10. SITE 52

Shipboard Scientific Party[1]

SITE DATA

Occupied: July 9-10, 1969.

Position: Abyssal floor of Pacific: Latitude: 27° 46.3′N. Longitude: 147° 07.8′E.

Water Depth: 5744 meters.

Cores: Ten Cores.

Total Depth: 69 meters in Mesozoic silicified volcanic ash.

MAIN RESULTS

A series of brown clays with strong volcanic admixture, some 65 meters thick, represents the Cenozoic and part of the Mesozoic, the boundary lying somewhere between 30 and 64 meters. The Mesozoic is recognized on the basis of poorly preserved but rather abundant Radiolaria, not specifically identifiable.

At 65 meters, lithified (partly silicified) ash proved too hard to drill safely at such shallow depth, and the hole was abandoned.

BACKGROUND

On July 7, Site 51 had been completed as the last of the planned northern sites. In each case drilling had been stopped short of our main objectives by hard rocks: three holes were abandoned after twisting off; two sites were abandoned because hard drilling was encountered before the bottom hole assembly of drill collars was adequately buried and the risk of twisting off appeared to be high; and four sites had been abandoned after diamond bits had been destroyed in drilling chert. Having drilled more sites than initially anticipated, there were only three remaining beacons, and prospects of beacon delivery in the Mariana Islands (see narrative summary in Introduction). The ship was headed south, reluctantly in view of the failure to penetrate to B′ or basement anywhere in this region, and a decision was made for one more try at penetrating the oceanic section. The chief limiting factor in choosing a location was the southward decrease in the thickness of the upper transparent acoustic layer, shown by Ewing, Ewing, Aitken and Ludwig (1968). A site was found with about 0.12 second of transparent layer, off the southern end of the Bonin arc.

At Site 52, the scientists were confident of penetration to the upper opaque layer, and of thus obtaining a third point on the stratigraphic position and the age relations of this acousto-stratigraphic unit. They had some hopes of being able to penetrate somewhat beyond its top at 0.12 second, and to thus obtain further information on its compositions; and had even a faint glimmer of hope of penetrating through it, into the lower transparent layer, despite the very dark nature of the opaque layer on the profiles and its thickness, a bottom seemed apparent at a depth of 0.3 second.

OPERATIONS

The beacon for Site 52 was dropped at 0030 hours July 9, and the hole was spudded at 1000 hours. Continuous coring commenced from the surface; and retrieved 8 cores of brown clay before encountering cherty ash on the 9th and 10th cores, a depth of 65 meters below mudline. Hard drilling at this shallow depth, with part of the bottom hold assembly above mudline, was deemed too risky, and the hole was reluctantly abandoned at a total depth of 69 meters at 1830 hours on July 10.

A bathymetric contour map of Site 52 is given as Figure 1. The *CHALLENGER* bathymetric and magnetic profile as Figure 2, and bottom soundings as Figure 3.

NATURE OF THE SEDIMENTS

Ten cores were recovered from the one hole at this site between mudline and 59 meters subbottom depth. The sediments encountered to a subbottom depth of about 37 meters are predominantly clay-rich volcanic ash and brown clay with abundant volcanic glass; below that depth brown clays predominate to the bottom of the hole where chert was encountered.

Cores 1 through 4 (0 to about 37 meters subbottom) have sediment characterized by abundant volcanic glass. Most of this interval is poorly sorted, silty brown clay containing, in addition to abundant clay minerals and

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limonitic grains, numerous sand to silt size shards of volcanic glass. Other less common components include angular, fine sand to silt size plagioclase and quartz grains, opaque minerals, hematite, pyroxene, and mica. Zeolites are usually very sparse except in the upper part of Core 1 where they are locally abundant. Diatoms, radiolarian remains, and fish debris likewise occur sparingly.

With increasing amounts of volcanic glass (up to 50%) these brown clays may grade into very poorly sorted, clay-rich brown volcanic ashes, as in the middle part of Core 2, the bottom part of Core 3 and the top part of Core 4. Additionally, Cores 1, 2 and the top part of Core 3 contain thin (5 to 15 cm) beds of more nearly pure volcanic ashes that are relatively well sorted, comprise up to 85 per cent glass, and vary in color from pinkish white, light gray, light brown-gray to dark gray. The predominant glass in both the well sorted and poorly sorted ashes is colorless and often occurs in elongate, vesicular shards. Much less common are reddish-brown glass and very light brown glass with tiny plagioclase laths as phenocrysts. Pumic fragments are scattered throughout this upper part of the hole.

Cores 5 through 8 (37 to 65 meters subbottom) are mainly brown zeolitic clays of various shades: dark brown, dark gray-brown, gray-brown and yellow-brown: In addition to abundant clay minerals and limonite grains, lath-shaped zeolites (phillipsite?) are common to abundant in these clays. Also present are variable amounts of unaltered colorless glass, quartz, plagioclase, potash feldspar, and yellowish palagonite grains that are sometimes isotropic, sometimes altered to a fine-grained mixture of weakly birefringent clay minerals and chlorite (?). According to X-ray studies by Rex, Core 8 and the bottom part of Core 7 contain abundant cristobalite.

In Cores 1 through 8, but particularly in Cores 4 through 8, are variable amounts of coarse to fine sand size grains consisting of a fine-grained aggregation of clay minerals and limonitic grains, and sometimes with an admixture of zeolites and small feldspar laths. Such grains are especially prominent in the washed coarse fractions (greater than 0.062 millimeter) and locally are very abundant. In reflected light they have a pellet-like form, are pale brown, and have a slightly silky luster. In some cases individual crystals of phillipsite seem to have grown outward in different directions from such grains which appear to have acted as nuclei for zeolite growth. The exact origin of these grains is uncertain. At first it was assumed they were simply artificial aggregations or flocculates of clay minerals, etc., but the presence of

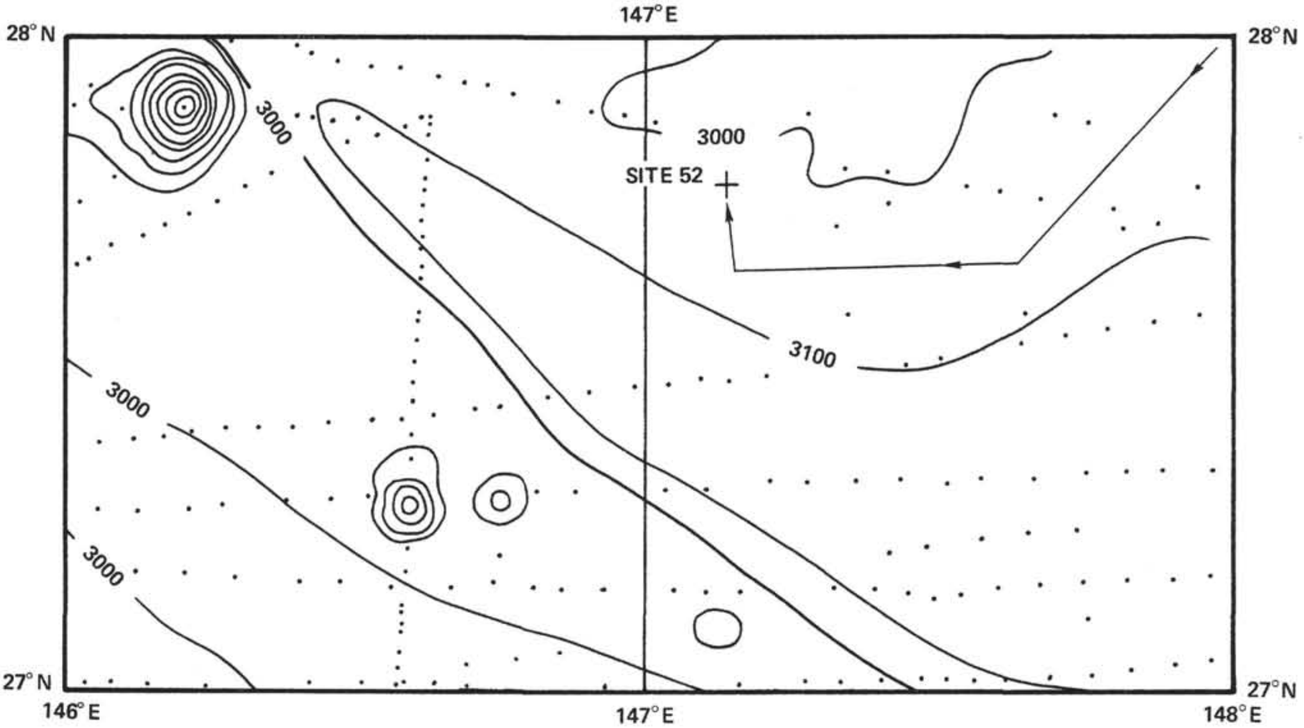


Figure 1. *Bathymetric contour map at Site 52.*

zeolites and feldspars in some of them suggests otherwise. They are tentatively interpreted as highly altered volcanic fragments. It should be noted that Bonatti (1963) has applied the term "palagonite" to similar grains, but as noted previously, the term palagonite is here restricted to a yellowish isotropic mineraloid.

The brown clays in Cores 7 and 8 contain small amounts of secondarily silicified radiolarian tests and scattered angular pieces of radiolarian-rich mudstone. The latter are finely laminated and show color banding from dark brown to reddish-brown to pale yellow. These siliceous mudstones have very poorly preserved, quartz-filled sponge spicules and radiolarian molds dispersed in a very fine-grained, weakly birefringent matrix of clay minerals, microcrystalline quartz and limonitic granules (Chapter 38). In contrast to the glassy, very hard cherts of other sites, these rocks have a dull luster and are somewhat softer.

Only core catcher samples were recovered from Cores 9 and 10. These consisted of dark brown silty clay with numerous chert fragments up to 3 centimeters across. A washed coarse fraction (greater than 0.062 millimeter) yielded clear glass shards, pellet-like aggregations of clay minerals as described above, abundant otoliths, secondarily silicified radiolarian remains, chert fragments, and fish bones and teeth, along with minor zeolites and opaque minerals.

PHYSICAL PROPERTIES

These sediments were disturbed during coring operations, therefore, these physical properties do not necessarily represent *in situ* conditions.

Natural Gamma Radiation

Tertiary-Cretaceous brown clay and ash were recovered from 0 to 74 meters in Hole 52.0. Natural gamma emissions ranged from 200 to 2700 counts with an approximate average of 850 counts/7.6-cm core segment/1.25 minutes. Radiation emitted from Quaternary to Tertiary brown ashey clay (0 to 6.1 meters below the mudline), with zeolites in places, ranged from 700 to 1900 with an average of 1100 counts/7.6-cm core segment/1.25 minutes, (see hole and core plots). From 6.1 meters to 9.1 meters, the gamma radiation count in similar sediment dropped to an average of 800 counts.

