U.S. DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

STRATIGRAPHY, DESCRIPTIONS, AND PHYSICAL PROPERTIES OF SEDIMENTS CORED IN LAKE MICHIGAN

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ABSTRACT

A total of 55 box, gravity, piston, and vibracores were collected in the southern two-thirds of Lake Michigan in 1988 and 1989. Analyses of these cores reveal the late Quaternary stratigraphy beneath the lake and characterize the Holocene sediments. These cores augment previous coring studies in the lake, and with a few exceptions, corroborate the stratigraphic framework inferred by previous studies. Most important of these exceptions is our subdivision of the lacustrine sediments of the Lake Michigan Formation into only two units: a lower, red unit and an upper, gray unit. The two units each appear to represent a continuous interval of sedimentation; they are separated by a gradational color change in deep water and by an unconformity, related to the Chippewa low lake stage, in relatively shallow water.

Sediment texture is variable in the upper Lake Michigan Formation in areas overlain by less than about 80 m of water. In these areas, sediments immediately above the Chippewa unconformity and those at the tops of the cores tend to be noticeably coarser than the remainder of the unit. In contrast, the upper Lake Michigan Formation in the deep basins tends to be uniformly fine-grained. Core-top sediments show a general tendency to become finer grained with increasing water depth, but the relationship has considerable scatter. The sediments are generally very water-rich at the tops of the cores, especially in the deep basins. Water contents show a strong tendency to decrease with depth in the cores and with increasing grain size.

INTRODUCTION

As part of a cooperative project with the states of Illinois and Indiana, the U.S. Geological Survey collected a large number of cores in the southern two-thirds of Lake Michigan in 1988 and 1989. The impetus for this project was generated by concerns about the impacts of recent high water levels in the Great Lakes on natural features and on man-made structures. Bluff recession, beach erosion, and damage to structures are among the most serious of the consequences of high water levels. Although the current focus of concern is on rising lake levels, equally serious problems that may be associated with falling lake levels include siltation of harbors, entrenchment of tributary streams, and dispersion of previously deposited pollutants.

All issues related to mitigating current damage and to planning for future impacts depend heavily on the ability to predict future trends in lake level and the response of the lake to those trends. Important elements that affect the impact of changing lake levels include the rate, cyclicity, and duration of lake-level changes. Predicting future trends in lake level and their impacts depends on understanding the history of past lake-level changes, the causes of those changes, and the responses of the lakes and their shorelines to those changes.

The cores described in this report (Fig. 1) were collected as part of a subproject whose goal was to document the history of lake level in Lake Michigan over the past several thousand years, to try to understand the causes of lake-level fluctuations, and to study how the lake and its shoreline have responded to those fluctuations. The bottom sediments sampled by the

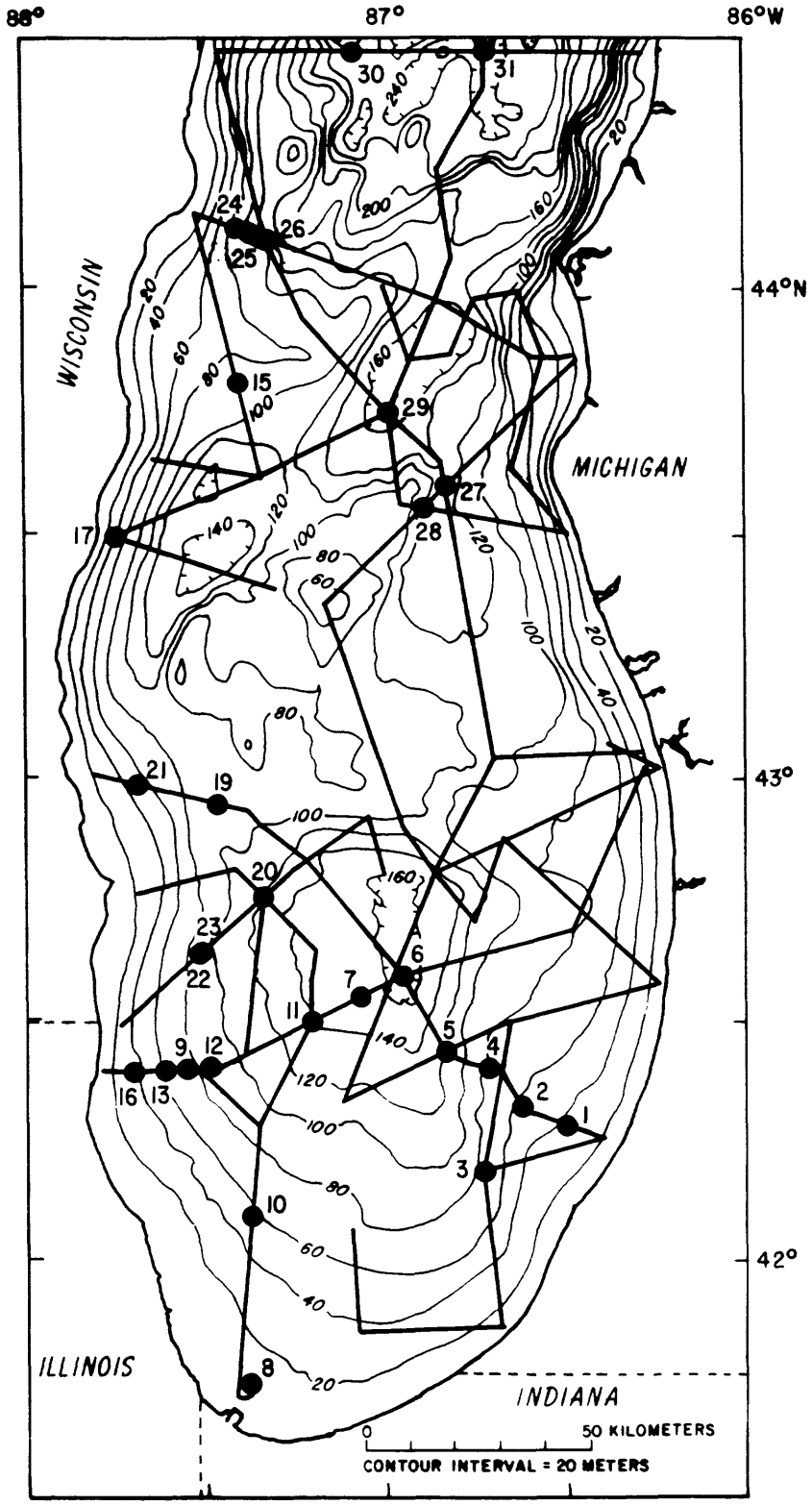

Figure 1. Map of Lake Michigan showing the location of cores described in this study. Solid lines are seismic-reflection profiles collected concurrently. Bathymetric contour interval 10 m.

cores contain a record of past lake history in the form of both direct stratigraphic evidence, including deposits and unconformities, and indirect evidence, reflected in the paleontology, chemistry, and physical properties of the sediments.

This report presents the basic core descriptions, along with sediment texture and water content data. Our observations are placed in the framework of a revised stratigraphic framework for the post-glacial deposits in Lake Michigan. Other types of studies, including magnetic and paleomagnetic analyses, geochemical measurements, paleontological investigations, dating studies, and isotopic analyses, are currently underway in an attempt to decipher the recent history and sediment budget of the lake.

PREVIOUS WORK

Suspended sediments in Lake Michigan have been examined in a variety of previous studies (reviews by Rea and others, 1981; Eadie and Robbins, 1987). The bottom sediments of the lake have also been extensively studied, mostly from the point of view of the accumulation of anthropogenic materials and recent sedimentation rates (reviews by Lineback and others, 1970; Rea and others, 1981; Eadie and Robbins, 1987). In addition, Rea and others (1980) studied the mineralogy, chemistry, and texture of sediments from short (1-m) cores in southeastern Lake Michigan.

Two major coring studies preceded ours in Lake Michigan. The first was conducted by (Hough, 1955, 1958) using long piston cores. He identified a "deep water sequence" consisting of gray clay that grades downward into red clay (fig. 2). Cores from water depths less than 107 m contain a sand and shell zone that replaces part of the reddish clays in the "deep water sequence". This sand and shell zone represents and unconformity that Hough used to define the low Chippewa stage of Lake Michigan (Hough, 1955, 1958; Hansel and others, 1985).

The second major study (Fig. 2), conducted by the Illinois State Geological Survey was based on relatively short gravity cores and high-resolution, seismic-reflection profiles (Gross and others, 1970, 1972; Lineback and others, 1970, 1971, 1974, 1979; Lineback and Gross, 1972; Wickham and others, 1978). In addition to the several till units beneath Lake Michigan, they identified the Equality Formation (Carmi Member) and the Lake Michigan Formation, as defined by Willman and Frye (1970). They described the Lake Michigan Formation in detail, and subdivided it into five members and one bed.

METHODS

Cores for this study were collected in the southern two-thirds of Lake Michigan during two research cruises, one in September, 1988 aboard the R.V. Roger R. Simons, and one in June, 1989 aboard the R.V. Laurentian (fig. 1). High-resolution seismic-reflection profiles were collected at the same time, and were used as an aid in selecting the core sites.

During the 1988 cruise, an Alpine-type piston corer and an electric vibracorer were used. The piston corer had a 40 ft (12.2 m) barrel and a plastic liner with an inner diameter of 5.7 cm. The vibracorer had a 30 ft (9.1 m) barrel and a plastic liner with an inner diameter of 9.2 cm. A total of 6

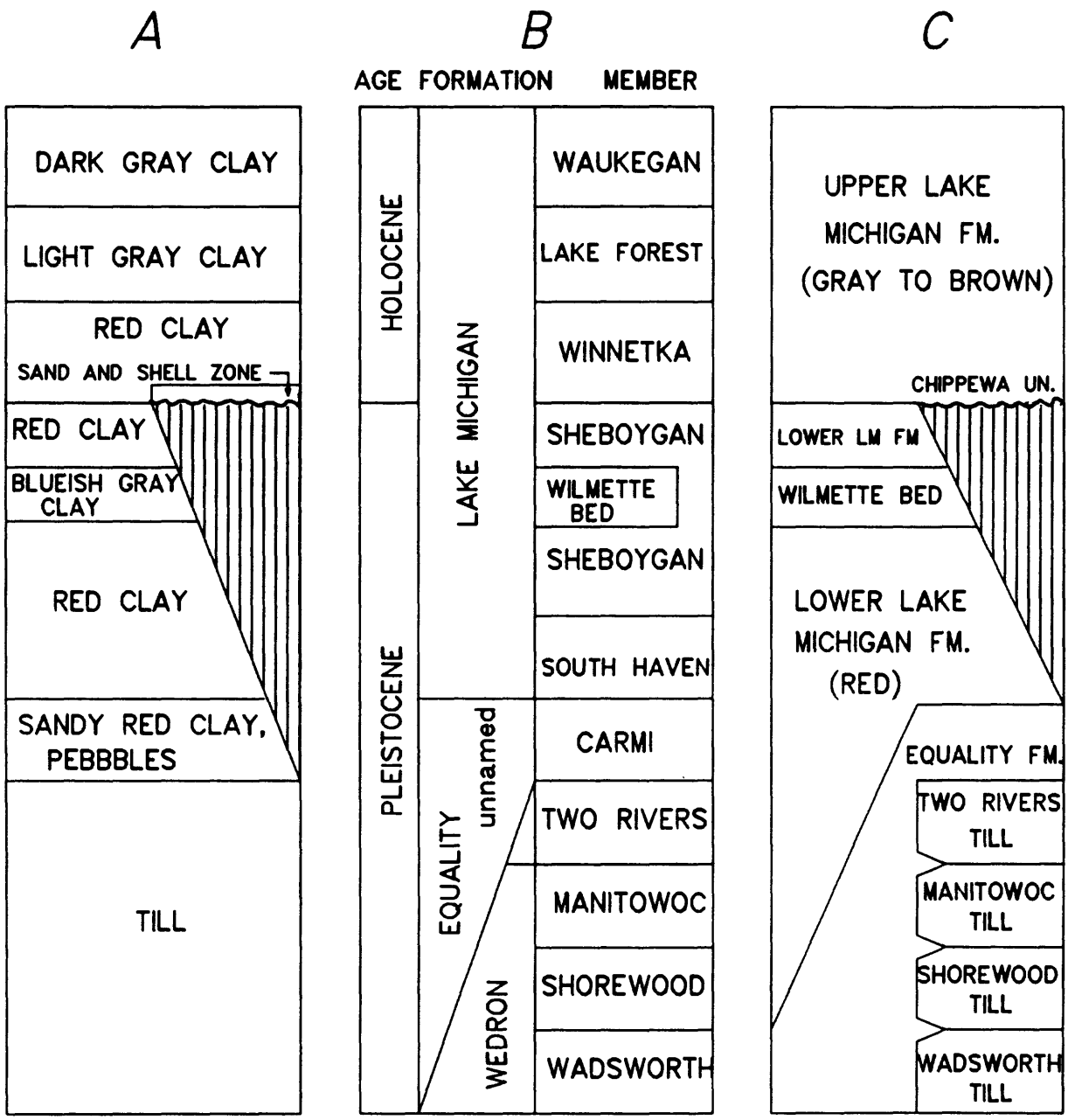

Figure 2. Quaternary stratigraphic framework for Lake Michigan. A, Hough (1955, 1958); B, Illinois State Geological Survey (Lineback and others, 1970, 1971, 1974; Wickham and others, 1978); and C, this study. Vertical ruling indicates parts of the section missing due to erosion.

piston cores and 7 vibracores were collected during this cruise (Table 1). In this paper, letters following core site numbers indicate the type of core: B, box; G, gravity; P, piston; and V, vibracore.

A total of 20 box cores and 22 gravity cores were collected during the 1989 cruise (Table 1). The gravity corer used 3-m sections of PVC pipe with an inner diameter of 10.2 cm. The box corer took undisturbed samples approaching one meter thick; the box cores were subsampled by pushing 10.2 cm thin-walled PVC pipe vertically into the core box after it had been brought on deck. Box cores and gravity cores were collected at many of the sites cored with heavier equipment in 1988, as well as at a variety of new sites.

The piston cores and vibracores had to be recovered horizontally because of their length, whereas the gravity cores and box cores were recovered vertically to minimize disturbance. All cores were cut into 1.5 m sections aboard ship, capped, sealed, and shipped to the Core Storage Facility at Woods Hole Oceanographic Institute. They were split longitudinally, described, and x-rayed in the laboratory. Visual core descriptions and x-ray observations are presented in Appendix C.

The quality of the box cores, gravity cores, and vibracores was generally excellent. The box cores clearly sampled the undisturbed sediment-water interface. Comparisons of the box cores with the gravity cores and vibracores at the same sites indicated that no more than the upper few cm of the latter were lost or disturbed. The upper sections of many of the cores settled somewhat during shipment, commonly by a few cm. Comparisons of the box and gravity cores to the piston cores at the same sites revealed that the uppermost part of the sedimentary section was commonly missing in the piston cores. The amount missing was commonly 30-60 cm, but in one case (core 19P), it was as much as 150 cm. The failure to sample the uppermost sediments was probably caused by penetration of the trigger weight past the sediment-water interface or by overpenetration of the corer, or both. In addition, some of the piston cores contained gaps or disturbed zones, probably caused by suction on the base of the core; in most cases this disturbance was minor, but in core 2P, the disturbance was substantial.

Grain-size measurements were performed on selected sections of some cores (Appendix A). Measurements were made for contiguous 3-cm channel samples of the upper 250 cm of vibracore 9, all 50 cm of core 9B, the upper 70 cm of core 6B, the upper 580 cm of core 4P, and the upper 65 cm of core 4G. In addition, grain-size measurements wee made on samples of the tops of most cores and on samples of individual rhythmite beds in core 4P. The sand fraction was measured using standard sieving techniques and the silt and clay fraction were measured using a multi-aperture model TA-2 Coulter counter.

Water content and bulk density measurements were made on most of the cores at varying sampling densities (Appendix B). Measured volumes of wet sediment were sampled using a beveled syringe, similar to a mini-piston core, and the samples were weighed before and after drying for 24 hours at 60 ^{o}C.

Table 1.--Core locations, depths, and lengths.

Site	Type[1]	Latitude	Longitude	Water Depth (m)	Length (cm)
1	B	42°16.9169'	-86°30.1849'	37	45
1	G	42°16.9169'	-86°30.1849'	37	237
2	B	42°19.3201'	-86°37.5741'	58	68
2	G	42°19.3201'	-86°37.5741'	58	262
2	P	42°19.3192'	-86°37.5709'	57	1058
3	B	42°11.2503'	-86°43.8976'	79	51
3	G	42°11.2503'	-86°43.8976'	79	265
4	B	42°24.0543'	-86°42.9873'	81	64
4	G	42°24.0543'	-86°42.9873'	81	261
4	P	42°24.0446'	-86°43.0194'	80	883
5	B	42°25.8451'	-86°50.0978'	120	70
5	G	42°25.8451'	-86°50.0978'	120	231
5	P	42°25.8738'	-86°50.0671'	119	1163
6	B	42°35.5111'	-86°56.8783'	173	82
6	G	42°35.5111'	-86°56.8783'	173	259
6	P	42°35.4889'	-86°56.8732'	168	1103
7	B	42°32.7295'	-87°04.1058'	160	65
7	G	42°32.7295'	-87°04.1058'	160	300
8	V	41°44.5739'	-87°23.0714'	13	543
9	B	42°23.7743'	-87°33.1996'	79	50
9	G	42°23.7743'	-87°33.1996'	79	226
9	V	42°23.7977'	-87°33.2052'	77	698
10	V	42° 5.4903'	-87°22.5114'	56	220
11	B	42°29.7721'	-87°12.1446'	148	70
11	G	42°29.7721'	-87°12.1446'	148	295
12	B	42°23.9368'	-87°29.5141'	90	50
12	G	42°23.9368'	-87°29.5141'	90	280
13	G	42°23.5915'	-87°37.0401'	64	185
15	V	43°48.1035'	-87°24.0825'	87	779
16	V	42°23.4166'	-87°42.1824'	36	133
17	V	43°29.1791'	-87°45.1875'	39	308
19	P	42°56.6581'	-87°28.0719'	99	1002
20	B	42°45.2817'	-87°20.3712'	122	63
20	G	42°45.2817'	-87°20.3712'	122	300
20	P	42°45.2833'	-87°20.3433'	122	1160
21	V	42°58.9823'	-87°41.4292'	50	108
22	B	42°37.7222'	-87°31.2409'	92	44
22	G	42°37.7222'	-87°31.2409'	92	292
23	G	42°38.1460'	-87°30.7258'	95	245
24	B	44°07.0280'	-87°24.4095'	94	47
24	G	44°07.0280'	-87°24.4095'	94	236

Table 1. (Continued)

Site	Type[1]	Latitude	Longitude	Water Depth (m)	Length (cm)
25	B	44°06.4704'	-87°22.1886'	109	62
25	G	44°06.4704'	-87°22.1886'	109	236
26	B	44°05.7326'	-87°19.4059'	126	49
26	G	44°05.7326'	-87°19.4059'	126	236
27	B	43°35.7146'	-86°49.5465'	137	50
27	G	43°35.7146'	-86°49.5465'	137	268
28	B	43°32.8822'	-86°53.4432'	143	41
28	G	43°32.8822'	-86°53.4432'	143	252
29	B	44°28.2477'	-86°42.9550'	275	83
29	G	44°28.2477'	-86°42.9550'	275	294
30	B	44°28.1705'	-87°04.8796'	239	86
30	G	44°28.1705'	-87°04.8796'	239	239
31	B	43°44.5990'	-86°59.3337'	172	81
31	G	43°44.5990'	-86°59.3337'	172	215

[1] B, Box; G, Gravity; P, Piston; V, Vibracore.

STRATIGRAPHY

Previous Work

Hough (1955, 1958) first described the general stratigraphy of the deposits beneath Lake Michigan (fig. 2), identifying a general sequence of gray clays overlying red clays. He identified a distinctive blueish-gray bed within the red clays, and noted that in water shallower that 107 m, much of the lower red section is represented by a thin sand and shell bed. This sand and shell zone marks an unconformity that Hough associated with the low Chippewa level (Hough, 1955, 1958; Hansel and others, 1985) of Lake Michigan.

Willman and Frye (1970) outlined the basic Quaternary stratigraphy of Illinois, including the area covered by Lake Michigan, and defined the Wedron, Equality, and Lake Michigan Formations. In their work during the 1970's on Lake Michigan, the Illinois State Geological Survey refined the basic stratigraphy (fig. 2), including the till Members of the Wedron Formation (Wadsworth, Shorewood, and Manitowoc) and the Two Rivers Till (Lineback and others, 1974).

Above the till units beneath Lake Michigan, the Illinois State Geological Survey (Lineback and others, 1970, 1971, 1979; Wickham and others, 1978) identified the Equality Formation, consisting of mud, sand, and clay-pebble conglomerate. They described the overlying lacustrine muds of the Lake Michigan Formation in detail, and subdivided the lower, reddish lacustrine clays into two members, the South Haven and the Sheboygan.

They defined the distinctive gray to blue-gray marker bed, first identified by Hough (1955, 1958), as the Wilmette Bed, which occurs within the Sheboygan Member. The upper, gray muds of the Lake Michigan Formation were subdivided into three members, from bottom to top, the Winnetka, the Lake Forest, and the Waukegan (fig. 2).

The following late-glacial and Holocene history was inferred for the Lake Michigan Formation by Wickham and others (1978) and Lineback and others (1979). After deposition of the Equality Formation in ice-proximal positions as glaciers in the Lake Michigan basin retreated, the red clays of the Sheboygan and South Haven Members of the Lake Michigan Formation were deposited. Because these red clays show no north-south trend in thickness, deposition of the South Haven Member did not begin until after the Two Rivers glacier had begun to recede at about 11,200 years ago. The source of most of the red clay in these two Members was derived from the Lake Superior basin rather than from the Lake Michigan basin. The red clay in the upper Sheboygan Member (above the Wilmette bed) was reworked from the older red clays and redeposited during the Chippewa low lake level.

In relatively shallow water, the sand and shell layer, identified and associated with the Chippewa low stage by Hough (1955, 1958), separates the overlying Winnetka Member (gray to brown clay) from the underlying Sheboygan Member (red clay). In the deep basins, a shift from glacial-lacustrine sedimentation to deposition of local gray-to-brown sediment derived from river input and local reworking resulted in a gradual change in deposition of the red Sheboygan Member to the brown Winnetka Member. Following the Chippewa low stage, the lake transgressed to the Nipissing high lake level and has remained relatively high since. During this time, the gray Lake Forest Member was deposited, followed by the Waukegan Member. Lineback and others (1970) suggested that two episodes of sedimentation occurred, one associated with the Winnetka and Lake Forest Members, the other with the Waukegan Member. However, Lineback and others (1979) associated the brown Winnetka Member with the Chippewa low stage, and grouped the Lake Forest and Waukegan Members into the post-Nipissing interval.

This Study

Our observations are consistent with the general stratigraphic framework proposed by previous workers (Hough, 1955, 1958; Lineback and others, 1970, 1971, 1974; Lineback and Gross, 1972; Wickham and others, 1978), but our interpretations differ in several details. Only a few of our cores penetrated till units (cores 8V, 9V, 15V, and 17V), and with one exception, the diamictons recovered are consistent with the till units described by Lineback and others (1974). Core 9V reached a gray, clay-rich diamicton that is clearly equivalent to Wadsworth Till rather than the reddish Shorewood till mapped by Lineback and others (1974) at this site. Seismic-reflection data that we collected also suggests that the Shorewood Till margin is north of core site 9.

We did not observe true red (5YR) colors above the sandy zone that marks the Chippewa unconformity (with the possible exception of core 12G, 92-105 cm), in contrast to the findings of Hough (1955, 1958). Moreover, none of the core descriptions of the Illinois State Geological Survey (Lineback and others, 1970, 1971, 1972, 1974; Lineback and Gross, 1972)

show 5YR colors above the sandy zone. Brownish (7.5YR) colors are common in the sediments immediately above the unconformity, however, and Hough (1955, 1958) may have grouped the brownish sediments with the red ones below the unconformity rather than with the gray ones above.

Despite our general agreement with the stratigraphic framework proposed by the Illinois State Geological Survey (Lineback and others, 1970, 1971, 1974; Lineback and Gross, 1972; Wickham and others, 1978), we subdivide the Lake Michigan Formation into only two units, rather than the five Members previously proposed. We were unable to consistently distinguish between the two red members of the Lake Michigan Formation (South Haven and Sheboygan) nor among the three gray-brown members (Winnetka, Lake Forest, and Waukegan), as the Members were defined (Lineback and others, 1970; Wickham and others, 1978). Consequently, we have informally grouped the red Members into the lower Lake Michigan Formation and the gray-brown Members into the upper Lake Michigan Formation (Fig. 2). The two are separated by the Chippewa unconformity in relatively shallow water (e.g. core 9V) and by a transitional color change in deeper water (e.g. core 6P). The Wilmette Bed is commonly present within the lower Lake Michigan Formation.

The distinction between the South Haven and Sheboygan Members, as originally described, was based primarily on subtle differences in color, between reddish-gray and reddish-brown (Lineback and others, 1970; Wickham and others, 1978), which we could not consistently distinguish in our cores. Lineback and others (1979) suggested that the red clays were not deposited until after the Two Rivers glacier had begun to recede and that the primary source of the red material was the Lake Superior basin. However, we believe that the red, lower Lake Michigan Formation was deposited in association with the three reddish tills (Shorewood, Manitowoc, and Two Rivers) in the Lake Michigan basin. The Lake Superior basin may have been the ultimate source of the red materials (Dell, 1976; Lineback and others, 1979; Hansel and others, 1985), but the red tills in the Lake Michigan basin form a more reasonable, immediate source than that of outwash from Lake Superior across the Upper Peninsula of Michigan (Lineback and others, 1979). In addition, Drexler and others (1983) have shown that the Upper Peninsula was deglaciated during the interval between 11 and 10 ka, cutting off the source of red sediment and leaving very little time for deposition of the lower Lake Michigan Formation after retreat of the Two Rivers glacier about 11,200 years ago (Hansel and others, 1985). The lack of north to south variation in thickness of the red clay, the primary evidence for the deposition of the red clays after retreat of the Two Rivers glacier (Lineback and others, 1979) may be found in the wide variations in sedimentation rates in glacial-lacustrine environments and in lake-basin focusing effects.

Drexler and others (1983) suggested that the gray Wilmette bed was deposited between 11 and 10 ka, while deglaciation of the Superior basin had cut off the supply of red sediment to the Lake Michigan basin, a suggestion adopted by Hansel and others (1985). However, the red clay of the upper Sheboygan Member (above the Wilmette Bed) may have come from meltwater that flowed briefly across the Upper Peninsula of Michigan into the Lake Michigan basin during the advance and retreat of the Marquette glacier in the Superior basin (10.0 to 9.8 ka; Drexler and others, 1983; Teller, 1985). Finally, the gradational color change from red to gray (from the

Sheboygan to the Winnetka Member) in the deep basins of Lake Michigan may be due to reworking of older red sediments during the Chippewa low stage, along with a shift to local rivers and bluffs as sources of sediment (Wickham and others, 1978; Lineback and others, 1979).

The separation of the Waukegan, Lake Forest, and Winnetka Members appears to be mostly based on the abundance of black streaks and mottling in the Lake Forest Member (Lineback and others, 1970; Wickham and others, 1978), although the Winnetka Member tends to be browner than the other two and the Waukegan tends to be siltier. The black staining of the Lake Forest Member is caused by hydrous iron monosulfides, probably hydrotroilite (Lineback and others, 1970) and (or) greigite (Dell, 1972), which are unstable, reduced phases that oxidize rapidly when exposed to air. In our cores, the black monosulfides are commonly concentrated in the middle part of the upper Lake Michigan Formation, although the distribution is commonly irregular (Appendix C). The black material is also abundant in the Wilmette Bed, and it occurs sporadically in the lower Lake Michigan Formation where that unit is close to the sediment-water interface.

We interpret the black monosulfides to be largely a diagenetic feature, associated with reducing conditions caused by decaying organic matter. The organic carbon content of Great Lakes bottom sediments, including those in Lake Michigan, typically decreases with depth, due at least in part to the decomposition of organic matter (Shimp and others, 1971; Rea and others, 1980, 1981). Although Lineback and others (1970) state that the black beds in the Lake Forest Member contain more organic matter than the surrounding sediment, the analyses of Shimp and others (1971) and Rea and others (1980) suggest a steady decrease in organic matter with depth.

The transition from oxidizing to reducing conditions occurs at some distance below the sediment-water interface as pore water and other phases are gradually depleted of oxygen. In the uppermost part of the cores, which are presumably in mostly oxidizing conditions, the monosulfides are rare. Where oxidizing conditions exist, the upper part of some cores contain oxidized laminae that appear identical to the black laminae in the lower, reduced part of the cores; after the black laminae oxidize upon exposure to air, all these laminae are the same color. Because of our inference that the black monosulfides are a diagenetic feature, we conclude that their distribution is not an appropriate stratigraphic criterion. Consequently, we have grouped the Winnetka, Lake Forest, and Waukegan members into a single stratigraphic unit, the upper Lake Michigan Formation.

GRAIN-SIZE DISTRIBUTIONS

In their detailed descriptive work, the Illinois State Geological Survey characterized the grain-size distribution of each of the units that they defined (Gross and others, 1972; Lineback and others, 1974; and Wickham and others, 1978). Average values for each of the members of the Lake Michigan Formation are presented in Table 2. The most obvious difference in grain size is between the coarser, silty gray members of the upper Lake Michigan Formation and the finer, clayey red members of the lower Lake Michigan Formation.

Table 2.--Average grain-size composition (weight percent) of members of the Lake Michigan Formation (from Wickham and others, 1978).

Member	Gravel	Sand	Silt	Clay	No. samples
Waukegan	1	8	41	51	51
Lake Forest	0	4	39	57	75
Winnetka	0	2	39	59	114
Sheboygan					
Upper	0	1	26	73	35
Wilmette Bed	0	1	17	82	17
Lower	0	1	14	85	14
South Haven	0	1	19	80	19

Our grain-size analyses (Appendix A) were performed to examine details of textural fluctuations with depth and age in selected cores, rather than for characterization purposes. They are, however, generally consistent with the observations of Gross and others (1972) and Wickham and others (1978). Grain-size distributions for both the lower Lake Michigan Formation (Fig. 3) and upper Lake Michigan Formation (Fig. 4) are generally unimodal, but a minor secondary mode occurs in the sand range of some samples. Except for relatively coarse sediment near the core tops (*e.g.* sample 4T9, Fig. 4), the grain-size distributions are generally negatively skewed (Appendix A). In most of the Lake Michigan Formation, the sediments are silty clays or clayey silts, having distributions characterized by long tails extending into the sand-size range. The existence of sand in these relatively fine-grained sediments, in some cases a minor second mode and in some cases coarse sand and fine gravel, suggests ice-rafting as the source of the coarse material, which is clearly not hydrodynamically equivalent to the majority of the sediment. Some of the sand may result from deposition during storms, but the existence of sand in virtually all samples argues for a more frequent process, such as the seasonal addition of ice-rafted sand.

We analyzed the lower Lake Michigan Formation only in core 9V below 200 cm (Figs. 3, 5) and core 4P below 510 cm (Fig. 3, 9). These analyses show the lower Lake Michigan Formation at that site to be extremely fine grained and uniform, dominated by clay and containing virtually no sand.

The upper Lake Michigan Formation varies in texture, as indicated in grain-size profiles for several cores (Figs. 5 - 9). The unit is generally a clayey silt, but the upper part of the unit grades into sand near shore (Lineback and others, 1970, 1971; Lineback and Gross, 1972; Wickham and others, 1978; cores 13, 15, 16, 17, 21, Appendix C). Cores at sites 9 and 4, both in less than 80 m of water, have rather irregular profiles, with a tendency to coarsen near the sediment surface (Figs. 5, 6, 8, and 9).

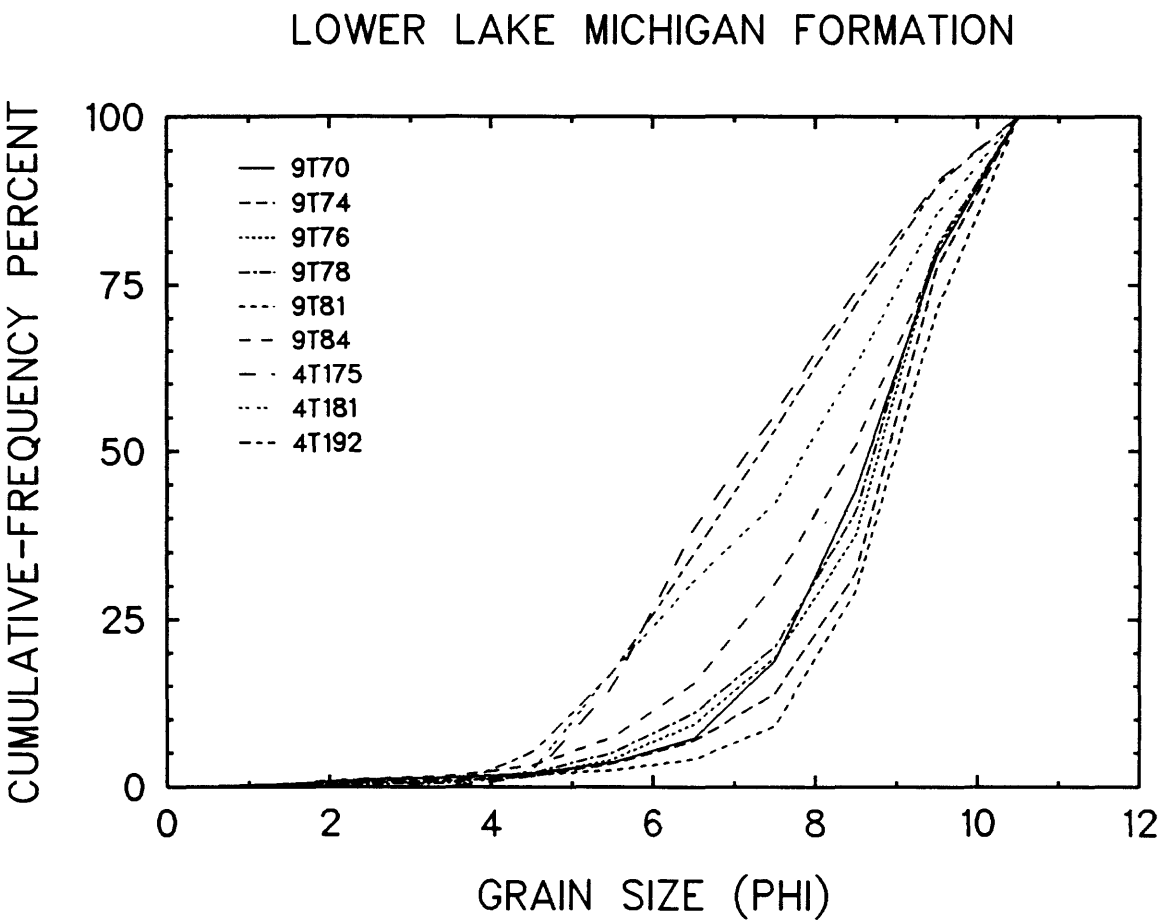

Figure 3. Plot of grain-size cumulative-frequency percents of representative samples of the lower Lake Michigan Formation.

