5.0 GEOMORPHOLOGY RESULTS

The Barratts Chapel Road Improvements project is located on a broad upland area with very low relief. According to the Web Soil Survey (USDA-NRCS 2005), the soils occurring within the archaeological APE are all forming in stratified fluviomarine sediments, with wide differences in landscape position, pedogenic development, and degree of internal drainage. The majority of the soils are well drained, deeply weathered, and fully developed pedogenically. A well developed and deeply leached argillic horizon identifies these soil types as having been stable and exposed in place to weathering since their deposition. Other soils mapped within the archaeological APE are considered to be poorly or very poorly drained, exhibiting gleyed conditions at shallow depths. Gleyed soils exhibit predominantly gray colors, often with mottles, which result from the reduction and/or translocation of iron and other elements during frequent and prolonged saturation. A high and/or perched water table is frequently found within gleyed soil horizons.

Soil maps show that the soil types occurring within the archaeological APE that are well drained and on a convex summit or sideslope position are the Downer sandy loam, the Hambrook sandy loam, the Ingleside loamy sand, the Runclint loamy sand (actually considered excessively drained), the Sassafras sandy loam, and the Unicorn loam. Soils which are located on upland landforms and are moderately well drained are the Hammonton sandy loam and the Woodstown loam. Occurring within depressional areas is the Fallsington sandy loam, which is poorly drained. This soil is typically gleyed below approximately 25.0 cm (9.8 in). The Mullica sandy loam also occurs in depressions, but is considered to be very poorly drained. This soil type is gleyed below about 8.0 cm (3.2 in).

Two floodplain soils are mapped within the Barratts Chapel Road Improvements project archaeological APE. The Lenape mucky peat, very frequently flooded, is a very poorly drained soil which typically occurs in depressions and on floodplains and tidal pool swamps. The Lenape mucky peat soil profile consists of layers of organic matter (peat) in various stages of decomposition, overlying gleyed and undeveloped estuarine or marine sediments. The Lenape mucky peat is mapped in the drainage of Double Run, a tributary to Spring Creek, which Barratts Chapel Road crosses near the center of the archaeological APE. The Zekiah sandy loam, frequently flooded, is a poorly drained soil found on floodplains and in depressions. This soil consists of approximately 8.0 cm (3.2 in) of dark, highly organic topsoil overlying gleyed, stratified silts and sands. The Zekiah sandy loam is mapped near the western terminus of the archaeological APE, in the drainage of a small unnamed tributary to the Hudson Branch of Spring Creek.

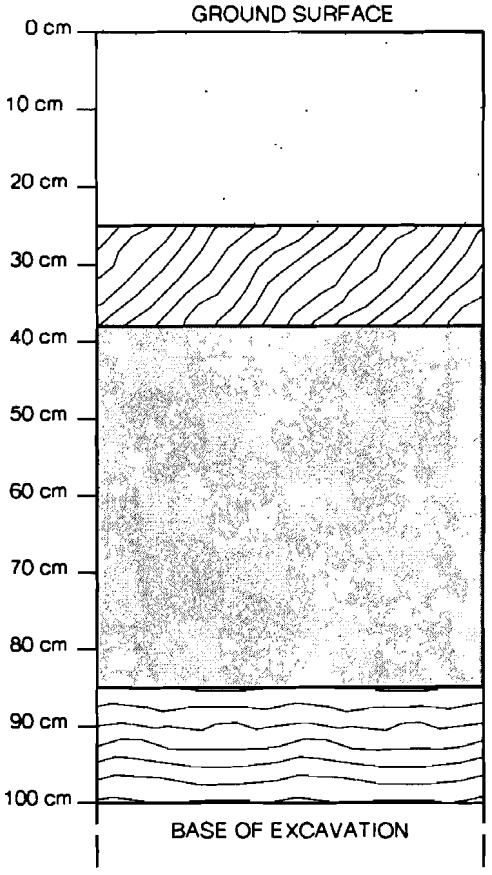
The majority of the archaeological APE is presently agricultural fields. A few isolated areas of residential development are also present. The excavation of ditches to contain roadway runoff on this flat landscape has disturbed the intact soils/sediments along Barratts Chapel Road, Skeeter Neck Road, and S.R. 1 from the existing roadway berm out approximately 4.0 m (13.1 ft). Very slight differences in convex or concave landform shapes occur within the archaeological APE; however, a few small, localized depressional basins are present.