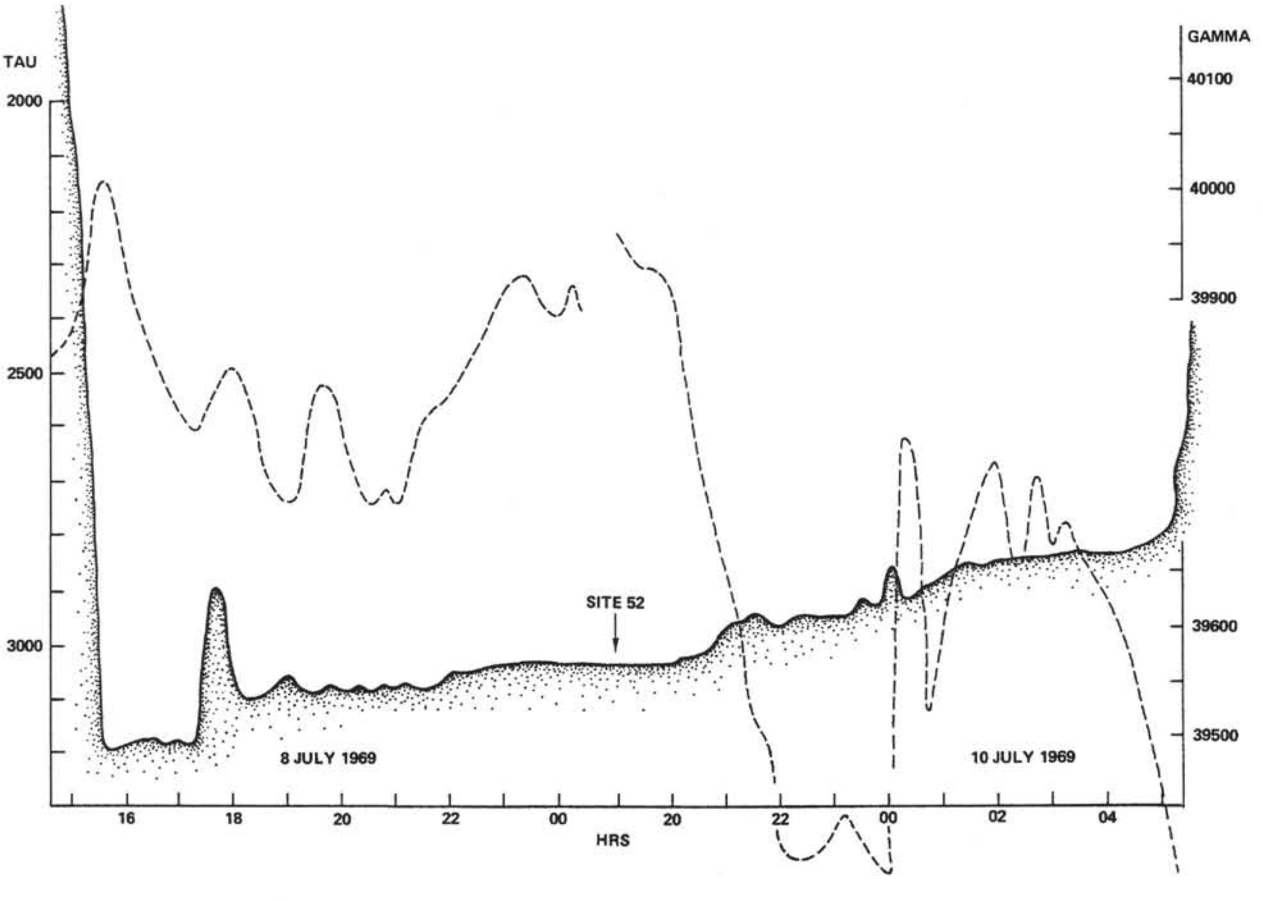


Figure 2. Challenger *bathymetric and magnetic profile at Site 52.*

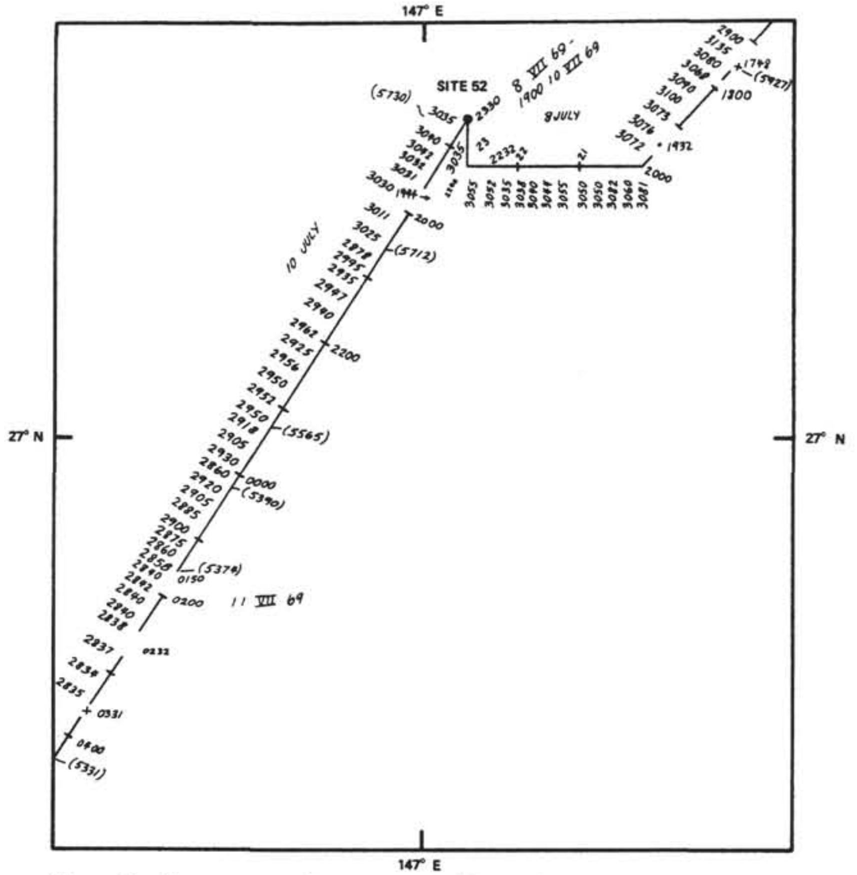


Figure 3. *Bottom soundings in area of Site 52.*

From 9 to 74 meters below mudline, the gamma radiation was fairly steady (except for Core 7), at 600 to 900 counts from Quaternary-Tertiary and Cretaceous clay with ash, ashey clay, and ash. Core 7 (55 to 74 meters depth) had a maximum count of 2600, and Core 8 had a maximum of 1800 counts/7.6-cm core segment/1.25 minutes.

Ash layers generally had slightly higher counts (100 to 200 greater) than adjacent sediment; however, they also had lower porosities. Porosity variations, in general, were partly the cause of gamma count variation in all sediment types.

The brown clay in Cores 7 and 8 appears similar to that in the rest of Hole 52.0 and the reason for such a high gamma radiation is not evident from the visual core description. This increase, in part, may be the result of the sediments higher density and lower porosity, allowing more radioactive material to be scanned in the 7.6-centimeter core interval.

In Hole 52.0 there is a similar situation to that in Hole 47.0, where the radiation was noticably higher in the top 6.1 meters of sediment despite the fact that the sediment does not alter its composition greatly with depth.

Porosity, Wet-Bulk Density, and Water Content

Porosity, wet-bulk density, and water content of Quaternary-Tertiary and Cretaceous brown ashey clays from Hole 52.0 were typically about 72 per cent, 1.39 g/cc and 58 per cent, respectively. The ranges were 30 per cent to 90 per cent (?), 1.18 (?) to 1.86 g/cc, and 48 per cent to 71 per cent. The Quaternary-Teriary (?) brown ashey clay and clayey ash, recovered from 0 to 36.6 meters, had approximate porosity of 71 per cent and wet-bulk densities of 1.40 g/cc. Water content ranged from 48 per cent to 59 per cent. The lowest porosities (30 per cent) occurred in consolidated clay fragments in Core 2.

From 36.6 meters to 73 meters, Tertiary-Cretaceous brown clays had porosities of 80 per cent (1.33 g/cc wet-bulk density), 66 per cent (1.55 g/cc), and 70 per cent (1.31 g/cc) in Cores 5, 7 and 8, respectively (see hole and core plots). Cores 6 and 8 were highly disturbed. The water content averaged 64 per cent in Core 5 and 57 per cent in Core 7. The lowest Cretaceous porosities (44 per cent) occurred in Core 8, which was not split.

TABLE 1
Summary of Coring at Site 52

Core No.	Interval Cored (below mudline) (ft)	(m)	Recovery (ft)	(m)
52.0-1	0-30	0.0-9.1	30	9.1
52.0-2	30-60	9.1-18.3	28	8.5
52.0-3	60-90	18.3-27.4	30	9.1
52.0-4	90-120	27.4-36.6	25	7.6
52.0-5	120-150	36.6-45.7	21	6.4
52.0-6	150-180	45.7-54.9	4	1.2
52.0-7	180-210	54.9-64.0	5	1.5
52.0-8	210-213	64.0-64.9	3	0.9
52.0-9	213-218	64.9-66.4	1	0.3
52.0-10	218-226	66.4-68.9	1	0.3

Water Depth: 5744.33 meters (18,846 feet)

Many of the ash layers have porosities which were 7 per cent lower than the surrounding sediment. These low porosities in some parts of the cores reflect the particle size and amount of ash present in the brown clay. Porosities were indirectly similar to the sound velocity between the surface and 60 meters. Below 60 meters the remaining core was artificially disturbed. Porosity also had general indirect similarities to natural gamma radiation and thermal conductivity; and direct similarities to needle penetration.

Sound Velocity

Quaternary-Tertiary and Cretaceous clayey ash and ashey clay, from 0 to 73 meters in Hole 52.0, had sound velocities ranging from 1.46 to 1.70 km/sec with an overall average of 1.56 km/sec. There was a good correlation between sound velocities and the amount of ash mixed with the clay; the high velocities being associated with high ash content, which tended to coincide with coarser grain size and lower porosities.

Quaternary-Tertiary brown ashey clay from Core 1, 0 to 9.1 meters below mudline, had a sound velocity average of 1.52 km/sec and an estimated 30 per cent ash content. Similar sediment in Cores 2, 3 and 4 (9.1 to 36 meters) had sound velocity averages of 1.57, 1.59 and 1.56 km/sec, respectively, with a higher ash content of 50 to 60 per cent (see hole and core plots). Tertiary and Cretaceous brown ashey clay in Cores 5, 7 and 8 (36 to 65 meters) had average sound velocities within 1.46 to 1.50 km/sec and a low ash content ranging from 10 to 20 per cent.

Sound velocities plotted against depth in the sediment have an indirect similarity with penetrometer values in the Quaternary-Tertiary brown ash and clay (0 to 46 meters). Below 46 meters the sediments recovered were highly disturbed by the drilling. As would be expected, both sound velocity and penetrometer values were related to ash content in the cores. The higher the ash content, the faster the sound velocity and the less penetration by the needle (more compact). Also in Hole 52.0 sound velocity values had a general direct variation with particle size, and the porosities were such that velocity was both inversely and directly related to density and porosity. Those sediments with porosities greater than 70 per cent had a typical direct relationship between porosity and sound velocity. This relationship was inverse when porosities were less than 60 to 70 per cent.

Thermal Conductivity

Thermal conductivity measurements were made in Quaternary, Tertiary and Cretaceous clay and ash recovered from mudline to depth of 73 meters. Values ranged from 1.97 to 2.24 with an average of 2.11×10^{-3} cal-$°C^{-1} cm^{-1} sec^{-1}$. These results were not obviously equated with changes in lithology; however, conductivity does vary inversely with water content.

Penetrometer

Penetrometer measurements made on Quarternary-Tertiary brown ashey clay (0 to 36.6 meters), with thin ash beds, ranged from 20 to 200×10^{-1} millimeters. Average values were 74, 71 and 50×10^{-1} millimeters for Cores 1, 2 and 3, which were about 4, 15 and 23 meters below the sediment surface, respectively (see hole and core plots). In general, the penetrometer values decreased with increasing ash content, the sediment in this upper part of Hole 52.0 being quite firm and compact.

Tertiary brown ashey clay from 27 meters to 43 meters had penetrometer values higher than the sediments above. Here the typical values were 120×10^{-1} millimeters. Areas which contained abundant ash were penetrated with more difficulty.

Tertiary-Cretaceous brown ashey clay and clay below 55 meters (Core 7 and down) had lower average penetrometer values of about 50. These low values are due to the high ash content.

CONCLUSIONS

The absence of calcareous fossils, and the poor preservation of Radiolaria in the lower part of this sequence, leaves only very general age information.

Brown volcanic-rich clays, containing well-preserved Radiolaria, down to 32 meters are clearly of Cenozoic age.

Below this, the clay is nonfossiliferous and assumes a distinctly granular character and a more pinkish hue; and is largely a homogenous accumulation of palagonite particles.

More normal brown clay appears at 55 to 64 meters and yields Mesozoic types of Radiolaria in the form of chalcedony molds and chalcedonized fragments of spiny saturnalids.