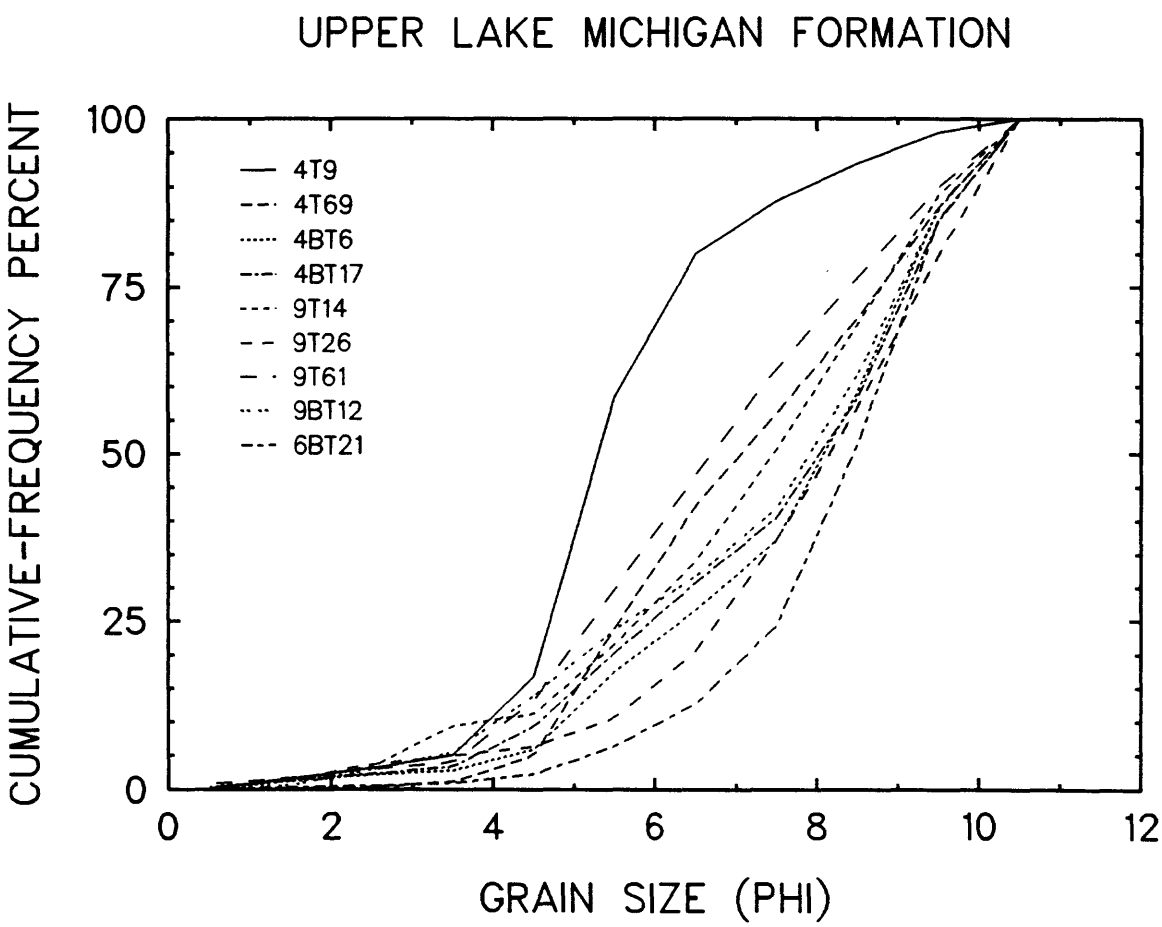

Figure 4. Plot of grain-size cumulative-frequency percents of representative samples of the upper Lake Michigan Formation.

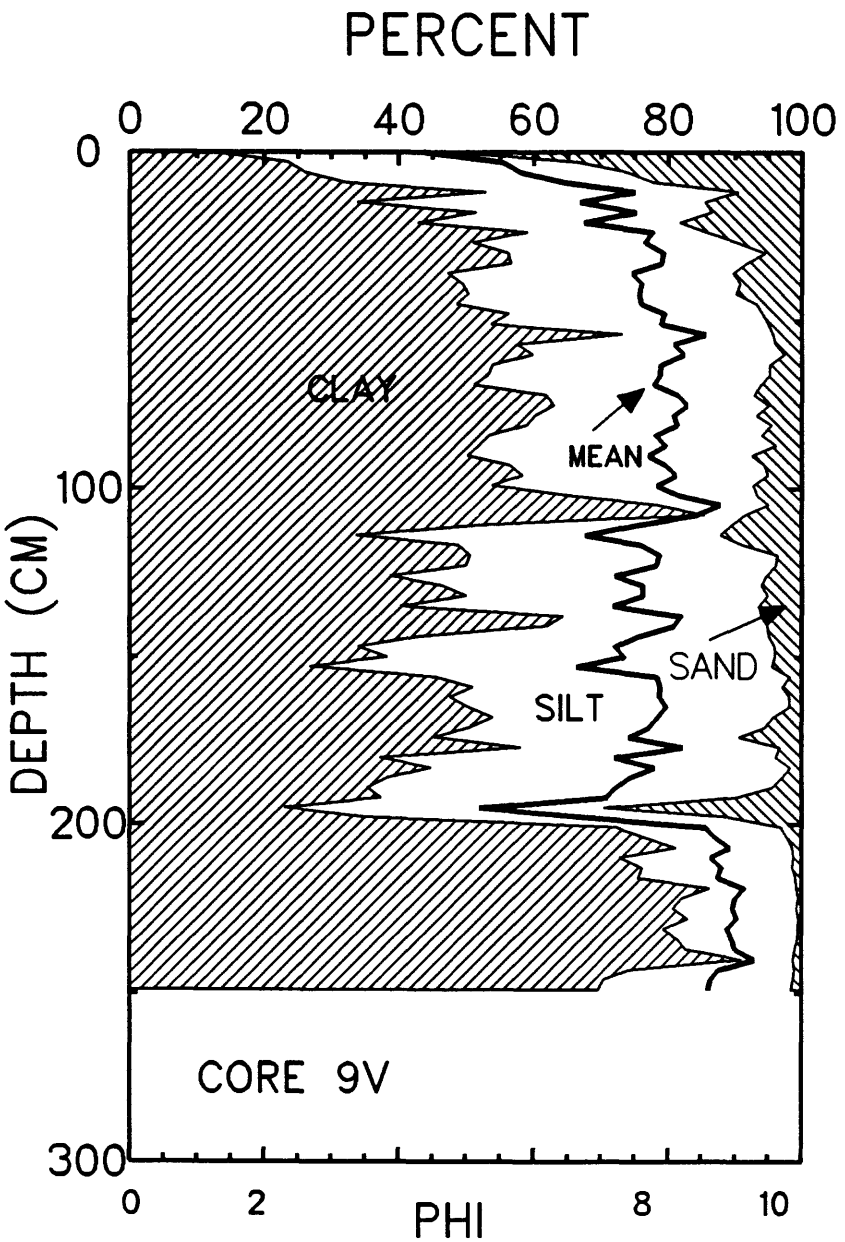

Figure 5. Profiles of clay (left, hatched), silt, and sand (right, hatched) percentages along with mean grain size (heavy line) for core 9V.

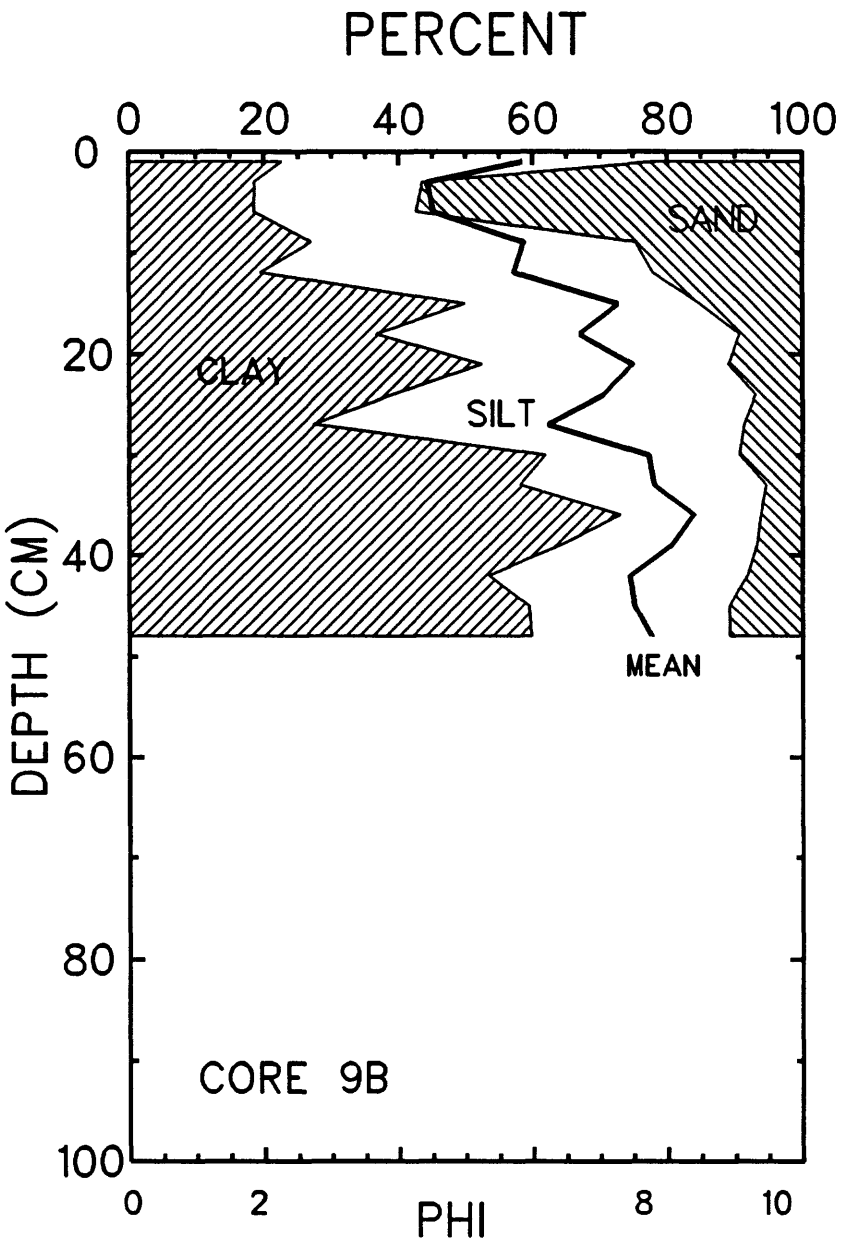

Figure 6. Profiles of clay (left, hatched), silt, and sand (right, hatched) percentages along with mean grain size (heavy line) for core 9B.

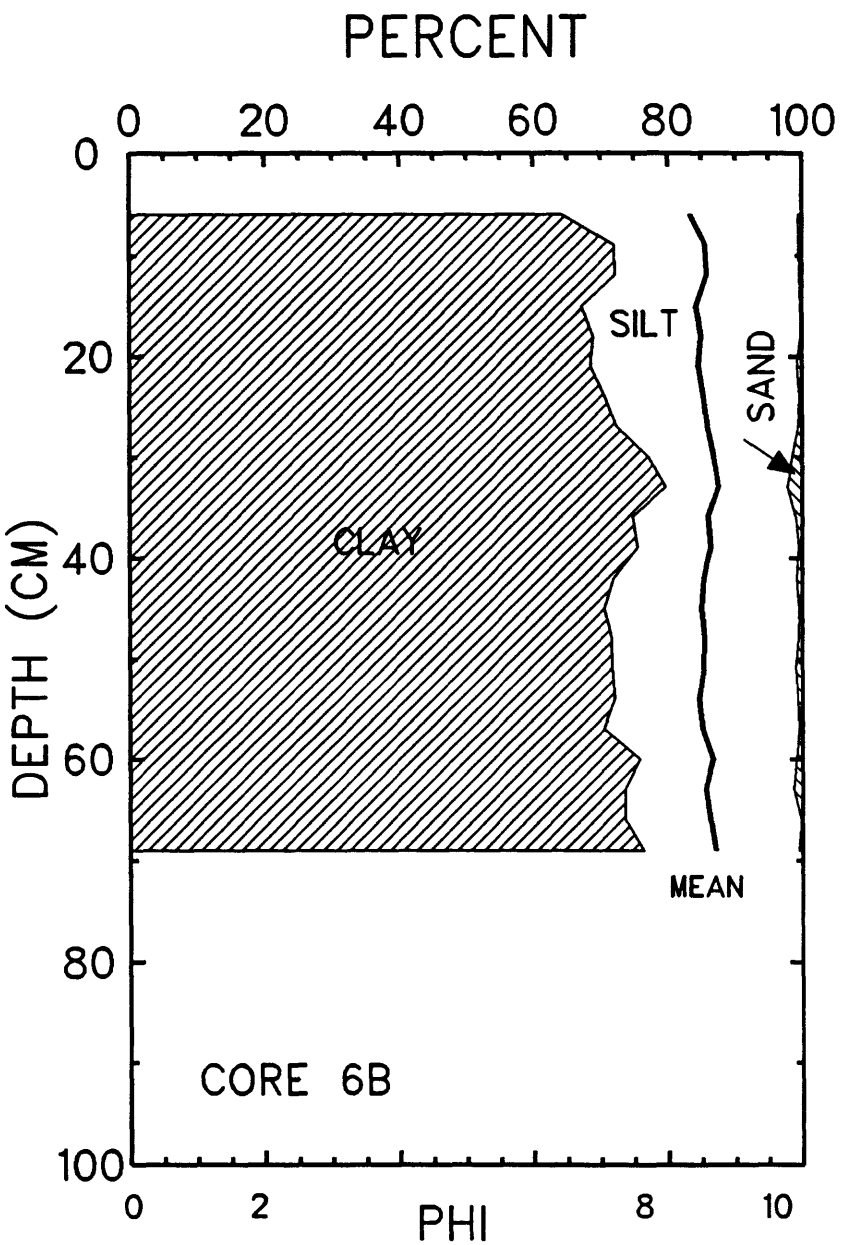

Figure 7. Profiles of clay (left, hatched), silt, and sand (right, hatched) percentages along with mean grain size (heavy line) for core 6B.

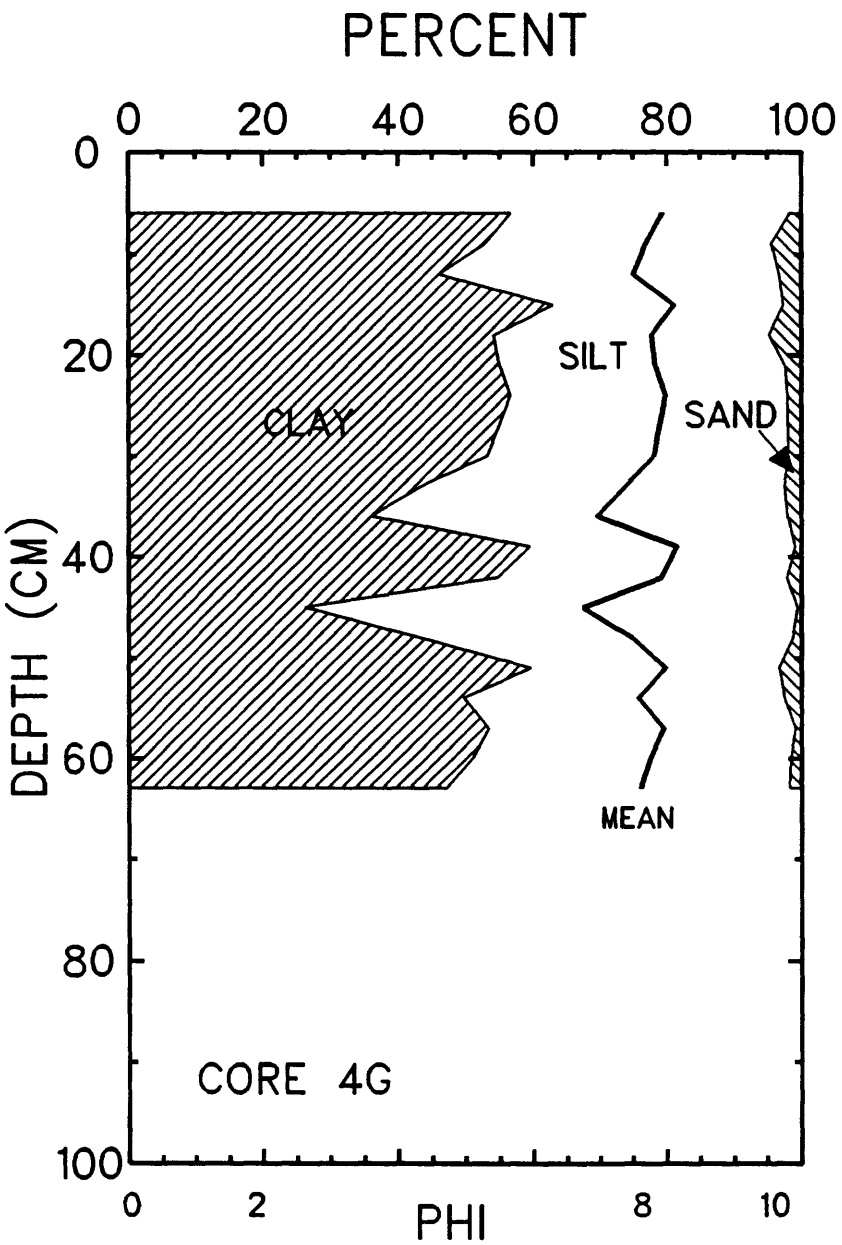

Figure 8. Profiles of clay (left, hatched), silt, and sand (right, hatched) percentages along with mean grain size (heavy line) for core 4G.

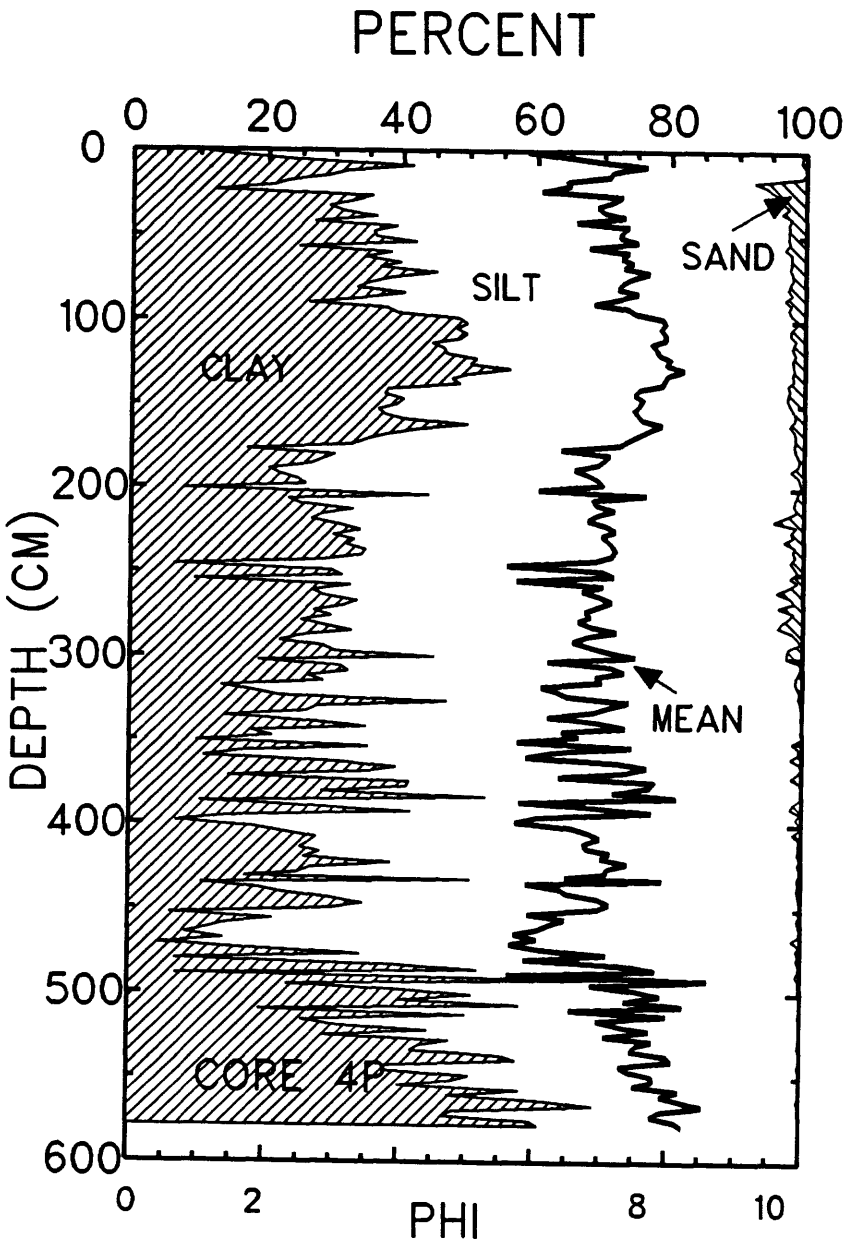

Figure 9. Profiles of clay (left, hatched), silt, and sand (right, hatched) percentages along with mean grain size (heavy line) for core 4P.

Increases in silt and sand near the top of the sediment section was also observed qualitatively in many of the cores collected in less than 80-100 m of water (Appendix C). The coarsening at the top of the section is particularly apparent at site 9 (Figs. 5 and 6). Core 9V contains the Chippewa unconformity at about 198 cm, and the sediment immediately above this unconformity contains abundant sand (Fig. 5) and gravel (Fig 10). At core site 6, in the center of the deep (173 m) southern basin of the lake, the upper part of the upper Lake Michigan Formation is remarkably uniform in texture (Fig. 7).

In core 4P, located in the thick accumulation of the upper Lake Michigan Formation on the eastern side of Lake Michigan (Lineback and Gross, 1972; Foster and Colman, in press), grain size becomes highly variable between about 250 and 500 cm (Fig. 9). This variablilty is associated with visually clear, rhythmic, alternating beds of silty clay and sandy silt (Appendix C). The unusually thick accumulation of Holocene sediment on the east side of the lake has been attributed to the rivers in western Michigan (Lineback and Gross, 1972; Foster and Colman, in press). In addition, preliminary radiocarbon, paleomagnetic, and ostracode data (unpublished) suggest that the sediments between 250 and 500 cm in core 4P were deposited very rapidly over a short interval of the earliest Holocene (about 9 to 10 ka).

Grain-size distributions were also measured for the top few cm of most of the cores to investigate the relationship between sediment texture and depth (Fig. 11). The data show a clear tendency for surficial grain size to decrease with water depth, but a great deal of scatter exists, much of which is probably related to the wide geographic distribution of the cores. This relationship has been noted in several studies in other Great Lakes (Rea and others, 1981). In the deep basins, all samples from water depths greater than about 150 m appear to have a consistent mean grain size of about 8.3 to 8.6 phi (Fig. 11).

WATER CONTENT AND BULK DENSITY

Water content and bulk density measurements were made on most of the cores, at a variety of sampling densities (Appendix B). These data show two clear relationships: (1) water content increases with decreasing grain size, and (2) water content decreases with increasing depth in any one core. Although some of the calculated values of grain-specific gravity deviate from the expected value of about 2.6, the associated measurement errors appear to be less important than the relationships to core depth and grain size.

The relationship of water content and bulk density to grain-size is illustrated by data for the core tops. The data show a clear increase in water content with decreasing grain-size, and the regression of grain size on water content has a coefficient of determination (R^2) of 0.66 (fig. 12). Because surface-sediment grain size decreases with water depth (fig. 11), water content of the surface sediment increases with water depth.

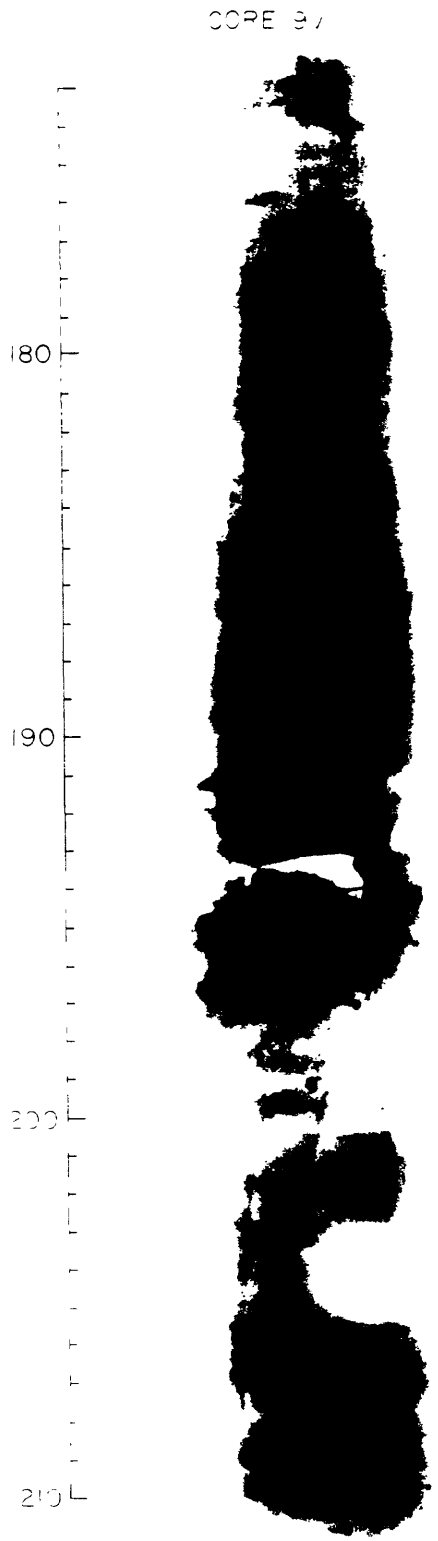

Figure 10. X-radiograph of the Chippewa unconformity and overlying coarse sediment in core 9V.

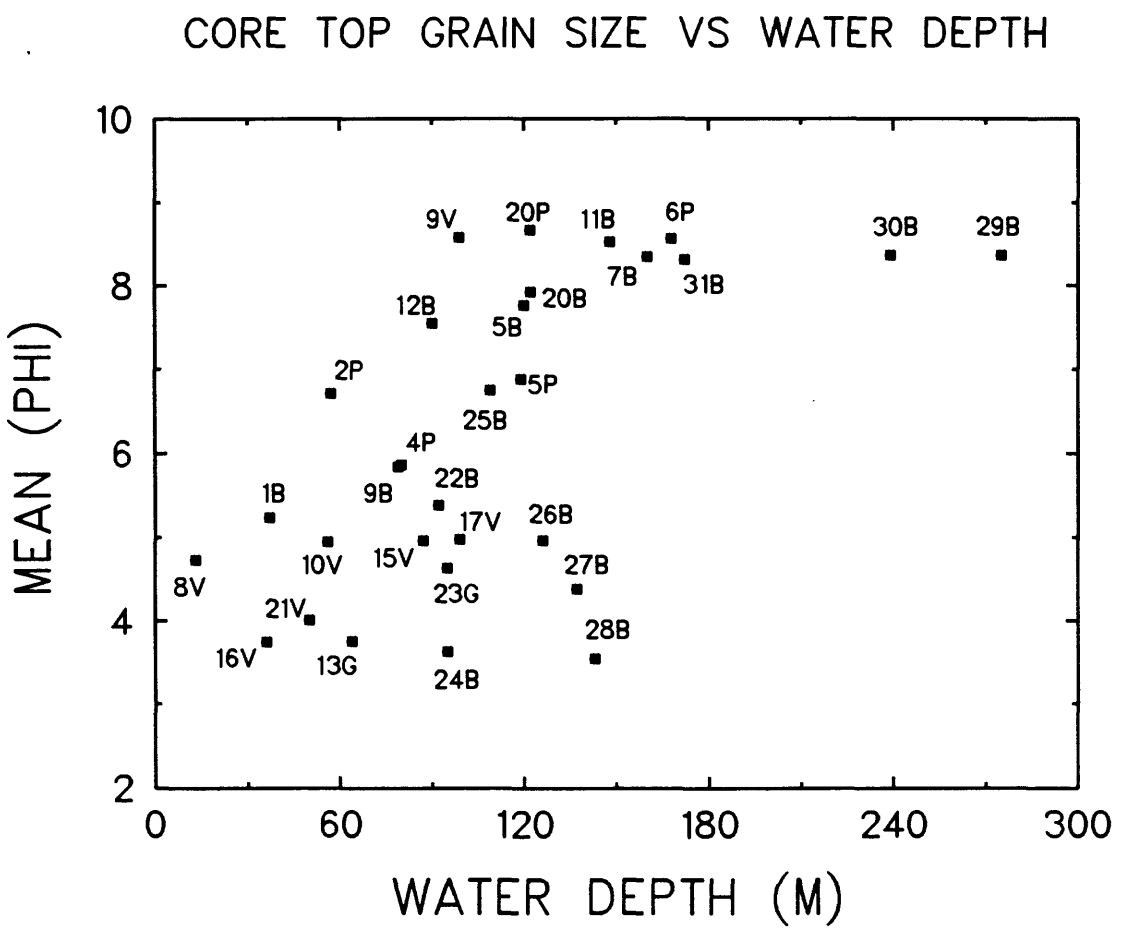

Figure 11. Plot of core-top grain size against water depth.

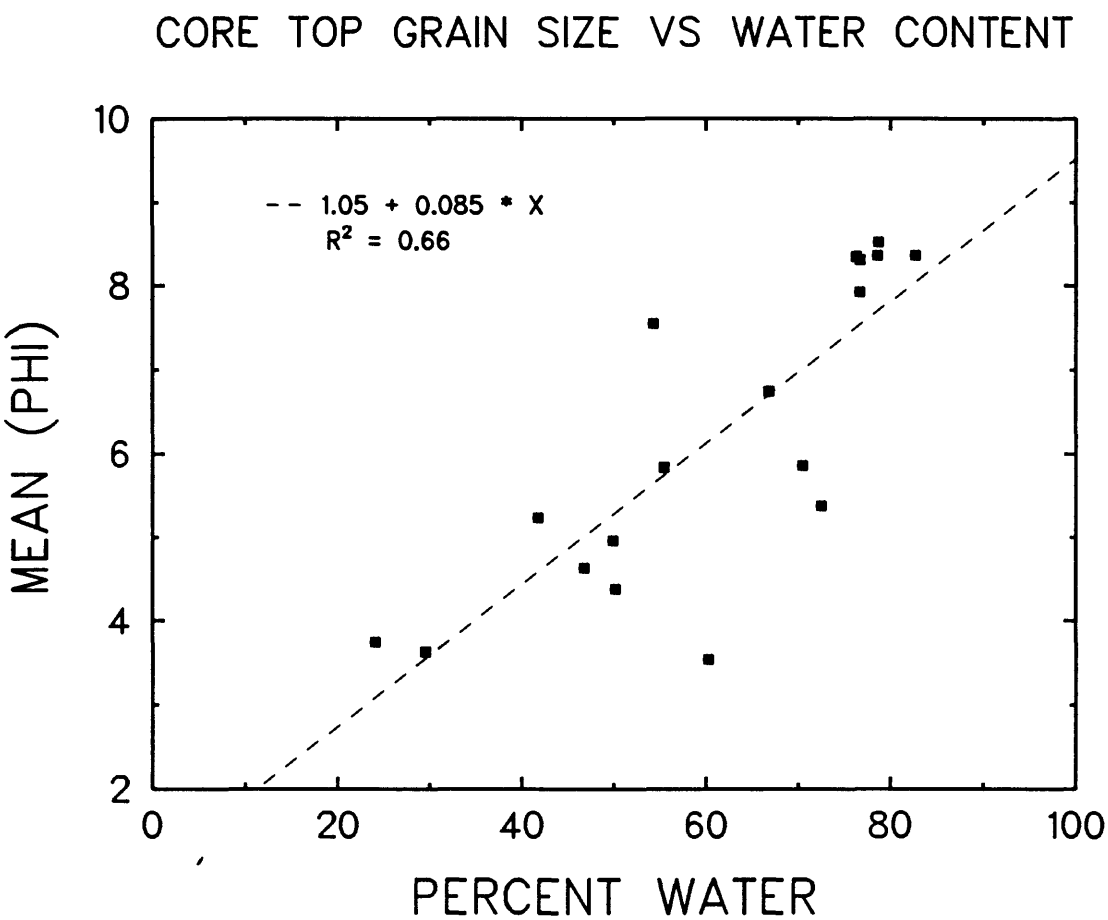

Figure 12. Plot of core-top grain size against water content.

Water content of the sediments decreases (and bulk density increases) with depth in the sediment column (Figs. 13 - 16), presumably due to compaction. The decrease is commonly regular, especially for cores in the deeper basins (Figs. 14 and 16). However, in cores that are relatively near shore and which vary in texture, grain-size variations may create irregularities in the overall decrease in water content with depth (Fig. 15). Cores on the western side of the southern basin whose grain-size increases near the sediment-water interface (cores sites 9, 12, 13, 22, and 23), commonly show an increase in water content with increasing depth near the top of the core, followed by the normal decrease with increasing depth below.

DISCUSSION

The cores collected in this study penetrated glacial, proglacial, glacial-lacustrine, and lacustrine sediments ranging in age from late Pleistocene to modern. In general, the stratigraphy deduced from these cores is consistent with the stratigraphic framework erected by previous studies, especially by Hough, 1955, 1958) and by the Illinois State Geological Survey (Lineback and others, 1970, 1971, 1974, 1979; Lineback and Gross, 1972; Wickham and others, 1978).

The tills below Lake Michigan record a series of advances of the continental ice sheet during its overall retreat through the Lake Michigan basin (Lineback and others, 1974). Only a few of our cores sampled these till units, and only one of these cores suggests revision of the outline of till units by Lineback and others (1974). The sediments at the base of core 9V appear to be Wadsworth till, and the Shorewood till margin appears to be north of core site 9.