The examined auger boring soil profiles correspond well with the mapped soil types. Auger Borings 1, 3, 5, 6, 7, 8, 9, and 10 are comprised of a very well developed and deeply leached soil profile, which is forming in sandy coastal plain sediments (Figures 13, 14, 15, and 16). The presence of a well-developed argillic horizon (noted by the Bt horizon designation) within all of these soil profiles reflects deep, advanced weathering that has taken place since these sediments were deposited. As a soil profile is exposed to weathering, the mineral portion of the upper soil column is broken down to yield weathering products such as clay particles and iron and aluminum oxides. These weathering products are then leached down into the subsoil, and reattach onto soil particles. This accumulation of clay and oxides can change the structure, color, and texture of the subsoil. Significant accumulation of clay within the subsoil is identified by the presence of the argillic subsoil horizon. Significant accumulations of iron result in bright red soil colors.

An E horizon was present directly below the surface horizon in Auger Borings 1, 3, and 9. This horizon is formed directly under the surface horizon, when the leaching of clay and oxides from the upper soil profile produces a zone of eluviation, noted by a lighter color (loss of iron) and texture (loss of clay-sized particles). The accumulation of organic matter darkens the soil and masks these effects within the surface horizon. However, a lower portion of the zone of eluviation below the accumulation of organic matter may remain between the organic surface and the B subsoil horizons. This horizon, lighter in color and texture than the underlying B, but lacking the organic content of the A, is noted as the E horizon. In the majority of soils within farmed areas, if an E horizon was once present, it has been incorporated into the A horizon by deforestation and plowing. In Auger Borings 1, 3, and 9, the lower portion of the E horizon has remained intact below the level of plowing. Often, if a thick E horizon was originally present, erosion of the surface horizon occurs, the plow blade extends more deeply into the soil, and the E horizon is gradually incorporated into the plow zone (Ap) horizon over time. The surface Ap horizon then directly contacts the subsoil B horizon.

Auger Boring 6 was excavated in a slight depression in a cultivated field. This auger boring displays a well developed argillic horizon, but is gleyed below approximately 25.0 cm (9.8 in). Very slight elevational differences and variances between a convex and a concave landform within the

SOIL PROFILE
AUGER BORING 1



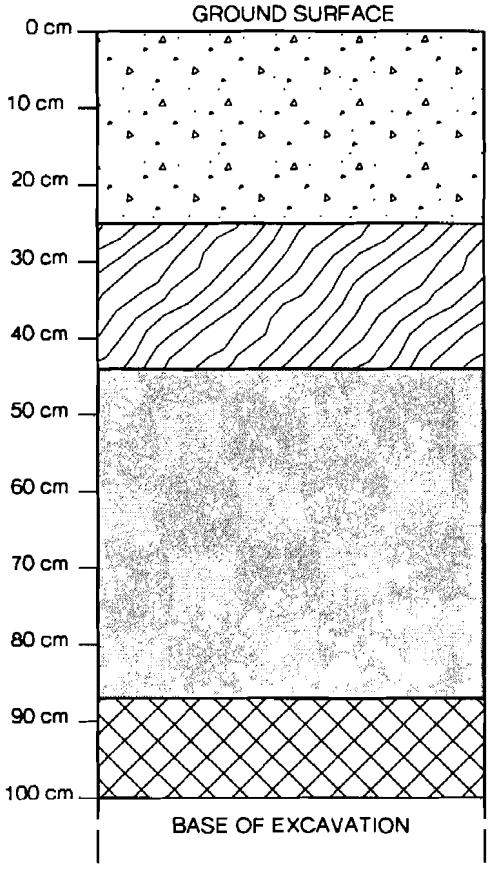
Ap 10YR 4/3 brown sandy loam

E 10YR 5/3 brown sandy loam

Bt 7.5YR 4/6 strong brown sandy clay loam, with common 5YR 4/4 reddish brown mottles

C 10YR 5/4 yellowish brown coarse sand

SOIL PROFILE
AUGER BORING 3



Ap 10YR 4/3 brown loam

E 10YR 5/3 brown sandy loam

Bt 7.5YR 4/6 strong brown sandy clay loam, with common 5YR 4/4 reddish brown mottles