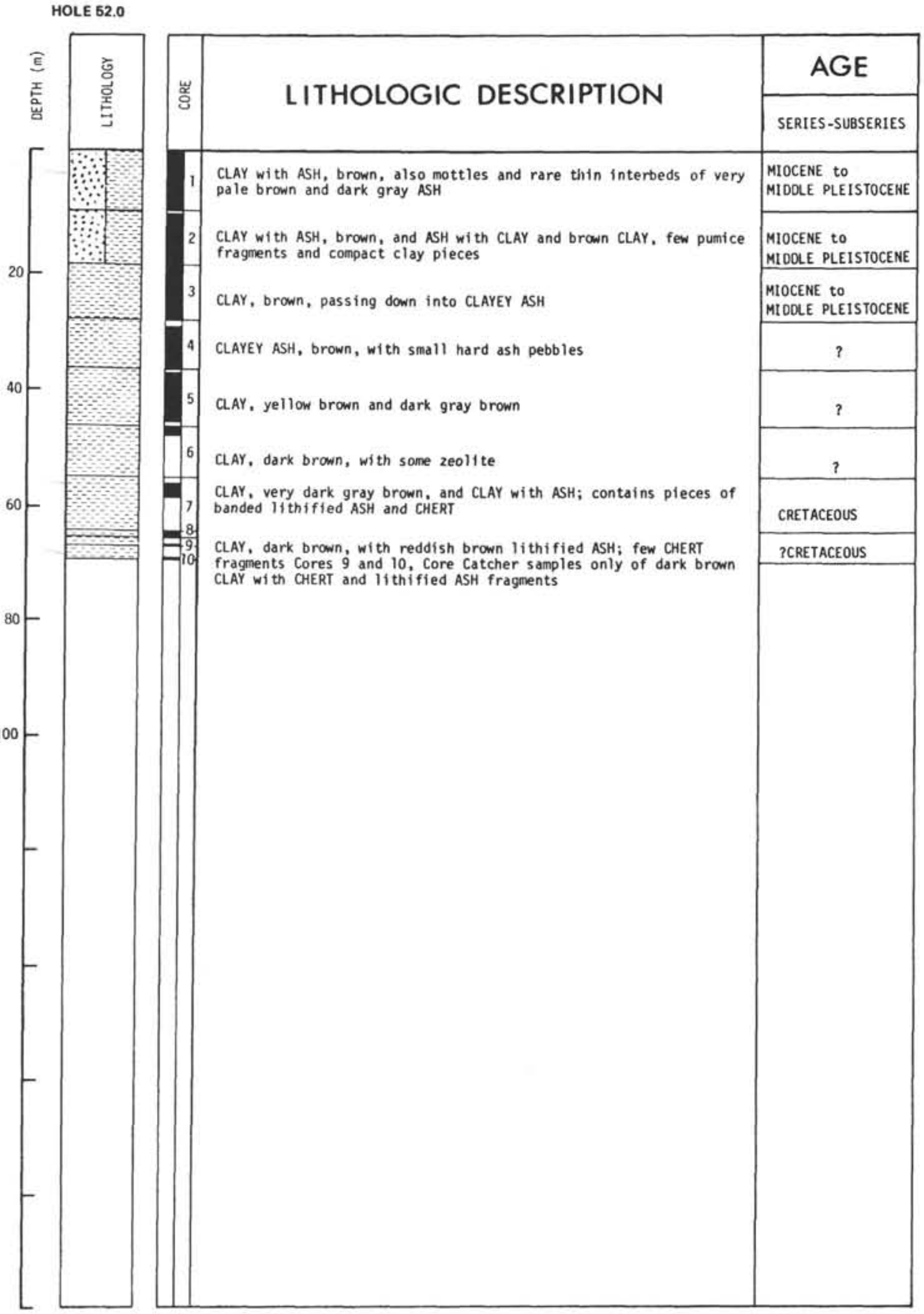
Lithified volcanic ash, some of it cherty and radiolarian-bearing, was encountered at 65 meters, in the Cretaceous. This corresponds to a weak reflector in the middle of what had been interpreted as the "upper transparent" acoustic unit but which, in age, appears to be akin to the "upper opaque" layer at Site 51.

The uppermost notably "opaque" layer at Site 52, not reached by the drill, would appear to be of Middle Cretaceous or even greater age. A lower transparent layer is seen below it on the profiles at the drill site; and, the seismic profiles from the ship taken between Site 52 and the Mariana Trench reveal the presence of yet another opaque and another transparent layer below this. The impression gained is that this region is not readily correlated seismically with the remainder of *The Challenger* in the Northwest Pacific, and that it probably contains older sediments than does the region around the Shatsky Rise – possibly the oldest sediments in the Pacific.

REFERENCES

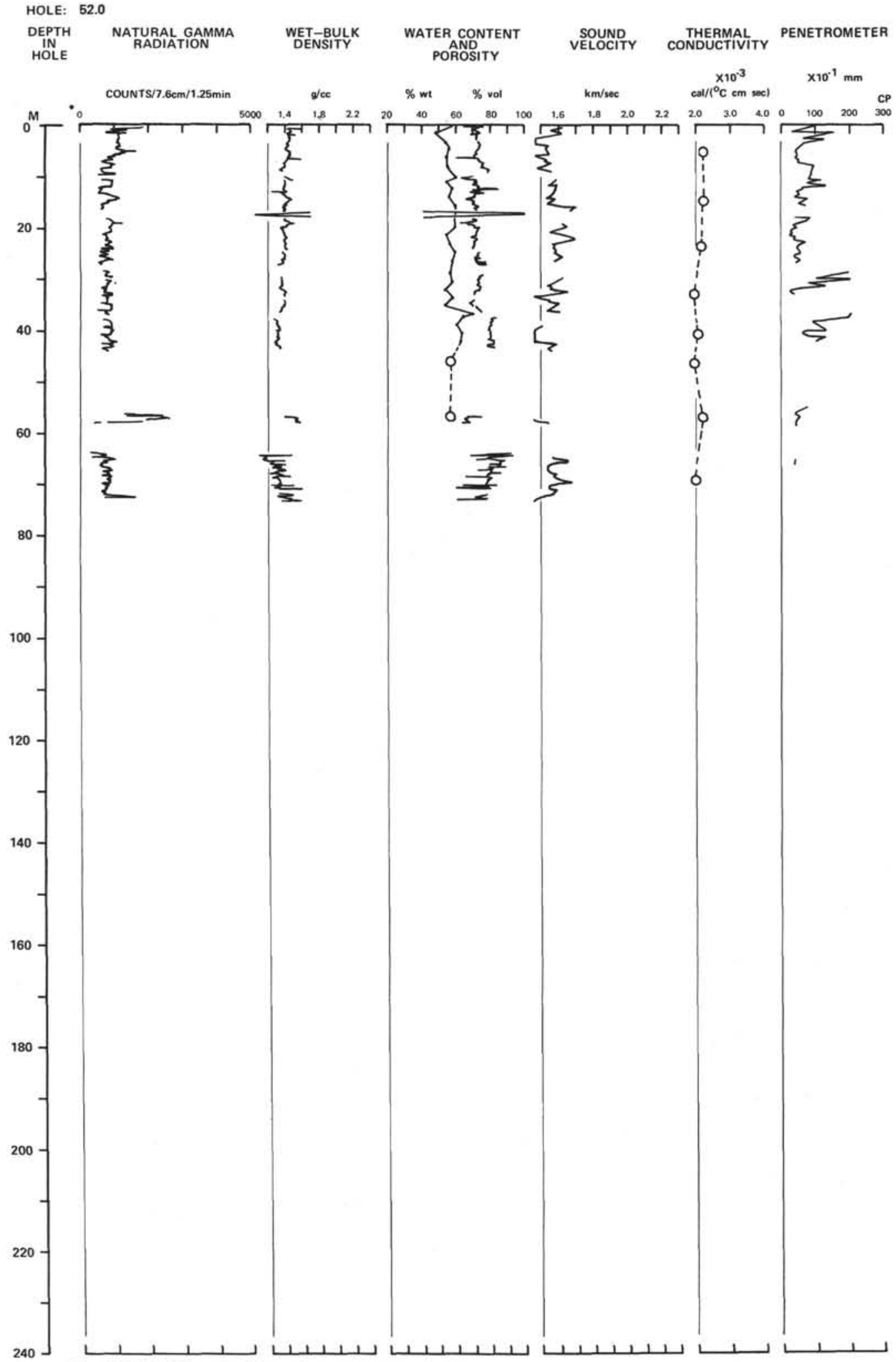
Bonatti, E., 1963, Zeolites in Pacific pelagic sediments. *Trans. New York Acad. Sciences,* **25**, 938.

Ewing, J., Ewing, M., Aitken, T. and Ludwig, W. J., 1968. North Pacific sediment layers measured by seismic profiling. **In** The crust and upper mantle of the Pacific area. *Trans. Am. Geophys. Union.* **12**. 147.



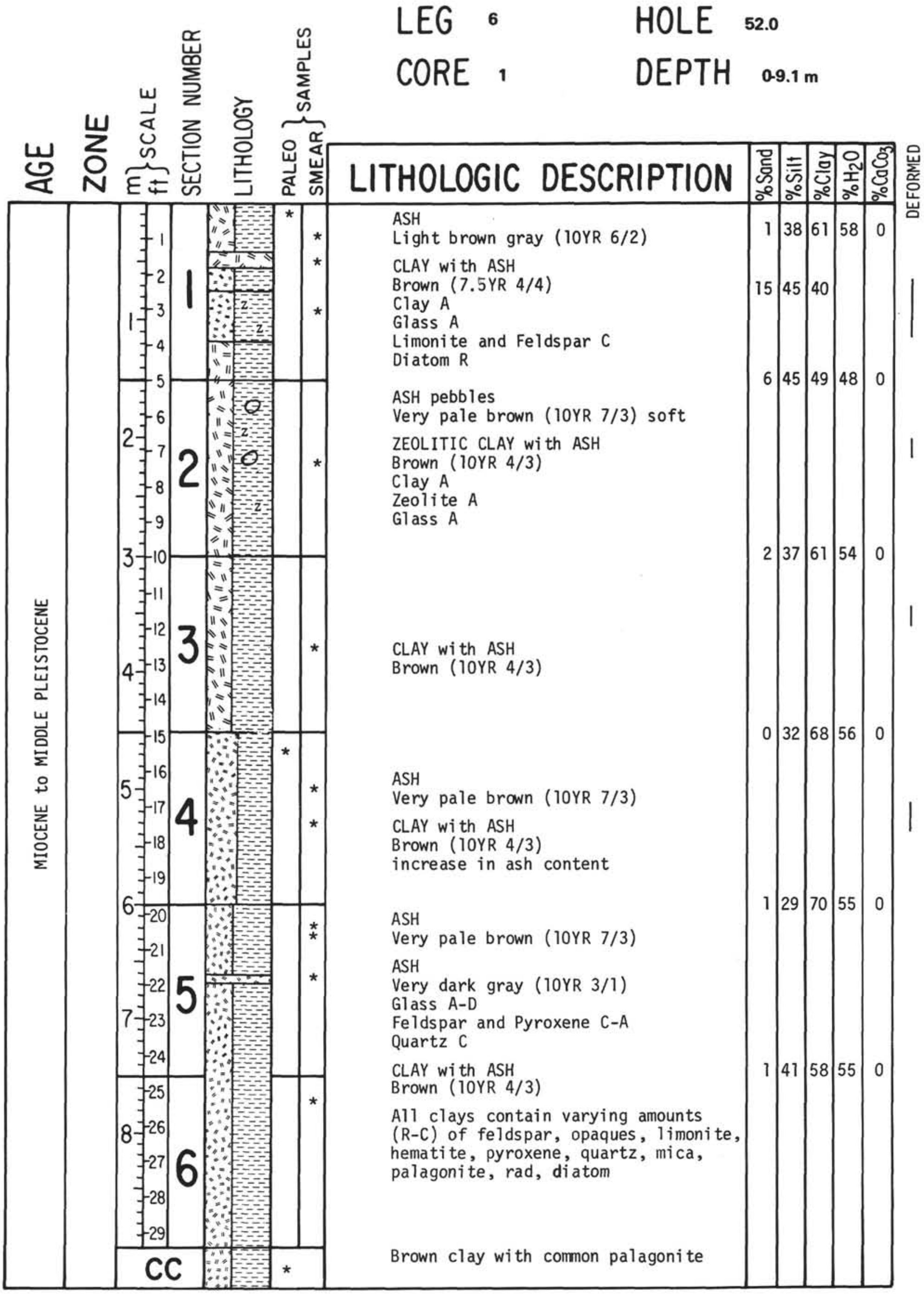
CORE	LITHOLOGIC DESCRIPTION	AGE SERIES-SUBSERIES
1	CLAY with ASH, brown, also mottles and rare thin interbeds of very pale brown and dark gray ASH	MIOCENE to MIDDLE PLEISTOCENE
2	CLAY with ASH, brown, and ASH with CLAY and brown CLAY, few pumice fragments and compact clay pieces	MIOCENE to MIDDLE PLEISTOCENE
3	CLAY, brown, passing down into CLAYEY ASH	MIOCENE to MIDDLE PLEISTOCENE
4	CLAYEY ASH, brown, with small hard ash pebbles	?
5	CLAY, yellow brown and dark gray brown	?
6	CLAY, dark brown, with some zeolite	?
7	CLAY, very dark gray brown, and CLAY with ASH; contains pieces of banded lithified ASH and CHERT	CRETACEOUS
8 9 10	CLAY, dark brown, with reddish brown lithified ASH; few CHERT fragments Cores 9 and 10, Core Catcher samples only of dark brown CLAY with CHERT and lithified ASH fragments	?CRETACEOUS

Figure 4. *Summary of lithology in Hole 52.0.*



*O = LABORATORY– ATMOSPHERIC BACKGROUND COUNT.

