: 0-1', cobbly sand; 1'-4', sandy silt with silt-clay; 4'- 5' boulders.
	3	1971	1-3.5	0-1	No	66	60	49	40	20	11	26.0%	Gran. Borrow (Grav)	Test #3 was dug in brush covered clearing which represents the northeast extension of the pit, 120' N35°E. of Test #1A. About one-third of the stones were over 6" in diameter; none were included in the sample, however. Log of Test #3: 0-1', over-burden; 1'-3.5', dirty bouldery gravel; 3.5'-4.5', silt-clay with angular stones (probably till).
	4	1971	1-10	0-1	No	100	100	95	91	26	7	-----	Sand	Test #4 was dug on top of rise or small knoll in cornfield just west of Weathersfield Town Line, 535' S60°E. of Test #2. Log of Test #4: 0-1', over-

BALTIMORE 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						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
														burden; 1'-10', sand with an occasional pebble.
3	1	1971	7-25	0-2	Yes	100	100	100	96	41	18	-----	-----	Owner: Mrs. Margaret B. Hammond. Area is a small wooded knoll with a pit on the east end. This area is about 450' in a straight line south of the pit in Map Identification No. 2, and is southeast of the small brook. Test #1 was a hand shovel sample of the west face of the pit and represents the westward extension of the pit. The knoll was too steep and too heavily wooded to sample with a backhoe. Log of Test #1: 0-2', overburden; 2'-7', inaccessible, but seems to be pebbly sand over silt-clay over sand; 7'-25', interbedded sand and fine silty sand, and silt-clay layers.
	2	1971	0-2	---	Yes	100	100	100	95	58	24	-----	----	Test #2 was dug in floor, 40' east of Test #1. Log of Test #2: 0-2', silt; 2-5.5', silt-clay and boulders.
4	1A	1971	0.5-2.5	0-0.5	Yes	82	74	65	49	6	3	24.2%	Gravel	Owner: Elbridge Thomas. Area is a wooded, steep ridge with a small pit at its north-northwest end. The area is about four-tenths of a mile in a straight line southeast of Town Highway No. 2 at a point near Town Highway No. 8.

BALTIMORE 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"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														Access is possible from Town Highway No. 2 but a right-of-way would be needed from Mark Knight. Access is also possible via an old logging road northeast from State Aid Highway No. 1 near Town Highway No. 7 and is entirely on Thomas' land. This latter route has many abrupt turns and would need relocation over a small brook in order to exploit the area. Test #1A was a hand shovel sample of the upper part of pit face. Log of Test #1A: 0-0.5', sod; 0-5'-2.5', gravel.
	1B	1971	2.5-15	0-0.5	Yes	100	92	84	75	7	3	27.9%	Sand	Log of Test #1B: 2.5'-15', layers of sand and gravel
	2	1971	0.5-10	0-0.5	No	90	85	75	60	5	3	26.4%	Gran. Borrow (Grav)	Test #2 was dug atop crest of wooded ridge 85' S10°E. of Test #1A. Log of Test #2: 0-0.5', overburden; 0.5'-10', fine gravel. Most of the stones were sub-angular and in the 2"-4" size range. The gravel dipped northward towards the mountain slopes. The material was unconsolidated and caved-in quite readily.
	3	1971	0.5-10	0-0.5	Yes	100	100	100	100	94	64	-------	----	Test #3 was dug in the floor, 35" N35°W. of Test #1B. Log of Test #3: 0-0.5', overburden; 0.5'-10', fine sandy silt; test bottoms in silt-clay.
5	1	1971	0.5-10	0-0.5	No	100	100	94	90	30	12		Sand	Owner: Elbridge Thomas, Area

BALTIMORE 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"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
	2	1971	0.5-12	0-0.5	No	100	100	100	100	97	83		----	is a slightly rolling pine woods west-southwest of Map Identification No. 4. Access is possible via the same routes as Map Identification No. 4. Test #1 was dug in a clearing 375' S70°W. of Map Identification No. 4. Log of Test #1: 0-0.5', overburden; 0.5'-10', sand with some fine sand or silt seams; 10', test bottoms in coarse sand with some pebbles. Test #2 was dug near woods road, 275' S10°E. of Test #1. Log of Test #2: 0-0.5', overburden; 0.5'-12', sandy fine silt. Test bottoms in same.
6	1	1971	0.5-4.5	0-0.5	Yes	89	85	71	53	16	12	35.6%	Gran. Borrow (Grav)	Owner: Mark Knight. Area is a poorly stripped pit beyond the southern end of Town Highway No. 8. Property line is very close to northeast side of pit. The granular material runs out close to the northern side of the pit. It seems that an extension would only be possible to the west and northwest of present pit. However, trash, junk cars and tree trunks would have to be cleared from extension. Test #1 was dug in floor at center of pit. Log of Test #1: 0-0.5', overburden; 0.5'-4.5', cobbly sandy gravel. Test bottoms at 4.5' on boulders.