The Equality Formation was sampled in several of our cores. It has been described as proglacial sediment and rock-flour outwash by Lineback and others (1970, 1971, 1974) and Wickham and others (1978) and has a relatively fine-grained texture. However, sandy zones and minor gravel occur within it, which, combined with its common and distinctive clay-pebble conglomerate, are consistent with the suggested origin.

The lower Lake Michigan Formation (South Haven and Sheboygan Members of Lineback and others, 1970) were deposited as distal glacial-lacustrine sediments. These reddish sediments are extremely fine-grained and relatively uniform. We were unable to consistently find the subtle color change that Lineback and others (1970) used to distinguish between the two members, so we have informally grouped the two together as the lower Lake Michigan Formation. The unit contains the Wilmette Bed, a distinctive gray marker bed of unknown origin. Wickham and others (1978) and Lineback and others (1979) argued that the red clays were not deposited until after the Two Rivers glacier began to retreat and that the majority of the red sediment was brought into the Lake Michigan basin as outwash from the Lake Superior basin. In contrast, we suggest that the red clays below the Wilmette Bed were deposited in association with the reddish tills in the Lake Michigan basin.

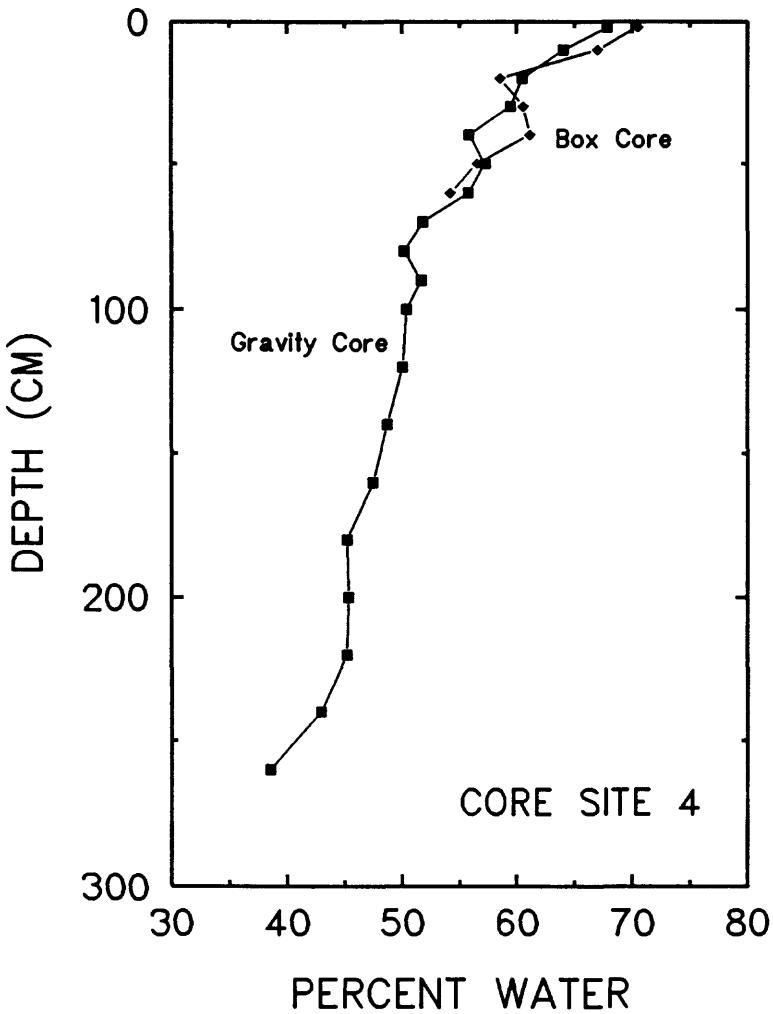

Figure 13. Profile of water content against depth for core site 4.

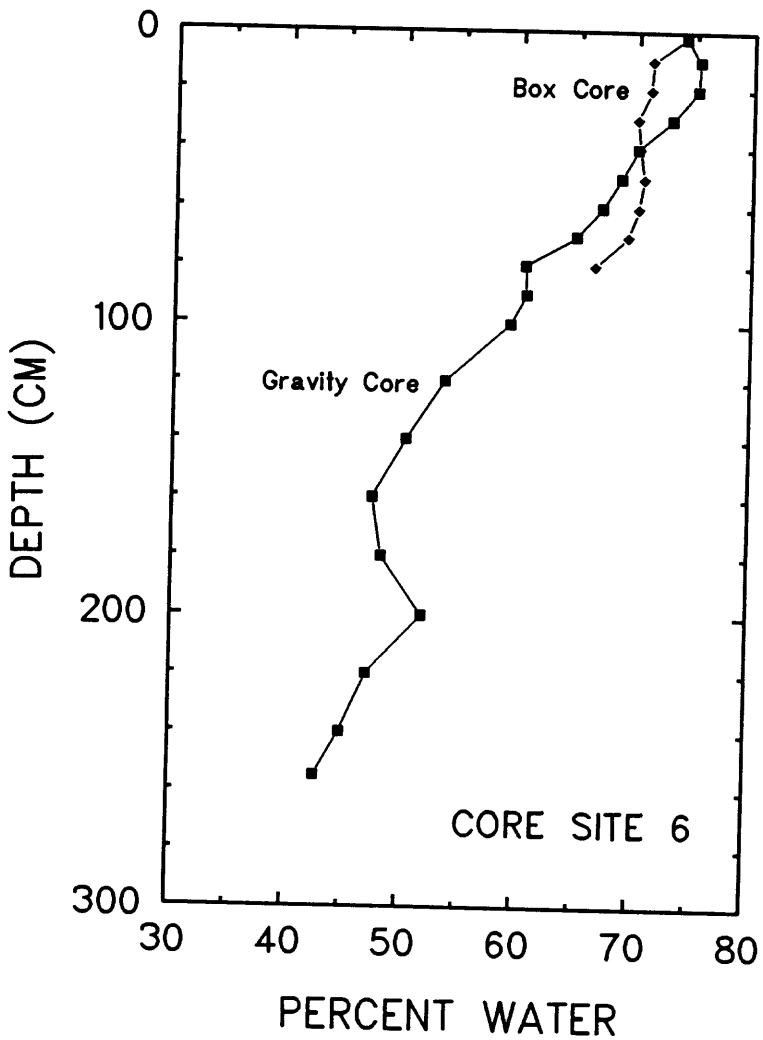

Figure 14. Profile of water content against depth for core site 6.

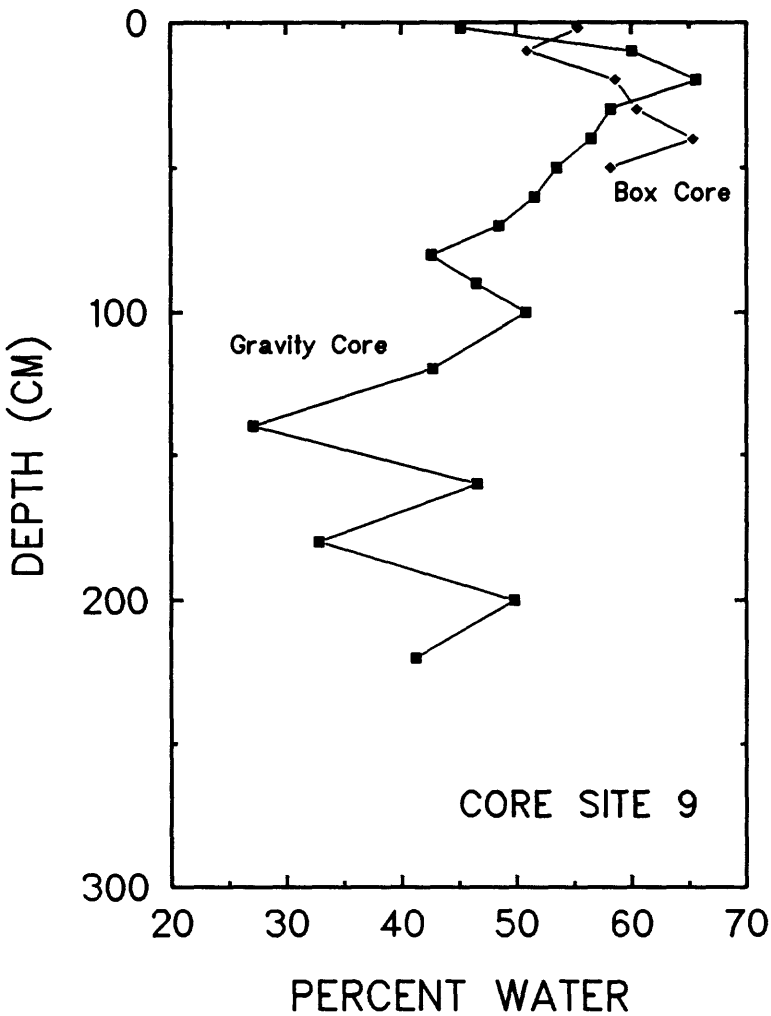

Figure 15. Profile of water content against depth for core site 9.

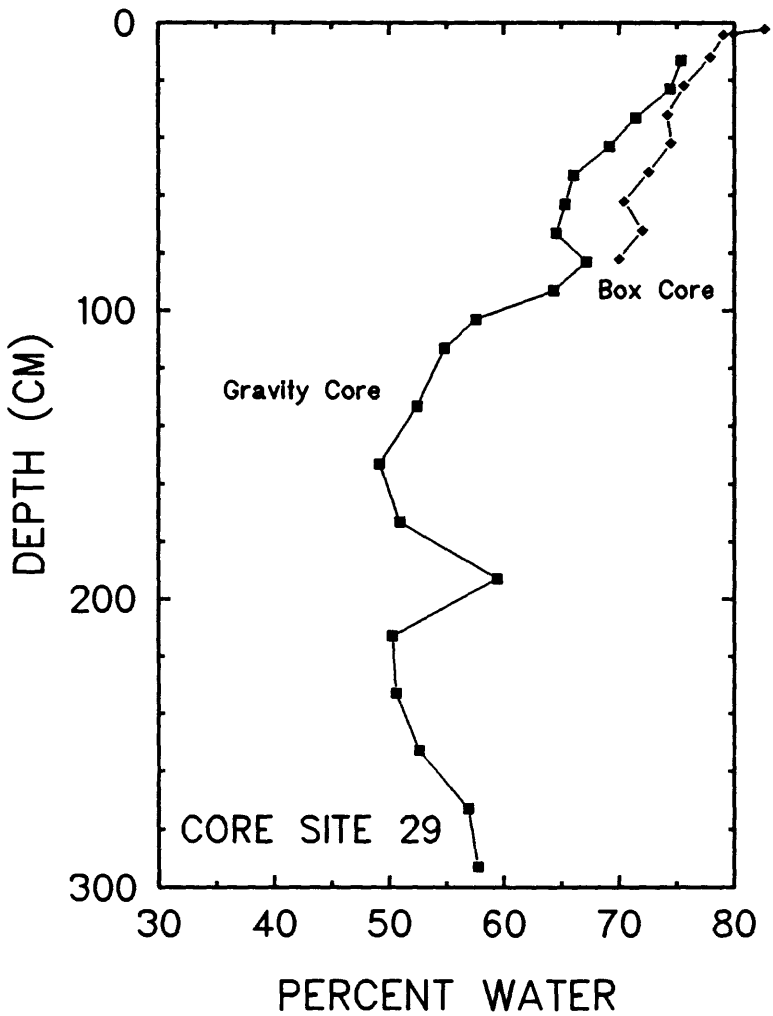

Figure 16. Profile of water content against depth for core site 29.

The upper Lake Michigan Formation (Winnetka, Lake Forest, and Waukegan Members of Lineback and others, 1970) was deposited after glaciers had left the basin. It is separated from the lower Lake Michigan Formation by the Chippewa unconformity in water less than about 80-100 m deep, and by a gradational color change in deeper water. The unconformity was formed during the Chippewa low stage of Lake Michigan and the subsequent transgression. Although the Chippewa unconformity was not discussed in the early Illinois State Geological Survey reports, Wickham and others (1978) and Lineback and others (1979) state that the unconformity truncates both the South Haven and the Sheboygan Members and that the associated sandy zone extends to depths of 82 m below lake level, as opposed to the 107-m estimate of Hough (1955). The upper limit of the truncated red clays is also at this level (Wickham and others, 1978; Lineback and others, 1979).

The distinctions between the Winnetka, Lake Forest, and Waukegan Members was apparently based mostly on the abundance of streaks and laminae of black hydrous monosulfides in the Lake Forest Member (Lineback and others, 1970). However, the Winnetka Member tends to be browner than the other two and the Waukegan Member tends to coarsen upward (Lineback and others, 1970, 1971; Lineback and Gross, 1972; Wickham and others, 1978). We infer that the black monosulfides are a diagenetic feature associated with decreasing organic matter content with depth (Shimp and others, 1971; Rea and others, 1980). We also infer that the sediments above the Chippewa unconformity represent continuous sedimentation since the Chippewa low stage. Therefore, we have grouped the three members into a single informal unit, the upper Lake Michigan Formation. In some senses, our subdivision of the Lake Michigan Formation into a lower, red unit and an upper, gray unit is more akin to Hough's (1955, 1958) classification than to the Illinois State Geological Survey framework (Lineback and others, 1970, 1971; Wickham and others, 1978).

Detailed grain-size profiles of our cores show that the upper Lake Michigan Formation in less than about 80 m of water fluctuates in grain size, and that the sediments immediately above the Chippewa unconformity and at the tops of the cores in these areas tend to be noticeably coarser. In contrast, the upper Lake Michigan Formation in the deep basins tends to be fine-grained and relatively uniform. Core-top sediments show a general tendency, with considerable scatter, to become finer grained with water depth. The sediments are generally very water-rich at the tops of the cores, especially in the deep basins. Water contents show a strong tendency to decrease with depth in the cores and with increasing grain size.

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Appendix A.-- Grain-size data.

Sample	Interval (cm) Top	Bottom	Cumulative-frequency percent -- Phi class midpoints 10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Weight percentages Gravel	Sand	Silt	Clay	Statistics Mean	SD	Skew	Kurt
											Core tops													
1BT1	0.0	2.0	100.00	98.37	95.33	92.23	89.61	83.23	57.70	5.42	2.92	1.80	0.23	0.00	0.00	0.00	5.42	86.81	7.77	5.23	1.49	0.70	3.33
4PT1	0.0	1.5	100.00	98.04	94.23	89.60	83.48	68.43	29.77	0.73	0.07	0.03	0.02	0.00	0.00	0.00	0.73	88.87	10.40	5.86	1.42	0.71	1.62
5BT1	0.0	2.0	100.00	89.72	66.43	47.78	37.53	24.46	6.03	0.51	0.31	0.17	0.08	0.00	0.00	0.00	0.51	47.27	52.22	7.77	1.84	-0.15	-0.99
5PT1	0.0	1.0	100.00	93.84	80.78	66.52	54.95	42.67	19.57	1.81	1.20	0.66	0.08	0.00	0.00	0.00	1.81	64.71	33.48	6.88	1.97	0.07	-0.91
6PT1	0.0	1.0	100.00	86.27	55.64	27.50	14.39	7.47	1.63	0.68	0.36	0.23	0.04	0.00	0.00	0.00	0.68	26.82	72.50	8.56	1.45	-0.56	1.65
7BT1	0.0	2.0	100.00	87.55	58.74	33.22	19.87	9.68	3.03	1.23	0.83	0.50	0.13	0.00	0.00	0.00	1.23	31.99	66.78	8.35	1.61	-0.55	1.57
8VT1	0.0	1.0	100.00	94.83	82.63	68.78	58.45	49.76	39.94	36.69	34.23	31.45	29.23	27.00	23.59	23.59	13.10	32.09	31.22	4.73	4.29	-0.20	-1.41
9BT1	0.0	2.0	100.00	95.56	86.01	77.41	69.09	58.69	37.29	21.92	13.66	5.06	1.10	0.39	0.00	0.00	21.92	55.49	22.59	5.84	2.42	0.05	-0.67
9VT1	0.0	1.0	100.00	84.26	55.89	30.87	15.10	5.00	0.82	0.14	0.09	0.01	0.00	0.00	0.00	0.00	0.14	30.73	69.13	8.58	1.38	-0.33	-0.05
10VT1	0.0	1.0	99.98	98.08	94.64	91.22	87.94	81.72	60.26	31.42	7.70	2.26	0.14	0.00	0.00	0.00	31.42	59.80	8.76	4.94	1.80	0.54	1.31
11BT1	0.0	2.0	100.00	88.52	53.18	28.44	16.35	7.20	2.13	0.96	0.58	0.23	0.03	0.00	0.00	0.00	0.96	27.48	71.56	8.52	1.48	-0.60	1.79
12BT1	0.0	2.0	100.00	88.83	66.20	47.31	37.27	27.54	16.94	6.20	3.01	0.84	0.33	0.26	0.00	0.00	6.20	41.11	52.69	7.55	2.22	-0.32	-0.42
13GT1	0.0	2.0	100.00	97.54	92.93	89.09	86.74	84.31	80.18	67.88	53.78	19.25	2.30	0.45	0.15	0.15	67.73	21.21	10.91	3.75	2.42	0.66	0.93
15VT1	0.0	1.0	100.00	94.41	83.71	74.37	68.92	65.27	59.49	52.43	35.32	11.59	3.53	2.51	2.33	2.33	50.10	21.94	25.63	4.96	3.08	0.17	-1.02
16VT1	0.0	1.0	100.00	97.18	91.20	85.68	82.23	78.73	75.41	74.94	60.30	21.94	4.66	2.40	0.85	0.85	74.09	10.74	14.32	3.74	2.74	0.56	0.14
17VT1	0.0	1.0	100.00	97.63	93.20	88.70	84.12	77.02	60.98	32.15	13.14	3.55	1.11	0.58	0.37	0.37	31.78	56.55	11.30	4.97	2.07	0.35	0.60
20BT1	0.0	2.0	100.00	88.46	63.78	43.11	31.05	20.22	8.24	1.36	0.70	0.36	0.14	0.00	0.00	0.00	1.36	41.75	56.89	7.93	1.87	-0.31	-0.37
20PT1	6.0	8.0	100.00	84.24	51.56	24.06	11.18	5.86	2.92	1.57	1.04	0.52	0.13	0.11	0.00	0.00	1.57	22.49	75.94	8.67	1.51	-0.85	4.60
21VT1	0.0	1.0	100.00	97.37	92.86	88.61	85.67	82.26	73.22	60.65	43.28	14.35	4.91	3.54	2.59	2.59	58.06	27.96	11.39	4.01	2.55	0.37	0.40
22BT1	0.0	2.0	99.85	92.11	76.50	64.94	58.97	54.39	49.77	46.75	41.74	20.79	3.60	1.08	0.00	0.00	46.75	18.19	34.91	5.38	3.40	0.06	-1.61
23GT1	0.0	2.0	100.00	94.71	85.56	78.36	75.13	72.46	67.99	59.93	39.11	10.18	1.83	1.13	0.79	0.79	59.14	18.43	21.64	4.63	2.88	0.38	-0.69
24BT1	0.0	2.0	100.00	98.11	93.79	90.09	87.86	85.41	81.27	73.86	57.56	16.64	1.84	0.42	0.20	0.20	73.66	16.23	9.91	3.63	2.31	0.75	1.42
25BT1	0.0	2.0	100.00	92.21	74.64	58.84	50.03	42.68	30.27	14.93	9.55	1.84	0.26	0.00	0.00	0.00	14.93	43.91	41.16	6.75	2.52	-0.12	-1.13
26BT1	0.0	2.0	100.00	95.29	85.13	76.45	71.61	68.10	62.09	50.67	36.38	7.86	0.71	0.00	0.00	0.00	50.67	25.78	23.55	4.96	2.83	0.31	-1.07
27BT1	0.0	2.0	100.00	94.37	83.52	75.13	71.09	68.12	66.34	65.43	60.05	25.00	2.64	0.23	0.00	0.00	65.43	9.70	24.87	4.38	3.22	0.38	-1.12
28BT1	0.0	2.0	99.92	96.95	90.08	84.24	81.40	79.23	77.64	76.69	71.47	33.65	3.84	0.00	0.00	0.00	76.69	7.55	15.68	3.54	2.82	0.67	0.26
29BT1	0.0	2.0	100.00	88.41	59.68	34.46	19.27	9.03	2.17	0.38	0.25	0.13	0.00	0.00	0.00	0.00	0.38	34.08	65.54	8.36	1.50	-0.39	0.30
2PT1	0.0	1.0	100.00	95.28	84.94	73.06	61.64	40.51	11.57	8.05	2.83	0.90	0.08	0.00	0.00	0.00	8.05	65.01	26.94	6.71	1.89	0.01	-0.22
30BT1	0.0	2.0	100.00	89.26	61.55	34.29	18.50	8.23	2.07	0.28	0.18	0.06	0.00	0.00	0.00	0.00	0.28	34.01	65.71	8.36	1.45	-0.37	0.23
31BT1	0.0	2.0	100.00	87.88	60.21	33.98	20.14	11.09	4.28	0.59	0.41	0.16	0.00	0.00	0.00	0.00	0.59	33.39	66.02	8.31	1.60	-0.44	0.42
											Core 9V												
9T1	0.0	1.5	100.00	98.13	93.71	88.29	82.77	76.71	67.57	53.67	37.24	12.20	1.93	0.44	0.00	0.00	53.67	34.62	11.71	4.37	2.41	0.39	-0.27
9T2	1.5	4.5	100.00	96.02	87.08	76.58	65.78	56.07	44.04	33.72	24.58	9.14	2.60	1.16	0.71	0.71	33.01	42.86	23.42	5.53	2.76	-0.01	-0.97
9T3	4.5	7.5	100.00	95.45	85.07	74.06	63.90	54.55	41.35	26.20	18.90	7.29	1.99	0.88	0.38	0.38	25.82	47.86	25.94	5.80	2.66	-0.03	-0.88
9T4	7.5	10.5	100.00	94.98	82.74	67.79	53.11	40.60	28.20	22.28	9.94	3.58	0.71	0.13	0.00	0.00	22.28	45.51	32.21	6.46	2.46	-0.16	-0.88

Sample	Interval (cm) Top	Bottom	Cumulative-frequency percent -- Phi class midpoints 10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Weight percentages Gravel	Sand	Silt	Clay	Statistics Mean	SD	Skew	Kurt
9T5	10.5	13.5	100.00	89.44	66.27	47.19	35.14	26.28	14.34	9.64	6.31	2.42	1.08	0.80	0.78	0.78	8.86	37.55	52.81	7.50	2.40	-0.51	0.77
9T6	13.5	16.5	100.00	94.42	81.46	66.14	52.61	39.24	27.62	14.46	4.42	0.84	0.10	0.00	0.00	0.00	14.46	51.68	33.86	6.69	2.24	-0.08	-1.00
9T7	16.5	19.5	100.00	88.96	67.32	48.62	34.32	24.07	16.98	13.54	4.61	0.93	0.10	0.00	0.00	0.00	13.54	35.08	51.38	7.51	2.31	-0.37	-0.45
9T8	19.5	22.5	100.00	93.01	72.58	57.15	47.03	40.93	32.04	18.24	10.65	2.83	0.62	0.47	0.43	0.43	17.81	38.91	42.85	6.74	2.65	-0.20	-0.94
9T9	22.5	25.5	100.00	87.95	59.34	41.10	27.75	19.58	15.61	14.29	6.46	2.13	0.16	0.02	0.00	0.00	14.29	26.81	58.90	7.76	2.40	-0.54	0.12
9T10	25.5	28.5	100.00	87.65	67.07	48.96	32.82	20.56	11.29	9.74	4.80	1.25	0.18	0.07	0.00	0.00	9.74	39.22	51.04	7.66	2.19	-0.43	0.17
9T11	28.5	31.5	100.00	85.97	63.04	43.86	27.88	15.91	7.85	5.56	4.69	2.44	0.76	0.16	0.00	0.00	5.56	38.30	56.14	7.92	2.11	-0.60	1.48
9T12	31.5	34.5	100.00	86.00	63.43	43.46	27.18	16.41	9.51	8.34	3.82	1.57	0.29	0.06	0.00	0.00	8.34	35.12	56.54	7.90	2.12	-0.54	0.81
9T13	34.5	37.5	100.00	88.69	69.63	52.80	36.59	25.06	14.65	10.40	5.16	1.45	0.13	0.02	0.00	0.00	10.40	42.40	47.20	7.45	2.26	-0.35	-0.26
9T14	37.5	40.5	100.00	88.70	69.29	50.61	34.05	21.47	11.14	9.32	3.36	1.30	0.33	0.18	0.15	0.15	9.17	41.29	49.39	7.60	2.15	-0.42	0.36
9T15	40.5	43.5	100.00	84.29	64.67	49.69	35.49	25.49	17.87	9.88	4.14	1.00	0.21	0.16	0.00	0.00	9.88	39.81	50.31	7.57	2.34	-0.33	-0.50
9T16	43.5	46.5	100.00	86.44	67.73	51.32	35.71	21.64	10.93	6.80	5.77	2.40	0.61	0.29	0.00	0.00	6.80	44.52	48.68	7.60	2.23	-0.44	0.52
9T17	46.5	49.5	100.00	84.57	62.11	43.68	28.64	15.87	7.81	5.91	5.00	2.29	0.41	0.08	0.00	0.00	5.91	37.77	56.32	7.94	2.13	-0.56	1.16
9T18	49.5	52.5	100.00	83.25	62.48	46.33	29.94	17.00	9.16	5.00	4.14	1.84	0.39	0.03	0.00	0.00	5.00	41.33	53.67	7.90	2.12	-0.48	0.70
9T19	52.5	55.5	100.00	79.94	49.31	26.98	14.22	8.21	5.45	4.35	3.63	1.65	0.48	0.30	0.00	0.00	4.35	22.63	73.02	8.55	1.91	-0.94	4.25
9T20	55.5	58.5	100.00	85.22	62.38	42.46	25.94	11.81	5.44	3.98	3.04	1.14	0.16	0.04	0.00	0.00	3.98	38.48	57.54	8.08	1.90	-0.54	1.42
9T21	58.5	61.5	100.00	82.85	58.89	40.24	23.23	10.50	4.61	2.62	2.11	0.78	0.07	0.00	0.00	0.00	2.62	37.62	59.76	8.24	1.82	-0.51	1.23
9T22	61.5	64.5	100.00	86.68	65.62	46.11	28.86	15.30	7.11	4.79	4.21	1.82	0.43	0.13	0.00	0.00	4.79	41.32	53.89	7.89	2.02	-0.54	1.34
9T23	64.5	67.5	100.00	86.21	65.57	46.75	29.72	16.20	7.57	4.85	3.69	1.17	0.31	0.08	0.00	0.00	4.85	41.90	53.25	7.88	2.01	-0.47	0.86
9T24	67.5	70.5	100.00	85.84	66.41	48.88	30.80	17.21	8.80	6.17	4.88	2.02	0.32	0.05	0.00	0.00	6.17	42.71	51.12	7.79	2.11	-0.48	0.81
9T25	70.5	73.5	100.00	78.53	55.48	38.32	23.68	13.26	8.47	7.19	5.98	3.22	1.47	1.10	0.76	0.76	6.43	31.13	61.68	8.13	2.34	-0.79	2.76
9T26	73.5	76.5	100.00	79.91	56.82	37.05	20.55	10.62	6.27	4.94	3.74	1.36	0.21	0.00	0.00	0.00	4.94	32.11	62.95	8.29	1.98	-0.66	1.86
9T27	76.5	79.5	100.00	83.59	59.45	39.77	23.76	12.44	7.89	6.75	5.26	2.07	0.37	0.13	0.00	0.00	6.75	33.02	60.23	8.09	2.11	-0.66	1.71
9T28	79.5	82.5	100.00	82.56	60.16	41.04	25.11	12.19	5.99	4.58	3.80	1.42	0.17	0.00	0.00	0.00	4.58	36.46	58.96	8.13	1.98	-0.57	1.40
9T29	82.5	85.5	100.00	83.32	61.84	46.53	32.18	19.47	11.12	6.01	4.99	2.52	0.78	0.11	0.00	0.00	6.01	40.52	53.47	7.81	2.25	-0.48	0.60
9T30	85.5	88.5	100.00	85.13	66.59	48.05	28.31	12.91	5.23	3.92	3.38	1.40	0.27	0.07	0.00	0.00	3.92	44.13	51.95	7.95	1.92	-0.49	1.38
9T31	88.5	91.5	100.00	86.76	67.50	49.77	32.50	19.34	11.35	7.52	3.85	1.12	0.14	0.00	0.00	0.00	7.52	42.25	50.23	7.70	2.12	-0.40	0.15
9T32	91.5	94.5	100.00	85.82	64.06	43.66	26.94	14.57	7.33	5.57	4.85	1.80	0.17	0.00	0.00	0.00	5.57	38.09	56.34	7.95	2.05	-0.56	1.24
9T33	94.5	97.5	100.00	83.87	62.30	41.72	22.35	10.87	6.39	5.17	4.39	1.72	0.26	0.05	0.00	0.00	5.17	36.55	58.28	8.11	1.98	-0.65	1.98
9T34	97.5	100.5	100.00	86.53	65.91	46.15	28.88	16.06	8.67	7.34	5.92	2.00	0.46	0.16	0.00	0.00	7.34	38.81	53.85	7.82	2.15	-0.56	1.14
9T35	100.5	103.5	100.00	86.81	58.20	34.87	19.47	11.51	8.64	6.77	5.36	2.10	0.46	0.18	0.00	0.00	6.77	28.10	65.13	8.16	2.07	-0.79	2.42
9T36	103.5	106.5	100.00	80.69	34.09	21.79	13.48	6.71	5.11	4.99	4.13	1.77	0.42	0.16	0.00	0.00	4.99	16.80	78.21	8.77	1.90	-1.12	5.30
9T37	106.5	109.5	100.00	89.34	41.37	14.68	11.05	9.57	8.75	8.55	7.84	5.30	4.10	3.91	3.82	3.82	4.73	6.13	85.32	8.42	2.59	-1.37	6.90
9T38	109.5	112.5	100.00	84.26	63.51	48.21	36.18	26.06	15.53	10.60	9.00	4.10	0.75	0.15	0.00	0.00	10.60	37.61	51.79	7.52	2.52	-0.43	-0.07
9T39	112.5	115.5	100.00	89.16	76.66	66.26	55.39	42.75	18.52	12.19	8.17	2.98	0.79	0.39	0.36	0.36	11.83	54.07	33.74	6.76	2.42	-0.15	-0.35
9T40	115.5	118.5	100.00	84.89	66.45	51.20	36.99	22.00	11.76	8.84	5.74	2.41	0.52	0.17	0.00	0.00	8.84	42.36	48.80	7.59	2.30	-0.41	0.20
9T41	118.5	121.5	100.00	86.02	66.74	49.47	32.13	15.82	5.23	3.64	2.20	1.03	0.40	0.18	0.09	0.09	3.55	45.83	50.53	7.87	1.92	-0.41	1.05