Figure 5. *Summary of physical properties in Hole 52.0.*



LEG 6 HOLE 52.0

CORE 1 DEPTH 0-9.1 m

LITHOLOGIC DESCRIPTION

ASH
Light brown gray (10YR 6/2)

CLAY with ASH
Brown (7.5YR 4/4)
Clay A
Glass A
Limonite and Feldspar C
Diatom R

ASH pebbles
Very pale brown (10YR 7/3) soft

ZEOLITIC CLAY with ASH
Brown (10YR 4/3)
Clay A
Zeolite A
Glass A

CLAY with ASH
Brown (10YR 4/3)

ASH
Very pale brown (10YR 7/3)

CLAY with ASH
Brown (10YR 4/3)
increase in ash content

ASH
Very pale brown (10YR 7/3)

ASH
Very dark gray (10YR 3/1)
Glass A-D
Feldspar and Pyroxene C-A
Quartz C

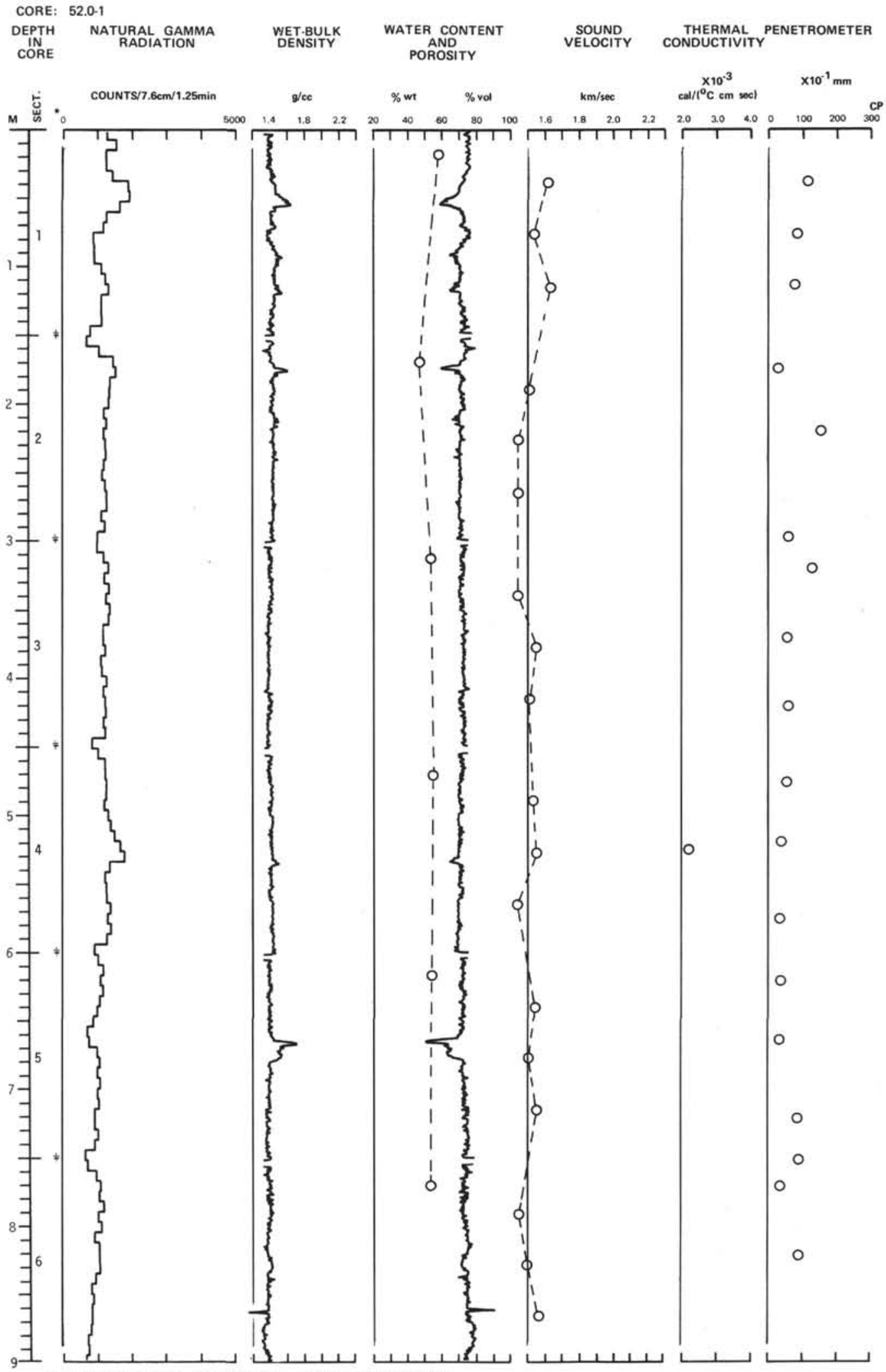
CLAY with ASH
Brown (10YR 4/3)

All clays contain varying amounts (R-C) of feldspar, opaques, limonite, hematite, pyroxene, quartz, mica, palagonite, rad, diatom

Brown clay with common palagonite

%Sand	%Silt	%Clay	%H_2O	%$CaCO_3$
1	38	61	58	0
15	45	40		
6	45	49	48	0
2	37	61	54	0
0	32	68	56	0
1	29	70	55	0
1	41	58	55	0

Figure 6. *Summary of lithology in Hole 52.0 Core 1.*



*O = LABORATORY–ATMOSPHERIC BACKGROUND COUNT.

Figure 7. *Summary of physical properties in Hole 52.0 Core 1.*

LEG 6 HOLE 52.0

CORE 1 DEPTH 0-9.1 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	Radiolaria are rare to absent throughout this core. The species present range from Miocene through middle Pleistocene. TOP: *Eucyrtidium calvertense* and *Druppatractus acquilonius*. BOTTOM: same.

Figure 8. *Summary of biostratigraphy in Hole 52.0 Core 1.*

Plate 1. *Photographs of Hole 52.0 Core 1.*

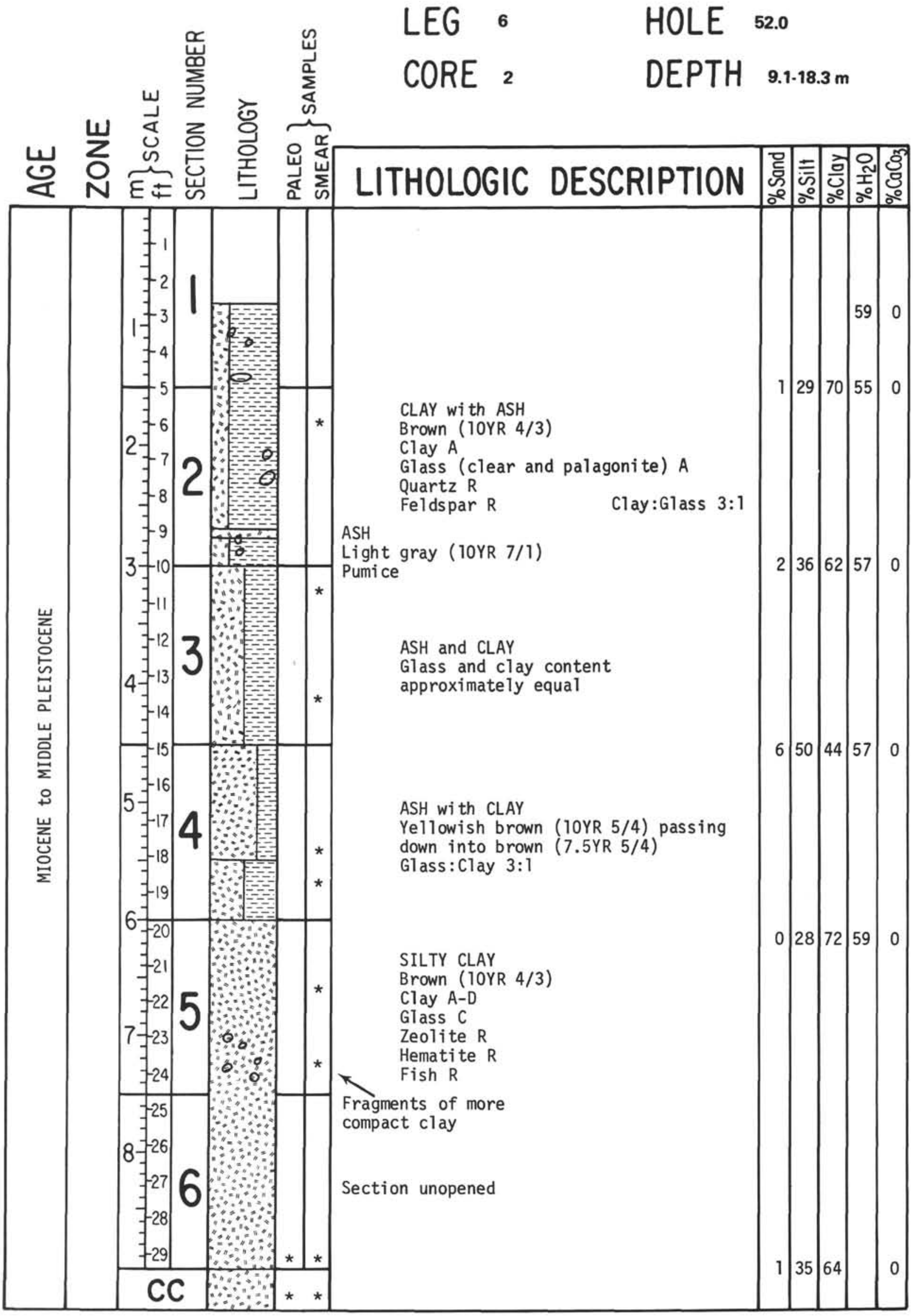
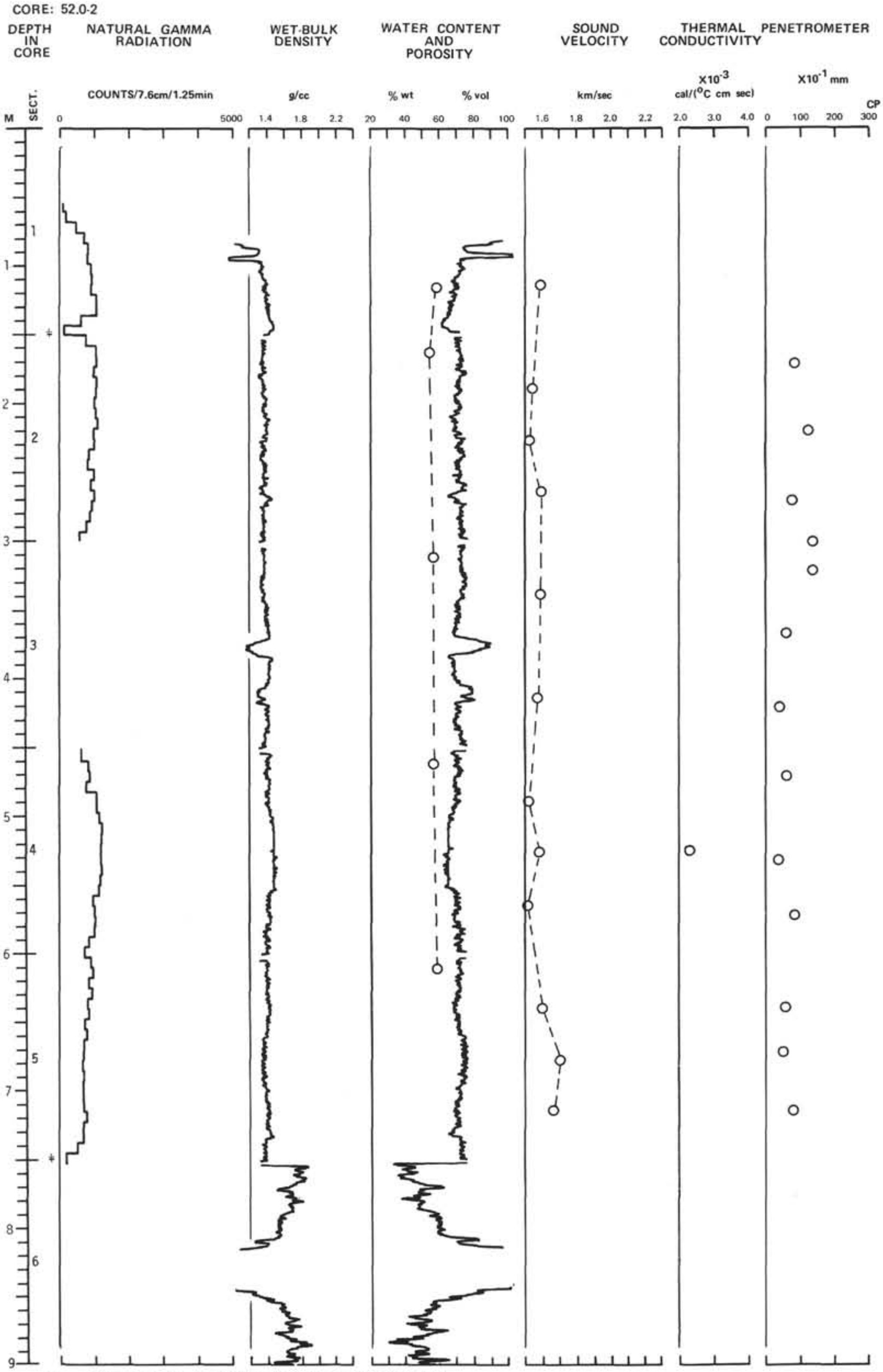


