DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-768 B
CONSTRUCTION CONDITIONS,
PRINCE GEORGES COUNTY, MD.

EXPLANATION

1

Mostly well-drained materials providing good foundation conditions

2

Mostly very fine sand providing good drainage and good foundation conditions. Some layers of swelling clays may be encountered

3

Soils with hardpan layer at 2-3 ft (about 1 m) depth causing poor drainage near surface. Generally good drainage conditions below. Foundation conditions generally good

4

Mostly clay. Poor drainage; on steep slopes, poor foundation conditions

4+1

Complex deposits of clay, silt, sand, and gravel. Drainage and foundation conditions vary locally from poor to good

5

Hard rock overlain by soft weathered material; generally good drainage and good foundation conditions where slopes are suitable

6

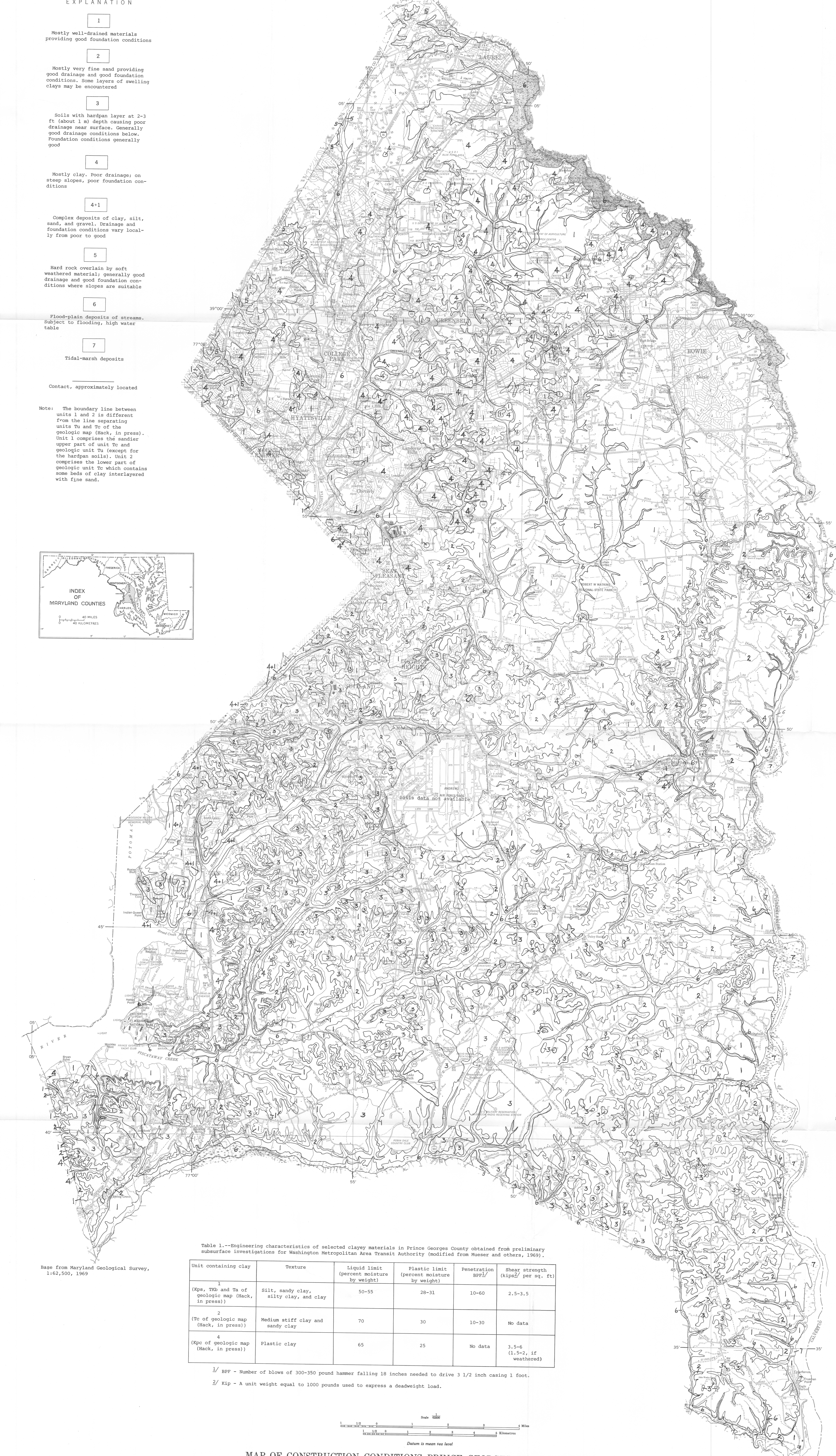
Flood-plain deposits of streams. Subject to flooding, high water table

7

Tidal-marsh deposits

Contact, approximately located

Note: The boundary line between units 1 and 2 is different from the line separating units Tu and Tc of the geologic map (Hack, in press). Unit 1 comprises the sandier upper part of unit Tc and geologic unit Tu (except for the hardpan soils). Unit 2 comprises the lower part of geologic unit Tc which contains some beds of clay interlayered with fine sand.