Sample	Interval (cm) Top	Bottom	Cumulative-frequency percent -- Phi class midpoints 10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Weight percentages Gravel	Sand	Silt	Clay	Statistics Mean	SD	Skew	Kurt
9T42	121.5	124.5	100.00	86.59	67.41	50.04	33.18	17.47	6.47	3.89	2.37	0.78	0.13	0.05	0.00	0.00	3.89	46.15	49.96	7.82	1.93	-0.34	0.32
9T43	124.5	127.5	100.00	88.71	73.86	61.22	47.90	31.99	16.38	5.31	2.69	0.93	0.21	0.18	0.14	0.14	5.17	55.91	38.78	7.20	2.15	-0.13	-0.47
9T44	127.5	130.5	100.00	86.58	68.96	53.60	36.74	21.44	11.34	6.03	2.02	0.63	0.15	0.09	0.00	0.00	6.03	47.57	46.40	7.62	2.06	-0.28	-0.23
9T45	130.5	133.5	100.00	91.07	70.06	50.00	34.76	21.06	10.48	5.15	3.47	1.45	0.41	0.21	0.00	0.00	5.15	44.85	50.00	7.62	2.04	-0.43	0.56
9T46	133.5	136.5	100.00	88.10	73.34	59.73	46.85	33.36	18.11	6.42	4.64	1.76	0.63	0.32	0.19	0.19	6.23	53.31	40.27	7.17	2.28	-0.21	-0.27
9T47	136.5	139.5	100.00	82.50	55.91	35.77	23.29	14.52	8.02	6.08	3.74	1.14	0.26	0.07	0.00	0.00	6.08	29.69	64.23	8.19	2.07	-0.62	1.25
9T48	139.5	142.5	100.00	83.11	57.11	38.11	26.77	17.52	9.70	5.15	2.72	0.95	0.25	0.09	0.00	0.00	5.15	32.96	61.89	8.09	2.09	-0.52	0.56
9T49	142.5	145.5	100.00	87.81	71.36	56.78	40.49	21.73	7.46	4.93	2.61	1.09	0.27	0.07	0.00	0.00	4.93	51.85	43.22	7.55	2.00	-0.26	0.13
9T50	145.5	148.5	100.00	90.10	77.49	66.04	49.78	29.06	10.03	4.04	1.76	0.62	0.10	0.01	0.00	0.00	4.04	62.00	33.96	7.21	1.93	-0.04	-0.42
9T51	148.5	151.5	100.00	89.35	74.75	61.69	45.98	24.98	10.86	4.09	2.48	1.19	0.25	0.03	0.00	0.00	4.09	57.60	38.31	7.34	2.00	-0.17	-0.14
9T52	151.5	154.5	100.00	92.26	82.31	73.13	62.03	43.79	23.31	4.47	3.32	1.33	0.31	0.05	0.00	0.00	4.47	68.66	26.87	6.64	2.06	0.08	-0.45
9T53	154.5	157.5	100.00	87.73	70.84	54.58	33.69	11.90	3.85	1.79	1.44	0.79	0.22	0.09	0.00	0.00	1.79	52.79	45.42	7.83	1.74	-0.27	0.88
9T54	157.5	160.5	100.00	85.70	65.98	49.10	32.00	14.61	4.66	2.90	2.43	1.70	1.12	0.91	0.91	0.91	1.99	46.20	50.90	7.88	2.01	-0.64	3.47
9T55	160.5	163.5	100.00	87.93	69.28	52.39	32.73	12.76	3.77	1.92	1.44	0.75	0.22	0.12	0.00	0.00	1.92	50.47	47.61	7.87	1.75	-0.31	0.87
9T56	163.5	166.5	100.00	87.05	67.63	49.69	30.42	11.90	3.34	1.94	1.47	0.73	0.16	0.08	0.00	0.00	1.94	47.75	50.31	7.96	1.74	-0.33	0.88
9T57	166.5	169.5	100.00	85.90	65.13	46.06	29.09	13.53	5.86	4.35	4.11	3.49	2.93	2.77	2.77	2.77	1.58	41.71	53.94	7.84	2.33	-0.96	5.25
9T58	169.5	172.5	100.00	87.64	67.66	49.57	33.78	17.50	7.25	5.52	4.93	2.89	1.15	0.65	0.59	0.59	4.93	44.05	50.43	7.71	2.16	-0.61	2.16
9T59	172.5	175.5	100.00	88.07	70.04	54.65	38.31	23.26	12.91	9.40	7.92	3.67	0.74	0.13	0.00	0.00	9.40	45.25	45.35	7.41	2.34	-0.43	0.29
9T60	175.5	178.5	100.00	82.33	60.43	42.03	23.27	8.89	3.85	3.32	2.65	1.29	0.31	0.13	0.00	0.00	3.32	38.71	57.97	8.22	1.85	-0.58	2.16
9T61	178.5	181.5	100.00	89.89	76.45	62.75	46.98	29.86	13.15	3.92	3.06	1.66	0.79	0.58	0.54	0.54	3.38	58.83	37.25	7.20	2.11	-0.27	0.76
9T62	181.5	184.5	100.00	90.22	73.52	55.22	33.60	12.08	3.17	1.73	1.18	0.52	0.14	0.07	0.00	0.00	1.73	53.49	44.78	7.79	1.65	-0.24	0.79
9T63	184.5	187.5	100.00	90.23	75.99	61.55	44.43	22.58	6.57	2.95	2.04	0.89	0.17	0.02	0.00	0.00	2.95	58.60	38.45	7.43	1.86	-0.15	0.07
9T64	187.5	190.5	100.00	92.05	79.10	64.69	48.36	25.45	8.35	4.42	3.17	1.60	0.42	0.22	0.19	0.19	4.23	60.27	35.31	7.22	1.94	-0.25	0.79
9T65	190.5	193.5	100.00	91.04	77.16	62.69	45.85	25.41	13.95	9.96	8.10	4.84	1.35	0.43	0.15	0.15	9.81	52.73	37.31	7.09	2.32	-0.41	0.56
9T66	193.5	196.5	100.00	94.26	85.73	76.94	66.72	52.22	36.01	29.65	26.37	20.19	15.14	13.83	13.07	13.07	16.58	47.29	23.06	5.20	3.54	-0.29	-0.63
9T67	196.5	199.5	100.00	91.15	77.28	64.99	53.85	37.79	20.03	11.01	9.20	5.74	2.31	1.17	0.71	0.71	10.30	53.98	35.01	6.75	2.51	-0.31	0.21
9T68	199.5	202.5	100.00	81.54	47.16	27.77	16.56	9.51	5.23	3.15	2.52	1.44	0.29	0.04	0.00	0.00	3.15	24.62	72.23	8.55	1.85	-0.83	3.19
9T69	202.5	205.5	100.00	81.18	46.26	23.46	13.19	7.43	3.25	2.13	1.54	0.74	0.14	0.07	0.00	0.00	2.13	21.33	76.54	8.71	1.64	-0.87	4.00
9T70	205.5	208.5	100.00	79.52	44.20	18.82	7.22	3.56	2.00	1.36	1.12	0.43	0.11	0.00	0.00	0.00	1.36	17.46	81.18	8.92	1.40	-0.97	6.31
9T71	208.5	211.5	100.00	83.04	50.37	27.19	13.70	6.84	3.14	1.19	0.98	0.35	0.09	0.00	0.00	0.00	1.19	26.00	72.81	8.63	1.56	-0.69	2.61
9T72	211.5	214.5	100.00	79.30	42.70	23.85	13.28	6.09	2.25	1.39	1.10	0.47	0.07	0.00	0.00	0.00	1.39	22.46	76.15	8.80	1.56	-0.78	3.25
9T73	214.5	217.5	100.00	80.14	42.63	24.47	14.79	8.20	3.90	0.90	0.65	0.30	0.09	0.02	0.00	0.00	0.90	23.57	75.53	8.74	1.62	-0.71	2.10
9T74	217.5	220.5	100.00	77.71	32.06	13.93	6.83	3.37	1.55	0.87	0.71	0.30	0.07	0.00	0.00	0.00	0.87	13.06	86.07	9.13	1.30	-1.10	7.23
9T75	220.5	223.5	100.00	80.31	37.61	17.96	8.58	3.29	1.02	0.53	0.42	0.18	0.06	0.00	0.00	0.00	0.53	17.43	82.04	9.00	1.30	-0.82	4.23
9T76	223.5	226.5	100.00	80.58	37.56	19.30	9.30	4.11	1.53	0.86	0.77	0.24	0.07	0.02	0.00	0.00	0.86	18.44	80.70	8.96	1.38	-0.90	4.78
9T77	226.5	229.5	100.00	79.04	36.31	17.11	8.50	4.24	1.73	0.57	0.39	0.15	0.03	0.00	0.00	0.00	0.57	16.54	82.89	9.02	1.34	-0.86	4.01
9T78	229.5	232.5	100.00	81.07	41.01	20.88	10.95	5.01	2.10	0.65	0.48	0.18	0.03	0.00	0.00	0.00	0.65	20.23	79.12	8.88	1.42	-0.76	2.97

Sample	Interval (cm) Top	Bottom	Cumulative-frequency percent -- Phi class midpoints 10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Weight percentages Gravel	Sand	Silt	Clay	Statistics Mean	SD	Skew	Kurt
9T79	232.5	235.5	100.00	80.10	39.08	18.67	9.35	4.26	1.88	0.68	0.49	0.18	0.04	0.00	0.00	0.00	0.68	17.99	81.33	8.95	1.37	-0.83	3.85
9T80	238.5	238.5	100.00	78.69	36.89	17.46	8.46	3.96	2.07	1.01	0.74	0.32	0.06	0.00	0.00	0.00	1.01	16.45	82.54	9.00	1.39	-0.96	5.33
9T81	238.5	241.5	100.00	71.28	29.31	9.02	4.06	2.47	1.76	1.35	0.95	0.32	0.10	0.05	0.00	0.00	1.35	7.67	90.98	9.29	1.27	-1.39	12.00
9T82	241.5	244.5	100.00	78.20	45.38	25.94	13.41	6.38	2.66	1.16	0.92	0.38	0.08	0.00	0.00	0.00	1.16	24.78	74.06	8.75	1.58	-0.70	2.54
9T83	244.5	247.5	100.00	80.29	49.37	29.57	14.36	6.28	2.60	1.31	1.05	0.51	0.22	0.13	0.00	0.00	1.31	28.26	70.43	8.64	1.60	-0.70	3.16
9T84	247.5	250.5	100.00	79.81	50.99	30.44	15.40	7.30	3.15	1.61	1.18	0.45	0.10	0.02	0.00	0.00	1.61	28.83	69.56	8.60	1.65	-0.64	2.20
											Core 9B												
9BT1	0.0	2.0	100.00	95.56	86.01	77.41	69.09	58.69	37.29	21.92	13.66	5.06	1.10	0.39	0.00	0.00	21.92	55.49	22.59	5.84	2.42	0.05	-0.67
9BT2	1.5	4.5	99.99	95.44	87.47	81.49	78.48	76.05	71.92	56.46	42.05	15.02	2.24	0.59	0.00	0.00	56.46	25.03	18.50	4.43	2.77	0.44	-0.45
9BT3	4.5	7.5	100.00	96.24	88.77	81.56	76.07	71.30	65.41	57.44	42.43	14.42	2.83	1.18	0.38	0.38	57.06	24.12	18.44	4.52	2.82	0.34	-0.75
9BT4	7.5	10.5	100.00	95.08	84.38	73.03	64.01	55.33	42.21	24.76	17.37	5.96	0.86	0.25	0.12	0.12	24.64	48.27	26.97	5.87	2.60	0.02	-1.01
9BT5	10.5	13.5	100.00	97.16	89.97	80.61	69.58	57.67	39.92	22.20	15.23	4.42	0.61	0.00	0.00	0.00	22.20	58.41	19.39	5.73	2.31	0.05	-0.74
9BT6	13.5	16.5	100.00	87.38	65.64	50.15	40.20	31.48	20.20	15.33	10.08	2.76	0.35	0.00	0.00	0.00	15.33	34.82	49.85	7.26	2.59	-0.32	-0.72
9BT7	16.5	19.5	100.00	91.89	76.17	63.39	55.42	47.54	29.31	9.45	6.29	1.47	0.37	0.00	0.00	0.00	9.45	53.94	36.61	6.69	2.37	-0.02	-1.04
9BT8	19.5	22.5	100.00	88.18	65.22	47.62	38.13	27.07	16.35	11.04	6.36	1.61	0.27	0.00	0.00	0.00	11.04	36.58	52.38	7.48	2.38	-0.36	-0.44
9BT9	22.5	25.5	100.00	92.61	76.47	61.00	48.04	34.13	19.35	7.07	4.23	0.89	0.11	0.00	0.00	0.00	7.07	53.93	39.00	7.06	2.16	-0.15	-0.73
9BT10	25.5	28.5	100.00	93.60	82.44	72.74	66.40	58.03	38.84	8.75	5.41	1.44	0.42	0.28	0.14	0.14	8.61	63.99	27.26	6.22	2.26	0.16	-0.66
9BT11	28.5	31.5	100.00	85.45	57.52	38.22	32.54	27.40	19.91	9.41	5.34	1.11	0.19	0.08	0.00	0.00	9.41	28.81	61.78	7.73	2.43	-0.41	-0.52
9BT12	31.5	34.5	100.00	86.76	61.72	41.89	31.69	23.65	13.90	5.39	2.91	0.67	0.15	0.06	0.00	0.00	5.39	36.50	58.11	7.81	2.16	-0.40	-0.25
9BT13	34.5	37.5	100.00	83.25	51.28	27.02	17.51	11.84	7.73	6.26	4.28	1.37	0.64	0.51	0.46	0.46	5.80	20.76	72.98	8.38	2.07	-0.91	3.64
9BT14	37.5	40.5	100.00	86.56	59.26	35.72	23.55	15.94	9.27	6.83	4.78	1.24	0.17	0.00	0.00	0.00	6.83	28.89	64.28	8.07	2.09	-0.63	1.15
9BT15	40.5	43.5	100.00	88.58	65.56	46.59	38.31	30.37	19.12	8.28	6.32	1.87	0.34	0.13	0.00	0.00	8.28	38.31	53.41	7.45	2.39	-0.34	-0.50
9BT16	43.5	46.5	100.00	87.31	62.03	40.55	29.07	21.26	14.53	10.98	10.93	10.69	8.60	2.46	0.14	0.14	10.84	29.57	59.45	7.51	2.89	-0.72	1.23
9BT17	46.5	49.5	100.00	86.43	61.13	40.29	28.79	20.90	14.16	10.94	8.65	2.46	0.33	0.04	0.00	0.00	10.94	29.35	59.71	7.76	2.40	-0.55	0.30
											Core 6B												
6BT3	4.5	7.5	100.00	85.84	58.21	35.84	21.73	10.33	2.91	0.67	0.44	0.18	0.07	0.00	0.00	0.00	0.67	35.17	64.16	8.34	1.61	-0.40	0.34
6BT4	7.5	10.5	100.00	86.43	55.79	28.00	14.79	7.19	1.71	0.51	0.35	0.17	0.05	0.01	0.00	0.00	0.51	27.49	72.00	8.55	1.44	-0.53	1.48
6BT5	10.5	13.5	100.00	86.34	56.40	27.94	13.85	6.31	1.47	0.42	0.25	0.12	0.03	0.00	0.00	0.00	0.42	27.52	72.06	8.57	1.40	-0.49	1.26
6BT6	13.5	16.5	100.00	86.31	57.39	32.83	19.82	8.90	1.75	0.32	0.17	0.09	0.04	0.00	0.00	0.00	0.32	32.51	67.17	8.42	1.52	-0.38	0.13
6BT7	16.5	19.5	100.00	86.29	57.11	31.12	17.08	7.84	1.71	0.32	0.15	0.06	0.03	0.00	0.00	0.00	0.32	30.80	68.88	8.48	1.47	-0.41	0.37
6BT8	19.5	22.5	100.00	87.39	58.82	31.53	16.95	7.37	1.95	0.82	0.33	0.16	0.03	0.00	0.00	0.00	0.82	30.71	68.47	8.45	1.47	-0.47	1.07
6BT9	22.5	25.5	100.00	87.03	57.17	29.42	14.90	6.47	1.56	0.44	0.27	0.14	0.04	0.00	0.00	0.00	0.44	28.98	70.58	8.53	1.41	-0.48	1.20
6BT10	25.5	28.5	100.00	86.19	53.91	27.74	14.74	6.63	1.50	0.64	0.36	0.22	0.06	0.00	0.00	0.00	0.64	27.10	72.26	8.58	1.44	-0.55	1.67
6BT11	28.5	31.5	100.00	85.52	51.38	22.91	11.41	5.80	2.33	1.51	1.00	0.41	0.06	0.00	0.00	0.00	1.51	21.40	77.09	8.68	1.46	-0.82	4.09
6BT12	31.5	34.5	100.00	85.05	49.54	20.41	8.16	4.34	2.77	2.30	1.70	0.79	0.08	0.00	0.00	0.00	2.30	18.11	79.59	8.75	1.48	-1.07	6.87
6BT13	34.5	37.5	100.00	84.03	51.40	25.38	15.12	9.43	3.36	1.01	0.61	0.20	0.03	0.00	0.00	0.00	1.01	24.37	74.62	8.59	1.57	-0.63	1.65
6BT14	37.5	40.5	100.00	85.01	51.51	24.54	13.75	8.33	2.63	0.56	0.34	0.17	0.07	0.00	0.00	0.00	0.56	23.98	75.46	8.63	1.49	-0.63	1.76

Sample	Interval (cm) Top	Bottom	Cumulative-frequency percent -- Phi class midpoints 10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Weight percentages Gravel	Sand	Silt	Clay	Statistics Mean	SD	Skew	Kurt
68T15	40.5	43.5	100.00	85.46	53.70	28.15	15.75	9.16	3.62	0.92	0.49	0.27	0.06	0.00	0.00	0.00	0.92	27.23	71.85	8.52	1.57	-0.60	1.54
68T16	43.5	46.5	100.00	85.91	54.84	29.47	16.89	8.74	2.79	0.60	0.42	0.22	0.02	0.00	0.00	0.00	0.60	28.87	70.53	8.50	1.54	-0.53	1.07
68T17	46.5	49.5	100.00	85.96	54.44	28.46	15.77	7.58	2.56	0.66	0.43	0.19	0.08	0.00	0.00	0.00	0.66	27.80	71.54	8.54	1.50	-0.56	1.51
68T18	49.5	52.5	100.00	84.68	52.51	28.42	17.23	9.66	3.06	0.99	0.71	0.37	0.15	0.00	0.00	0.00	0.99	27.43	71.58	8.52	1.61	-0.61	1.71
68T19	52.5	55.5	100.00	89.84	60.49	28.02	15.46	6.29	2.18	0.76	0.54	0.26	0.00	0.00	0.00	0.00	0.76	27.26	71.98	8.46	1.41	-0.59	2.12
68T20	55.5	58.5	100.00	86.54	56.10	29.60	15.82	7.93	2.61	0.59	0.39	0.21	0.03	0.00	0.00	0.00	0.59	29.01	70.40	8.50	1.50	-0.53	1.28
68T21	58.5	61.5	100.00	85.13	51.27	24.32	12.69	6.37	2.29	0.93	0.53	0.33	0.11	0.00	0.00	0.00	0.93	23.39	75.68	8.66	1.46	-0.71	2.95
68T22	61.5	64.5	100.00	84.44	52.45	26.44	15.46	9.23	3.55	1.40	0.91	0.44	0.10	0.00	0.00	0.00	1.40	25.04	73.56	8.56	1.61	-0.68	2.27
68T23	64.5	67.5	100.00	84.23	51.43	26.43	14.93	8.36	2.33	0.28	0.18	0.09	0.01	0.00	0.00	0.00	0.28	26.15	73.57	8.62	1.49	-0.52	0.80
68T24	67.5	70.5	100.00	84.19	49.88	23.67	12.13	6.46	2.49	0.69	0.54	0.33	0.04	0.00	0.00	0.00	0.69	22.98	76.33	8.70	1.46	-0.70	2.74
												Core 4P											
4T1	0.0	1.5	100.00	98.04	94.23	89.60	83.48	68.43	29.77	0.73	0.07	0.03	0.02	0.00	0.00	0.00	0.73	88.87	10.40	5.86	1.42	0.71	1.62
4T2	1.5	4.5	100.00	96.96	91.36	84.86	74.77	55.56	17.30	0.64	0.13	0.06	0.03	0.00	0.00	0.00	0.64	84.22	15.14	6.28	1.53	0.51	0.46
4T3	4.5	7.5	100.00	95.33	85.86	74.71	60.26	36.78	5.84	0.79	0.25	0.06	0.01	0.00	0.00	0.00	0.79	73.92	25.29	6.90	1.60	0.28	-0.46
4T4	7.5	10.5	100.00	83.07	69.84	58.69	45.23	26.59	5.43	0.25	0.05	0.02	0.00	0.00	0.00	0.00	0.25	58.44	41.31	7.61	1.90	0.08	-1.30
4T5	10.5	13.5	100.00	92.64	80.30	68.22	54.16	35.58	6.72	0.14	0.07	0.04	0.01	0.00	0.00	0.00	0.14	68.08	31.78	7.12	1.74	0.21	-0.98
4T6	13.5	16.5	100.00	94.76	84.00	71.32	55.26	31.76	5.26	0.71	0.38	0.20	0.07	0.00	0.00	0.00	0.71	70.61	28.68	7.06	1.62	0.18	-0.44
4T7	16.5	19.5	100.00	95.53	86.77	77.22	64.59	47.70	20.52	7.79	3.58	1.66	0.31	0.00	0.00	0.00	7.79	69.43	22.78	6.44	1.96	0.05	-0.19
4T8	19.5	22.5	100.00	96.80	89.40	79.39	65.64	43.99	15.82	5.98	3.50	1.99	0.36	0.00	0.00	0.00	5.98	73.41	20.61	6.47	1.82	-0.02	0.36
4T9	22.5	25.5	100.00	97.99	93.37	87.82	79.97	58.31	16.72	5.06	3.10	1.59	0.17	0.00	0.00	0.00	5.06	82.76	12.18	6.06	1.57	0.20	1.43
4T10	25.5	28.5	100.00	93.64	79.86	64.70	47.06	26.24	7.55	3.31	1.99	0.97	0.17	0.00	0.00	0.00	3.31	61.39	35.30	7.25	1.82	-0.14	0.09
4T11	28.5	31.5	100.00	94.28	81.75	67.43	51.51	29.98	6.88	3.53	2.28	1.00	0.10	0.00	0.00	0.00	3.53	63.90	32.57	7.11	1.81	-0.09	0.05
4T12	31.5	34.5	100.00	94.64	83.40	71.05	58.84	38.10	10.20	2.60	1.57	0.66	0.08	0.00	0.00	0.00	2.60	68.45	28.95	6.89	1.80	0.08	-0.34
4T13	34.5	37.5	100.00	94.30	82.21	68.78	54.90	34.73	9.70	3.60	2.21	0.92	0.10	0.00	0.00	0.00	3.60	65.18	31.22	6.99	1.85	-0.02	-0.22
4T14	37.5	40.5	100.00	93.38	79.19	64.06	47.06	25.75	6.50	2.18	1.36	0.60	0.07	0.00	0.00	0.00	2.18	61.88	35.94	7.30	1.76	-0.07	-0.20
4T15	40.5	43.5	100.00	95.01	84.57	73.26	62.73	48.75	22.26	2.64	1.53	0.68	0.10	0.00	0.00	0.00	2.64	70.62	26.74	6.58	1.92	0.17	-0.65
4T16	43.5	46.5	100.00	91.13	75.18	61.09	47.58	28.67	6.33	2.57	1.59	0.77	0.13	0.00	0.00	0.00	2.57	58.52	38.91	7.35	1.88	-0.08	-0.39
4T17	46.5	49.5	100.00	93.47	79.72	64.46	48.26	27.64	5.98	2.64	1.64	0.67	0.08	0.00	0.00	0.00	2.64	61.82	35.54	7.25	1.78	-0.07	-0.15
4T18	49.5	52.5	100.00	92.50	78.32	64.12	49.71	29.18	7.06	2.68	1.59	0.65	0.10	0.00	0.00	0.00	2.68	61.44	35.88	7.24	1.84	-0.04	-0.34
4T19	52.5	55.5	100.00	91.57	73.70	58.07	43.49	24.65	5.37	2.50	1.62	0.63	0.17	0.05	0.00	0.00	2.50	55.57	41.93	7.48	1.85	-0.15	-0.16
4T20	55.5	58.5	100.00	95.50	86.22	75.56	62.77	37.26	9.47	3.12	2.10	0.79	0.09	0.00	0.00	0.00	3.12	72.44	24.44	6.77	1.73	0.08	0.14
4T21	58.5	61.5	100.00	91.71	76.10	61.86	47.10	27.14	5.46	2.14	1.36	0.57	0.09	0.00	0.00	0.00	2.14	59.72	38.14	7.36	1.82	-0.05	-0.39
4T22	61.5	64.5	100.00	93.60	80.47	65.69	49.27	27.52	4.71	2.17	1.39	0.58	0.06	0.00	0.00	0.00	2.17	63.52	34.31	7.25	1.73	-0.03	-0.16
4T23	64.5	67.5	100.00	91.87	76.18	60.37	44.47	25.38	5.01	2.14	1.37	0.59	0.10	0.00	0.00	0.00	2.14	58.23	39.63	7.43	1.80	-0.10	-0.27
4T24	67.5	70.5	100.00	92.99	77.60	63.42	48.29	27.93	5.88	2.35	1.60	0.73	0.11	0.00	0.00	0.00	2.35	61.07	36.58	7.29	1.81	-0.07	-0.24
4T25	70.5	73.5	100.00	91.50	72.15	54.93	38.93	18.52	3.57	1.95	1.31	0.56	0.15	0.06	0.00	0.00	1.95	52.98	45.07	7.66	1.75	-0.21	0.16
4T26	73.5	76.5	100.00	90.11	74.72	61.54	46.78	24.54	5.47	1.93	1.33	0.50	0.06	0.00	0.00	0.00	1.93	59.61	38.46	7.43	1.83	-0.04	-0.43

Sample	Interval (cm) Top	Bottom	Cumulative-frequency percent -- Phi class midpoints 10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Weight percentages Gravel	Sand	Silt	Clay	Statistics Mean	SD	Skew	Kurt
4T27	76.5	79.5	100.00	92.98	79.30	64.82	49.08	26.85	5.48	2.35	1.49	0.61	0.11	0.00	0.00	0.00	2.35	62.47	35.18	7.27	1.77	-0.05	-0.16
4T28	79.5	82.5	100.00	93.37	80.50	66.89	51.82	27.71	5.76	2.61	1.76	0.73	0.12	0.00	0.00	0.00	2.61	64.28	33.11	7.19	1.77	-0.04	-0.03
4T29	82.5	85.5	100.00	92.63	75.63	59.78	42.78	21.28	4.02	2.08	1.37	0.49	0.06	0.00	0.00	0.00	2.08	57.70	40.22	7.50	1.74	-0.12	-0.12
4T30	85.5	88.5	100.00	93.81	80.86	65.71	48.25	27.00	6.57	3.15	2.23	0.96	0.15	0.00	0.00	0.00	3.15	62.56	34.29	7.21	1.80	-0.13	0.16
4T31	88.5	91.5	100.00	94.14	83.90	73.99	62.75	37.77	7.80	2.14	1.64	0.87	0.11	0.00	0.00	0.00	2.14	71.85	26.01	6.85	1.76	0.14	0.03
4T32	91.5	94.5	100.00	90.65	75.22	62.51	49.02	27.26	4.96	2.55	2.14	1.12	0.14	0.00	0.00	0.00	2.55	59.96	37.49	7.34	1.88	-0.09	-0.11
4T33	94.5	97.5	100.00	90.63	74.94	60.82	45.09	22.59	4.78	2.18	1.43	0.73	0.09	0.00	0.00	0.00	2.18	58.64	39.18	7.47	1.81	-0.10	-0.15
4T34	97.5	100.5	100.00	88.35	69.05	51.62	34.06	14.23	2.60	1.25	0.98	0.50	0.03	0.00	0.00	0.00	1.25	50.37	48.38	7.87	1.70	-0.19	-0.00
4T35	100.5	103.5	100.00	87.32	67.38	50.44	33.25	13.61	3.20	1.41	1.11	0.50	0.05	0.00	0.00	0.00	1.41	49.03	49.56	7.92	1.74	-0.23	0.06
4T36	103.5	106.5	100.00	87.81	68.66	51.94	34.09	13.24	3.69	2.22	1.86	0.81	0.07	0.00	0.00	0.00	2.22	49.72	48.06	7.86	1.78	-0.29	0.54
4T37	106.5	109.5	100.00	85.69	66.06	50.40	32.77	13.90	4.20	2.15	1.46	0.69	0.08	0.00	0.00	0.00	2.15	48.25	49.60	7.93	1.81	-0.28	0.24
4T38	109.5	112.5	100.00	87.21	68.22	51.42	32.92	12.23	2.63	1.37	1.08	0.49	0.05	0.00	0.00	0.00	1.37	50.05	48.58	7.92	1.70	-0.21	0.16
4T39	112.5	115.5	100.00	88.81	71.32	55.53	38.38	15.89	3.85	1.77	1.46	0.64	0.05	0.00	0.00	0.00	1.77	53.76	44.47	7.72	1.77	-0.18	0.08
4T40	115.5	118.5	100.00	88.51	70.58	53.74	36.00	14.76	3.52	1.91	1.63	0.67	0.06	0.00	0.00	0.00	1.91	51.83	46.26	7.79	1.76	-0.23	0.29
4T41	118.5	121.5	100.00	87.68	69.55	53.41	36.42	14.62	3.25	1.51	1.23	0.45	0.03	0.00	0.00	0.00	1.51	51.90	46.59	7.82	1.75	-0.17	-0.07
4T42	121.5	124.5	100.00	87.17	67.60	48.94	29.29	10.69	2.93	1.87	1.54	0.69	0.09	0.00	0.00	0.00	1.87	47.07	51.06	7.99	1.71	-0.33	0.85
4T43	124.5	127.5	100.00	87.03	67.45	49.92	30.88	13.24	3.50	1.78	1.41	0.57	0.08	0.00	0.00	0.00	1.78	48.14	50.08	7.94	1.75	-0.28	0.39
4T44	127.5	130.5	100.00	84.63	63.16	43.88	23.91	8.82	2.79	1.69	1.28	0.50	0.07	0.00	0.00	0.00	1.69	42.19	56.12	8.19	1.68	-0.38	0.97
4T45	130.5	133.5	100.00	84.54	66.17	50.27	31.97	12.96	3.26	1.92	1.52	0.64	0.08	0.00	0.00	0.00	1.92	48.35	49.73	7.97	1.79	-0.27	0.30
4T46	133.5	136.5	100.00	85.68	68.07	52.61	32.41	11.64	3.17	1.68	1.29	0.51	0.06	0.00	0.00	0.00	1.68	50.93	47.39	7.93	1.73	-0.22	0.26
4T47	136.5	139.5	100.00	84.63	67.10	51.39	32.85	14.84	4.87	2.60	2.03	1.02	0.24	0.07	0.00	0.00	2.60	48.79	48.61	7.88	1.88	-0.33	0.62
4T48	139.5	142.5	100.00	88.80	75.68	62.16	42.81	18.36	4.07	2.32	1.72	0.71	0.09	0.00	0.00	0.00	2.32	59.84	37.84	7.53	1.78	-0.11	0.17
4T49	142.5	145.5	100.00	89.30	75.68	62.58	44.10	20.47	7.00	2.56	1.88	0.93	0.14	0.00	0.00	0.00	2.56	60.02	37.42	7.45	1.85	-0.14	0.08
4T50	145.5	148.5	100.00	89.21	74.56	59.84	39.73	17.75	5.03	2.52	1.56	0.65	0.11	0.00	0.00	0.00	2.52	57.32	40.16	7.59	1.79	-0.16	0.16
4T51	148.5	151.5	100.00	88.37	74.38	60.81	41.19	19.71	6.16	2.13	1.38	0.61	0.09	0.00	0.00	0.00	2.13	58.68	39.19	7.55	1.82	-0.12	-0.12
4T52	151.5	154.5	100.00	89.67	76.68	63.50	44.31	21.20	5.19	1.74	0.98	0.49	0.09	0.00	0.00	0.00	1.74	61.76	36.50	7.46	1.76	-0.04	-0.22
4T53	154.5	157.5	100.00	90.02	76.84	62.46	41.91	19.82	5.31	1.42	0.67	0.30	0.04	0.00	0.00	0.00	1.42	61.04	37.54	7.51	1.72	-0.03	-0.36
4T54	157.5	160.5	100.00	89.75	74.63	59.86	41.18	19.16	4.61	1.62	1.10	0.53	0.09	0.00	0.00	0.00	1.62	58.24	40.14	7.57	1.76	-0.10	-0.13
4T55	160.5	163.5	100.00	87.17	68.06	50.27	32.82	15.40	4.87	2.27	1.50	0.74	0.09	0.00	0.00	0.00	2.27	48.00	49.73	7.87	1.82	-0.29	0.28
4T56	163.5	166.5	100.00	89.00	73.54	57.79	38.39	15.43	3.83	1.57	0.90	0.44	0.40	0.00	0.00	0.00	1.57	56.22	42.21	7.69	1.73	-0.15	0.30
4T57	166.5	169.5	100.00	89.34	76.01	62.24	43.90	18.50	3.93	1.46	0.91	0.51	0.14	0.07	0.00	0.00	1.46	60.78	37.76	7.53	1.73	-0.05	0.02
4T58	169.5	172.5	100.00	90.40	77.89	65.31	46.56	22.95	5.28	1.37	0.92	0.53	0.09	0.00	0.00	0.00	1.37	63.94	34.69	7.39	1.75	0.00	-0.24
4T59	172.5	175.5	100.00	91.90	79.27	67.42	51.60	26.87	6.24	1.55	1.13	0.67	0.14	0.05	0.00	0.00	1.55	65.87	32.58	7.23	1.77	0.02	-0.12
4T60	175.5	178.5	100.00	95.37	88.98	83.01	74.28	53.60	13.44	1.38	1.00	0.59	0.17	0.13	0.00	0.00	1.38	81.63	16.99	6.38	1.65	0.39	0.82
4T61	178.5	181.5	100.00	91.66	80.97	69.98	56.09	33.29	6.11	1.04	0.75	0.38	0.07	0.00	0.00	0.00	1.04	68.94	30.02	7.10	1.76	0.17	-0.47
4T62	181.5	184.5	100.00	92.50	82.23	71.76	58.03	36.27	5.12	0.71	0.42	0.21	0.03	0.00	0.00	0.00	0.71	71.05	28.24	7.03	1.71	0.25	-0.56
4T63	184.5	187.5	100.00	92.91	83.15	73.58	60.08	38.41	7.42	0.90	0.51	0.25	0.02	0.00	0.00	0.00	0.90	72.68	26.42	6.93	1.73	0.26	-0.47