Figure 9. *Summary of lithology in Hole 52.0 Core 2.*



*O = LABORATORY–ATMOSPHERIC BACKGROUND COUNT.

Figure 10. *Summary of physical properties in Hole 52.0 Core 2.*

LEG 6 HOLE 52.0
CORE 2 DEPTH 9.1-18.3 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	Radiolaria are absent or very rare in this core. The only identifiable species ranges from Miocene through middle Pleistocene. TOP: no Radiolaria. BOTTOM: *Druppatractus acquilonius*.

Figure 11. *Summary of biostratigraphy in Hole 52.0 Core 2.*

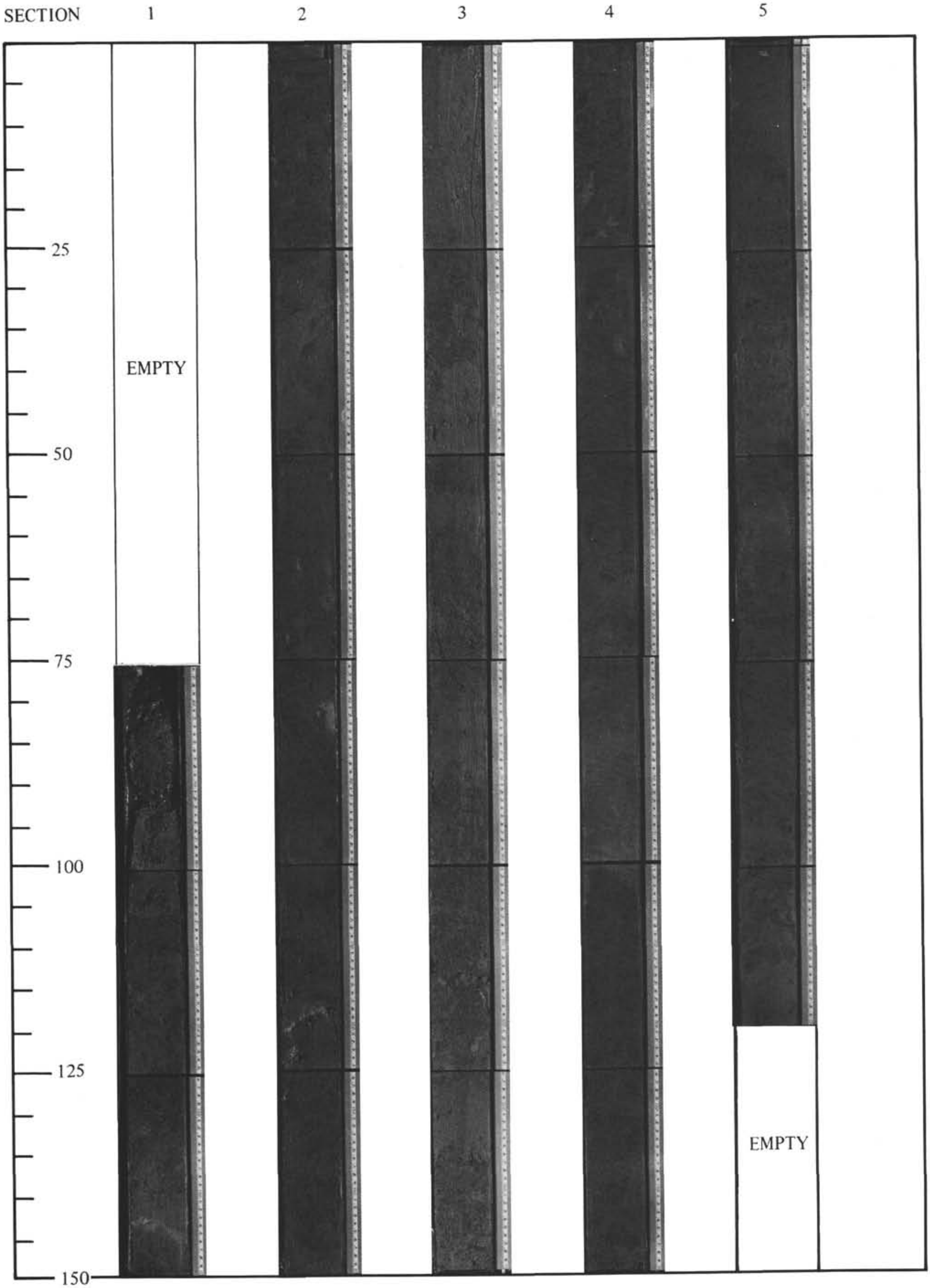
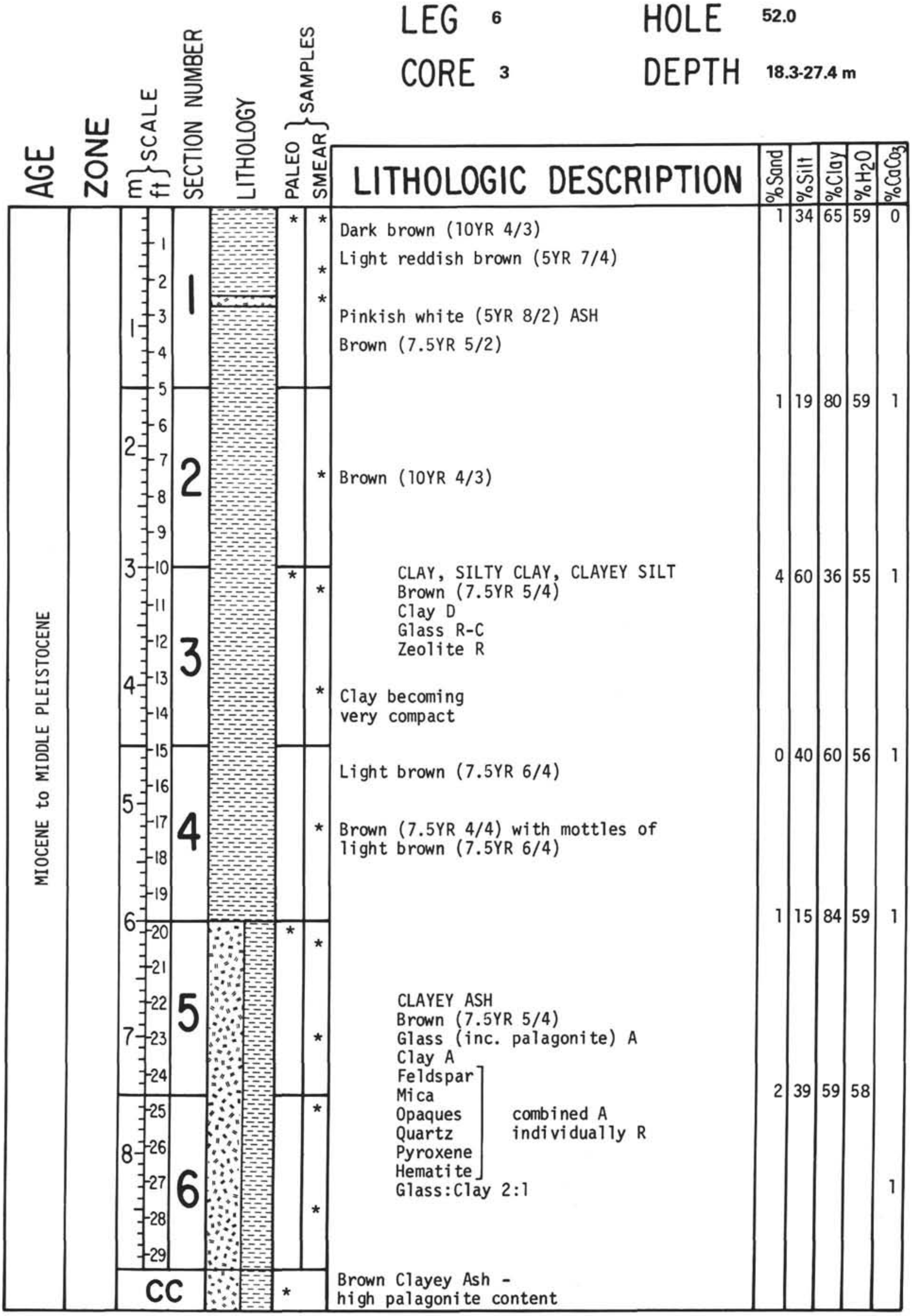


Plate 2. *Photographs of Hole 52.0 Core 2.*

LEG 6 HOLE 52.0

CORE 3 DEPTH 18.3-27.4 m



LITHOLOGIC DESCRIPTION

Dark brown (10YR 4/3)

Light reddish brown (5YR 7/4)

Pinkish white (5YR 8/2) ASH

Brown (7.5YR 5/2)

Brown (10YR 4/3)

CLAY, SILTY CLAY, CLAYEY SILT
Brown (7.5YR 5/4)
Clay D
Glass R-C
Zeolite R

Clay becoming
very compact

Light brown (7.5YR 6/4)

Brown (7.5YR 4/4) with mottles of
light brown (7.5YR 6/4)

CLAYEY ASH
Brown (7.5YR 5/4)
Glass (inc. palagonite) A
Clay A
Feldspar
Mica
Opaques combined A
Quartz individually R
Pyroxene
Hematite
Glass:Clay 2:1

Brown Clayey Ash -
high palagonite content

%Sand	%Silt	%Clay	%H_2O	%$CaCO_3$
1	34	65	59	0
1	19	80	59	1
4	60	36	55	1
0	40	60	56	1
1	15	84	59	1
2	39	59	58	
				1