Cg 10YR 5/2 grayish brown coarse sand, with many coarse 5YR 4/4 reddish brown mottles and with iron stains and concretions

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BARRATTS CHAPEL ROAD IMPROVEMENTS
S.R. 1 TO MCGINNIS POND ROAD
KENT COUNTY

SOIL PROFILES
AUGER BORINGS 1 AND 3

FIGURE - 13

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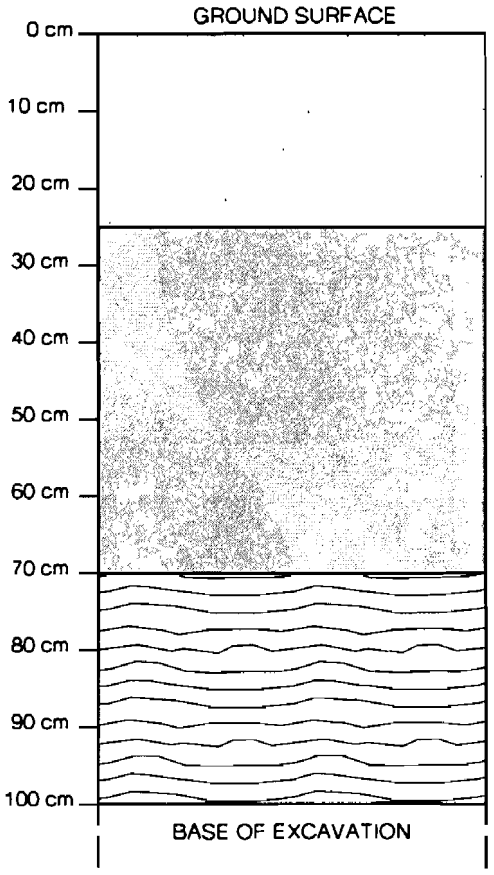
SOIL PROFILE
AUGER BORING 5

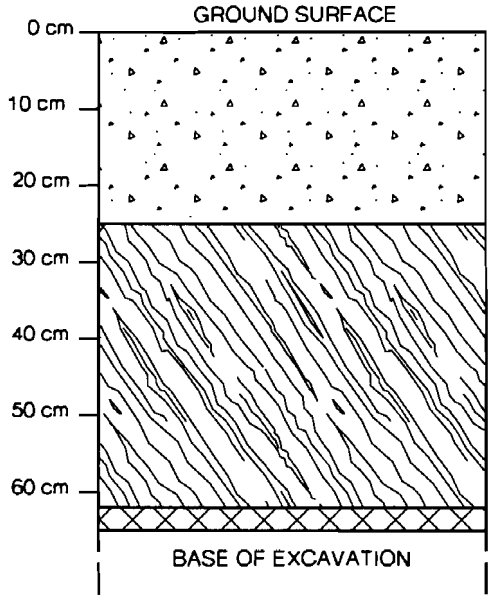


Ap 10YR 4/3 brown sandy loam

Bt 7.5YR 5/8 strong brown sandy clay loam

C 10YR 5/4 yellowish brown coarse sandy loam

SOIL PROFILE
AUGER BORING 6



Ap 2.5Y 4/1 dark gray sandy loam

Btg 10BG 6/1 greenish gray sandy clay loam, with common 5YR 4/4 reddish brown mottles

Cg 10YR 5/1 gray coarse sand

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BARRATTS CHAPEL ROAD IMPROVEMENTS
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SOIL PROFILES
AUGER BORINGS 5 AND 6

FIGURE - 14

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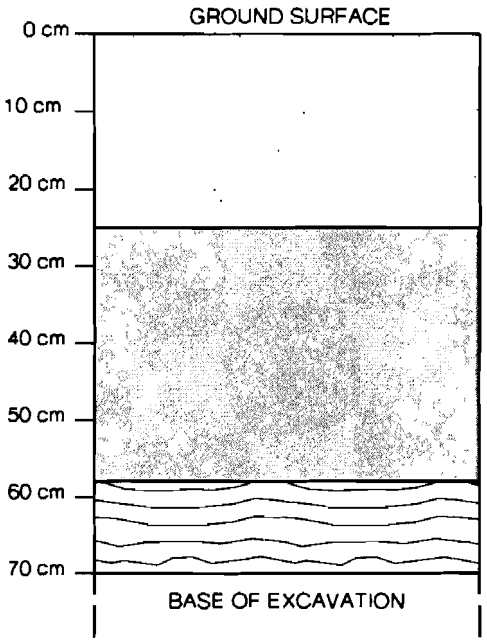
SOIL PROFILE
AUGER BORING 7