Sample	Interval (cm)		Cumulative-frequency percent -- Phi class midpoints													Weight percentages				Statistics			
	Top	Bottom	10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Gravel	Sand	Silt	Clay	Mean	SD	Skew	Kurt
4T64	187.5	190.5	100.00	94.69	87.38	79.77	68.98	46.71	10.52	2.02	0.95	0.53	0.11	0.00	0.00	0.00	2.02	77.75	20.23	6.58	1.69	0.31	0.23
4T65	190.5	193.5	100.00	94.82	87.19	78.16	64.32	38.88	7.24	1.00	0.36	0.16	0.01	0.00	0.00	0.00	1.00	77.16	21.84	6.78	1.60	0.33	-0.09
4T66	193.5	196.5	100.00	93.78	84.69	75.32	60.56	36.27	5.65	0.72	0.35	0.16	0.03	0.00	0.00	0.00	0.72	74.60	24.68	6.92	1.64	0.29	-0.32
4T67	196.5	199.5	100.00	93.85	84.47	74.35	59.21	34.32	4.33	0.54	0.22	0.11	0.01	0.00	0.00	0.00	0.54	73.81	25.65	6.99	1.61	0.30	-0.42
4T68	199.5	202.5	100.00	98.39	95.85	92.14	84.05	56.75	17.28	0.81	0.23	0.10	0.01	0.00	0.00	0.00	0.81	91.33	7.86	6.04	1.26	0.60	2.16
4T69	202.5	205.5	100.00	87.05	70.27	56.05	42.37	23.86	4.93	1.14	0.33	0.13	0.01	0.00	0.00	0.00	1.14	54.91	43.95	7.64	1.84	-0.02	-1.01
4T70	205.5	208.5	100.00	94.34	86.42	76.92	61.64	35.32	6.88	1.41	0.23	0.09	0.01	0.00	0.00	0.00	1.41	75.51	23.08	6.87	1.61	0.29	-0.21
4T71	208.5	211.5	100.00	93.97	85.18	74.98	60.54	35.70	7.40	1.47	0.22	0.08	0.01	0.00	0.00	0.00	1.47	73.51	25.02	6.90	1.65	0.27	-0.40
4T72	211.5	214.5	100.00	91.43	76.88	67.29	55.62	33.06	7.49	0.99	0.17	0.05	0.00	0.00	0.00	0.00	0.99	66.30	32.71	7.17	1.81	0.18	-1.00
4T73	214.5	217.5	100.00	91.03	79.88	71.92	61.12	40.96	11.65	2.62	0.30	0.09	0.00	0.00	0.00	0.00	2.62	69.30	28.08	6.90	1.88	0.24	-0.79
4T74	217.5	220.5	100.00	91.79	80.94	73.47	61.77	42.76	15.96	4.54	0.26	0.09	0.00	0.00	0.00	0.00	4.54	68.93	26.53	6.78	1.92	0.22	-0.77
4T75	220.5	223.5	100.00	90.73	77.88	69.06	56.42	37.63	11.19	1.16	0.12	0.05	0.00	0.00	0.00	0.00	1.16	67.90	30.94	7.06	1.87	0.20	-1.00
4T76	223.5	226.5	100.00	89.67	75.17	66.13	53.83	35.01	9.18	1.86	0.17	0.06	0.00	0.00	0.00	0.00	1.86	64.27	33.87	7.19	1.90	0.14	-1.07
4T77	226.5	229.5	100.00	90.60	78.65	70.10	58.07	39.40	11.85	1.59	0.22	0.06	0.01	0.00	0.00	0.00	1.59	68.51	29.90	6.99	1.89	0.21	-0.93
4T78	229.5	232.5	100.00	90.18	76.02	66.95	55.15	38.23	12.81	2.93	0.21	0.08	0.01	0.00	0.00	0.00	2.93	64.02	33.05	7.07	1.96	0.13	-1.06
4T79	232.5	235.5	100.00	90.64	76.54	68.16	54.90	34.59	9.72	1.45	0.11	0.03	0.00	0.00	0.00	0.00	1.45	66.71	31.84	7.14	1.86	0.17	-1.02
4T80	235.5	238.5	100.00	90.60	74.85	65.38	51.71	34.86	11.40	1.60	0.10	0.05	0.01	0.00	0.00	0.00	1.60	63.78	34.62	7.19	1.91	0.11	-1.13
4T81	238.5	241.5	100.00	90.17	73.72	65.87	56.39	37.62	11.05	1.34	0.09	0.02	0.00	0.00	0.00	0.00	1.34	64.53	34.13	7.14	1.94	0.17	-1.19
4T82	241.5	244.5	100.00	90.91	79.75	71.63	59.82	41.80	14.46	1.98	0.19	0.06	0.01	0.00	0.00	0.00	1.98	69.65	28.37	6.89	1.91	0.23	-0.89
4T83	244.5	247.5	100.00	97.95	95.48	93.75	91.29	78.90	31.49	1.46	0.13	0.04	0.01	0.00	0.00	0.00	1.46	92.29	6.25	5.60	1.25	1.02	4.96
4T84	247.5	250.5	100.00	90.32	79.00	70.30	58.06	39.22	10.88	0.89	0.05	0.01	0.00	0.00	0.00	0.00	0.89	69.41	29.70	7.01	1.86	0.24	-0.96
4T85	250.5	253.5	100.00	89.73	77.58	68.80	53.93	33.02	8.75	1.97	0.11	0.04	0.01	0.00	0.00	0.00	1.97	66.83	31.20	7.16	1.85	0.16	-0.91
4T86	253.5	256.5	100.00	96.83	93.16	90.56	87.04	77.86	30.72	0.95	0.07	0.01	0.00	0.00	0.00	0.00	0.95	89.61	9.44	5.73	1.43	0.94	3.13
4T87	256.5	259.5	100.00	89.79	75.35	67.52	57.78	42.76	13.10	2.15	0.27	0.12	0.05	0.00	0.00	0.00	2.15	65.37	32.48	7.01	1.99	0.18	-1.09
4T88	259.5	262.5	100.00	93.21	80.14	73.24	62.71	45.58	15.77	3.98	1.33	1.04	1.02	1.01	1.01	1.01	2.97	69.26	26.76	6.70	2.06	-0.08	1.13
4T89	262.5	265.5	100.00	91.34	79.38	71.56	59.78	40.99	8.75	1.98	0.18	0.04	0.00	0.00	0.00	0.00	1.98	69.58	28.44	6.96	1.84	0.25	-0.84
4T90	265.5	268.5	100.00	89.90	76.12	66.47	54.89	37.68	9.05	1.32	0.12	0.05	0.01	0.00	0.00	0.00	1.32	65.15	33.53	7.14	1.89	0.17	-1.09
4T91	268.5	271.5	100.00	90.70	77.58	68.54	57.43	42.76	13.39	3.77	0.24	0.06	0.01	0.00	0.00	0.00	3.77	64.77	31.46	6.96	1.97	0.17	-1.02
4T92	271.5	274.5	100.00	92.11	80.15	73.07	62.61	47.47	18.90	1.48	0.15	0.08	0.00	0.00	0.00	0.00	1.48	71.59	26.93	6.74	1.93	0.28	-0.91
4T93	274.5	277.5	100.00	91.85	78.29	70.37	59.97	45.54	18.36	2.20	0.10	0.03	0.01	0.00	0.00	0.00	2.20	68.17	29.63	6.83	1.97	0.22	-1.06
4T94	277.5	280.5	100.00	93.48	81.83	74.83	65.13	47.97	18.73	3.14	0.08	0.03	0.01	0.00	0.00	0.00	3.14	71.69	25.17	6.65	1.89	0.29	-0.77
4T95	280.5	283.5	100.00	90.94	79.04	71.42	61.09	46.05	14.65	3.76	0.41	0.11	0.00	0.00	0.00	0.00	3.76	67.66	28.58	6.83	1.97	0.22	-0.89
4T96	283.5	286.5	100.00	90.27	79.09	67.32	50.51	28.32	11.07	1.66	0.34	0.26	0.06	0.00	0.00	0.00	1.66	65.66	32.68	7.21	1.83	0.08	-0.71
4T97	286.5	289.5	100.00	92.81	83.92	74.89	62.57	41.50	14.87	0.98	0.13	0.04	0.00	0.00	0.00	0.00	0.98	73.91	25.11	6.78	1.79	0.29	-0.66
4T98	289.5	292.5	100.00	94.11	86.19	78.03	67.50	49.98	16.86	0.34	0.05	0.03	0.00	0.00	0.00	0.00	0.34	77.69	21.97	6.57	1.74	0.40	-0.42
4T99	292.5	295.5	100.00	91.37	80.96	71.52	60.49	44.11	16.47	2.09	0.20	0.06	0.01	0.00	0.00	0.00	2.09	69.43	28.48	6.83	1.92	0.24	-0.90
4T100	295.5	298.5	100.00	91.80	81.17	69.77	53.93	30.14	7.63	2.37	0.22	0.03	0.01	0.00	0.00	0.00	2.37	67.40	30.23	7.13	1.75	0.15	-0.67

Sample	Interval (cm)		Cumulative-frequency percent -- Phi class midpoints													Weight percentages				Statistics			
	Top	Bottom	10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Gravel	Sand	Silt	Clay	Mean	SD	Skew	Kurt
4T101	298.5	301.5	100.00	87.54	70.61	54.97	40.45	27.48	16.43	2.34	0.25	0.15	0.04	0.00	0.00	0.00	2.34	52.63	45.03	7.50	2.03	-0.10	-1.09
4T102	301.5	304.5	100.00	94.58	87.63	81.10	73.13	61.33	30.66	0.44	0.08	0.05	0.00	0.00	0.00	0.00	0.44	80.66	18.90	6.21	1.80	0.51	-0.12
4T103	304.5	307.5	100.00	91.52	80.13	68.83	54.33	32.43	8.84	0.33	0.07	0.03	0.00	0.00	0.00	0.00	0.33	68.50	31.17	7.13	1.76	0.20	-0.92
4T104	307.5	310.5	100.00	91.63	80.11	67.78	49.27	23.79	4.36	0.61	0.24	0.12	0.02	0.00	0.00	0.00	0.61	67.17	32.22	7.32	1.65	0.15	-0.62
4T105	310.5	313.5	100.00	93.48	84.34	73.86	59.20	37.09	10.34	1.02	0.16	0.07	0.00	0.00	0.00	0.00	1.02	72.84	26.14	6.90	1.71	0.25	-0.61
4T106	313.5	316.5	100.00	92.83	82.62	71.56	56.11	34.18	11.59	1.11	0.27	0.11	0.01	0.00	0.00	0.00	1.11	70.45	28.44	7.00	1.76	0.18	-0.71
4T107	316.5	319.5	100.00	96.58	91.90	86.54	78.90	63.74	20.62	0.83	0.12	0.06	0.00	0.00	0.00	0.00	0.83	85.71	13.46	6.11	1.53	0.64	1.03
4T108	319.5	322.5	100.00	95.40	89.34	82.27	71.72	56.89	19.43	0.42	0.06	0.02	0.00	0.00	0.00	0.00	0.42	81.85	17.73	6.34	1.66	0.50	0.05
4T109	322.5	325.5	100.00	93.92	86.40	78.01	66.14	49.92	25.49	0.67	0.11	0.05	0.00	0.00	0.00	0.00	0.67	77.34	21.99	6.49	1.82	0.35	-0.59
4T110	325.5	328.5	100.00	86.07	67.91	53.05	44.54	36.46	21.52	0.35	0.08	0.04	0.00	0.00	0.00	0.00	0.35	52.70	46.95	7.40	2.16	-0.02	-1.52
4T111	328.5	331.5	100.00	92.71	82.98	72.42	55.13	30.47	4.41	0.29	0.10	0.07	0.02	0.00	0.00	0.00	0.29	72.13	27.58	7.11	1.63	0.27	-0.58
4T112	331.5	334.5	100.00	93.20	83.65	73.79	60.82	38.54	11.22	0.20	0.03	0.01	0.00	0.00	0.00	0.00	0.20	73.59	26.21	6.89	1.72	0.30	-0.71
4T113	334.5	337.5	100.00	96.40	91.49	85.94	76.86	59.26	19.03	0.31	0.03	0.00	0.00	0.00	0.00	0.00	0.31	85.63	14.06	6.21	1.53	0.60	0.74
4T114	337.5	340.5	100.00	92.86	83.52	73.91	60.33	35.98	7.40	0.17	0.02	0.00	0.00	0.00	0.00	0.00	0.17	73.74	26.09	6.96	1.67	0.32	-0.64
4T115	340.5	343.5	100.00	90.67	78.00	65.01	48.31	26.89	5.93	0.21	0.05	0.02	0.00	0.00	0.00	0.00	0.21	64.80	34.99	7.35	1.73	0.14	-1.00
4T116	343.5	346.5	100.00	94.99	88.77	82.26	71.94	52.93	17.29	0.32	0.05	0.01	0.00	0.00	0.00	0.00	0.32	81.94	17.74	6.41	1.64	0.50	0.08
4T117	346.5	349.5	100.00	94.60	87.53	79.01	64.65	43.71	13.36	0.22	0.05	0.03	0.00	0.00	0.00	0.00	0.22	78.79	20.99	6.67	1.65	0.37	-0.34
4T118	349.5	352.5	100.00	97.35	93.96	90.07	84.21	72.46	29.33	1.52	1.09	1.04	1.00	0.99	0.99	0.99	0.53	88.55	9.93	5.76	1.60	0.16	4.71
4T119	352.5	355.5	100.00	90.20	78.12	64.76	45.52	21.33	4.69	0.53	0.07	0.03	0.00	0.00	0.00	0.00	0.53	64.23	35.24	7.45	1.67	0.12	-0.83
4T120	355.5	358.5	100.00	95.82	90.13	83.73	73.90	57.80	20.77	0.55	0.08	0.03	0.00	0.00	0.00	0.00	0.55	83.18	16.27	6.27	1.62	0.53	0.27
4T121	358.5	361.5	100.00	97.13	93.33	89.11	82.58	69.89	27.09	1.65	0.10	0.03	0.00	0.00	0.00	0.00	1.65	87.46	10.89	5.89	1.48	0.72	1.70
4T122	361.5	364.5	100.00	92.62	82.41	69.53	51.10	24.57	3.11	0.35	0.09	0.04	0.00	0.00	0.00	0.00	0.35	69.18	30.47	7.26	1.58	0.22	-0.65
4T123	364.5	367.5	100.00	90.44	77.29	60.62	36.43	15.10	2.46	0.16	0.04	0.02	0.00	0.00	0.00	0.00	0.16	60.46	39.38	7.67	1.55	0.07	-0.77
4T124	367.5	370.5	100.00	91.36	79.20	64.52	45.41	23.25	6.54	0.70	0.17	0.10	0.01	0.00	0.00	0.00	0.70	63.82	35.48	7.39	1.69	0.07	-0.74
4T125	370.5	373.5	100.00	96.44	91.52	85.38	74.04	50.12	13.12	1.57	0.15	0.06	0.00	0.00	0.00	0.00	1.57	83.81	14.62	6.38	1.50	0.48	0.61
4T126	373.5	376.5	100.00	90.37	76.12	58.55	32.17	11.89	1.23	0.28	0.04	0.02	0.00	0.00	0.00	0.00	0.28	58.27	41.45	7.79	1.49	0.05	-0.69
4T127	376.5	379.5	100.00	90.69	76.45	58.87	34.90	13.56	1.46	0.18	0.04	0.01	0.00	0.00	0.00	0.00	0.18	58.69	41.13	7.74	1.51	0.06	-0.80
4T128	379.5	382.5	100.00	93.35	83.83	71.61	53.53	26.75	2.68	0.21	0.04	0.01	0.00	0.00	0.00	0.00	0.21	71.40	28.39	7.18	1.55	0.28	-0.61
4T129	382.5	385.5	100.00	85.78	66.26	47.06	26.02	10.83	1.54	0.31	0.06	0.01	0.00	0.00	0.00	0.00	0.31	46.75	52.94	8.12	1.57	-0.11	-0.80
4T130	385.5	388.5	100.00	97.33	93.62	89.58	83.85	71.66	33.53	1.32	0.10	0.04	0.00	0.00	0.00	0.00	1.32	88.26	10.42	5.79	1.48	0.76	1.84
4T131	388.5	391.5	100.00	91.99	82.16	71.64	57.77	36.07	6.86	1.66	0.08	0.03	0.00	0.00	0.00	0.00	1.66	69.98	28.36	7.02	1.74	0.24	-0.71
4T132	391.5	394.5	100.00	89.62	75.06	58.33	35.42	13.76	2.47	0.32	0.05	0.02	0.00	0.00	0.00	0.00	0.32	58.01	41.67	7.75	1.57	0.03	-0.78
4T133	394.5	397.5	100.00	96.25	91.13	85.68	77.99	65.08	27.54	0.98	0.07	0.00	0.00	0.00	0.00	0.00	0.98	84.70	14.32	6.05	1.61	0.62	0.69
4T134	397.5	400.5	100.00	98.38	96.06	93.21	88.07	75.60	24.96	0.35	0.03	0.02	0.00	0.00	0.00	0.00	0.35	92.86	6.79	5.73	1.22	0.94	3.89
4T135	400.5	403.5	100.00	95.65	89.42	82.16	71.28	48.58	5.89	0.32	0.06	0.02	0.00	0.00	0.00	0.00	0.32	81.84	17.84	6.57	1.50	0.55	0.36
4T136	403.5	406.5	100.00	94.50	86.80	77.28	63.95	37.48	7.15	1.28	0.06	0.02	0.00	0.00	0.00	0.00	1.28	76.00	22.72	6.81	1.60	0.34	-0.25
4T137	406.5	409.5	100.00	93.45	83.91	72.41	56.72	34.97	8.92	0.41	0.06	0.01	0.00	0.00	0.00	0.00	0.41	72.00	27.59	6.99	1.69	0.24	-0.73

Sample	Interval (cm)		Cumulative-frequency percent -- Phi class midpoints													Weight percentages				Statistics			
	Top	Bottom	10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Gravel	Sand	Silt	Clay	Mean	SD	Skew	Kurt
4T138	409.5	412.5	100.00	93.10	83.54	73.45	63.43	49.27	9.71	0.43	0.06	0.01	0.00	0.00	0.00	0.00	0.43	73.02	26.55	6.77	1.77	0.36	-0.72
4T139	412.5	415.5	100.00	93.66	84.67	74.81	62.03	44.18	11.15	0.46	0.06	0.02	0.00	0.00	0.00	0.00	0.46	74.35	25.19	6.79	1.73	0.33	-0.65
4T140	415.5	418.5	100.00	93.17	83.76	71.86	53.80	27.87	5.03	0.60	0.06	0.01	0.00	0.00	0.00	0.00	0.60	71.26	28.14	7.14	1.60	0.23	-0.59
4T141	418.5	421.5	100.00	93.99	85.27	74.23	58.00	32.58	4.18	0.25	0.06	0.03	0.02	0.01	0.00	0.00	0.25	73.98	25.77	7.01	1.57	0.31	-0.45
4T142	421.5	424.5	100.00	90.89	77.37	61.26	47.04	29.34	4.71	0.52	0.06	0.02	0.00	0.00	0.00	0.00	0.52	60.74	38.74	7.39	1.75	0.10	-1.11
4T143	424.5	427.5	100.00	94.32	85.31	73.29	54.76	27.02	4.86	0.36	0.07	0.02	0.00	0.00	0.00	0.00	0.36	72.93	26.71	7.10	1.54	0.25	-0.48
4T144	427.5	430.5	100.00	94.40	86.14	75.39	56.73	25.35	3.61	0.33	0.17	0.12	0.09	0.01	0.00	0.00	0.33	75.06	24.61	7.08	1.50	0.27	0.02
4T145	430.5	432.0	100.00	96.12	90.30	82.84	71.47	50.62	9.41	0.53	0.15	0.03	0.00	0.00	0.00	0.00	0.53	82.31	17.16	6.49	1.52	0.51	0.34
4T145	432.0	433.5	100.00	86.82	67.33	49.45	35.32	16.37	2.37	0.52	0.10	0.04	0.01	0.01	0.00	0.00	0.52	48.93	50.55	7.92	1.70	-0.08	-1.00
4T146	433.5	436.5	100.00	97.79	94.06	89.30	82.14	69.40	26.45	0.47	0.04	0.01	0.01	0.00	0.00	0.00	0.47	88.83	10.70	5.90	1.42	0.73	1.64
4T147	436.5	439.5	100.00	94.76	87.21	80.89	73.88	58.68	13.13	0.70	0.06	0.02	0.00	0.00	0.00	0.00	0.70	80.19	19.11	6.41	1.66	0.55	0.15
4T148	439.5	442.5	100.00	94.36	85.70	77.22	68.89	58.48	15.26	0.45	0.04	0.01	0.00	0.00	0.00	0.00	0.45	76.77	22.78	6.50	1.76	0.46	-0.41
4T149	442.5	445.5	100.00	93.57	82.54	70.05	56.56	41.33	9.54	0.35	0.07	0.02	0.00	0.00	0.00	0.00	0.35	69.70	29.95	6.96	1.76	0.24	-0.95
4T150	445.5	448.5	100.00	91.50	77.98	65.40	55.70	38.19	7.49	0.31	0.09	0.04	0.02	0.00	0.00	0.00	0.31	65.09	34.60	7.13	1.82	0.20	-1.12
4T151	448.5	451.5	100.00	92.72	81.06	70.04	60.26	41.58	7.73	0.23	0.04	0.02	0.00	0.00	0.00	0.00	0.23	69.81	29.96	6.96	1.77	0.29	-0.93
4T152	451.5	454.5	100.00	98.91	96.95	93.94	87.85	66.73	12.06	0.28	0.02	0.01	0.00	0.00	0.00	0.00	0.28	93.66	6.06	5.93	1.08	0.89	4.07
4T153	454.5	457.5	100.00	95.17	87.42	78.82	70.21	55.76	14.09	0.52	0.05	0.02	0.00	0.00	0.00	0.00	0.52	78.30	21.18	6.48	1.68	0.47	-0.22
4T154	457.5	460.5	100.00	97.20	92.31	85.93	77.17	60.81	11.03	0.40	0.09	0.03	0.00	0.00	0.00	0.00	0.40	85.53	14.07	6.25	1.43	0.65	1.04
4T155	460.5	463.5	100.00	97.81	93.83	88.72	82.20	66.37	14.32	0.29	0.05	0.02	0.00	0.00	0.00	0.00	0.29	88.43	11.28	6.06	1.35	0.77	1.95
4T156	463.5	466.5	100.00	98.08	95.01	91.69	88.15	79.10	25.46	0.26	0.05	0.02	0.00	0.00	0.00	0.00	0.26	91.43	8.31	5.72	1.28	1.00	3.93
4T157	466.5	469.5	100.00	96.89	91.97	86.06	79.19	67.38	21.60	1.42	0.06	0.01	0.00	0.00	0.00	0.00	1.42	84.64	13.94	6.05	1.54	0.65	1.00
4T158	469.5	472.5	100.00	99.17	97.70	95.64	91.94	81.91	17.11	0.27	0.05	0.01	0.00	0.00	0.00	0.00	0.27	95.37	4.36	5.66	0.97	1.20	7.57
4T159	472.5	475.5	100.00	96.45	90.32	82.33	74.48	64.89	28.56	0.62	0.09	0.04	0.02	0.00	0.00	0.00	0.62	81.71	17.67	6.12	1.69	0.54	0.11
4T160	475.5	478.5	100.00	92.14	78.95	65.75	53.94	39.87	10.33	0.50	0.06	0.02	0.00	0.00	0.00	0.00	0.50	65.25	34.25	7.08	1.85	0.17	-1.15
4T161	478.5	481.5	100.00	98.62	96.25	93.19	87.75	70.32	15.02	0.51	0.05	0.01	0.00	0.00	0.00	0.00	0.51	92.68	6.81	5.88	1.15	0.91	3.95
4T162	481.5	484.5	100.00	91.88	77.72	61.31	45.51	28.62	5.12	0.26	0.09	0.03	0.00	0.00	0.00	0.00	0.26	61.05	38.69	7.39	1.72	0.08	-1.09
4T163	484.5	487.5	100.00	89.40	70.36	48.17	33.69	20.46	4.22	0.39	0.10	0.06	0.02	0.00	0.00	0.00	0.39	47.78	51.83	7.83	1.72	-0.13	-0.94
4T164	487.5	490.5	100.00	98.61	96.22	93.08	89.01	80.05	28.27	0.74	0.10	0.02	0.00	0.00	0.00	0.00	0.74	92.34	6.92	5.64	1.21	0.98	4.25
4T165	490.5	493.5	100.00	83.00	52.93	28.73	17.05	7.03	1.01	0.28	0.05	0.03	0.00	0.00	0.00	0.00	0.28	28.45	71.27	8.60	1.46	-0.39	-0.02
4T166	493.5	496.5	100.00	95.44	87.08	76.56	62.08	35.04	5.80	0.28	0.07	0.03	0.00	0.00	0.00	0.00	0.28	76.28	23.44	6.88	1.54	0.34	-0.34
4T167	496.5	499.5	100.00	90.85	74.74	59.30	44.27	19.35	8.80	0.35	0.12	0.05	0.01	0.00	0.00	0.00	0.35	58.95	40.70	7.52	1.74	-0.00	-0.93
4T168	499.5	502.5	100.00	88.77	68.58	49.10	33.17	15.10	4.40	0.16	0.05	0.02	0.00	0.00	0.00	0.00	0.16	48.94	50.90	7.91	1.67	-0.11	-0.93
4T169	502.5	505.5	100.00	90.92	74.34	59.99	49.74	33.45	4.13	0.21	0.06	0.03	0.00	0.00	0.00	0.00	0.21	59.78	40.01	7.37	1.80	0.12	-1.31
4T170	505.5	508.5	100.00	86.37	63.28	41.93	24.89	8.53	0.75	0.22	0.05	0.03	0.00	0.00	0.00	0.00	0.22	41.71	58.07	8.24	1.52	-0.15	-0.79
4T171	508.5	511.5	100.00	95.96	88.93	80.74	71.93	49.87	6.12	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.09	80.65	19.26	6.56	1.52	0.55	0.19
4T172	511.5	514.5	100.00	88.84	69.60	49.87	31.08	10.58	1.02	0.30	0.05	0.02	0.00	0.00	0.00	0.00	0.30	49.57	50.13	7.99	1.54	-0.05	-0.90
4T173	514.5	517.5	100.00	94.54	84.94	74.43	62.42	34.30	3.35	0.19	0.08	0.03	0.00	0.00	0.00	0.00	0.19	74.24	25.57	6.96	1.56	0.37	-0.46

Sample	Interval (cm) Top	Bottom	Cumulative-frequency percent -- Phi class midpoints 10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Weight percentages Gravel	Sand	Silt	Clay	Statistics Mean	SD	Skew	Kurt
4T174	517.5	520.5	100.00	94.25	83.56	69.87	50.56	20.62	2.82	0.16	0.04	0.01	0.00	0.00	0.00	0.00	0.16	69.71	30.13	7.28	1.49	0.22	-0.59
4T175	520.5	523.5	100.00	90.42	74.12	55.56	38.75	14.81	1.53	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.09	55.47	44.44	7.75	1.57	0.05	-1.05
4T176	523.5	526.5	100.00	94.62	84.46	71.37	54.51	30.53	7.15	0.14	0.04	0.01	0.00	0.00	0.00	0.00	0.14	71.23	28.63	7.07	1.61	0.21	-0.74
4T177	526.5	529.5	100.00	89.25	70.51	52.30	37.40	19.41	1.99	0.18	0.07	0.04	0.01	0.00	0.00	0.00	0.18	52.12	47.70	7.79	1.68	-0.02	-1.12
4T178	529.5	532.5	100.00	89.85	72.61	56.76	45.09	26.57	3.01	0.29	0.08	0.05	0.00	0.00	0.00	0.00	0.29	56.47	43.24	7.56	1.76	0.06	-1.25
4T179	532.5	535.5	100.00	89.92	72.77	58.06	48.52	30.41	3.90	0.17	0.05	0.01	0.00	0.00	0.00	0.00	0.17	57.89	41.94	7.46	1.81	0.10	-1.34
4T180	535.5	538.5	100.00	87.53	65.70	44.75	31.20	16.71	2.84	0.14	0.04	0.02	0.00	0.00	0.00	0.00	0.14	44.61	55.25	8.01	1.68	-0.15	-1.03
4T181	538.5	541.5	100.00	85.74	62.79	42.37	30.90	17.16	2.34	0.11	0.02	0.01	0.00	0.00	0.00	0.00	0.11	42.26	57.63	8.09	1.71	-0.16	-1.11
4T182	541.5	544.5	100.00	91.19	76.39	62.22	52.27	32.40	4.99	0.36	0.06	0.03	0.00	0.00	0.00	0.00	0.36	61.86	37.78	7.30	1.78	0.15	-1.19
4T183	544.5	547.5	100.00	91.46	76.88	62.21	47.48	23.83	4.28	0.20	0.01	0.00	0.00	0.00	0.00	0.00	0.20	62.01	37.79	7.44	1.68	0.12	-1.07
4T184	547.5	550.5	100.00	88.65	68.80	49.36	37.03	23.30	3.27	0.16	0.02	0.01	0.00	0.00	0.00	0.00	0.16	49.20	50.64	7.79	1.76	-0.06	-1.26
4T185	550.5	553.5	100.00	88.08	68.68	51.67	37.28	20.78	3.65	0.14	0.06	0.02	0.00	0.00	0.00	0.00	0.14	51.53	48.33	7.80	1.74	-0.05	-1.18
4T186	553.5	556.5	100.00	91.26	76.31	59.92	42.22	22.34	6.36	0.17	0.08	0.02	0.00	0.00	0.00	0.00	0.17	59.75	40.08	7.51	1.70	0.03	-0.99
4T187	556.5	559.5	100.00	87.16	64.60	41.84	26.58	10.28	0.64	0.14	0.04	0.01	0.00	0.00	0.00	0.00	0.14	41.70	58.16	8.19	1.53	-0.14	-0.92
4T188	559.5	562.5	100.00	90.51	73.12	52.52	30.39	9.53	1.15	0.13	0.03	0.01	0.00	0.00	0.00	0.00	0.13	52.39	47.48	7.93	1.47	-0.01	-0.81
4T189	562.5	565.5	100.00	85.52	60.48	38.15	24.92	13.66	2.05	0.38	0.15	0.02	0.00	0.00	0.00	0.00	0.38	37.77	61.85	8.25	1.64	-0.27	-0.65
4T190	565.5	568.5	100.00	84.23	57.37	30.87	15.95	6.37	0.80	0.08	0.03	0.01	0.00	0.00	0.00	0.00	0.08	30.79	69.13	8.54	1.41	-0.31	-0.23
4T191	568.5	571.5	100.00	88.98	70.70	51.68	32.51	13.02	1.25	0.22	0.04	0.01	0.00	0.00	0.00	0.00	0.22	51.46	48.32	7.92	1.57	-0.03	-0.98
4T192	571.5	574.5	100.00	89.99	72.07	53.11	34.91	16.96	5.04	0.11	0.02	0.00	0.00	0.00	0.00	0.00	0.11	53.00	46.89	7.78	1.66	-0.07	-0.96
4T193	574.5	577.5	100.00	86.38	62.93	40.10	26.75	16.36	2.85	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.10	40.00	59.90	8.14	1.67	-0.22	-0.89
4T194	577.5	580.5	100.00	85.94	61.96	39.02	23.44	12.20	2.88	0.15	0.03	0.01	0.00	0.00	0.00	0.00	0.15	38.87	60.98	8.24	1.61	-0.26	-0.63
Core 4P (Miscellaneous)																							
4T196	553.0	554.0	100.00	86.32	62.91	41.53	27.76	13.38	2.21	0.31	0.12	0.06	0.01	0.00	0.00	0.00	0.31	41.22	58.47	8.15	1.64	-0.21	-0.74
4T197	554.0	556.0	100.00	86.77	63.33	44.06	32.79	19.40	2.00	0.07	0.03	0.01	0.00	0.00	0.00	0.00	0.07	43.99	55.94	8.02	1.73	-0.13	-1.22
4T198	465.0	467.0	100.00	89.53	70.24	53.83	42.06	26.72	7.78	0.38	0.04	0.01	0.00	0.00	0.00	0.00	0.38	53.45	46.17	7.59	1.85	-0.03	-1.27
4T199	467.0	468.0	100.00	91.00	75.00	58.30	45.15	27.73	4.54	0.27	0.04	0.01	0.00	0.00	0.00	0.00	0.27	58.03	41.70	7.48	1.75	0.06	-1.21
4T200	394.0	395.0	100.00	97.75	93.91	90.19	85.88	77.59	47.48	2.99	0.07	0.01	0.00	0.00	0.00	0.00	2.99	87.20	9.81	5.54	1.50	0.85	2.25
4T201	392.0	394.0	100.00	92.29	79.13	65.95	55.02	39.89	10.87	0.24	0.09	0.04	0.00	0.00	0.00	0.00	0.24	65.71	34.05	7.06	1.84	0.18	-1.14
4T202	312.0	313.0	100.00	94.73	85.50	74.50	65.10	53.48	17.05	1.36	0.10	0.03	0.00	0.00	0.00	0.00	1.36	73.14	25.50	6.58	1.80	0.34	-0.71
4T203	310.0	312.0	100.00	96.33	89.22	80.12	67.47	45.90	9.32	0.75	0.17	0.08	0.01	0.00	0.00	0.00	0.75	79.37	19.88	6.61	1.56	0.39	-0.07
CORE 4G																							
4GT3	4.5	7.5	100.00	89.07	65.38	43.40	30.06	18.88	5.43	1.83	1.33	0.69	0.13	0.00	0.00	0.00	1.83	41.57	56.60	7.94	1.83	-0.36	0.19
4GT4	7.5	10.5	100.00	89.25	67.39	47.18	34.96	23.59	8.03	4.46	3.91	2.34	0.48	0.00	0.00	0.00	4.46	42.72	52.82	7.68	2.09	-0.43	0.54
4GT5	10.5	13.5	100.00	91.26	72.27	54.04	40.90	26.05	7.98	3.33	2.56	1.25	0.23	0.00	0.00	0.00	3.33	50.71	45.96	7.50	1.97	-0.26	-0.05
4GT6	13.5	16.5	100.00	86.87	59.08	37.12	26.67	17.39	5.87	2.75	2.13	1.20	0.18	0.05	0.00	0.00	2.75	34.37	62.88	8.11	1.92	-0.52	0.91
4GT7	16.5	19.5	100.00	88.65	66.33	45.89	33.60	20.70	7.72	4.81	3.45	1.71	0.31	0.00	0.00	0.00	4.81	41.08	54.11	7.77	2.04	-0.44	0.52
4GT8	19.5	22.5	100.00	89.71	66.09	45.04	32.90	21.29	6.62	2.47	1.80	0.93	0.17	0.11	0.00	0.00	2.47	42.57	54.96	7.83	1.91	-0.37	0.25

Sample	Interval (cm)		Cumulative-frequency percent -- Phi class midpoints													Weight percentages				Statistics			
	Top	Bottom	10.50	9.50	8.50	7.50	6.50	5.50	4.50	3.50	2.50	1.50	0.50	-0.50	-1.50	Gravel	Sand	Silt	Clay	Mean	SD	Skew	Kurt
4GT9	22.5	25.5	100.00	89.30	66.37	43.42	28.84	14.81	4.55	2.05	1.48	0.89	0.16	0.00	0.00	0.00	2.05	41.37	56.58	7.98	1.77	-0.42	0.80
4GT10	28.5	31.5	100.00	89.51	67.10	46.83	33.99	21.40	6.23	1.98	1.32	0.61	0.11	0.00	0.00	0.00	1.98	44.85	53.17	7.81	1.87	-0.29	-0.18
4GT11	31.5	34.5	100.00	91.75	73.68	56.56	43.98	29.73	8.77	2.56	2.01	1.22	0.21	0.09	0.00	0.00	2.56	54.00	43.44	7.39	1.96	-0.19	-0.23
4GT12	34.5	37.5	100.00	92.60	77.01	64.00	55.40	43.89	16.19	2.03	1.63	0.95	0.13	0.00	0.00	0.00	2.03	61.97	36.00	6.96	2.03	0.05	-0.89
4GT13	37.5	40.5	100.00	85.29	59.08	40.60	29.12	15.34	2.87	0.97	0.92	0.62	0.24	0.00	0.00	0.00	0.97	39.63	59.40	8.15	1.79	-0.36	0.26
4GT14	40.5	43.5	100.00	86.02	62.58	45.32	34.69	19.53	4.23	2.19	1.62	0.85	0.23	0.04	0.00	0.00	2.19	43.13	54.68	7.93	1.92	-0.32	0.09
4GT15	43.5	46.5	100.00	94.25	83.25	73.84	66.31	49.43	8.37	0.63	0.43	0.19	0.03	0.00	0.00	0.00	0.63	73.21	26.16	6.73	1.75	0.35	-0.53
4GT16	46.5	49.5	100.00	89.69	71.20	56.82	45.59	27.69	7.30	1.30	0.97	0.61	0.18	0.00	0.00	0.00	1.30	55.52	43.18	7.49	1.91	-0.08	-0.68
4GT17	49.5	52.5	100.00	84.91	58.20	40.49	30.79	20.21	9.24	3.35	2.30	1.39	0.34	0.16	0.16	0.16	3.19	37.14	59.51	7.98	2.09	-0.47	0.61
4GT18	52.5	55.5	100.00	87.68	64.84	50.26	42.46	30.83	10.80	2.57	1.82	0.89	0.11	0.00	0.00	0.00	2.57	47.69	49.74	7.58	2.10	-0.18	-0.81
4GT19	55.5	58.5	100.00	87.43	63.90	46.63	34.84	17.61	2.17	0.90	0.63	0.28	0.00	0.00	0.00	0.00	0.90	45.73	53.37	7.96	1.76	-0.18	-0.66
4GT20	58.5	61.5	100.00	87.78	65.53	49.10	38.70	24.43	5.50	1.64	1.21	0.68	0.06	0.00	0.00	0.00	1.64	47.46	50.90	7.75	1.93	-0.20	-0.57
4GT21	61.5	64.5	100.00	87.98	68.14	52.98	41.80	26.43	7.31	1.75	1.32	0.71	0.15	0.00	0.00	0.00	1.75	51.23	47.02	7.61	1.96	-0.15	-0.61