Figure 12. *Summary of lithology in Hole 52.0 Core 3.*

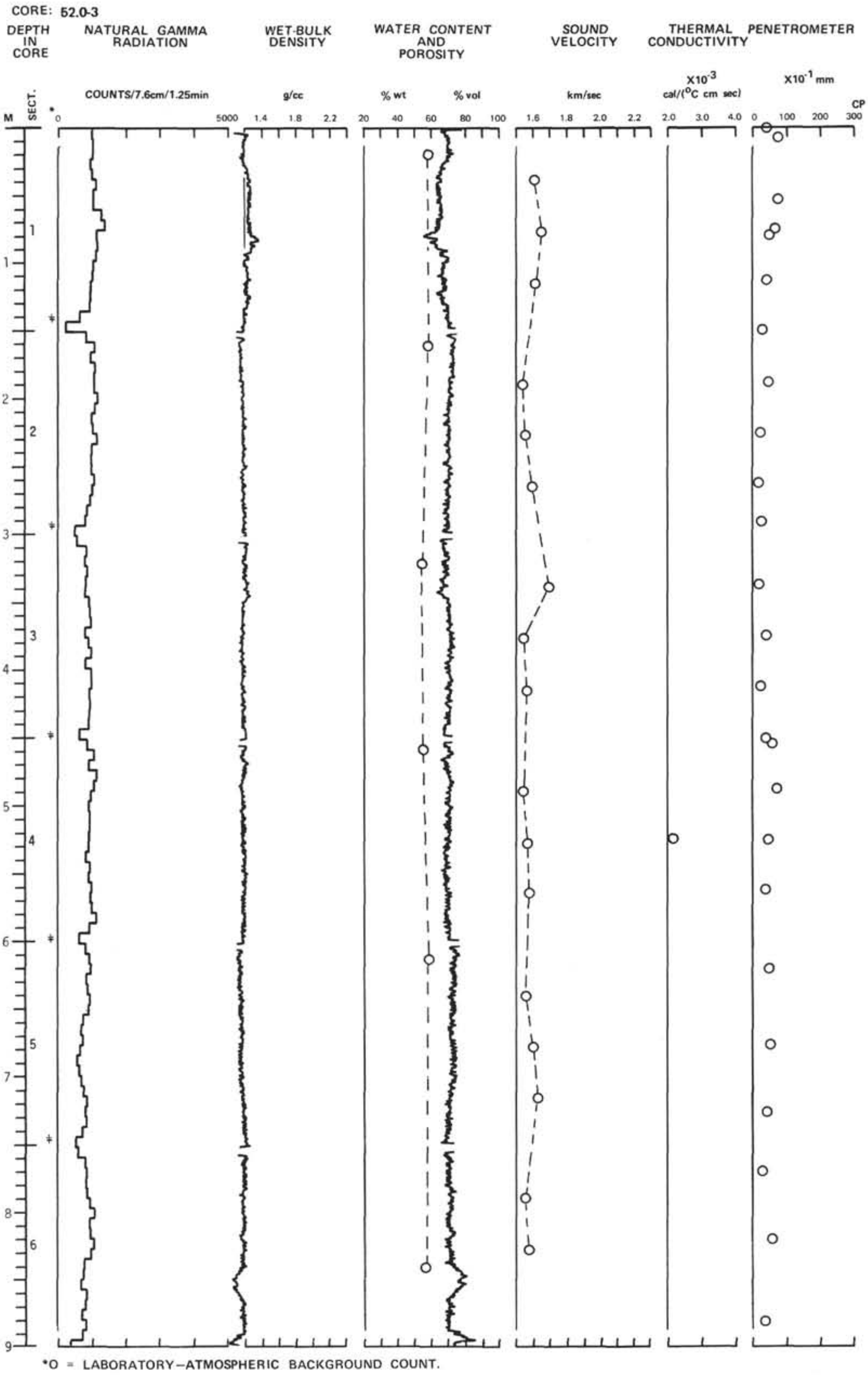


Figure 13. *Summary of physical properties in Hole 52.0 Core 3.*

LEG 6 HOLE 52.0
CORE 3 DEPTH 18.3-27.4 m

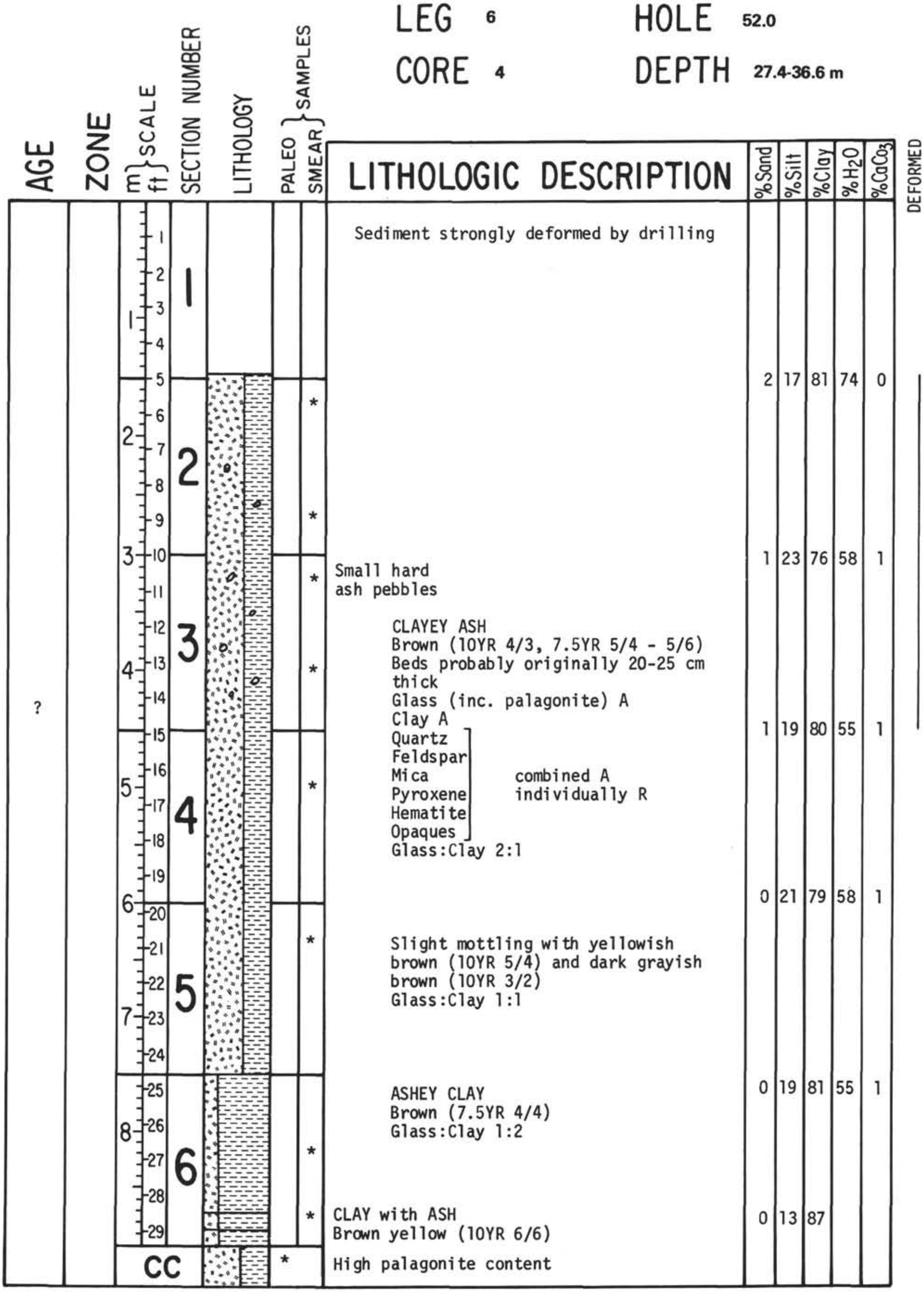
FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	Radiolaria are absent or very rare in this core. The one identifiable species ranges from the Miocene through the middle Pleistocene. TOP: *Druppatractus acquilonius*. BOTTOM: no species identifiable.

Figure 14. *Summary of biostratigraphy in Hole 52.0 Core 3.*

late 3. *Photographs of Hole 52.0 Core 3.*

LEG 6 HOLE 52.0

CORE 4 DEPTH 27.4-36.6 m



LITHOLOGIC DESCRIPTION

Sediment strongly deformed by drilling

Small hard
ash pebbles

CLAYEY ASH
Brown (10YR 4/3, 7.5YR 5/4 - 5/6)
Beds probably originally 20-25 cm thick
Glass (inc. palagonite) A
Clay A
Quartz, Feldspar, Mica, Pyroxene, Hematite, Opaques: combined A, individually R
Glass:Clay 2:1

Slight mottling with yellowish brown (10YR 5/4) and dark grayish brown (10YR 3/2)
Glass:Clay 1:1

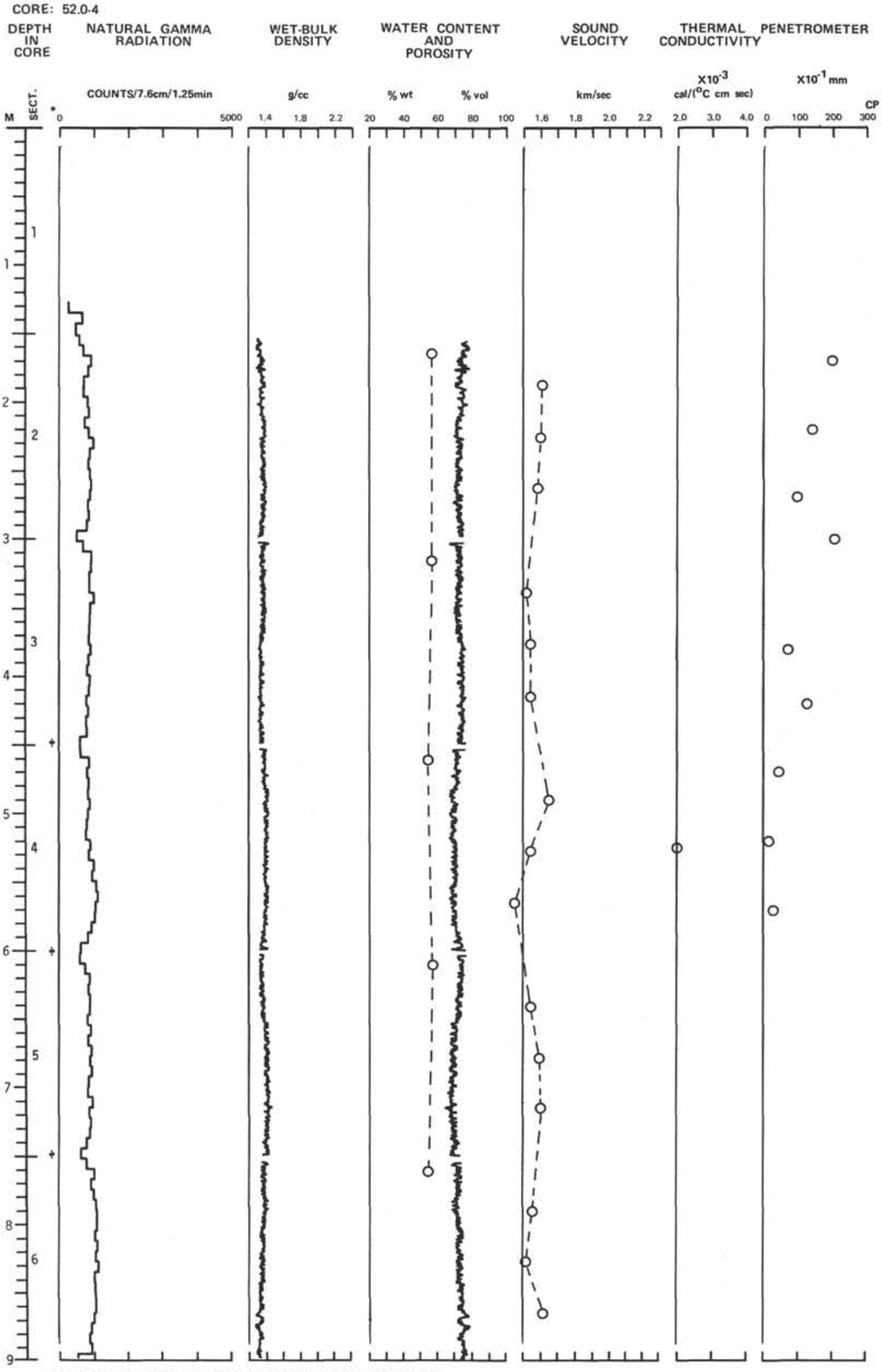
ASHEY CLAY
Brown (7.5YR 4/4)
Glass:Clay 1:2

CLAY with ASH
Brown yellow (10YR 6/6)

High palagonite content

%Sand	%Silt	%Clay	$\%H_2O$	$\%CaCO_3$
2	17	81	74	0
1	23	76	58	1
1	19	80	55	1
0	21	79	58	1
0	19	81	55	1
0	13	87		

Figure 15. *Summary of lithology in Hole 52.0 Core 4.*



*O = LABORATORY–ATMOSPHERIC BACKGROUND COUNT.

Figure 16. *Summary of physical properties in Hole 52.0 Core 4.*

LEG 6 HOLE 52.0

CORE 4 DEPTH 27.4-36.6 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	None.