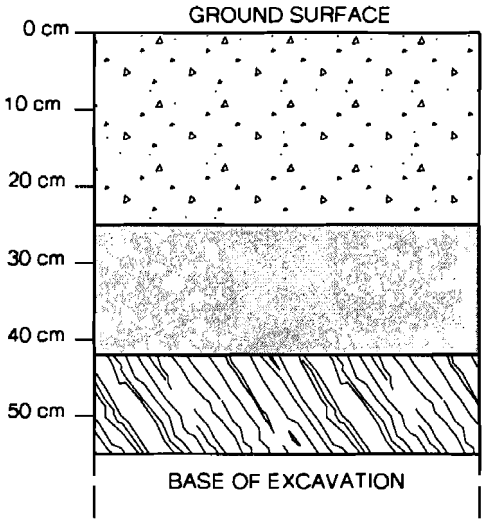


Ap 10YR 3/4 dark yellowish brown sandy loam

Bt1 5YR 5/6 yellowish red sandy clay loam

Bt2 2.5YR 4/8 dark red coarse sandy loam

SOIL PROFILE
AUGER BORING 8



Ap 10YR 3/4 dark yellowish brown sandy loam

Bt1 5YR 4/6 yellowish red sandy clay loam

Bt2 2.5YR 4/8 dark red coarse sand

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BARRATTS CHAPEL ROAD IMPROVEMENTS
S.R. 1 TO MCGINNIS POND ROAD
KENT COUNTY

SOIL PROFILES
AUGER BORINGS 7 AND 8

FIGURE - 15

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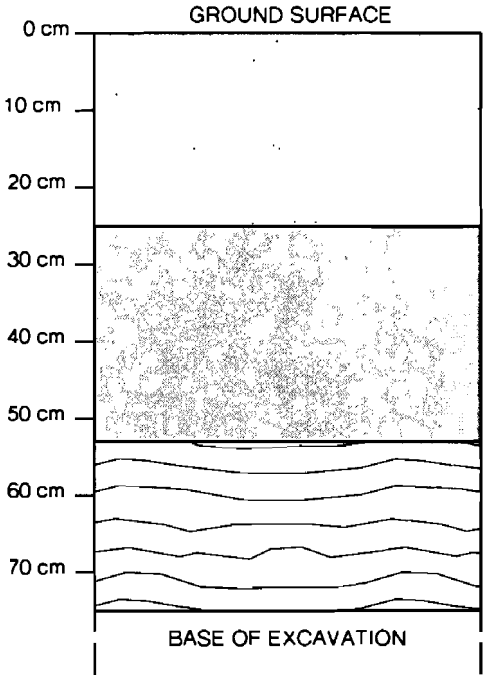
SOIL PROFILE
AUGER BORING 9

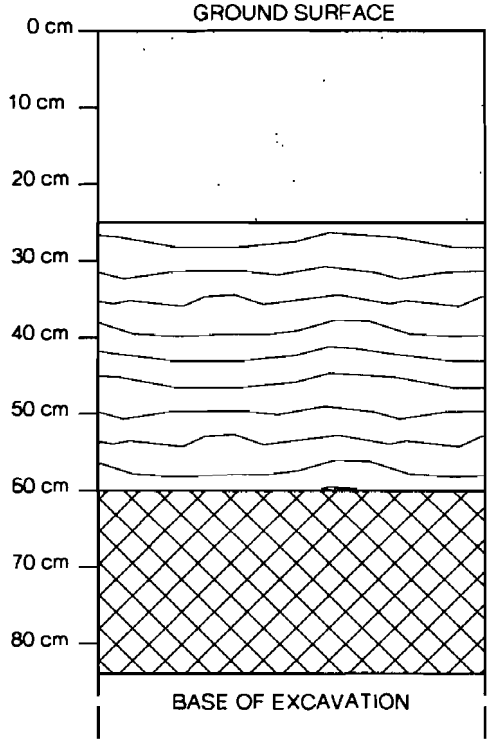


Ap 10YR 4/3 brown sandy loam

E 10YR 5/3 brown coarse sandy loam

Bt 5YR 5/6 yellowish red sandy clay loam, becoming more coarse with depth

SOIL PROFILE
AUGER BORING 10



Ap 10YR 4/3 brown sandy loam

Bt1 5YR 5/6 yellowish red sandy clay loam with common 5YR 4/4 reddish brown mottles