Base from Maryland Geological Survey, 1:62,500, 1969

GENERAL GROUND CONDITIONS RELATED TO CONSTRUCTION

This map of construction conditions combines and modifies boundaries of the units shown on the geologic map of this area (Hack, in press) in order to delineate areas having different physical constraints on construction. In general, the constraints increase in severity from unit 1 to unit 7. Ground conditions are the principal consideration in this report, and topographic conditions such as steepness of slope are not considered. Excavation with light power equipment is feasible in well over 90 percent of the county because its area is underlain mostly by soft earth materials. Local areas of hard rock are present, but it is not possible to show most of them because of the small map scale, limited areal extent, and lack of data.

The rocks include granitic gneiss encountered in deeper valleys along the northwestern margin of the county. Iron-carbonate masses of boulder or larger size are locally present in the clays of the northern part of the county; scattered layers of sand cemented by iron and shell layers cemented by calcium carbonate are present in the east-central part.

The most common difficulties that may be encountered are related to foundation stability and drainage. In the variegated-clay layers, most common in the northern part of the county, foundation stability may be poor, particularly on steep slopes. Excavation walls may collapse in these areas in wet weather. Drainage conditions in the surface soils of the southern part of the county may cause problems. Drainage is generally poor in alluvial and tidal-marsh areas.

Unit 1
Gravel, sand, silt, and sandy and silty clay

This map unit consists of a variety of materials ranging from gravel and sand to silty and clayey sand and sandy clay. In many places, these materials are overconsolidated; that is, they are compacted enough to have some strength and cohesion. However, they are commonly overlain by from 3-15 ft (1-4.5 m) of unconsolidated surface soil generally of a sandy or loamy nature. The surface soils are well drained. Because of the permeable nature of the materials in this unit and the presence of some clay beds, deep excavations may encounter ground water under confining pressure. This often occurs where permeable materials are overlain by, or are near, clays such as those in unit 4 (Tmb on geologic map). (Here, and throughout the text, letters refer to units on geologic map of this area by Hack, in press.) In some places clay beds may be encountered, but they are not extensive enough to be shown on the map. Selected engineering properties of clay samples from this area are summarized in table 1.

Unit 1 includes extensive deposits of marine origin (geologic units TKb, Ta, and parts of Tc). Unit 1 also includes ancient river deposits consisting of sand, gravel, and sandy clay of geologic unit Kps and terraces adjacent to major streams (Qt).

Unit 2
Fine sands with clay layers

In general, this unit consists of fine sand to clayey fine sand. It is well drained, easily excavated, and provides good foundation material when overconsolidated at 2-15 ft (0.6-4.5 m) below surface. Surface material is generally sandy, but excavations may encounter fine silty clay and clay, which in places has swelling properties. Clays encountered in this unit may be difficult to compact (corresponds to lower layers of geologic unit Tc). Selected engineering properties of the clay are summarized in table 1.

Unit 3
Silty and fine sandy loam with hardpan near surface, sand and gravel below

Consists of loam ranging from sandy to clayey, generally under flat areas. Contains compacted hardpan layer 2-3 ft (about 1 m) below surface. The hardpan is as much as 4 ft (1.2 m) thick; it is nearly impervious to water. Material below the hardpan is generally sandy, becoming gravelly 10-20 ft (3-6 m) below surface.

Because of the presence of the hardpan, flat areas tend to drain poorly in winter; water stands on the surface after rains. In summer, the soil is dry. Tree roots are shallow and generally do not penetrate the hardpan. Developments on these areas must be graded or otherwise treated to provide good drainage. Excavation is difficult without power equipment.

Unit 4
Clay (in places associated with sand and gravel)

This unit consists mostly of clay of various colors, red clay being the most common. The unit may be overlain by well-drained sandy or silty surface soil. The clay does not have severe swelling properties, but it is poor foundation material. Trenches may collapse in wet weather unless shored, and slope failures are common unless the clay is protected from moisture. Even on gentle slopes, soil creep commonly occurs. In older urban developments within this unit, sidewalks, driveways, and retaining walls are locally warped or out of plumb. No development should be undertaken without testing foundation conditions and providing adequate support.