Appendix B.--Water Content and Bulk Density Measurements

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
1G	WC1	227.0	31.34	1.73	1.18	2.58
1G	WC2	127.0	29.57	1.75	1.23	2.54
1G	WC3	47.0	28.99	1.77	1.26	2.58
1G	WC4	2.0	38.38	1.55	0.96	2.36
1B	WC1	37.0	26.32	1.90	1.40	2.81
1B	WC2	2.0	41.84	1.58	0.92	2.72
2G	WC1	247.0	40.81	1.57	0.93	2.59
2G	WC2	147.0	43.40	1.52	0.86	2.52
2G	WC3	47.0	47.86	1.42	0.74	2.32
2G	WC4	2.0	59.82	1.35	0.54	2.77
2P	WC1	1000.0	51.00	1.36	0.67	2.18
2P	WC2	795.0	21.31	1.85	1.45	2.40
2P	WC3	690.0	25.51	1.64	1.22	2.10
2P	WC4	500.0	34.97	1.66	1.08	2.59
2P	WC5	350.0	36.04	1.79	1.15	3.23
2P	WC6	175.0	38.48	1.59	0.98	2.52
2P	WC7	100.0	43.44	1.48	0.84	2.34
2P	WC8	50.0	47.95	1.48	0.77	2.65
2P	WC9	10.0	50.98	1.40	0.68	2.38
3G	WC1	235.0	32.04	1.72	1.17	2.59
3G	WC2	175.0	34.77	1.69	1.10	2.66
3G	WC3	75.0	41.41	1.59	0.93	2.74
3G	WC4	25.0	48.77	1.48	0.76	2.70
3G	WC5	2.0	55.16	1.38	0.62	2.61
4P	WC1	678.0	30.46	1.78	1.24	2.70
4P	WC2	525.0	33.88	1.69	1.12	2.61
4P	WC3	363.0	36.15	1.67	1.06	2.68
4P	WC4	170.0	38.44	1.62	1.00	2.66
4P	WC5	120.0	45.71	1.53	0.83	2.78
4P	WC6	58.0	53.64	1.39	0.64	2.51
4P	WC7	25.0	61.86	1.32	0.50	2.70
4P	WC8	5.0	59.00	1.29	0.53	2.22

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
4G	WC1	260.0	38.59	1.63	1.00	2.71
4G	WC2	240.0	42.94	1.59	0.91	2.85
4G	WC3	220.0	45.22	1.55	0.85	2.87
4G	WC4	200.0	45.36	1.54	0.84	2.77
4G	WC5	180.0	45.24	1.53	0.84	2.71
4G	WC6	160.0	47.48	1.51	0.79	2.78
4G	WC7	140.0	48.73	1.43	0.73	2.42
4G	WC8	120.0	50.10	1.46	0.73	2.70
4G	WC9	100.0	50.41	1.47	0.73	2.84
4G	WC10	90.0	51.68	1.44	0.70	2.74
4G	WC11	80.0	50.21	1.47	0.73	2.77
4G	WC12	70.0	51.85	1.39	0.67	2.40
4G	WC13	60.0	55.78	1.36	0.60	2.52
4G	WC14	50.0	57.33	1.41	0.60	3.09
4G	WC15	40.0	55.84	1.40	0.62	2.83
4G	WC16	30.0	59.50	1.34	0.54	2.67
4G	WC17	20.0	60.45	1.33	0.53	2.72
4G	WC18	10.0	64.06	1.32	0.47	3.00
4G	WC19	2.0	67.81	1.18	0.38	1.90
4B	WC1	60.0	54.26	1.43	0.65	2.93
4B	WC2	50.0	56.60	1.36	0.59	2.57
4B	WC3	40.0	61.15	1.32	0.51	2.71
4B	WC4	30.0	60.60	1.32	0.52	2.61
4B	WC5	20.0	58.61	1.36	0.56	2.79
4B	WC6	10.0	67.00	1.24	0.41	2.38
4B	WC7	2.0	70.47	1.18	0.35	2.02
5P	WC1	1110.0	48.47	1.47	0.76	2.64
5P	WC2	940.0	27.58	1.82	1.31	2.63
5P	WC3	820.0	31.41	1.11	0.76	1.18
5P	WC4	660.0	48.55	1.45	0.75	2.54
5P	WC5	590.0	48.79	1.50	0.77	2.83
5P	WC6	185.0	33.33	1.70	1.13	2.62
5P	WC7	90.0	36.04	1.67	1.07	2.70
5P	WC8	20.0	47.66	1.48	0.78	2.63
5G	WC1	205.0	42.02	1.56	0.91	2.63
5G	WC2	152.0	53.80	1.40	0.65	2.62
5G	WC3	92.0	51.92	1.42	0.68	2.61
5G	WC4	52.0	57.83	1.32	0.56	2.34
5G	WC5	2.0	69.46	1.23	0.38	2.63

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
5B	WC1	57.0	58.54	1.33	0.55	2.52
5B	WC2	18.0	72.44	1.16	0.32	1.97
6P	WC1	770.0	55.65	1.38	0.61	2.65
6P	WC2	620.0	53.90	1.34	0.62	2.20
6P	WC3	470.0	60.14	1.31	0.52	2.50
6P	WC4	330.0	63.62	1.31	0.47	2.80
6P	WC5	279.0	61.81	1.32	0.51	2.78
6P	WC6	215.0	53.43	1.43	0.66	2.80
6P	WC7	150.0	47.24	1.50	0.79	2.70
6P	WC8	100.0	55.77	1.41	0.62	2.88
6P	WC9	50.0	67.97	1.25	0.40	2.71
6P	WC10	35.0	77.17	1.17	0.27	2.69
6P	WC11	12.0	77.02	1.17	0.27	2.80
6G	WC1	255.0	42.72	1.55	0.89	2.61
6G	WC2	240.0	44.93	1.53	0.84	2.71
6G	WC3	220.0	47.13	1.49	0.79	2.62
6G	WC4	200.0	51.85	1.40	0.67	2.44
6G	WC5	180.0	48.30	1.43	0.74	2.40
6G	WC6	160.0	47.47	1.51	0.79	2.78
6G	WC7	140.0	50.32	1.44	0.72	2.60
6G	WC8	120.0	53.66	1.37	0.64	2.42
6G	WC9	100.0	59.20	1.29	0.53	2.24
6G	WC10	90.0	60.55	1.21	0.48	1.79
6G	WC11	80.0	60.43	1.29	0.51	2.28
6G	WC12	70.0	64.75	1.27	0.45	2.52
6G	WC13	60.0	67.00	1.22	0.40	2.19
6G	WC14	50.0	68.60	1.26	0.40	2.93
6G	WC15	40.0	69.97	1.20	0.36	2.21
6G	WC16	30.0	72.93	1.21	0.33	2.89
6G	WC17	20.0	75.07	1.16	0.29	2.24
6G	WC18	10.0	75.26	1.18	0.29	2.64
6G	WC19	2.0	74.02	1.16	0.30	2.13
6B	WC1	80.0	66.42	1.25	0.42	2.49
6B	WC2	70.0	69.27	1.17	0.36	1.89
6B	WC3	60.0	70.07	1.22	0.37	2.53
6B	WC4	50.0	70.56	1.20	0.35	2.30
6B	WC5	40.0	70.13	1.17	0.35	1.97
6B	WC6	30.0	69.95	1.21	0.36	2.32
6B	WC7	20.0	71.03	1.19	0.34	2.20
6B	WC8	10.0	71.13	1.18	0.34	2.14
6B	WC9	2.0	73.96	1.17	0.30	2.25

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
7G	WC1	283.0	54.12	1.36	0.62	2.37
7G	WC2	218.0	48.02	1.53	0.79	2.98
7G	WC3	163.0	51.54	1.48	0.72	2.99
7G	WC4	147.0	59.40	1.32	0.54	2.49
7G	WC5	107.0	53.57	1.44	0.67	2.95
7G	WC6	62.0	64.80	1.30	0.46	2.90
7G	WC7	27.0	77.17	1.12	0.25	1.83
7B	WC1	50.0	64.71	1.29	0.45	2.73
7B	WC2	16.0	73.98	1.19	0.31	2.55
7B	WC3	2.0	76.26	1.20	0.28	3.36
9V	WC1	280.0	46.83	1.50	0.80	2.69
9V	WC2	205.0	53.74	1.39	0.64	2.57
9V	WC3	150.0	43.64	1.52	0.86	2.55
9V	WC4	80.0	52.24	1.44	0.69	2.78
9V	WC5	15.0	59.81	1.31	0.53	2.47
9G	WC1	220.0	41.23	1.58	0.93	2.67
9G	WC2	200.0	49.80	1.49	0.75	2.91
9G	WC3	180.0	32.85	1.69	1.13	2.54
9G	WC4	160.0	46.61	1.48	0.79	2.56
9G	WC5	140.0	27.12	1.86	1.36	2.75
9G	WC6	120.0	42.77	1.58	0.90	2.79
9G	WC7	100.0	50.82	1.48	0.73	2.94
9G	WC8	90.0	46.52	1.53	0.82	2.85
9G	WC9	80.0	42.64	1.61	0.93	2.97
9G	WC10	70.0	48.45	1.48	0.76	2.68
9G	WC11	60.0	51.58	1.45	0.70	2.76
9G	WC12	50.0	53.49	1.44	0.67	2.92
9G	WC13	40.0	56.50	1.43	0.62	3.22
9G	WC14	30.0	58.21	1.39	0.58	3.06
9G	WC15	20.0	65.57	1.29	0.44	2.90
9G	WC16	10.0	60.04	1.36	0.55	3.01
9G	WC17	2.0	45.17	1.56	0.85	2.86
9B	WC1	2.0	55.36	1.42	0.63	2.95
9B	WC2	10.0	50.94	1.45	0.71	2.74
9B	WC3	20.0	58.57	1.37	0.57	2.84
9B	WC4	30.0	60.45	1.34	0.53	2.79
9B	WC5	40.0	65.33	1.29	0.45	2.86
9B	WC6	50.0	58.13	1.37	0.57	2.79
10V	WC1	218.0	24.84	1.91	1.43	2.73
10V	WC2	117.0	45.56	1.51	0.82	2.64
10V	WC3	12.0	54.44	1.37	0.62	2.46

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
11G	WC1	277.0	59.73	1.35	0.55	2.86
11G	WC2	217.0	53.26	1.44	0.67	2.88
11G	WC3	163.0	49.79	1.45	0.73	2.61
11G	WC4	113.0	59.22	1.32	0.54	2.42
11G	WC5	53.0	53.51	1.38	0.64	2.47
11G	WC6	7.0	70.47	1.22	0.36	2.59
11B	WC1	63.0	71.01	1.25	0.36	3.33
11B	WC2	33.0	72.29	1.20	0.33	2.56
11B	WC3	2.0	78.70	1.17	0.25	3.04
12G	WC1	258.0	62.27	1.32	0.50	2.74
12G	WC2	203.0	63.70	1.33	0.48	3.22
12G	WC3	158.0	54.06	1.43	0.65	2.85
12G	WC4	92.0	50.00	1.44	0.72	2.59
12G	WC5	52.0	55.43	1.40	0.62	2.79
12G	WC6	16.0	63.86	1.34	0.48	3.35
12G	WC7	2.0	57.66	1.35	0.57	2.60
12B	WC1	38.0	54.78	1.39	0.63	2.67
12B	WC2	19.0	57.63	1.33	0.56	2.42
12B	WC3	8.0	54.25	1.39	0.64	2.59
13G	WC1	175.0	32.71	1.63	1.10	2.35
13G	WC2	148.0	40.45	1.64	0.98	2.91
13G	WC3	117.0	40.25	1.72	1.03	3.32
13G	WC4	68.0	48.18	1.50	0.78	2.83
13G	WC5	18.0	52.75	1.44	0.68	2.81
13G	WC6	2.0	24.14	1.87	1.42	2.58
15V	WC1	460.0	46.07	1.49	0.80	2.54
15V	WC2	340.0	46.82	1.49	0.79	2.63
15V	WC3	190.0	50.32	1.44	0.72	2.60
15V	WC4	110.0	49.90	1.47	0.74	2.75
15V	WC5	25.0	46.45	1.49	0.80	2.61
16V	WC1	47.0	31.84	1.78	1.22	2.82
20G	WC1	285.0	49.57	1.43	0.72	2.48
20G	WC2	185.0	54.19	1.34	0.62	2.26
20G	WC3	85.0	65.24	1.28	0.44	2.68
20G	WC4	10.0	67.68	1.21	0.39	2.12

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
20B	WC1	53.0	70.82	1.22	0.36	2.64
20B	WC2	8.0	73.21	1.19	0.32	2.54
20B	WC3	2.0	76.66	1.15	0.27	2.23
21V	WC1	18.0	41.46	1.63	0.95	2.92
21V	WC2	72.0	16.34	2.04	1.71	2.56
21V	WC3	97.0	18.03	2.06	1.69	2.69
22G	WC1	263.0	42.49	1.54	0.88	2.55
22G	WC2	163.0	45.02	1.52	0.84	2.67
22G	WC3	63.0	47.99	1.51	0.79	2.87
22G	WC4	33.0	41.89	1.57	0.91	2.68
22G	WC5	17.0	42.60	1.52	0.87	2.47
22G	WC6	8.0	41.80	1.56	0.91	2.59
22B	WC1	33.0	39.77	1.59	0.96	2.60
22B	WC2	13.0	43.71	1.52	0.86	2.56
22B	WC3	2.0	72.48	1.24	0.34	3.27
23G	WC1	233.0	44.98	1.52	0.83	2.62
23G	WC2	133.0	43.28	1.54	0.87	2.62
23G	WC3	73.0	46.78	1.46	0.78	2.48
23G	WC4	37.0	51.96	1.40	0.67	2.47
23G	WC5	17.0	46.75	1.50	0.80	2.66
24B	WC2	4.0	29.53	1.88	1.32	2.96
24B	WC1	47.0	51.23	1.49	0.73	3.05
24G	WC4	13.0	53.09	1.44	0.67	2.83
24G	WC3	67.0	33.69	1.72	1.14	2.70
24G	WC2	117.0	36.19	1.72	1.10	2.89
24G	WC1	217.0	30.19	1.81	1.27	2.80
25B	WC2	5.0	66.75	1.25	0.42	2.57
25B	WC1	57.0	64.73	1.26	0.44	2.42
25G	WC4	7.0	67.67	1.21	0.39	2.21
25G	WC3	77.0	61.41	1.25	0.48	2.11
25G	WC2	157.0	54.66	1.44	0.65	3.04
25G	WC1	227.0	50.11	1.45	0.72	2.62
26B	WC4	2.0	49.90	1.48	0.74	2.81
26B	WC3	8.0	55.09	1.38	0.62	2.56
26B	WC2	15.0	59.76	1.28	0.51	2.18
26B	WC1	28.0	61.87	1.33	0.51	2.91

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
26G	WC6	3.0	61.96	1.27	0.48	2.29
26G	WC5	10.0	61.35	1.26	0.49	2.15
26G	WC4	37.0	48.30	1.61	0.83	3.72
26G	WC3	107.0	44.36	1.54	0.86	2.69
26G	WC2	177.0	33.92	1.74	1.15	2.81
26G	WC1	217.0	52.11	1.37	0.66	2.31
27B	WC2	4.0	50.21	1.44	0.72	2.58
27B	WC1	47.0	58.41	1.31	0.54	2.32
27G	WC8	7.0	36.78	1.60	1.01	2.45
27G	WC7	17.0	40.52	1.52	0.90	2.34
27G	WC6	37.0	48.91	1.41	0.72	2.31
27G	WC5	73.0	30.55	1.72	1.20	2.53
27G	WC4	97.0	61.32	1.30	0.50	2.46
27G	WC3	117.0	65.11	1.25	0.43	2.30
27G	WC2	157.0	65.28	1.25	0.43	2.37
27G	WC1	237.0	61.67	1.29	0.49	2.37
28B	WC3	7.0	60.37	1.33	0.53	2.65
28B	WC2	27.0	46.38	1.48	0.79	2.52
28B	WC1	37.0	50.75	1.43	0.70	2.56
28G	WC6	7.0	58.84	1.32	0.54	2.40
28G	WC5	22.0	45.95	1.59	0.86	3.15
28G	WC4	47.0	52.69	1.36	0.65	2.30
28G	WC3	87.0	49.02	1.40	0.71	2.27
28G	WC2	157.0	47.47	1.45	0.76	2.45
28G	WC1	227.0	50.85	1.44	0.71	2.63
29B	WC10	2.0	82.66	1.12	0.19	2.64
29B	WC9	4.0	79.10	1.15	0.24	2.62
29B	WC8	12.0	77.93	1.14	0.25	2.29
29B	WC7	22.0	75.58	1.17	0.29	2.46
29B	WC6	32.0	74.23	1.18	0.30	2.43
29B	WC5	42.0	74.49	1.19	0.30	2.69
29B	WC4	52.0	72.54	1.17	0.32	2.15
29B	WC3	62.0	70.43	1.21	0.36	2.45
29B	WC2	72.0	71.98	1.18	0.33	2.22
29B	WC1	82.0	69.98	1.22	0.37	2.56

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
29G	WC20	13.0	75.39	1.16	0.28	2.24
29G	WC19	23.0	74.42	1.17	0.30	2.36
29G	WC18	33.0	71.43	1.19	0.34	2.24
29G	WC17	43.0	69.15	1.22	0.38	2.38
29G	WC16	53.0	66.01	1.24	0.42	2.32
29G	WC15	63.0	65.33	1.28	0.45	2.77
29G	WC14	73.0	64.54	1.28	0.45	2.63
29G	WC13	83.0	67.15	1.25	0.41	2.50
29G	WC12	93.0	64.30	1.28	0.46	2.60
29G	WC11	103.0	57.58	1.38	0.58	2.84
29G	WC10	113.0	54.84	1.41	0.64	2.80
29G	WC9	133.0	52.45	1.42	0.68	2.65
29G	WC8	153.0	49.19	1.49	0.76	2.84
29G	WC7	173.0	50.95	1.44	0.71	2.65
29G	WC6	193.0	59.43	1.38	0.56	3.14
29G	WC5	213.0	50.31	1.46	0.72	2.72
29G	WC4	233.0	50.63	1.45	0.72	2.68
29G	WC3	253.0	52.63	1.15	0.55	1.38
29G	WC2	273.0	56.92	1.36	0.58	2.57
29G	WC1	293.0	57.77	1.38	0.58	2.92
30B	WC2	13.0	78.57	1.11	0.24	1.84
30B	WC1	47.0	75.59	1.16	0.28	2.30
30G	WC4	13.0	75.47	1.13	0.28	1.88
30G	WC3	77.0	64.25	1.39	0.50	4.60
30G	WC2	127.0	61.84	1.39	0.53	3.75
30G	WC1	227.0	49.68	1.43	0.72	2.47
31B	WC9	2.0	76.74	1.14	0.26	2.10
31B	WC8	12.0	73.91	1.19	0.31	2.59
31B	WC7	22.0	73.92	1.13	0.30	1.82
31B	WC6	32.0	71.50	1.20	0.34	2.36
31B	WC5	42.0	70.18	1.18	0.35	2.09
31B	WC4	52.0	69.64	1.19	0.36	2.15
31B	WC3	62.0	69.88	1.23	0.37	2.69
31B	WC2	72.0	70.98	1.18	0.34	2.06
31B	WC1	78.0	69.37	1.20	0.37	2.22

Core number	Sample number	Depth (cm)	Weight percent H_2O	Wet bulk density (g/cm^3)	Dry bulk density (g/cm^3)	Grain specific gravity
31G	WC16	7.0	69.01	1.16	0.36	1.79
31G	WC15	17.0	69.90	1.18	0.36	2.05
31G	WC14	27.0	69.57	1.18	0.36	2.00
31G	WC13	37.0	67.74	1.22	0.39	2.22
31G	WC12	47.0	66.49	1.17	0.39	1.77
31G	WC11	57.0	64.42	1.12	0.40	1.43
31G	WC10	67.0	63.96	1.19	0.43	1.78
31G	WC9	77.0	63.86	1.22	0.44	1.98
31G	WC8	88.0	63.36	1.19	0.43	1.74
31G	WC7	97.0	61.88	1.28	0.49	2.36
31G	WC6	107.0	58.77	1.32	0.55	2.46
31G	WC5a	117.0	59.28	1.33	0.54	2.59
31G	WC5b	127.0	59.06	1.35	0.55	2.71
31G	WC4c	137.0	57.22	1.19	0.51	1.60
31G	WC4	147.0	60.09	1.30	0.52	2.37
31G	WC3	167.0	57.24	1.31	0.56	2.25
31G	WC2	187.0	55.33	1.22	0.54	1.66
31G	WC1	207.0	56.15	1.35	0.59	2.43

APPENDIX C.--CORE DESCRIPTIONS

EXPLANATION

 Silt beds

 Sand beds or sandy zones

 Diamicton

 Gap in core or no recovery

 Black streaks and mottles caused by iron monosulfides; oxidizes to brown colors upon exposure to air

o ● Clasts: filled, lithified; open, soft clay

) (Macroscopic shells

 Wood

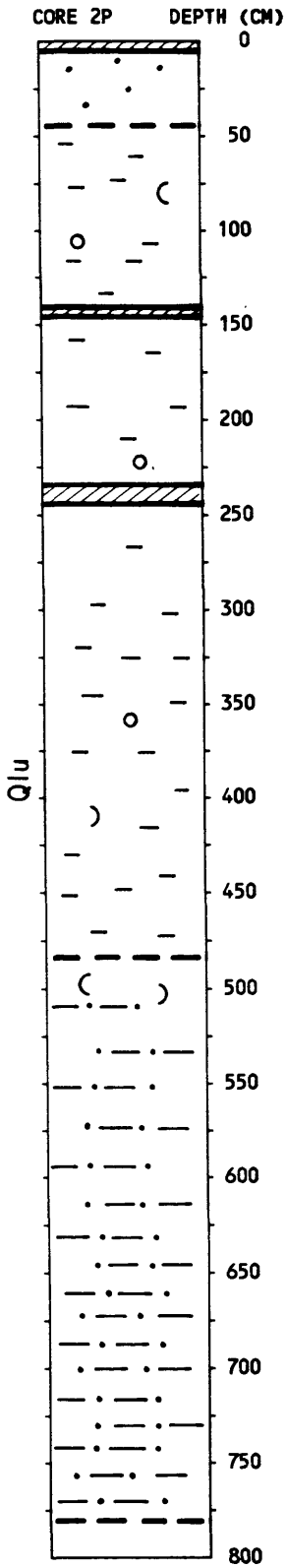
——-- Contact; solid where abrupt, dashed where gradational

Abbreviation of stratigraphic units (See text for discussion):

Qlu --	Upper Lake Michigan Formation
Qll--	Lower Lake Michigan Formation
Qllw--	Wilmette Bed
Qe--	Equality Formation
Qww--	Wedron Formation, Wadsworth Till Member
Qws--	Wedron Formation, Shorewood Till Member
Qwm--	Wedron Formation, Manitowoc Till Member
Qtr--	Two Rivers Till

Notes:

1. All colors are for wet sediment in standard Munsell notation.
2. Mud refers to clay, silty clay, and clayey silt, undifferentiated.
3. Laminated refers mostly to X-ray observations; banded refers mostly to visible colors.



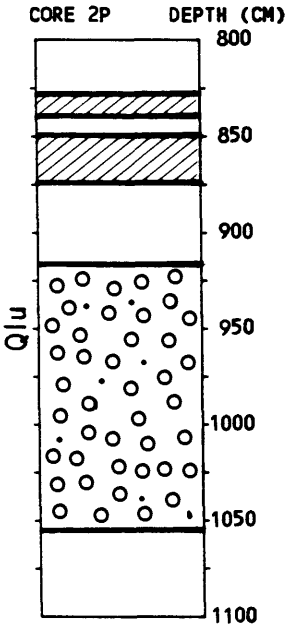
DESCRIPTION

0-45 Mud, brownish-gray (10YR3/1-2), massive. Upper part disturbed. Contains scattered sand grains.

45-485 Mud, brownish-gray (10YR4/2), massive to weakly laminated. Contains scattered black streaks, and rare shell fragments, clay clasts, and oxidized silt partings.

485-783 Mud, brownish-gray (10YR4/2), massive to faintly laminated. Contains abundant lenses and laminae of slightly oxidized (10YR4-5/3-2) silt. Contains a few shell fragments near top.

780-920 Mud, brownish-gray (10YR4/2), massive, watery, probably disturbed.
800 Continued

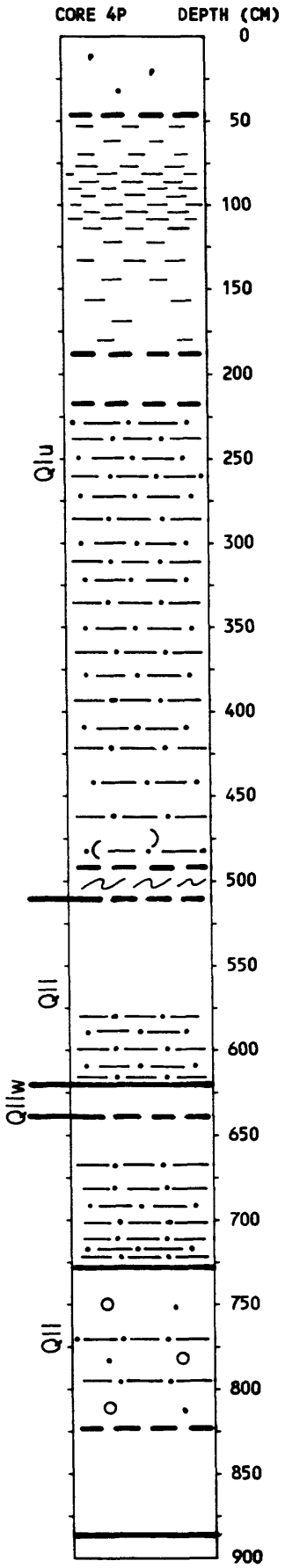


DESCRIPTION (Continued)

780-920 Mud, brownish-gray (10YR4/2), massive, watery, probably disturbed. Scattered sand grains.

920-1057 Mud, brownish-gray (10YR4/2), massive. Abundant soft clay clasts the same color as the matrix. Scattered sand grains.

1057 Bottom of core



DESCRIPTION

0-45 Mud, brownish-gray (10YR4/1), silt-rich, containing scattered sand grains, bedding disturbed.

45-187 Mud, gray-brown (10YR4/1-10YR4/2), faintly to moderately laminated. Contains abundant black streaks and mottles, which are especially dense from 78 to 117 cm. Scattered sand grains and shell fragments near base.

187-220 Mud, brown (10YR4-5/2), well laminated. Visible silt laminations.

220-490 Interbedded brown (10YR4/2) clayey silt and silt (10YR5/2), both well laminated. Silt beds are 0.5 to 1 cm thick and are 1 to 4 cm apart. Thickness and spacing between silt beds increases toward bottom of unit. A few shell fragments at bottom of unit.

490-510 Deformed beds of clayey silt and silt, brown (10YR4-5/2). Similar to unit above except for deformation.

510-622 Mud (silty clay) containing thin (less than 0.5 cm) silt beds. Brown (10YR5/2), but slightly redder than unit above, very well laminated. Appearance on X-rays is varve-like.

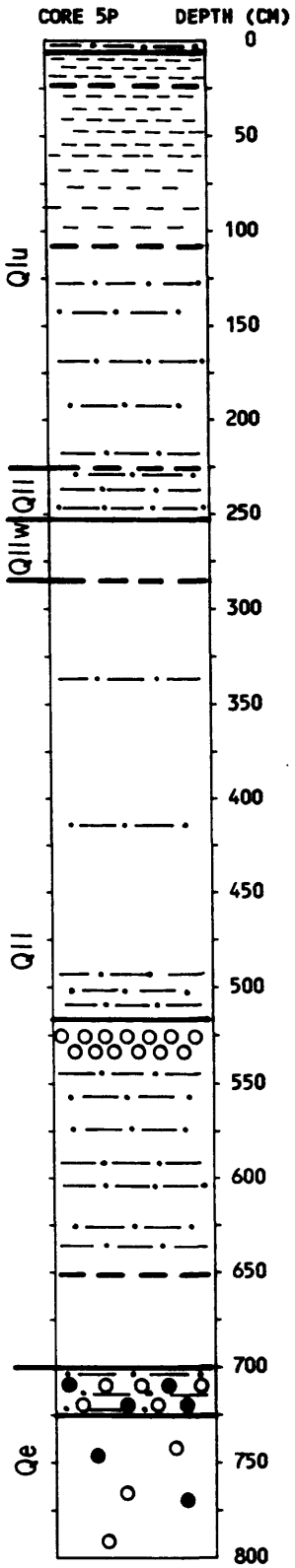
622-638 Mud, gray, massive to faintly laminated. Abrupt upper contact; gradational lower contact. Color grades from 10YR4/1 near top to 7.5YR4/2 near bottom.

638-728 Mud, reddish-brown, well laminated. Scattered sand grains and pebbles. Grades from 5YR4/2 near top tp 7.5YR(4/2) near bottom. A few varve-like silt beds (10YR4/2) less than 1 cm thick, becoming more abundant toward bottom of unit.

728-823 Mud, gray (10YR4/2), massive to very faintly laminated, weakly color-banded. Contains relatively abundant, but scattered, sand grains, pebbles, and clay clasts.

823-883 Mud, brown (7.5-10YR4/2), faintly laminated, deformed or disturbed. Slightly redder toward top.

883 Bottom of core



DESCRIPTION

0-8 Mud, gray (10YR3/1), well laminated. Silty with scattered sand grains.

8-25 Mud, brownish-gray (10YR4/2), well laminated. Abundant black streaks and laminae.

25-110 Mud, brown (7.5YR5/2), well laminated, faint color banding. Abundant black streaks becoming less numerous toward bottom.

110-225 Mud, interbedded with silt, brown, very well laminated. Mud is browner (7.5YR4-5/2) than silt beds (10YR4-5/2). Silt beds are about 0.5 cm thick and are irregularly spaced near top; near bottom they become more common and regularly spaced, 1-5 cm apart, and more varve-like.

225-253 Mud, brown (7.5YR4-5/2) interbedded with brownish-gray (10YR4-5/2) silt, very well laminated, varve-like.

253-284 Mud, grading from brownish-gray (10YR4/2) near top to reddish-brown (7.5YR4/2) near base, almost massive. Scattered black streaks.

284-517 Mud, reddish-brown (5YR4/3), weakly laminated. A few visible grayer silt beds less than 1 cm thick. Becomes distinctly laminated near base.

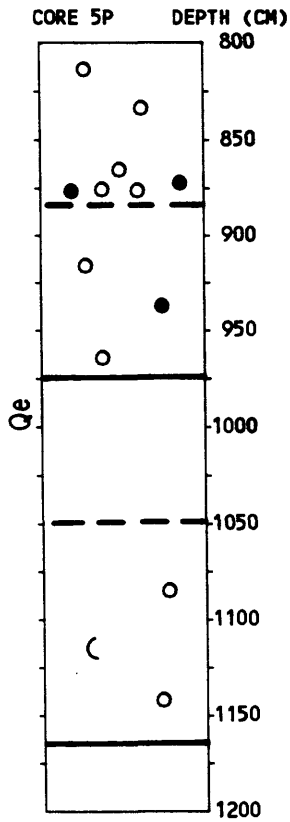
517-650 Mud, reddish-brown (5YR4/2), mostly weakly laminated. Contains abundant, varve-like, gray (10YR4/2) silt beds about 0.5 cm thick, which become more frequent toward base. Several thin beds of clay clasts at top of unit.

650-700 Mud, brownish-gray (10YR5/2), grades from faintly laminated at top to well laminated at base. Contains reddish-brown (5YR4/3) bands near top. Scattered sand grains.

700-724 Silt, brown (7.5YR4-5/2), massive. Contains abundant sand and hard and soft clasts.

724-800 Mud, brownish-gray (10YR4-5/1-2), grading from well laminated near top to weakly laminated near base. Moderately abundant hard and soft clasts

800 Continued



DESCRIPTION (Continued)

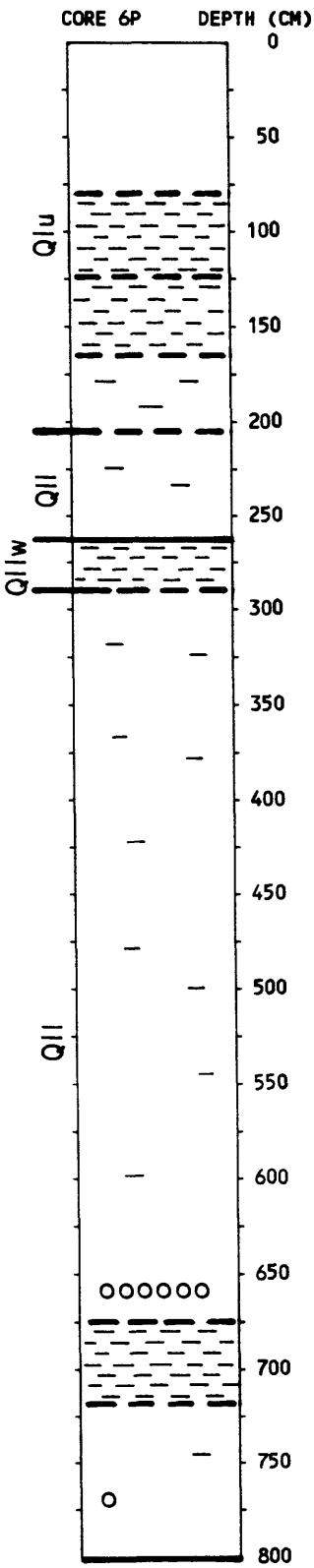
800-885 Mud, gray (10YR4-5/1), well laminated. Scattered clasts, more abundant toward base

885-975 Mud, brownish-gray (10YR5/2), weakly laminated to nearly massive. Scattered clasts.

975-1050 Mud, reddish-brown, grading from well-laminated near top to massive near bottom. Some disturbance in middle part. Color grades from 5YR5/2 near top to 7.5YR4/2 near base, with some weak color banding.

1050-1163 Mud, brownish-gray (10YR3-4/1-2), massive to weakly laminated, slightly color banded. Contains black mottling and rare clasts. One shell fragment seen.

1163 Base of core.



DESCRIPTION

0-81 Mud, brownish-gray (10YR 3/1), massive towards top, faintly laminated towards base. Core top appears disturbed.

81-123 Mud, light brownish-gray (10YR5/2), well laminated. Contains abundant black streaks and mottles.