Figure 17. *Summary of biostratigraphy in Hole 52.0 Core 4.*

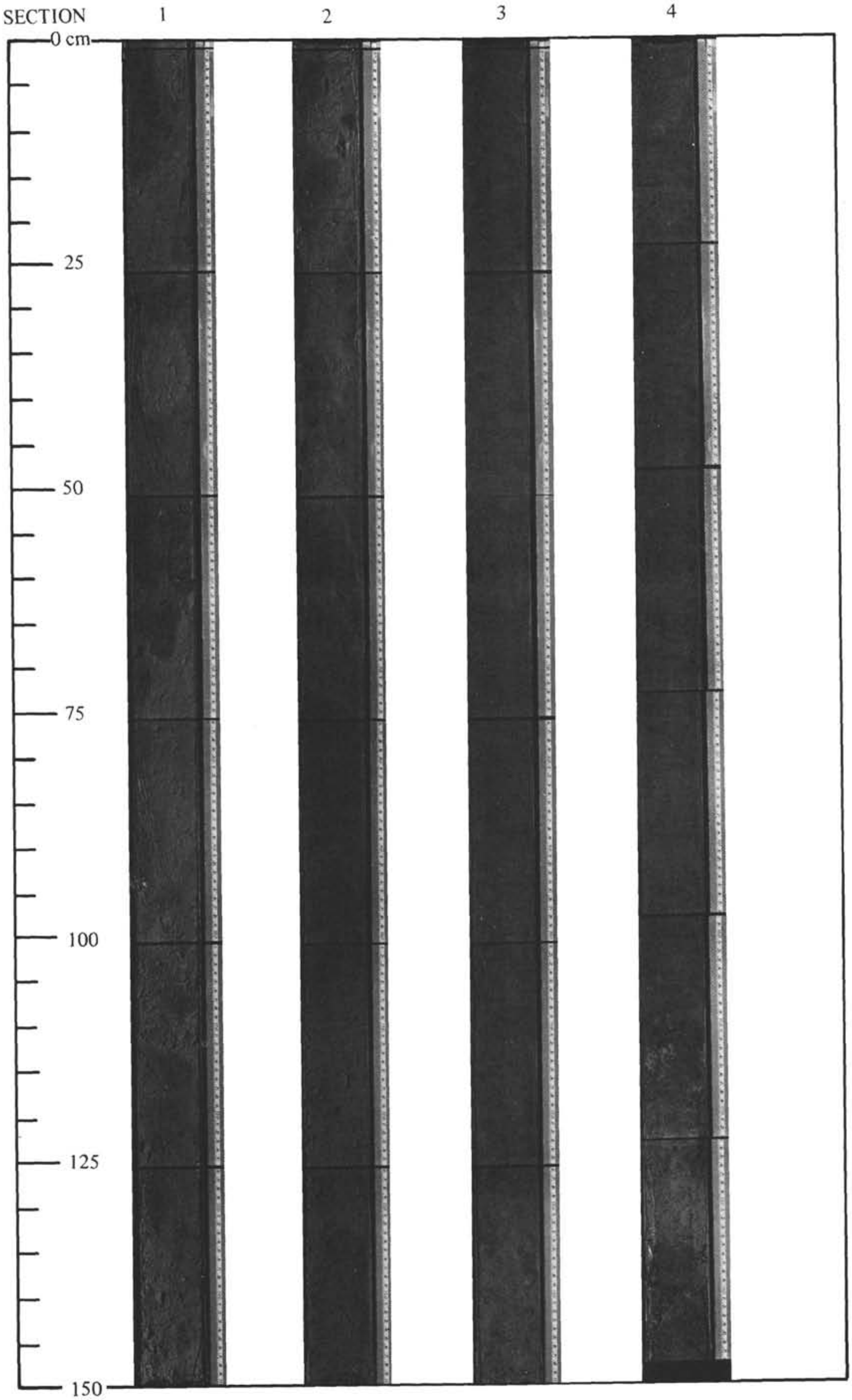
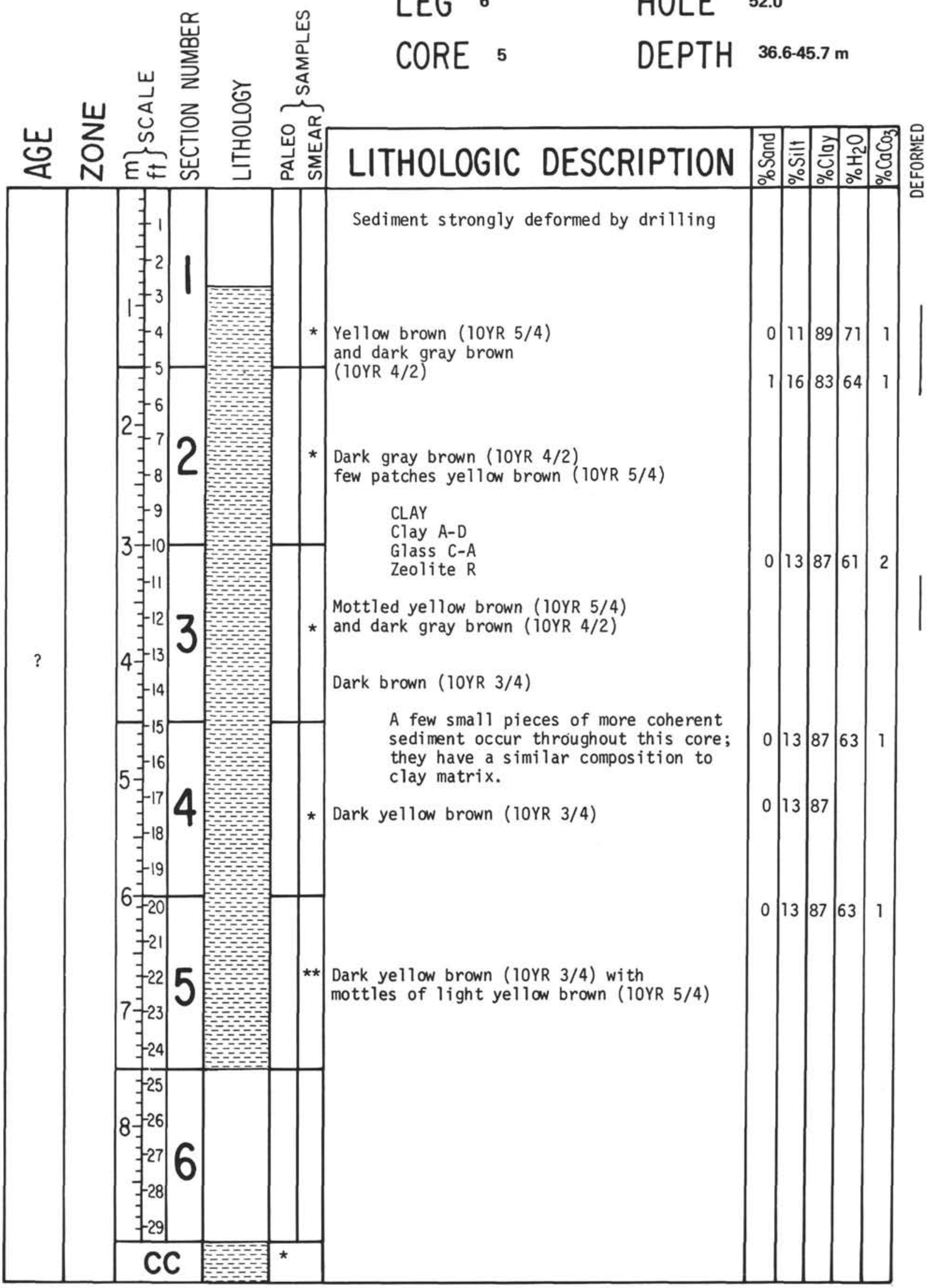


Plate 4. *Photographs of Hole 52.0 Core 4.*

LEG 6 HOLE 52.0

CORE 5 DEPTH 36.6-45.7 m



Sediment strongly deformed by drilling

Yellow brown (10YR 5/4)
and dark gray brown
(10YR 4/2)

Dark gray brown (10YR 4/2)
few patches yellow brown (10YR 5/4)

CLAY
Clay A-D
Glass C-A
Zeolite R

Mottled yellow brown (10YR 5/4)
and dark gray brown (10YR 4/2)

Dark brown (10YR 3/4)

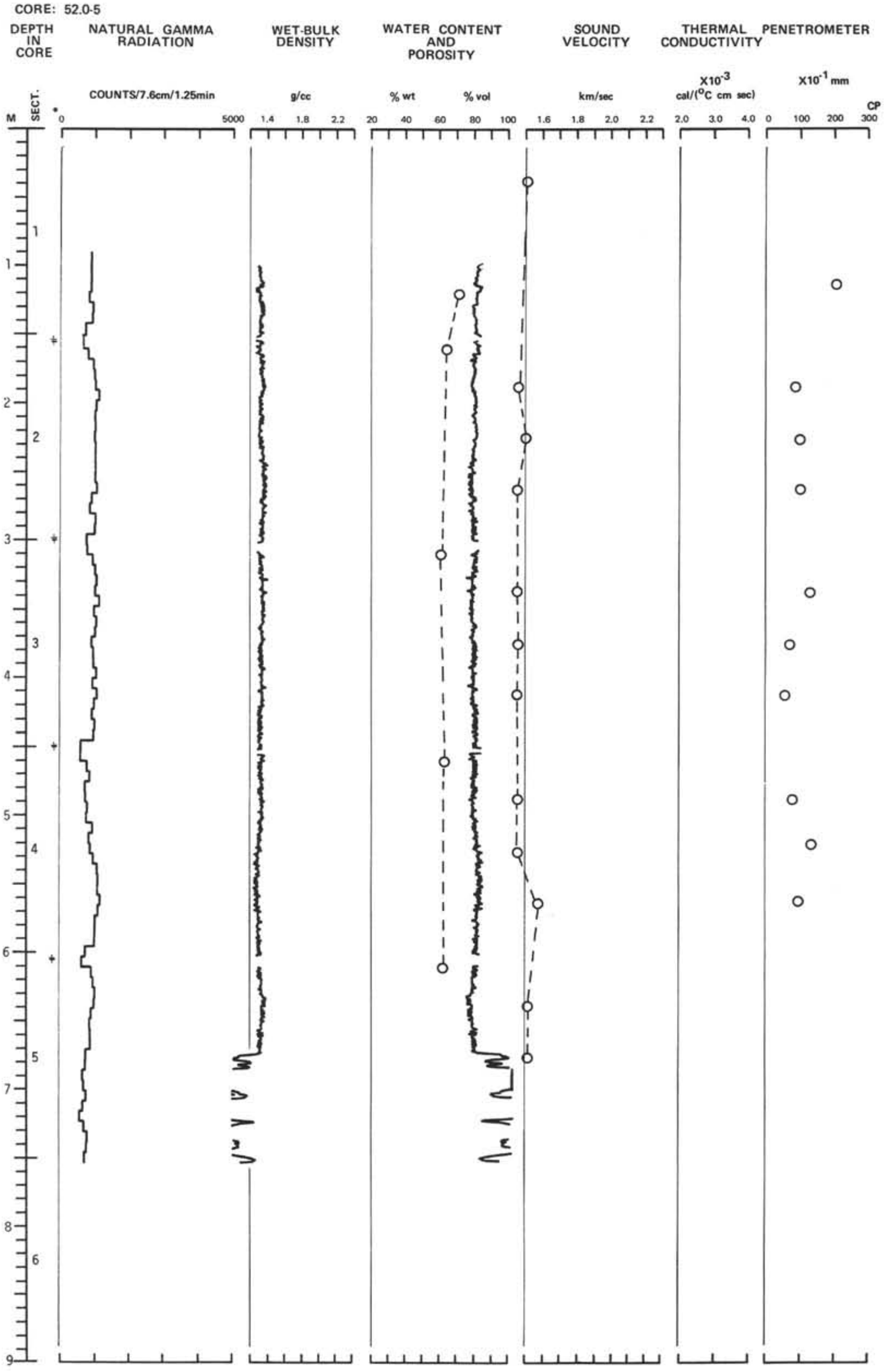
A few small pieces of more coherent sediment occur throughout this core; they have a similar composition to clay matrix.

Dark yellow brown (10YR 3/4)

Dark yellow brown (10YR 3/4) with
mottles of light yellow brown (10YR 5/4)

%Sand	%Silt	%Clay	%H2O	%CaCO3
0	11	89	71	1
1	16	83	64	1
0	13	87	61	2
0	13	87	63	1
0	13	87		
0	13	87	63	1

Figure 18. *Summary of lithology in Hole 52.0 Core 5.*



*O = LABORATORY–ATMOSPHERIC BACKGROUND COUNT.