BALTIMORE 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						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
	2A	1971	2.5-7.0	0-2.5	Yes	76	71	58	48	12	7	25.1%	Gran. Borrow (Grav)	Test #2A was a hand shovel sample of the northeast face, 60' N30°E. of Test #1. Log of Test #2A: 0-2.5', overburden; 2.5'-7', dirty gravel. Test bottoms at 7' in sand (See #2B).
	2B	1971	7-12	0-2.5	Yes	100	100	98	94	31	11		Gran. Borrow (Sand)	Test #2B was dug below Test # 2A on northeast face. Log of Test #2B: 7'-12', medium fine sand with a 2-inch clay seam near the bottom.
	3	1971	0.5-9	0-0.5	Yes	100	100	95	89	50	29		----	Test #3 was dug in slope beside pit access road, 175' N80°W. of, and 38' above Test #1. Log of Test #3: 0-0.5', overburden; 0.5'-5', gravelly sand; 5'-9', well-packed fine silty sand; test bottoms on boulders. Overall, this area does not seem to have very much material left.
7	1	1971	2.5-13	0-2.5	Yes	100	100	100	100	71	28		----	Owner: Elbridge Thomas. Area is a pit and its extensions northeast of State Aid Highway No. 1, and southeast of Town Highway No. 2. Area is south-southeast of the Baltimore school house. The pit is within a kame moraine area mapped by D.P. Stewart and is bounded on the southeast by pasture with knolls which the owner did not want sampled. Pit and extension are on a maple wooded ridge or series of low knolls which trend approx-

BALTIMORE GRANULAR DATA SHEET NO. 7

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														imately northeasterly. Test #1 was dug on east face of pit. Stratified bedding suggests aeolian deposition or a small delta. Log of Test #1: 0-2.5', overburden; 2.5'-13', fine silty sand with some silt- or silt- clay seams.
	2	1971	3-10	0-3	Yes	100	100	97	94	19	6		Sand	Test #2 was dug on north face of pit. Log of Test #2: 0-1', sod; 1'-3', stony overburden; 3'-5', pebbly sand; 5'-10', medium to fine sand; material gets finer with depth.
	3	1971	0.5-7.5	0-0.5	Yes	100	84	81	73	3	2		Gran. Borrow (Grav)	Test #3 was dug in floor near center of pit, 60' west of Test #1. Beds showed typical ice-contact slumping. Log of Test #3: 0-0.5', overburden; 0.5'-7.5', coarse sand with pebbly sand. There are a few small cobbles. The material caves easily and looks good.
	4	1971	1-7	0-1	Yes	100	100	100	99	22	5		Sand	Test #4 was a hand shovel sample of small bank 100' S55°W. of pit. Log of Test #4: 0-1', overburden; 1'-7', medium to fine sand with some pebbles.
8	1	1971	1-14	0-1	Yes	95	91	68	50	7	4	20.4%	Gravel	Owner: Miss Florence Dean. Area is a slightly sloping hillside with small pit and some knolls west-northwest of the west end of Town Highway No. 6. Area is mapped as being just outside of D.P. Stewart's kame moraine zone, and is just down-