Bt2 2.5YR 4/8 dark red coarse sandy clay loam, with fine gravels

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BARRATTS CHAPEL ROAD IMPROVEMENTS
S.R. 1 TO MCGINNIS POND ROAD
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SOIL PROFILES
AUGER BORINGS 9 AND 10

FIGURE - 16

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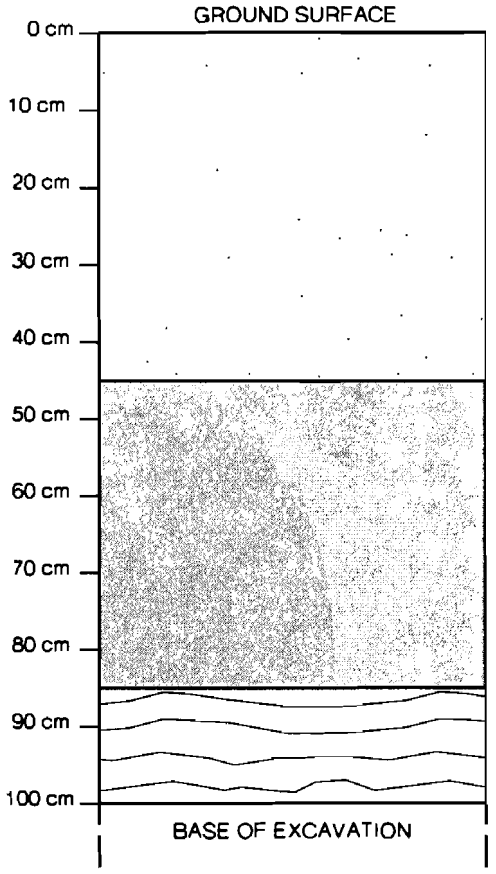
archaeological APE can result in significant differences in the degree of internal drainage of the soils. The majority of the archaeological APE consists of agricultural fields with shallow, upland soil profiles. These areas have been plowed, but have otherwise remained relatively undisturbed. Hand excavated shovel test pits (STPs), plowing and disking, or some combination of these should be used to test these agricultural fields. Drainage ditches and the area between the ditches and the roadway berm do not warrant archaeological testing due to extensive historic and modern disturbance related to the ditch, road, and utility construction and maintenance.

Auger Boring 2 was excavated in the drainage of a small tributary to the Hudson Branch of Spring Creek. Auger Boring 4 was excavated in the drainage of Double Run. Both of these drainages are essentially a wetland area with poorly defined channel flow. The auger borings are comprised of modern alluvium or organic litter accumulations overlying gleyed, saturated sands (Figure 17). The water levels in these drainages are affected by both precipitation events and tidal fluctuations from the Delaware Bay, and are saturated for the majority of the year. This permanent saturation has resulted in the extensive gleyed conditions and lack of soil development exhibited in these two auger borings. No archaeological testing is warranted in these wetland areas, as they would not have been attractive for direct occupation by Native Americans due to their wet condition. Slightly elevated areas surrounding the wetlands, however, would have been attractive to Native Americans for the plethora of natural resources which would have been available.

Auger Boring 11 was excavated within a broad, more pronounced depression located in an agricultural field along the west side of S.R. 1 near the northern boundaries of the GSI portion of the archaeological APE. This auger boring is comprised of in excess of 1.0 m (3.3 ft) of topsoil, which has washed in from the surrounding sideslopes after years of plowing and exposure to erosion (Figure 18). The depth to the subsoil is not known at this location because the maximum extent of the auger is 1.0 m (3.3 ft). Where the erosion of topsoil into a depression is significant and the depth to subsoil is beyond the reach of STPs, 1.0 x 1.0 m (3.3 x 3.3. ft) test units will be excavated. For all of the proposed archaeological testing, screening of the excavated materials should proceed from the modern surface to a minimum depth of 10.0 cm (3.9 in) into the culturally sterile subsoil, as accumulation of these sediments was gradual. Plowing would have lifted the original subsoil, then only gradually risen to the present plowing depth. Sediments (and artifacts, if present) from the original surface would be present throughout the existing surface horizon thickened by eroded topsoil accumulation.