123-165 Mud, brownish-gray (7.5YR4-5/1), well laminated. Contains abundant black streaks and mottles.

165-268 Mud, banded and well laminated; mostly brownish-gray (10YR4-5/2) with reddish (5YR5/2) bands near top, red with grayish bands near bottom. Scattered black streaks and mottles, especially near top.

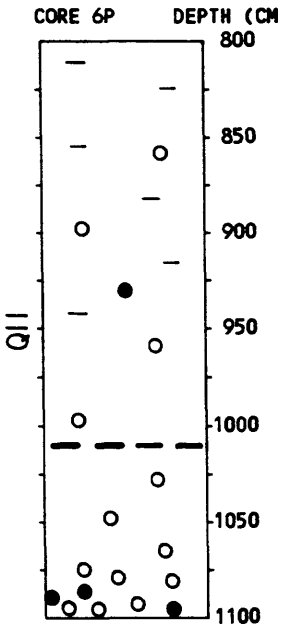
268-290 Mud, blue-gray (5G4/1) near top, grading to brownish-gray (7.5YR5/1) near bottom. Nearly massive; abrupt upper contact; gradational lower contact. Abundant black streaks.

290-675 Mud, reddish-brown (5YR5/2), faintly to moderately laminated. Contains bands of grayer (5YR5/1) and browner (10YR5/3) color. Mostly quite uniform.

675-720 Mud, reddish-brown (5YR5/2), well laminated. Very slight color banding. Contains abundant black streaks and mottles.

720-1010 Mud, mostly reddish-brown (5YR5/2), well laminated. Slight color banding (7.5YR4/3-2.5YR4/4). Scattered pebbles, especially near base.

800 Continued

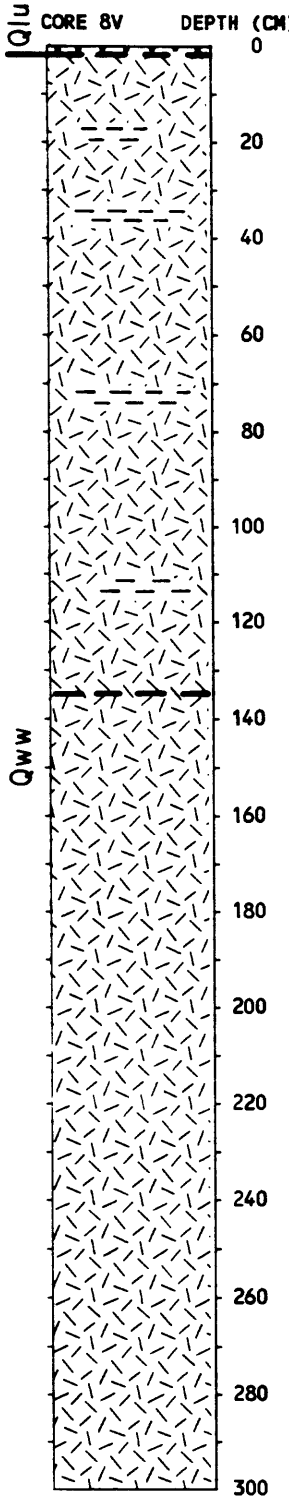


DESCRIPTION (Continued)

720-1010 Mud, mostly reddish-brown (5YR5/2), well laminated. Slight color banding (7.5YR4/3-2.5YR4/4). Scattered pebbles, especially near base.

1010-1100 Mud, mostly brownish-gray (10YR5/2-7.5YR5/2), well laminated. Color bands as red as 5YR5/2. Scattered pebbles and clay clasts, bacoming abundant at base.

1100 Base of core.



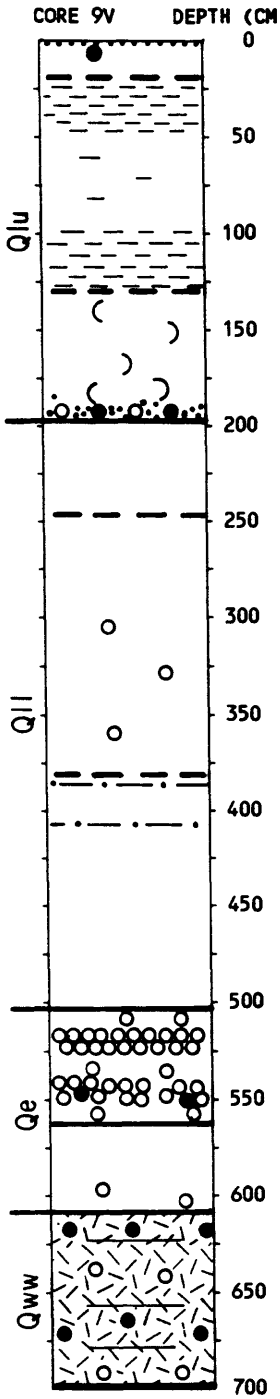
DESCRIPTION

0-1 Mud, gray (10YR5/1), massive. Contains abundant coarse sand.

1-135 Diamicton, gray (10YR4-5/1), crudely stratified and banded. Clay-rich matrix containing moderately abundant red clay clasts and shale pebbles. Darker bands have siltier matrix.

135-543 Diamicton, gray (10YR4-5/1), massive. Clay-rich matrix containing moderately abundant red clay clasts and shale pebbles.

Continues to base of core at 543 cm.



DESCRIPTION

0-20 Brownish-gray (7.5YR3/1-2) mud, massive. Thin black streaks towards bottom. Upper 1 cm sandy, thin iron-stained layer at 3 cm.

20-132 Brown (7.5YR3-4.5/2) mud, well-laminated. Prominent black streaks 20-45 cm and 100-132 cm.

132-198 Brown (7.5YR4-5/2) mud, faintly laminated. Scattered shells throughout; sandy and pebbly zone a few cm thick at base.

198-248 Reddish-brown (5YR4/2) mud, well laminated.

248-385 Reddish-brown (5YR5/2) mud, weakly laminated, faintly banded. Few scattered clay clasts below 305 cm.

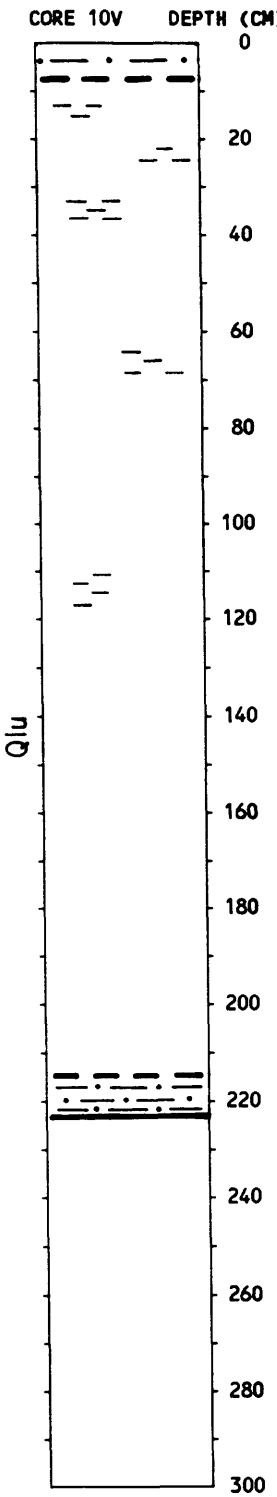
385-506 Banded mud, reddish-brown (5YR5/3-4) and weakly laminated at top, grading to brownish-gray (10YR4-5/2) and strongly laminated at base. Bands are several cm thick and as red as 2.5YR4/4. Rare sand grains and small mud clasts. Two thin silt beds at 385-386 and 408-412 cm.

506-568 Interbedded mud and clay-pebble conglomerate, in beds 10-25 cm thick. Clast poor mud is mostly brownish-gray (10YR4/2) with some reddish streaks. Clay-pebble conglomerate mostly reddish-brown (5YR5/2) with some gray streaks and swirls; contains scattered sand clasts and discrete sand grains. Clay clasts are mostly reddish-brown, but some are gray. Some beds appear deformed.

568-618 Gray (10YR5/1-2) mud, well-laminated. Disturbed laminations and a few red and gray clay clasts toward bottom.

618-698 Stratified gray (10YR5/1-2) diamicton. Alternating 5-20 cm beds of (1) very clay-rich, stone-poor, diamicton containing many small reddish clay clasts, and (2) sandy, silty, relatively stone-rich diamicton containing few reddish clay clasts.

698 Base of core



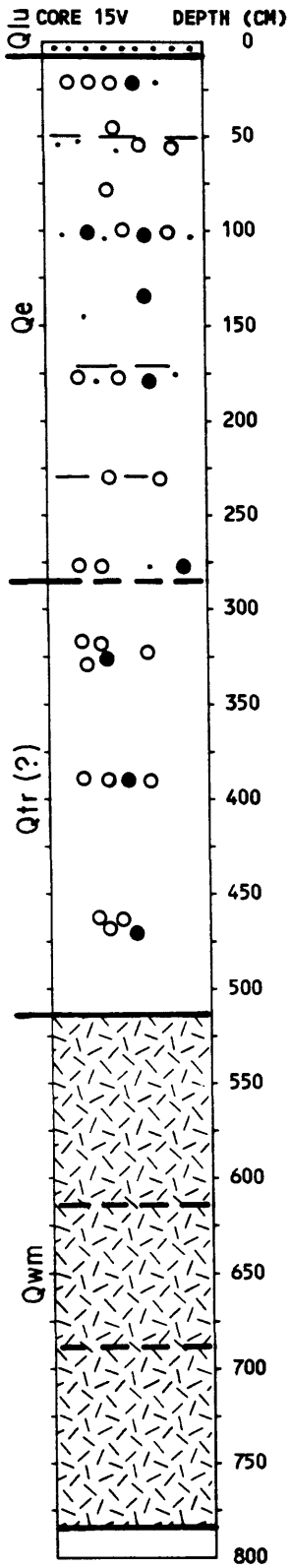
DESCRIPTION

0-7 Mud, brownish-gray (10YR5/2), massive, probably disturbed. Silt-rich with scattered sand grains.

7-214 Mud, brown (7.5YR-10YR5/2), laminated. Sightly redder and grayer bands, each 0.5 to 2 cm thick. Scattered black blotches, more common near top.

214-222 Silt, brownish-gray (10YR4/2), laminated.

222 Bottom of core.



DESCRIPTION

0-7 Medium sand, brown (7.5YR4/4), massive.

7-285 Mud, red (2.5YR4/3), massive with laminated sections 3-6 cm thick and 20-50 cm apart. Laminated sections also contain concentrations of clasts and become less frequent toward base. Soft clasts are mostly reddish-brown (7.5YR4/3) clay, but also include sand and silt clasts.

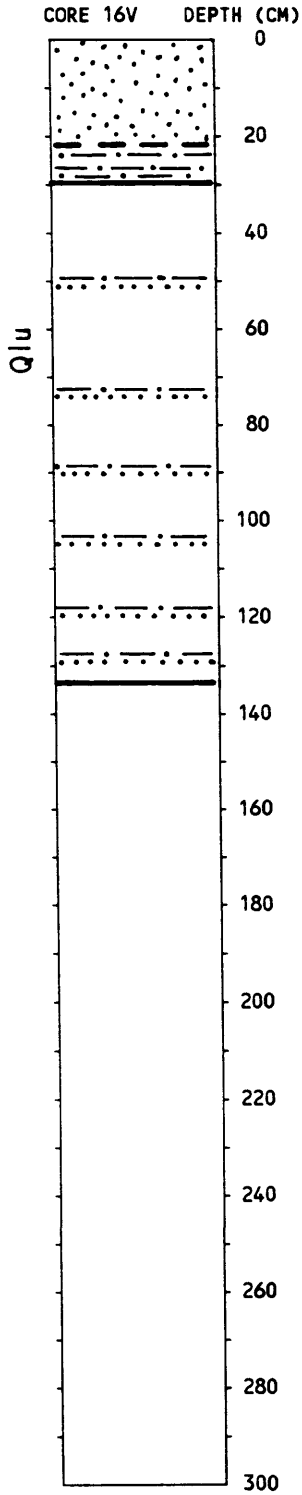
285-514 Mud, red (2.5YR4/3), mostly massive with scattered concentrations of clasts, most of which are soft.

514-615 Diamicton, reddish-brown, banded. Contains abundant hard and soft clasts and distinct color bands. Matrix varies in color (5YR4-5/2/3); bands are as red as 2.5YR4/5. In the middle part, bands appear to be swirled and deformed.

615-686 Diamicton, red (2.5YR4-5/2), massive. Mottled, with fewer clasts than unit above.

686-779 Diamicton, red (2.5YR4-5/2), banded and mottled. Color bands are deformed; fewer clasts than uppermost diamict unit.

779 Base of core



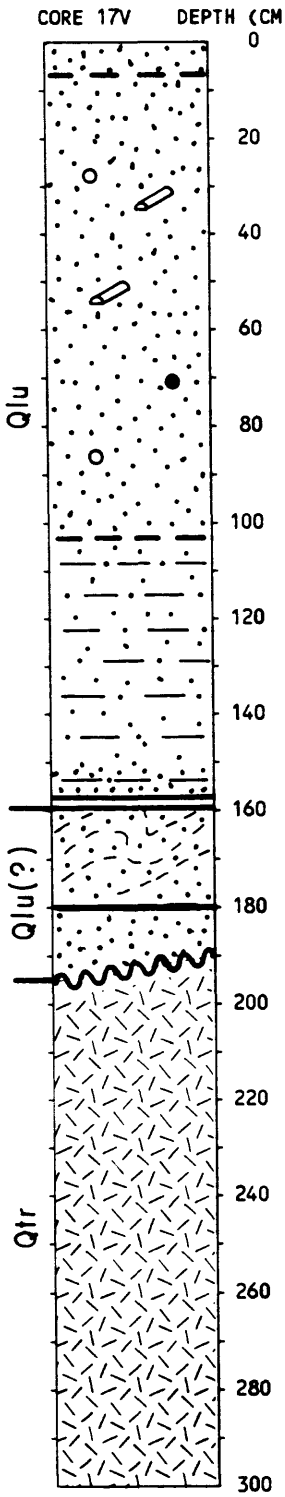
DESCRIPTION

0-22 Fine to medium sand, gray (10YR4/1), massive. Contains silt and scattered pebbles as much as 1 cm in diameter.

22-30 Mud, sandy, brownish-gray (10YR4/2), weakly laminated.

30-133 Mud, sandy, brown (7.5YR5/2), in distinct graded beds. Grades beds are 10 to 20 cm thick and have brownish-gray (10YR4/2), fine to medium sand at their bases. Unit as a whole fines upward. Contains scattered shells.

133 Base of core.



DESCRIPTION

0-7 Very fine sand, brownish-gray (10YR5/2), massive.
7-103 Fine to very fine sand, brownish-gray (10YR5/2), massive, coarsening upward. Contains scattered pebbles, wood fragments, and organic matter.

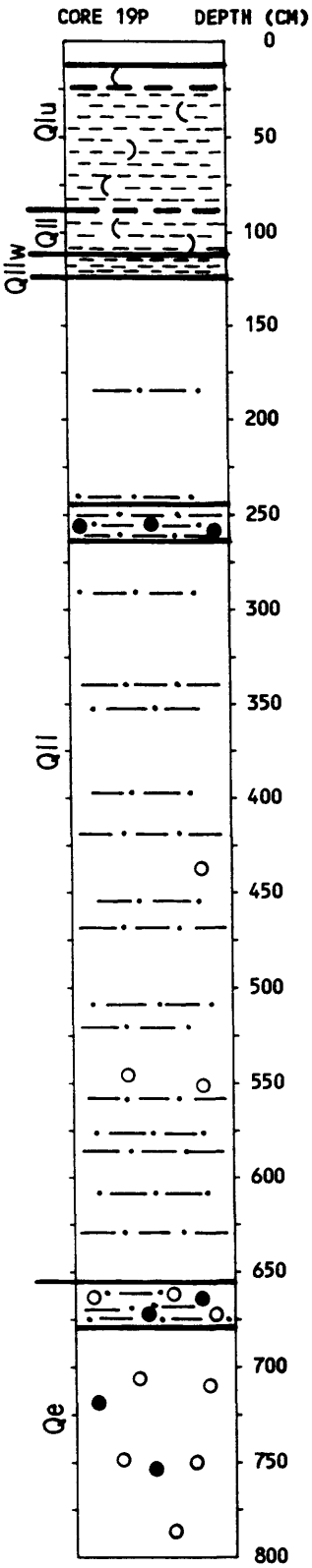
103-158 Sandy silt, brownish-gray (10YR3-4/2), massive to faintly bedded. Weakly mottled, contains organic fragments, sightly coarser toward base.

158-159 Clayey silt, brownish-gray (10YR3/2), massive.
159-180 Silt and silty fine sand, brownish-gray (sand, 10YR4/3; silt, 10YR3/2), bedded. Silt and sand interbedded and complexly deformed; irregular lower contact.

180-192 Fine sand, brownish-gray (10YR4-5/3-2), weakly bedded. Silty toward top. Inclined lower contact.

192-308 Diamicton, red (2.5YR4/2-5YR4/2), mottled, massive. Scattered hard and soft clasts.

Continues to base of core at 308 cm.



DESCRIPTION

0-12 Mud, brownish-gray (10YR5/2), massive, probably disturbed.
12-24 Mud, brown (7.5YR5/4), faintly laminated. Scattered shell fragments.
24-91 Mud, brown (7.5YR5/2-3), faintly laminated. Black mottles and streaks, increasing in abundance downward. Scattered shell fragments.

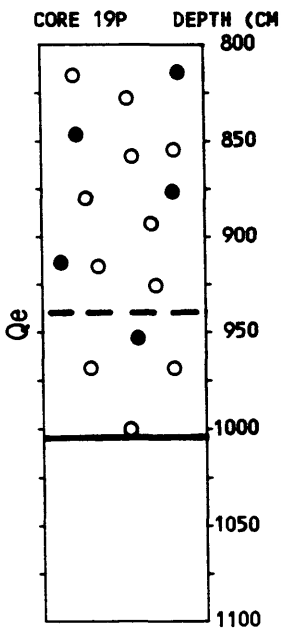
91-112 Mud, reddish-brown (5YR5/2), faintly laminated. Black mottles and streaks. Scattered shell fragments.
112-123 Mud, gray (10YR5/1), massive. Abundant black streaks and mottles.
123-246 Mud, reddish-brown (5YR5/2-4), faintly laminated. Slightly redder and more banded toward top. A few siltier beds and one prominent silt bed 1 cm thick near base.

246-267 Silt, brown (7.5YR5/2), laminated. Abundant sand, granules, and brown to red clay clasts.
267-655 Mud, reddish-brown (5YR5/2-3), mostly faintly laminated. Silt beds about 1 cm thick containing sand and granules spaced 5 to 40 cm apart. Rare clay and silt clasts.

655-677 Silt, brown (7.5YR5/2), beds about 1 cm thick. Scattered sand, granules, and hard and soft clasts.

677-798 Mud, reddish-brown (5YR5/2), banded to massive. Scattered hard and soft clasts, more abundant toward bottom. Some beds are 10 to 15 cm thick and slightly redder and less clast-rich.

800 Continued

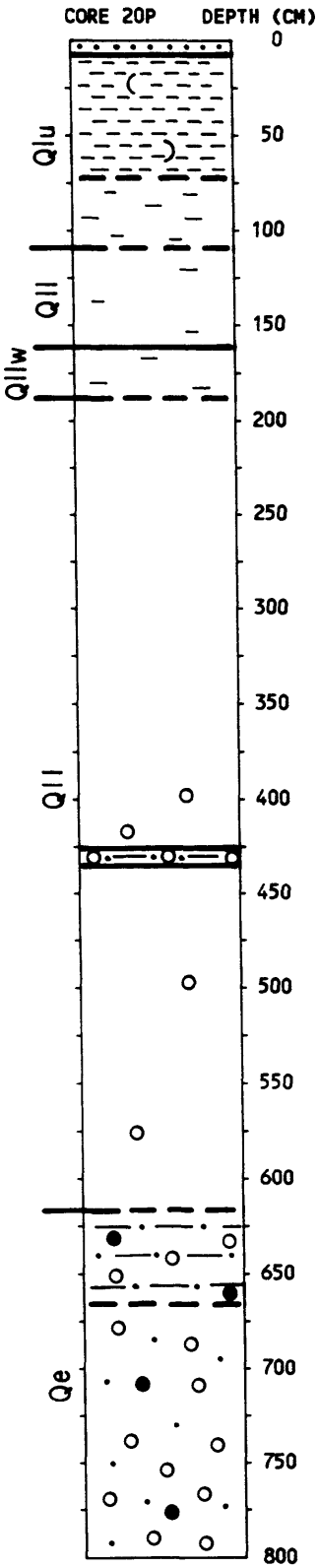


DESCRIPTION (Continued)

798-940 Mud, brown (7.5YR4-5/2), massive. Abundant hard and soft clasts.

940-1003 Mud, reddish-brown (5YR5/3), massive to faintly banded. Abundant hard and soft clasts.

1003 Base of core.



DESCRIPTION

0-7 Mud, gray (10YR2/1), massive, disturbed. Scattered sand grains.
7-72 Mud, brown (7.5YR5/2), laminated. Contains dense black streaks and laminae.

72-110 Mud, brown (7.5YR5/2), faintly laminated. Scattered black streaks and mottles.

110-168 Mud, brown (7.5YR5/2), well laminated. Rare black streaks and mottles.

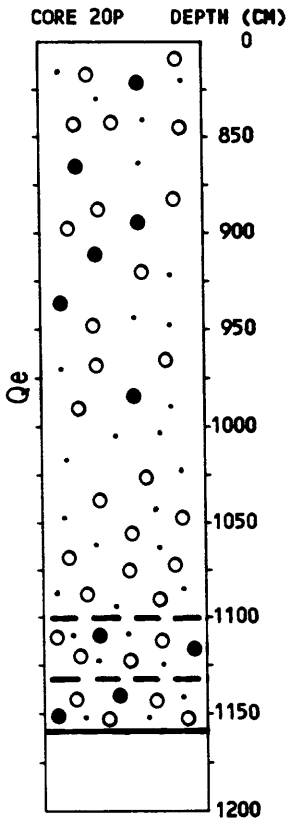
168-188 Mud, blueish-gray (5G4/1 to 5BG4/1), nearly massive. A few black streaks and mottles.
188-426 Mud, reddish-brown (5YR4-5/3-4), nearly massive with crude color banding. Black mottling at base of unit extends into underlying unit.

426-434 Silty mud, brown (7.5YR4/2), bedded. Abundant sand and clay clasts. Black mottles in upper part.
434-618 Mud, reddish-brown (5-7.5YR4/2-3) with redder (5YR4/2) bands, well laminated. Rare clay clasts.

618-668 Silty mud interbedded with clay, brown (7.5YR4/2), laminated. Silty beds contain abundant hard and soft clasts and sand; appears varve-like.

668-1100 Mud, brown (7.5YR4/2), massive. Contains moderately abundant hard and soft clasts and sand.

800 Continued.



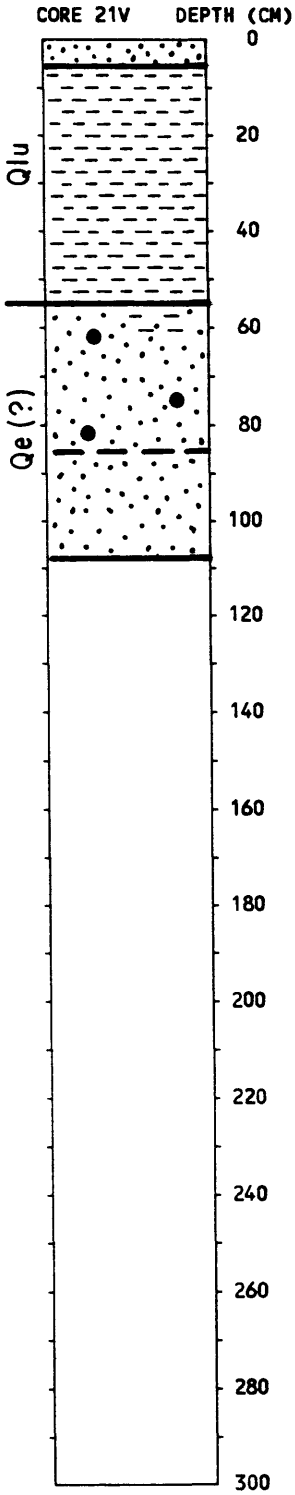
DESCRIPTION (Continued)

668-1100 Mud, brown (7.5YR4/2), massive. Contains moderately abundant hard and soft clasts and sand.

1100-1130 Mud, brownish-gray (10YR4/2), massive. Abundant hard and soft clasts and sand.

1130-1160 Mud, brownish-gray (10YR4/2), massive, disturbed. Contains swirls of red (5YR4/3) mud. Abundant hard and soft clasts and sand.

1160 Base of core.



DESCRIPTION

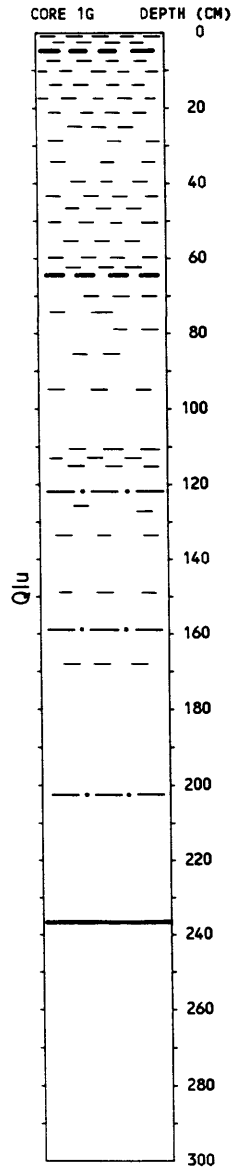
0-5 Sand, brown (10YR5/4), massive. Well sorted, scattered iron staining.

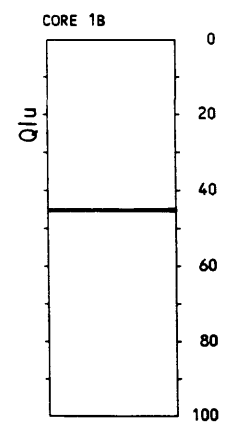
5-55 Mud, brown (7.5YR5/2), laminated. Abundant black streaks and laminate.

55-85 Fine to medium sand, brown (7.5YR5/2), laminated. Some black streaks near top; scattered small pebbles.

85-108 Fine to medium sand, brownish-gray (10YR4-5/2-1), bedded. Beds are 2 to 3 cm thick and vary sightly in color.

108 Base of core.





DESCRIPTION

0-5 Mud, dark grayish-brown (10YR3/1.5). Scattered sand.

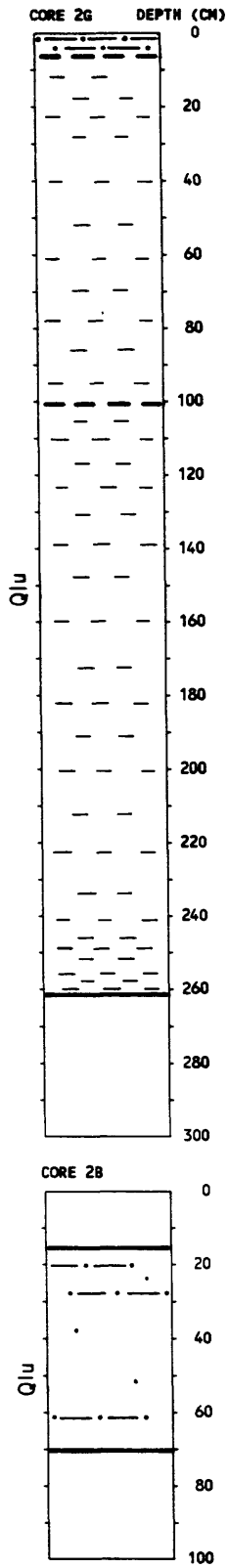
5-65 Mud, grayish-brown (10YR4/1.5), weakly laminated. Distinct black streaks and laminae.

65-237 Mud, grayish-brown (10YR4/1.5), weakly laminated. Scattered black streaks in upper part. Few thin (1 to 2 mm) silt laminations.

237 Base of core.

0-45 Mud, grayish-brown (10YR4/1.5-2). Massive, scattered sand near top.

45 Base of core.



DESCRIPTION

0-7 Mud, dark grayish-brown (10YR3/1), massive. Scattered sand, faint black mottling.

7-101 Mud, grayish-brown (10YR4/2), massive to very weakly laminated. Faint black mottling.

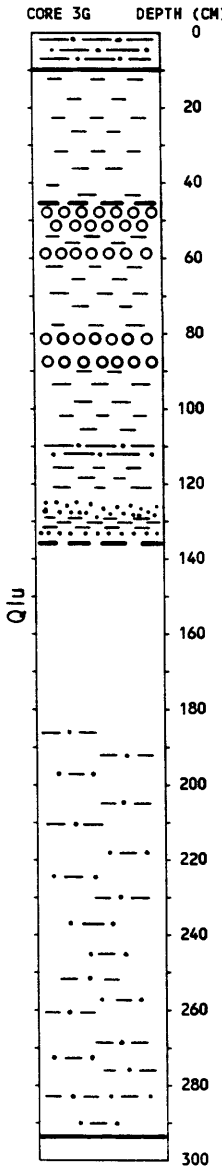
101-262 Mud, grayish-brown (10YR4/2), massive to very weakly laminated. Very faint black laminae, more common toward base.

262 Base of core.

0-15 Disturbed.

15-70 Mud, dark gray (10YR3/1), massive. Silty, with some sand.

70 Base of core.



DESCRIPTION

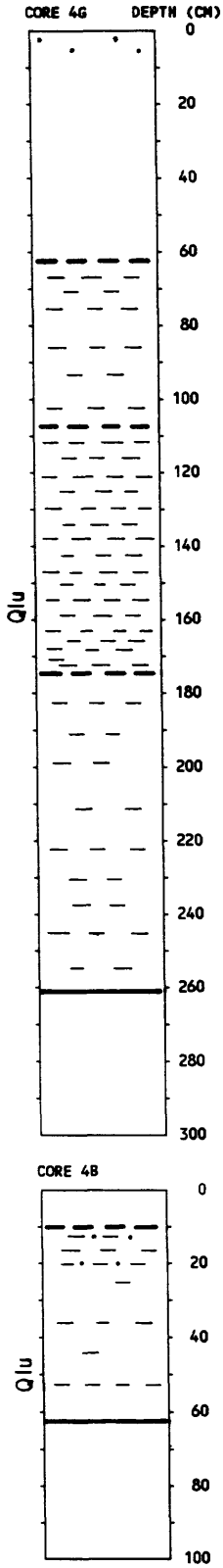
0-10 Sandy mud, dark grayish-brown (10YR3/2), massive. Distinct black streaks and laminae.

10-45 Mud, grayish-brown (10YR3.5/2), weakly laminated. Slightly mottled toward base. Distinct black streaks and mottles.

45-136 Mud, grayish-brown (10YR4/2), laminated. Laminations of silt and small pebbles. Silt bed (2 mm thick) at base; slightly sandy toward base. Distinct black streaks and mottles in upper half, becoming less frequent toward base.

136-294 Mud, grayish-brown (10YR4/2), weakly laminated. Contains silt pockets below 185 cm.

294 Base of core.



DESCRIPTION

0-63 Mud, silty, grayish-brown (10YR4/1-2), weakly laminated. Scattered sand and slightly darker at top.

63-107 Mud, grayish-brown (10YR4/1-2), weakly laminated. Faint black bands, increasing towards base.

107-175 Mud, grayish-brown (10YR4/1-2), laminated. Prominent black laminae and streaks.

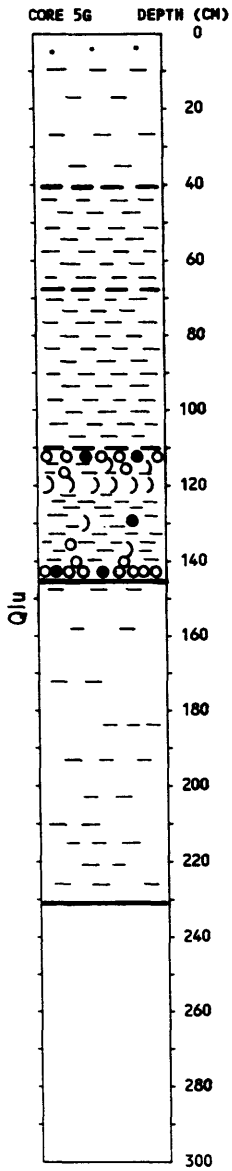
175-261 Mud, grayish-brown (10YR4/1-2), weakly laminated. Faint dark bands.

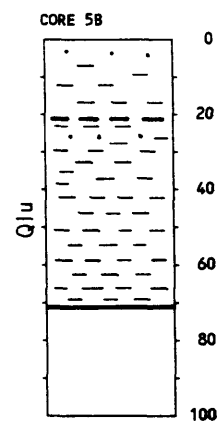
261 Base of core.

0-10 Mud, dark gray (10YR2-3/1), massive. Lighter color and sandier toward top.

10-63 Mud, grayish-brown (10YR4/1), massive. Weak, scattered black bands; siltier toward top.

63 Base of core.





DESCRIPTION

0-41 Mud, grayish-brown (10YR3/1), weakly laminated. Becomes siltier with scattered sand toward top. Scattered black streaks.

41-68 Mud, grayish-brown (10YR3/1), weakly laminated. Abundant black streaks and laminae.

68-110 Mud, grayish-brown (10YR4.5/1), weakly laminated. Abundant black streaks and laminae.

110-146 Mud, brownish-gray (10YR4.5/2), well laminated. Abundant black straaks and laminae. Contains scattered sand and clasts and several laminations of small clasts and(or) shells.

146-231 Mud, brownish-gray (10YR4/2), weakly laminated to massive. Slighly darker toward top and lightar toward bottom. Abundant faint black streaks.

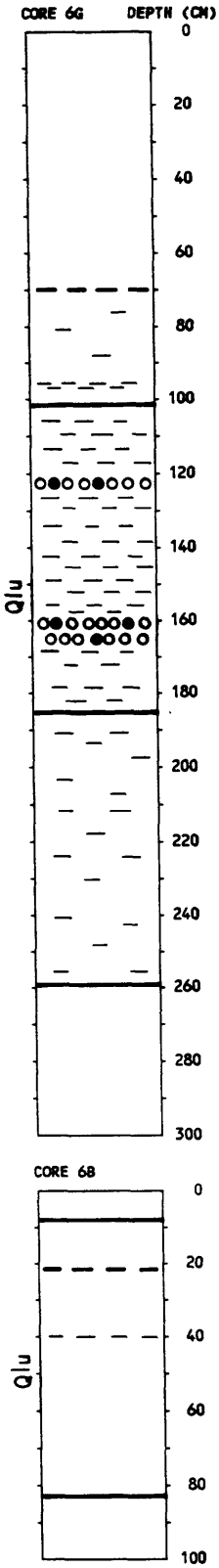
231 Base of core.