BALTIMORE GRANULAR DATA SHEET NO. 8

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														slope from the lower part of the talus slope of Hawk's Mountain. The water table is close to the surface as evidenced by several brooks running through the property, and the presence of soggy spots in the field. The only possible extension of the small pit would be to the west-northwest. Town Highway No. 6 would need grading, and a small brook crossing would need a culvert or bridge to allow exploitation of the area.
	2	1971	0.5-7.5	0-0.5	Yes	98	96	75	55	5	3	25.0%	Gravel	Test #1 was a hand shovel sample on the southeast face of the tiny pit in a small kame. Log of Test #1: 0-1', overburden; 1'-12', sandy fine gravel; 12'-14', fine- to medium- gravel. Test #2 was dug atop knoll, 25' west of Test #1. Most of the stones were sub-angular and in the 2" to 3" range. Log of Test #2: 0-0.5', overburden; 0.5-7.5', gravel; 7.5'-9', sand (not sampled).
	3	1971	1-8	0-1	No	100	100	92	89	32	7		Gran. Borrow (Sand)	Test #3 was dug atop a higher knoll, 100' west of, and 15' above Test #2. Log of Test #3: 0-1', overburden; 1-8', sand with some stones; 8'-9', boulders. Some fine gravel beds sloping from east to west were observed as a cap varying from one-foot to four-feet in thickness at the top of the test.

BALTIMORE GRANULAR DATA SHEET NO. 9

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing 2"	1½"	½"	#4	#100	#200	Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
														Owner was unable to give exact location of water supply.
9	1	1971	0.5-10	0-0.5	Yes	100	95	93	87	50	32		----	Owner: Clifton Loomis. Area has tiny, overgrown diggings and a possible extension in woods east of brook and State Aid Highway No. 1, north of the Chester Town Line. Access to area is via field road which goes northeast from Chester Town Highway No. 22. Area is in pine woods north of hay fields. Log of Test #1: 0.5'-3', pebbly sand; 3'-7', silty sand; 7'-8', boulders; 8'-10', silty sand. No boulders were included in test sample.
	2	1971	0.5-10	0-0.5	No	100	90	82	76	16	8		Sand	Test #2 was dug in a clearing on the slope of a knoll, 150' S70°E. of Test #1. Log of Test #2: 0-0.5', overburden; 0.5'-2', sand; 2'-4', gravelly sand; 4'-10', sand.
10	1	1971	0.5-15	0-0.5	Yes	100	100	100	98	15	4		Sand	Owner: Clifton Loomis. Area is large sloping granular ridge which drops off to the east from State Aid Highway No. 1. There is a small pit near the road. The feature is within a mapped kame moraine of D.P. Stewart's survey. Test #1 was a hand shovel sample of the shallow northwest face of pit. Log of Test #1: 0-0.5', overburden; 0.5'-15', clean sand with

BALTIMORE GRANULAR DATA SHEET NO. 10

Map Ident. No.	Field Test No.	Year Field Tested	Depth of Sample (Ft)	Over-burden (Ft)	Exist-ing Pit	Sieve Analysis % Passing						Abrasion AASHO T-4-35	Passes VHD Spec.	Remarks
						2"	1½"	½"	#4	#100	#200			
														some pebbly sand layers. Test bottoms at floor level in sand,
	2	1971	0.5-11	0-0.5	Yes	100	100	100	100	51	14		Gran Borrow (Sand)	Test #2 was dug in floor near access road, 25', southeast of Test #1. Log of Test #2: 0-0.5', overburden; 0.5'-5', sand with pebbles; 5'-11', sand.
	3	1971	1-10	0-1	No	100	100	100	100	94	75		---	Test #3 was dug on slope near access road, 245' east of Test #2. Log of Test #3: 0-1', overburden; 1-10', sandy silt.
	4	1971	2-10	0-2	No	100	100	90	79	6	3		Sand	Test #4 was dug on a low knoll, 300' downhill and southeast of Test #3. Beds dip southeast and show ice-contact slumping. There is a gravelly cap overlying sand. Log of Test #4: 0-2', gravelly overburden; 2'-10', sand. Test #4 was only about 10 to 15 feet above a marshy area near a brook.

BALTIMORE PROPERTY OWNERS - GRANULAR	TABLE I Supplement Map Ident. No.
Dean, Miss Florence	8
Hammond, Mrs. Margaret B.	2,3
Knight, Mark	6
Loomis, Clifton	9,10
Thomas, Elbridge	4,5,7
Weir, Mrs. D.E.	1

BALTIMORE ROCK DATA SHEET NO. 1

Ident. No.	Field Test No.	Year Field Tested	Rock Type	Existing Quarry	Method of Sampling	Abrasion AASHO T-3	Results
THERE WERE NO ROCK TESTS TAKEN IN BALTIMORE, DUE TO EITHER GLACIAL MANTLE OR INACCESSIBILITY.							

TABLE II
Supplement

BALTIMORE PROPERTY OWNERS - ROCK

Map Ident. No.

There were no rock tests made in Baltimore.