SOIL PROFILE
AUGER BORING 2

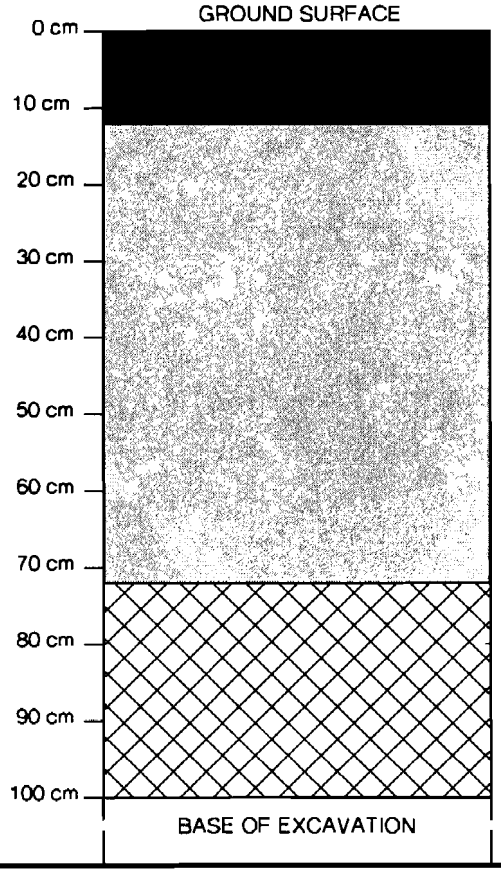


C1 7.5YR 4/6 strong brown lenses of sandy loam over loamy sand, with common 10YR 5/1 gray mottles

C2g N 5/0 gray loamy sand

C3g 10BG 6/1 greenish gray coarse loamy sand

SOIL PROFILE
AUGER BORING 4



OA dark organic litter

Cg1 N 5/0 gray loamy sand

Cg2 10YR 6/1 gray coarse sand, with many coarse 7.5YR 4/6 strong brown mottles

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BARRATTS CHAPEL ROAD IMPROVEMENTS
S.R. 1 TO MCGINNIS POND ROAD
KENT COUNTY

SOIL PROFILES
AUGER BORINGS 2 AND 4

FIGURE - 17

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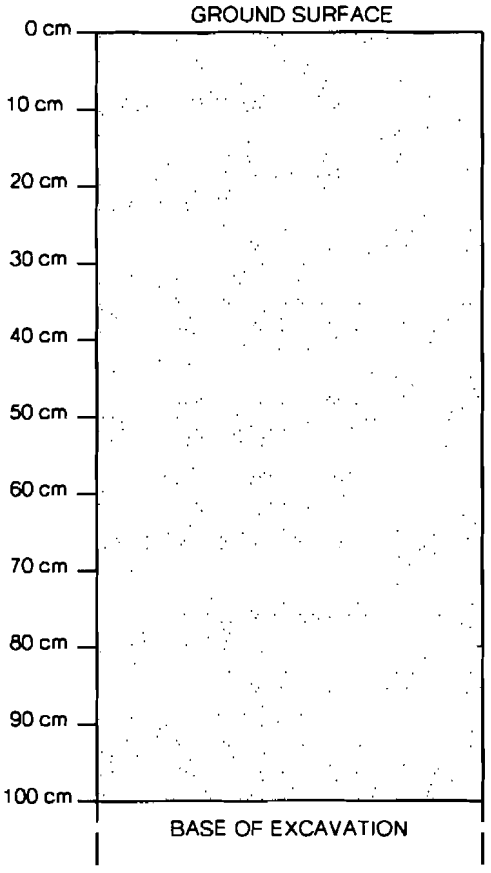
SOIL PROFILE
AUGER BORING 11



AC 10YR 4/3 brown sandy loam

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BARRATTS CHAPEL ROAD IMPROVEMENTS
S.R. 1 TO MCGINNIS POND ROAD
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SOIL PROFILE
AUGER BORING 11

FIGURE - 18

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