0-8 Disturbed.

8-22 Mud, grayish-brown (10YR3.5/1), massive. Some sand. Thin, faint black streaks.

22-71 Mud, grayish-brown (10YR4/1), massive. Sand grains near top. Abundant thin black straks.

71 Base of core.



DESCRIPTION

0-75 Mud, dark gray (10YR3/1), massive to faintly banded.

75-102 Mud, gray (10YR4/1), massive. Scattered black streaks.

102-184 Mud, silty, gray (10YR5/1), massive to weakly banded. Several soft clast bands and rare individual clasts.

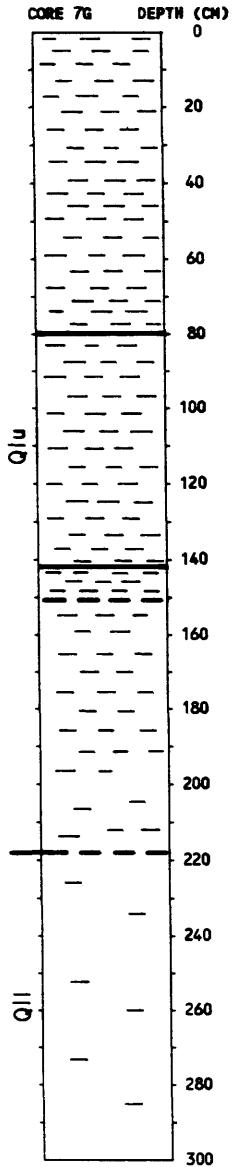
184-259 Mud, gray (10YR4/1-2), weakly laminated to banded.

259 Base of core.

0-8 Disturbed.
8-22 Mud, silty, dark gray (10YR3-2/1), massive.

22-83 Mud, dark gray (10YR3/1), weakly laminated. Single prominent black streak at 40 cm.

83 Base of core.



DESCRIPTION

0-80 Mud, silty, dark gray (10YR3-4/1), massive to weakly banded. Slightly darker toward base. Abundant black streaks and mottles.

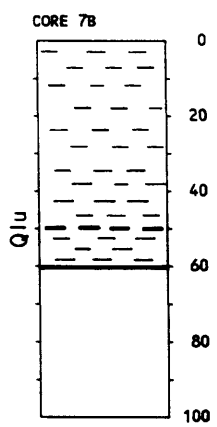
80-142 Mud, gray (10YR5/1), weakly banded. Common black streaks and laminae.

142-151 Mud, gray (10YR4/1.5), weakly laminated. Abundant black streaks.

151-218 Mud, brownish-gray (10YR-7.5YR5/2), weakly banded. Common black streaks and mottles, becoming fainter toward base.

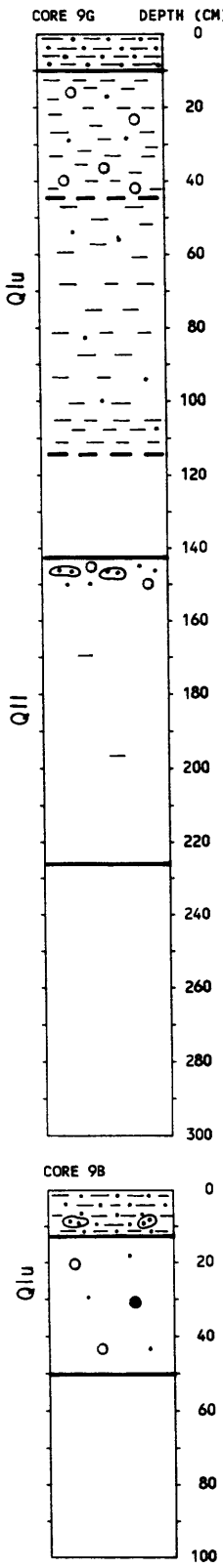
218-300 Mud, reddish-gray (5YR4/2), weakly banded. Rare, faint black streeks and mottles.

300 Base of core.



0-50 Mud, silty, dark gray (10YR3/2), massive. Some sand and scattered soft clasts near top. Common black mottles.

50-60 Mud, dark gray (10YR3.5/1), massive. Common black streaks and mottles.
60 Base of core.



DESCRIPTION

0-10 Silt, sandy, grayish-brown (10YR4/2), massive. Two brown (10YR4/3) silt bands near base.

10-45, Mud, silty, brownish-gray (10YR3.5/2), weakly laminated. Scattered sand grains and rare soft clasts. Prominent black streaks and laminae.

45-114 Mud, grayish-brown (10YR4/2), laminated. Scattered sand grains. Prominent black streaks and laminae, especially toward base.

114-142 Mud, brown (7.5YR4.5/2), laminated.

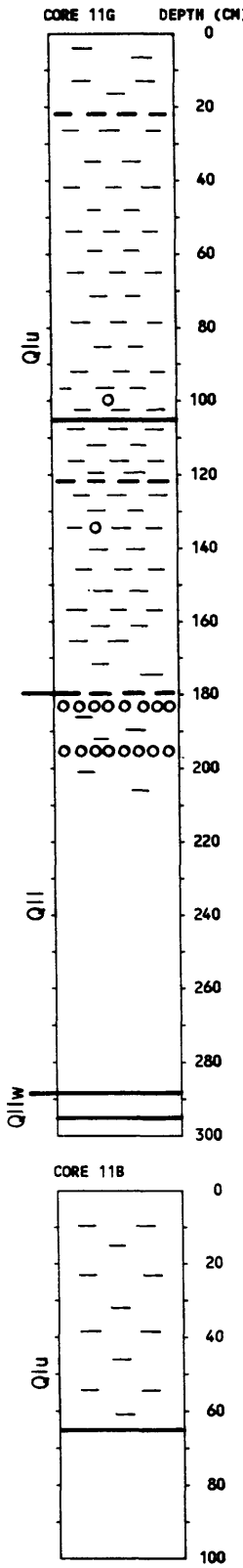
142-226 Mud, clayey, reddish-brown (5YR4/3, laminated. Upper few cm contains pockets of brown (7.5YR4/2) sandy mud and scattered clasts.

226 Base of core.

0-13 Silt, sandy, grayish-brown (10YR4/2), massive. Basal one cm is oxidized brown (10YR4/3). Contains pockets of silt and sand.

13-50 Mud, silty, grayish-brown (10YR3.5/2), weakly banded. Scattered clasts. Prominent black streaks, more common toward base.

50 Base of core.



DESCRIPTION

0-23 Mud, silty, brownish-gray (10YR3.5-4/1), massive. Faint black streaks.

23-105 Mud, grayish-brown (10YR5/1.5), weakly laminated. Slightly silty toward top. Abundant black streaks and mottles.

105-122 Mud, grayish-brown (10YR4/2), massive. Slightly silty. Abundant black streaks and mottles.

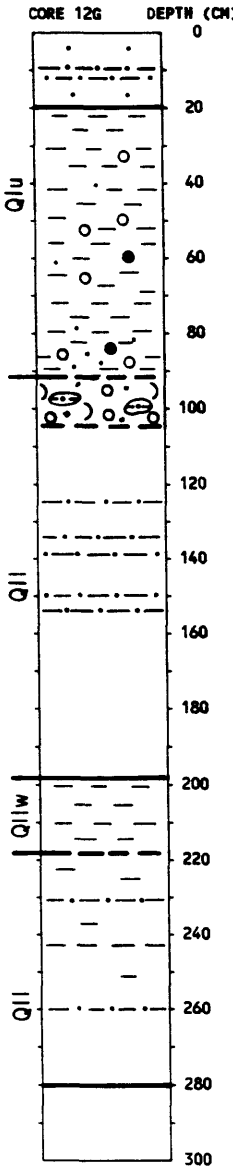
122-180 Mud, brown (7.5-10YR5/2), weakly laminated. Common black streaks and mottles, becoming fainter near base.

180-288 Mud, reddish-gray (5YR4.5-5/2), weakly banded and laminated. Colors vary as slightly redder and grayer bands. Contains several soft clast laminae near top. Faint black streaks near top.

288-295 Mud, gray (10YR4/1), massive.
295 Base of core.

0-70 Mud, silty, gray (10YR3/1), massive. Faint black laminae common below 7 cm.

70 Base of core.



DESCRIPTION

0-20 Mud, silty, brownish-gray (10YR3/1-2), massive. Contains some sand. Several silty oxidized (10YR3/3) laminae at 10-13 cm.

20-92 Mud, brownish-gray (10YR4/2), well laminated. Contains some sand. Scattered hard and soft clasts. Reddish-gray (5YR5/2) band at 82-88 cm. Common black streaks and mottles.

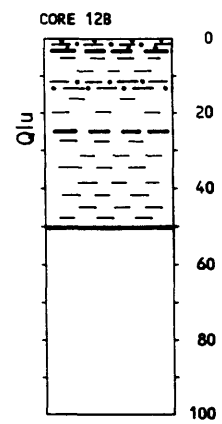
92-105 Mud, sandy, reddish-gray (5YR5/2), weakly laminated. Contains pockets of sandy material and scattered small shells.

105-197 Mud, reddish-gray (5YR4-5/2), laminated and banded. Contains alternating reddish and grayish bands, especially near base. Silt pockets and laminae from 125-155 cm.

197-218 Mud, gray (10YR4/1), massive. Common black mottles.

218-280 Mud, reddish-gray (5YR2-4/2), strongly banded. Alternating reddish and grayish bands. Contains silty laminae that tend to be grayer. Rare black mottles.

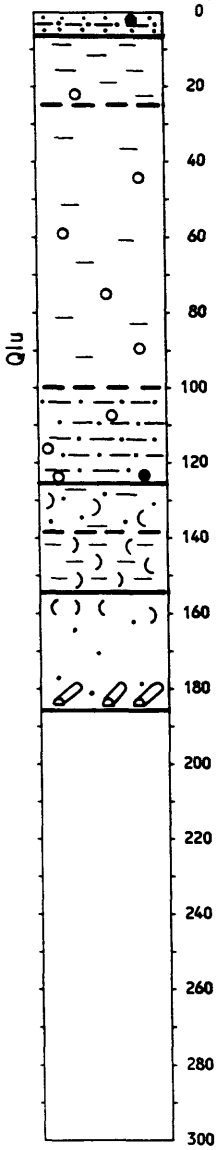
280 Base of core.



0-4 Silt, clayey and sandy, gray (10YR3/1), massive.
4-25 Mud, sandy, grayish-brown (10YR3/1-2), laminated. Contains several oxidized (10YR3/3) laminae at 12-16 cm. Faint black streaks.

25-50 Mud, grayish-brown (10YR4/2), weakly laminated. Common black mottles.

50 Base of core.



DESCRIPTION

0-7 Silt, sandy, grayish-brown (10YR4/2), massive. Oxidized (10YR4/3) layer at 4-5 cm.

7-25 Mud, silty and sandy, gray (10YR4/1), weakly banded. Faint black streaks.

25-100 Mud, grayish-brown (10YR4/2), weakly laminated. Scattered soft clasts. Faint black streaks.

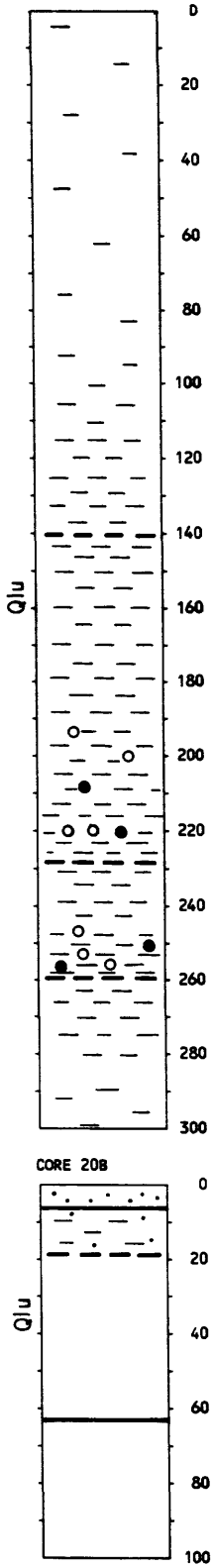
100-126 Mud, grayish-brown (10YR4/2), laminated. Contains abundant silt laminstions and scattered pebbles and soft clasts. Faint black streaks.

126-138 Mud, silty, grayish-brown (10YR4.5/2), laminated. Scattered sand and shells. Rere black streaka.

138-154 Mud, grayish-brown (10YR5/2), laminated. Contains distinct thin beds of organic material and shells. Rare black streaks.

154-185 Mud, silty, grayish-brown (10YR4/2). Scattered sand and organic material; abundant small shells near top.

185 Base of core, large wood fragments.



DESCRIPTION

0-140 Mud, dark gray (10YR3/1), weakly to well laminated. Scattered black streaks, more abundant toward base. Siltier toward top.

140-228 Mud, gray (10YR4/1-1.5), laminated. Scattered clasts. Common, distinct black streaks.

228-259 Mud, brownish-gray (10YR4/2), laminated. Clasts common below 145 cm. Color band (10YR5/2) at 248-252. Common, distinct black streaks.

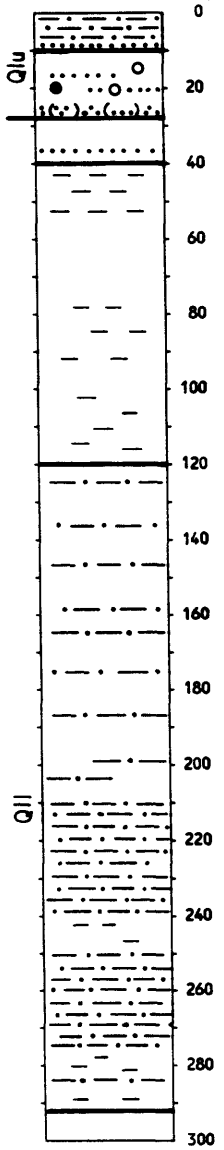
259-300 Mud, brown (7.5YR5/2), weakly laminated. Common black streaks in upper half, becoming faint and mottled toward bese.

300 Base of cora.

0-5 Mud, dark gray (10YR2/1), massive. Scattared sand grains.
5-18 Mud, brownish-gray (10YR3/2), massive. Scattared sand grains. Faint black bands.

18-63 Mud, gray (10YR3/1), weakly laminated.

63 Base of core.



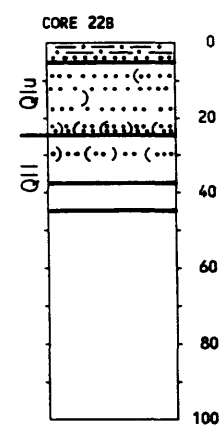
DESCRIPTION

0-10 Silt, sandy, grayish-brown (10YR3/3), massive. Sand concentrated at base.
10-28 Mud, brown (7.5YR5/4), laminated. Contains abundant thin sand beds, which also contain shells. Scatterd clasts. Unit generally fines upward, and is mottled with 10YR 4/3 colors.
28-40 Mud, silty and sandy, reddish-brown (5YR5/3), laminated. Thin sandy bed at 37 cm. Contains streaks of 5YR4/4 color.

40-120 Mud, brown (7.5YR5/2), weakly laminated. Faint black streaks and mottles.

120-292 Mud, reddish-brown (5YR4-4.5/2-2.5), laminated. Contains abundant thin silt beds and pockets that are less red (7.5YR5/2). Silt beds are less common at top and bottom of unit. Unit is less red toward top. Large (1 cm) shall at 171 cm.

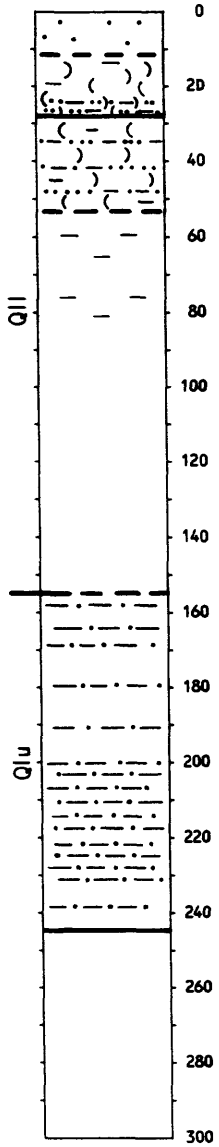
292 Base of core.



0-5 Silt, sandy, grsy (10YR3/1), massive. Sand concentrated at base.
5-24 Mud, brown (7.5YR4/4), laminated. Scattered shells and thin sand beds. Bed of sand and shells 1 cm thick at base.

24-38 Mud, reddish-brown (5YR5/3), weakly laminated. Thin sandy shell bed at 28-29 cm.

38-44 Mud, brown (7.5YR5/2), weakly laminated.
44 Base of core.



DESCRIPTION

0-12 Mud, sandy, light brown (10YR4/3) with mottles of (5YR5/3), massive.

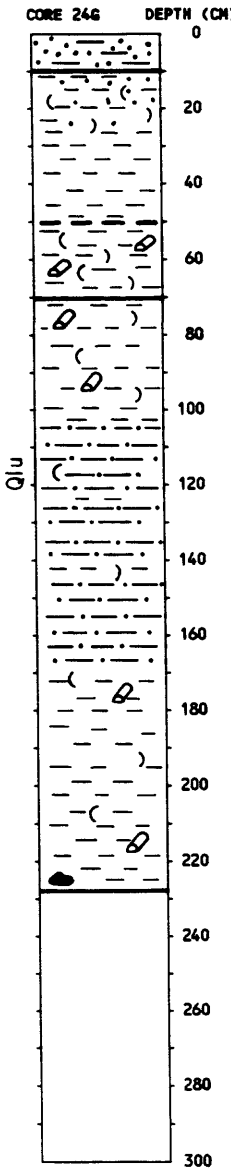
12-28 Mud, grayish-brown (10YR4/2) with streaks of (7.5YR5/2), laminated. Thin sandy silt beds containing small shells near base. Rare, faint, black streaks.

28-53 Mud, brown (7.5YR4/2), weakly laminated. Contains scattered shells and thin sandy silt beds. Faint black streaks.

53-155 Mud, brown (7.5YR4.5/2) weakly laminated. Faint black streaks in upper part.

155-245 Mud, reddish-brown (5YR4.5/2), laminated. Contains abundant silt laminae and lenses, most common between 200 and 230 cm. Rare, faint black streaks.

245 Base of core.



DESCRIPTION

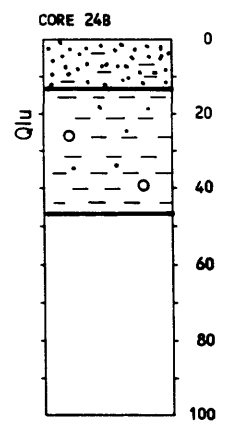
0-10 Silt, sandy, brownish-gray (10YR4/2), disturbed. Fragments of oxidized material near top.

10-50 Mud, brownish-gray (10YR4/2), laminated. Top 1 cm is 10YR(4/1). Scattered shells and sand near top. Abundant, distinct black streaks and mottles.

50-70 Mud, brown (7.5YR4/2), laminated. Scattered shells and wood fragments. Scattered sandy silt laminations. Abundant, distinct black streaks, becoming fainter toward base.

70-228 Mud, grayish-brown (10YR4/2), laminated. Scattered shell and wood fragments. Silt laminations common from 105 to 165 cm. Abundant, faint black streaks. Large pebble at base.

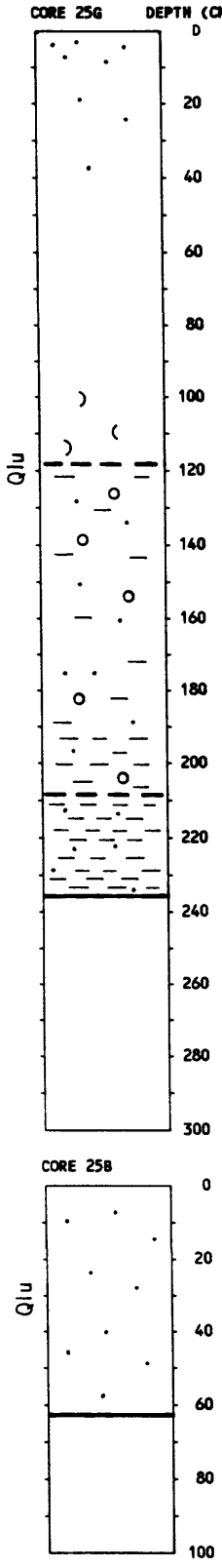
228 Base of core.



0-13 Silt, sandy, brownish-gray (10YR3-4/1-2), massive. Contains an oxidized (10YR4/3) bed at 9 to 10 cm. Rare black streaks.

13-47 Mud, gray (10YR4/1), weakly laminated. Browner (10YR4/2) at top. Scattered sand and rare clasts. Abundant, distinct black straaks below 21 cm.

47 Base of core.



DESCRIPTION

D-118 Mud, gray (10YR3/1), moderataly laminated. Slightly siltier with scattered sand grains toward top. Scattered shell fragments toward base.

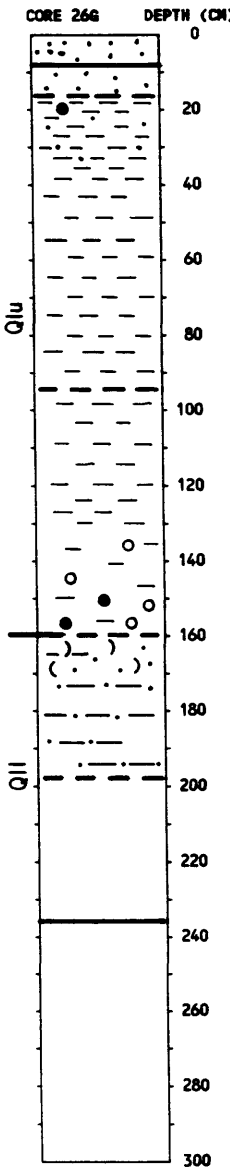
118-208 Mud, gray (10YR3-4/1), weakly laminated. Scattered sand and soft clasts. Rare black streaks and mottles, more distinct toward base.

208-236 Mud, brownish-gray (10YR4/2), weakly laminated. Scattered sand. Abundant, distinct black streaks.

236 Base of core.

0-62 Mud, gray (10YR3/1), moderately laminated. Scattered sand.

65 Base of core.



DESCRIPTION

0-8 Mud, brownish-gray (10YR3/3), massive. Scattered sand. Basal 1 cm is stiff and oxidized to 10YR4/4.5.
8-17 Mud, gray (10YR4/1), weakly laminated. Scattered sand.

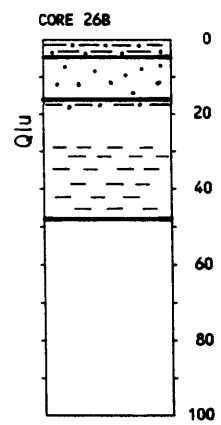
17-94 Mud, brownish-gray (10YR4/2), laminated. Siltier with scattered sand toward top. Abundant, distinct black streaks, more concentrated toward top.

94-160 Mud, brown (7.5YR4/2), laminated. scattered pebbles toward base. Common, distinct black streaks, becoming fainter toward base.

160-198 Mud, reddish-gray (5YR4/2), laminated. Contains bands of 5YR5/3 color. Scattered pockets and lenses of silt. Scattered sand and shells near top.

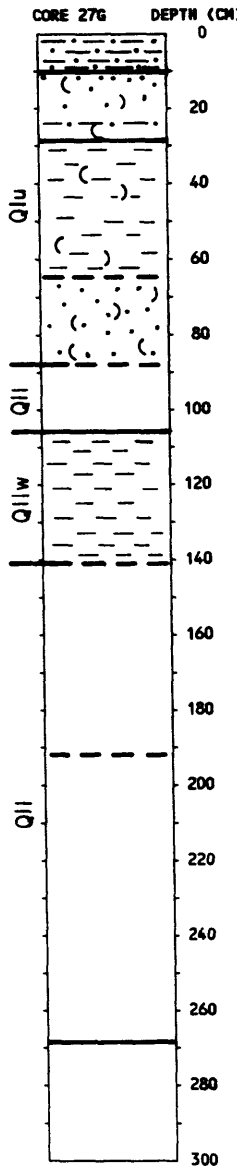
198-236 Mud, reddish-brown (5YR5/3), laminated.

236 Base of core.



0-4 Silt, gray (10YR3/1), laminated. Common scattered sand.
4-16 Mud, brownish-gray (10YR3/3), mottled with 10YR4/3, lamineted. Scattered sand. Two 3-mm-thick, stiff, oxidized (10YR4/4.5) bands at base.
16-48 Mud, gray (10YR4/1), weakly lamineted. Thin brown laminae at 18 cm. Distinct black streaks abundant below 28 cm.

48 Base of core.



DESCRIPTION

0-10 Silt, sandy, brownish-gray (10YR3/3), massive.

10-28 Mud, brownish-gray (10YR4/3), weakly laminated. Scattered sand, concentrated at top. Slightly mottled, with oxidized (10YR4/4) laminae at 25 cm. Scattered shells.

28-64 Mud, brownish-gray (10YR5/1), weakly laminated. Scattered sand and shells. Oxidized (10YR4/4) laminae at 32 cm. Common, distinct black streaks.

64-87 Mud, sandy, brown (7.5YR4.5/2), laminated. Scattered shells. More sand toward top.

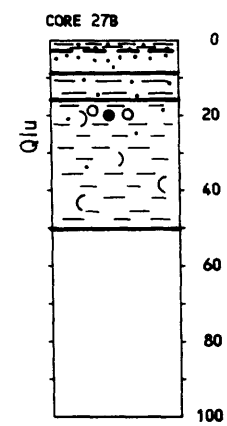
87-106 Mud, reddish, banded (5YR4/2.5, 7.5YR4/2.5, and 10YR4/2).

106-141 Mud, gray (10YR4/1-2) at top and bottom, blue-gray (5GY4/1) in middle, massive. Abundant, distinct black streaks and mottles.

141-192 Mud, reddish, banded (5YR4/3-4 and 7.5YR4/2).

192-268 Mud, reddish-brown (5YR4/3), laminated.

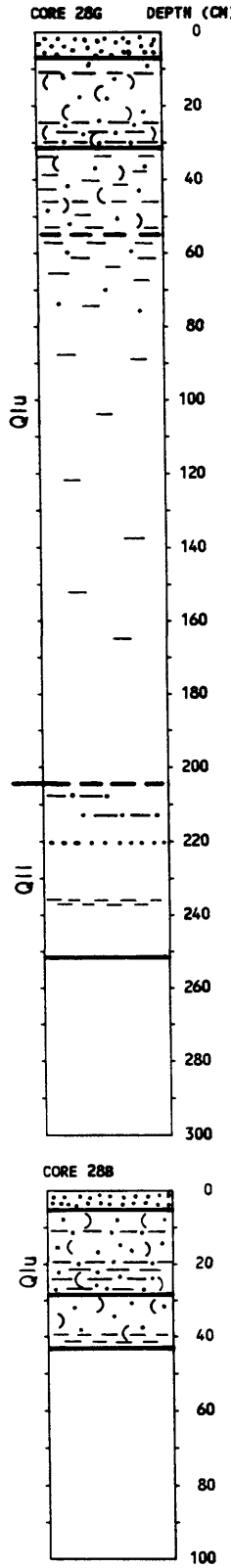
268 Base of core.



0-3 Silt, sandy, gray (10YR3/1), laminated.
3-9 Mud, brownish-gray (10YR4/3), laminated. Sandy toward top.
9-15 Mud, brownish-gray (10YR4/2), laminated. Contains several thin oxidized (10YR3/4) laminae.

15-50 Mud brownish-gray (10YR4/2), weakly laminated. Contains scattered sand and shells. Pocket of clasts at 18 to 20 cm. Common, distinct black streaks and mottles.

50 Base of core.



DESCRIPTION

0-7 Sand, silty, gray (1DYR3/1) to brownish-gray (10YR4/3), massive.

7-31 Mud, sandy, grayish-brown (10YR5/3), weakly laminated. Abundant scattered shells. Thin oxidized layers at 12 cm and 23 to 31 cm.

31-56 Mud, grayish-brown (10YR5/2), massive. Scattered sand and shells. Abundant, thick black streaks. Layer of clasts at 44 cm.

56-204 Mud, brown (7.5YR5/2, massive with a few faint bands. Scattered sand in upper part. Layer of clasts at 65 cm. Faint black streaks and mottles, more prominent toward top.

204-252 Mud, banded brown (7.5YR4-5/2) and reddish-brown (5YR5/3), massive. Silt lenses toward top. Sand laminae at 220 cm. Dark black band at 236 to 237 cm.

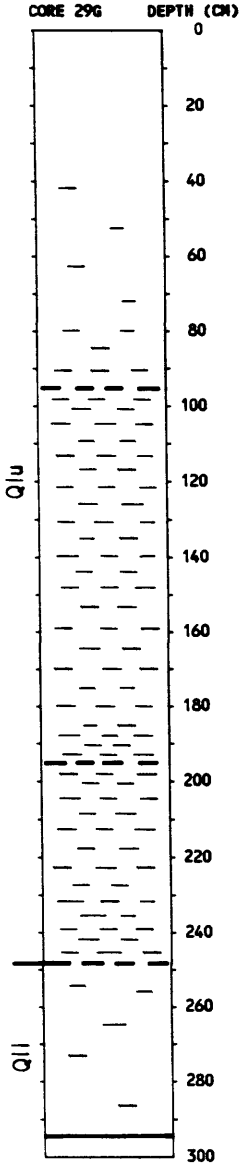
252 Base of core.

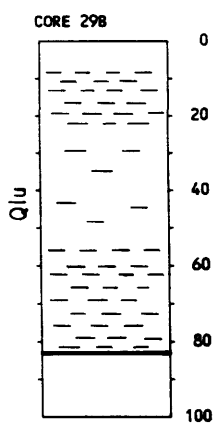
0-4 Sand, silty, grayish-brown (10YR4/3) at base to gray (10YR3/1) at top, massive.

4-28 Mud, grayish-brown (10YR5/3), laminated. Oxidized laminae at 11 cm and 19 to 28 cm. Abundant scattered sand and shells.

28-42 Mud, grayish-brown (10YR5/2), laminated. Scattered sand and shells. Prominent black streaks and mottles at base.

42 Base of core.





DESCRIPTION

0-95 Mud, gray (10YR3/1), massive. Silty with a trace of sand. Scattered, diatinct black laminae toward base.

95-195 Mud, gray (10YR5/1), weakly laminated. Abundant distinct black streaks and mottles.

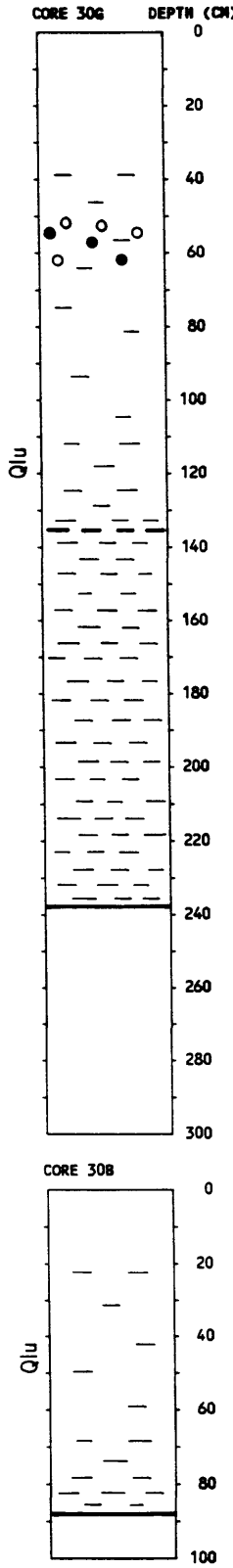
195-248 Mud, brownish-gray (10YR4/2) toward top, becoming browner (7.5YR5/2) toward base, weakly laminated. Abundant, distinct black streaks and mottles.

248-294 Mud, banded reddish-gray (5YR5/2) and reddish-brown (5YR4/3). Scattered, faint black streaks and mottles.

294 Base of core.

0-83 Mud, gray (10YR3/1), massive. Siltier toward top, trace of sand. Black streaks and mottles common from 8 to 23 cm and 55-83 cm, scattered elsewhere.

83 Base of core.



DESCRIPTION

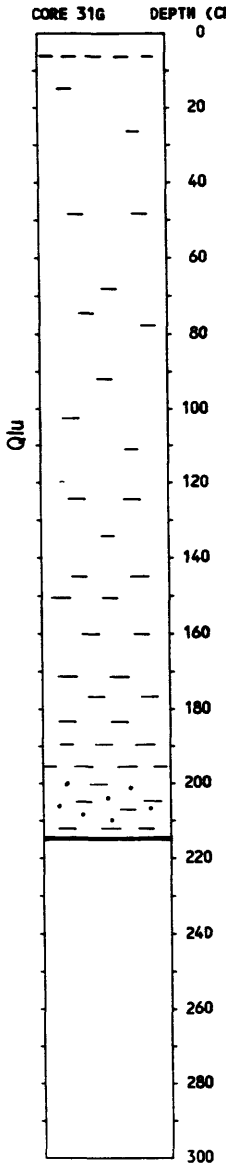
0-135 Mud, gray (10YR3/1), massive near top, weakly laminated toward base. Scattered clasts from 50 to 65 cm. Siltier toward top. Scattered black streaks and mottles, increasing toward base.

135-238 Mud, gray (10YR4/1), laminated. Abundant, distinct black streeks and mottles.

238 Base of core.

0-87 Mud, gray (10YR3/1), very faintly laminated. Scattered black streaks and mottles, becoming more common toward base.

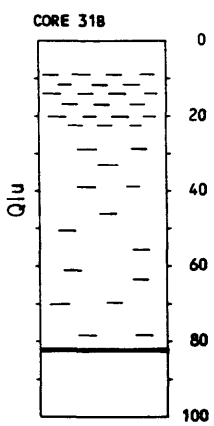
87 Base of core.



DESCRIPTION

0-215 Mud, gray (10YR3/1), massive with rare faint bands. Siltier toward top; scattered sand grains toward base. Black laminae at 5 cm. Scattered, faint black streaks and mottles, becoming more common and distinct toward base.

215 Base of core.



0-82 Mud, gray (10YR3/1), massive. Trace of sand in lower part. Dense black staining from 9 to 21 cm; scattered black streaks and mottles from 21 cm to base.

82 Base of core.