As the clays of unit 4 generally are in nearly horizontal layers, they may be encountered in shallow subsurface areas adjoining unit 4, particularly in nearby areas of units 1 and 2. This should be taken into account in planning any construction near unit 4. Unit 4 includes geologic units Kpc and Tmb. Selected engineering properties of Kpc are summarized in table 1.

Units 4 and 1 combined

In the area south of the District of Columbia, it is not possible to separate areas underlain by unit 4 from areas of unit 1 because of insufficient data. The clay and sand and gravel deposits are interlayered in a complex manner, and poor foundation materials may occur locally in areas of good foundation materials. Construction in this unit should not be planned without detailed regional field surveys.

Unit 5
Hard metamorphic rock

Deeper valleys along the Prince Georges-Montgomery County line have steep lower slopes underlain by hard rocks consisting of gneiss and schist which can be excavated only by blasting. The outcrop areas are, in many places, steep valley walls unsuitable for development. On the higher slopes, however, the rock is commonly weathered to a sandy, micaceous material that is generally easily excavated, well drained, and slope stable.

Unit 6
Flood-plain deposits of streams

These alluvial areas are generally sandy with gravel beneath, but they are subject to recurrent flooding (on the average about once every 2 years), making them unsuitable for construction without extensive modification. Many small areas of unit 6 are not shown because of map-scale limitations.

Unit 7
Tidal-marsh deposits

These deposits consist of peat, muck, silt, and sand, generally saturated by brackish water and flooded at high water.

Septic systems

Unit 1--Percolation is generally good in most of these areas. In some, especially in low-lying areas on valley floors, percolation may be excessive. In any part of the unit, care should be taken not to pollute ground-water supplies.

Unit 2--Constraints on septic systems are minimal except in areas of steep slopes.

Unit 3--Septic systems may have serious problems because this unit contains an almost impermeable hardpan layer at 2-3 ft (about 1 m) from the surface. Good permeability may not be encountered until depths greater than 7-8 ft (2.1-2.4 m) are reached. If effluent is discharged at this depth or below, percolation will probably be excessive; therefore, the danger of polluting ground-water supplies is considerable.

Unit 4--Except where large drainage fields are possible, septic systems are not desirable in these areas because of the impermeable nature of the clay.

Unit 5--Constraints on septic systems are minimal, but in Prince Georges County, slopes in this unit are generally too steep to support septic systems.

Unit 6--The high water table and frequency of flooding make this area unsuitable for septic systems.

Unit 7--Tidal marsh, subject to periodic flooding, is unsuitable for any septic system.

REFERENCES CITED

Hack, J. T., in press, Geologic map for land-use planning, Prince Georges County, Maryland: U.S. Geol. Survey Misc. Inv. Ser. Map I-1004.

Mueser, W. H., and others, 1969, Preliminary subsurface investigation--Washington Metropolitan Area Rapid Transit Authority adopted regional system: U.S. Dept. Commerce, Natl. Tech. Inf. Service, PB-184066, p. 7-10.

Table 1.--Engineering characteristics of selected clayey materials in Prince Georges County obtained from preliminary subsurface investigations for Washington Metropolitan Area Transit Authority (modified from Mueser and others, 1969).

Unit containing clay	Texture	Liquid limit (percent moisture by weight)	Plastic limit (percent moisture by weight)	Penetration BPF 1/	Shear strength (kips 2/ per sq. ft)
1 (Kps, TKb and Ta of geologic map (Hack, in press))	Silt, sandy clay, silty clay, and clay	50-55	28-31	10-60	2.5-3.5
2 (Tc of geologic map (Hack, in press))	Medium stiff clay and sandy clay	70	30	10-30	No data
4 (Kpc of geologic map (Hack, in press))	Plastic clay	65	25	No data	3.5-6 (1.5-2, if weathered)

1/ BPF - Number of blows of 300-350 pound hammer falling 18 inches needed to drive 3 1/2 inch casing 1 foot.

2/ Kip - A unit weight equal to 1000 pounds used to express a deadweight load.

Scale 1/62500

1 1/2 0 1 2 3 4 Miles

1 1/2 0 1 2 3 4 5 Kilometres

Datum is mean sea level

MAP OF CONSTRUCTION CONDITIONS, PRINCE GEORGES COUNTY, MARYLAND

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For sale by Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202, price $.50