Figure 19. *Summary of physical properties in Hole 52.0 Core 5.*

LEG 6 HOLE 52.0

CORE 5 DEPTH 36.6-45.7 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	None.

Figure 20. *Summary of biostratigraphy in Hole 52.0 Core 5.*

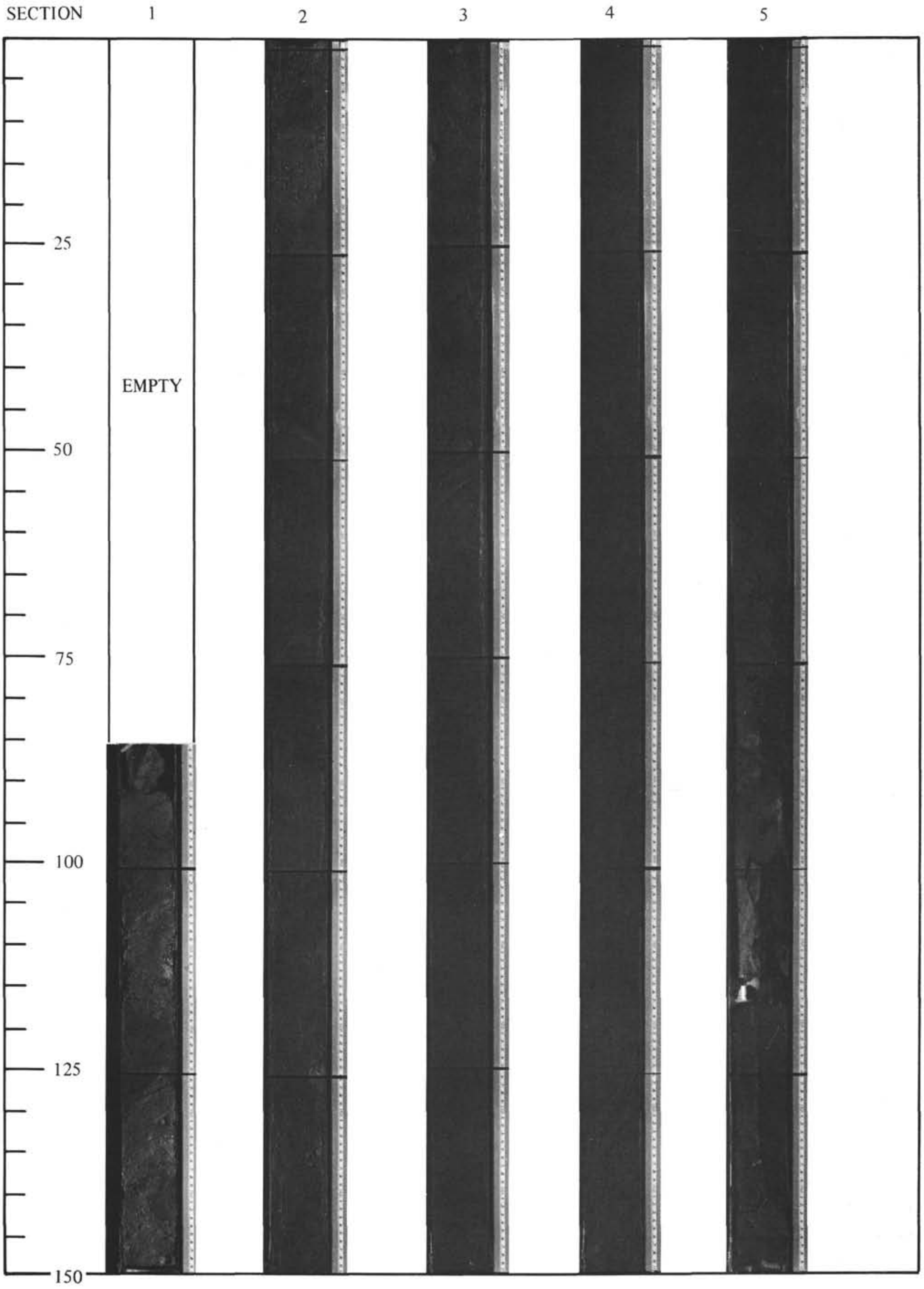
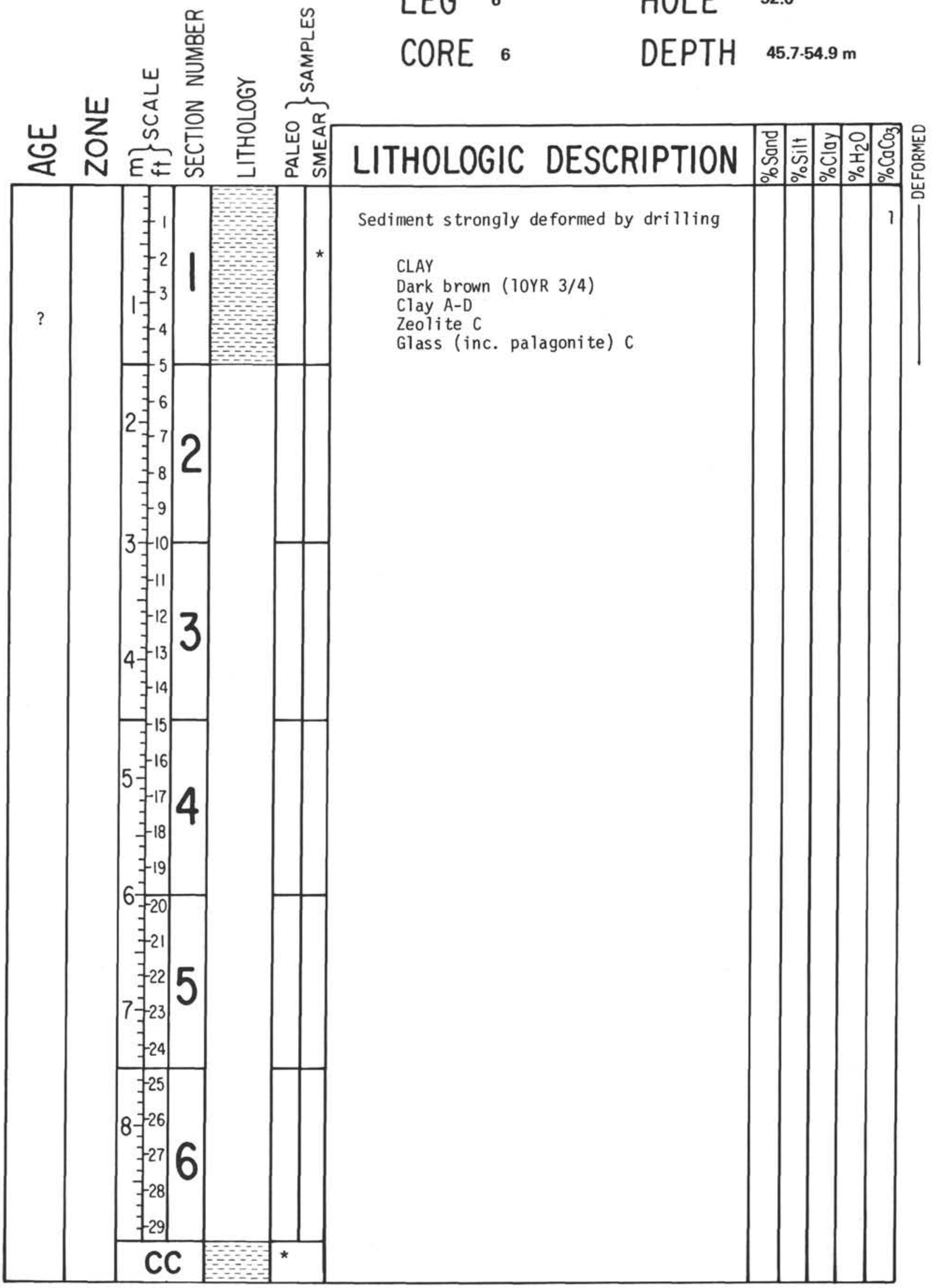


Plate 5. *Photographs of Hole 52.0 Core 5.*

LEG 6 **HOLE** 52.0

CORE 6 **DEPTH** 45.7-54.9 m



Sediment strongly deformed by drilling

CLAY
Dark brown (10YR 3/4)
Clay A-D
Zeolite C
Glass (inc. palagonite) C

Figure 21. *Summary of lithology in Hole 52.0 Core 6.*

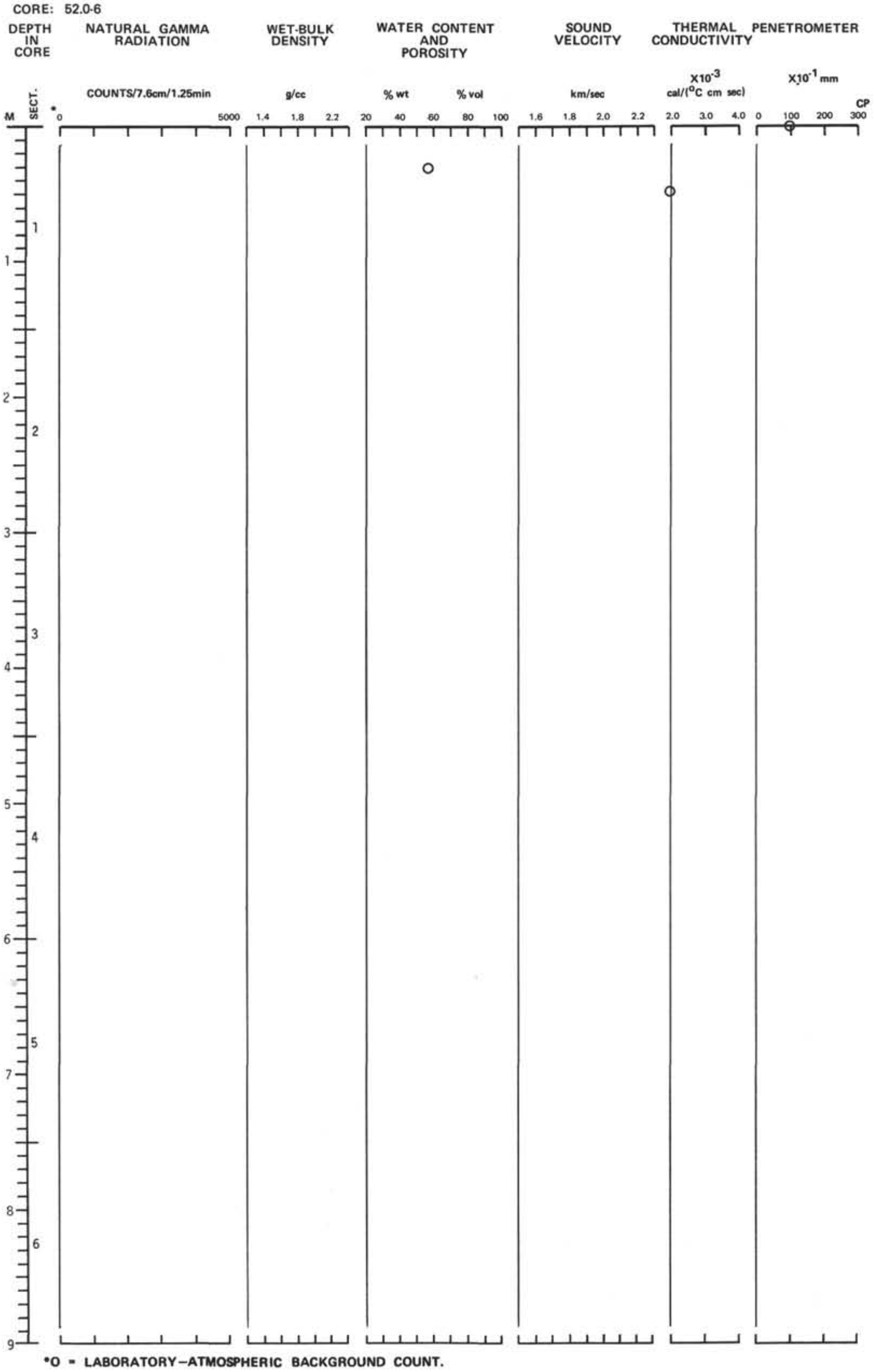


Figure 22. *Summary of physical properties in Hole 52.0 Core 6.*

LEG 6 HOLE 52.0

CORE 6 DEPTH 45.7-54.9 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	None.

Figure 23. *Summary of biostratigraphy in Hole 52.0 Core 6.*

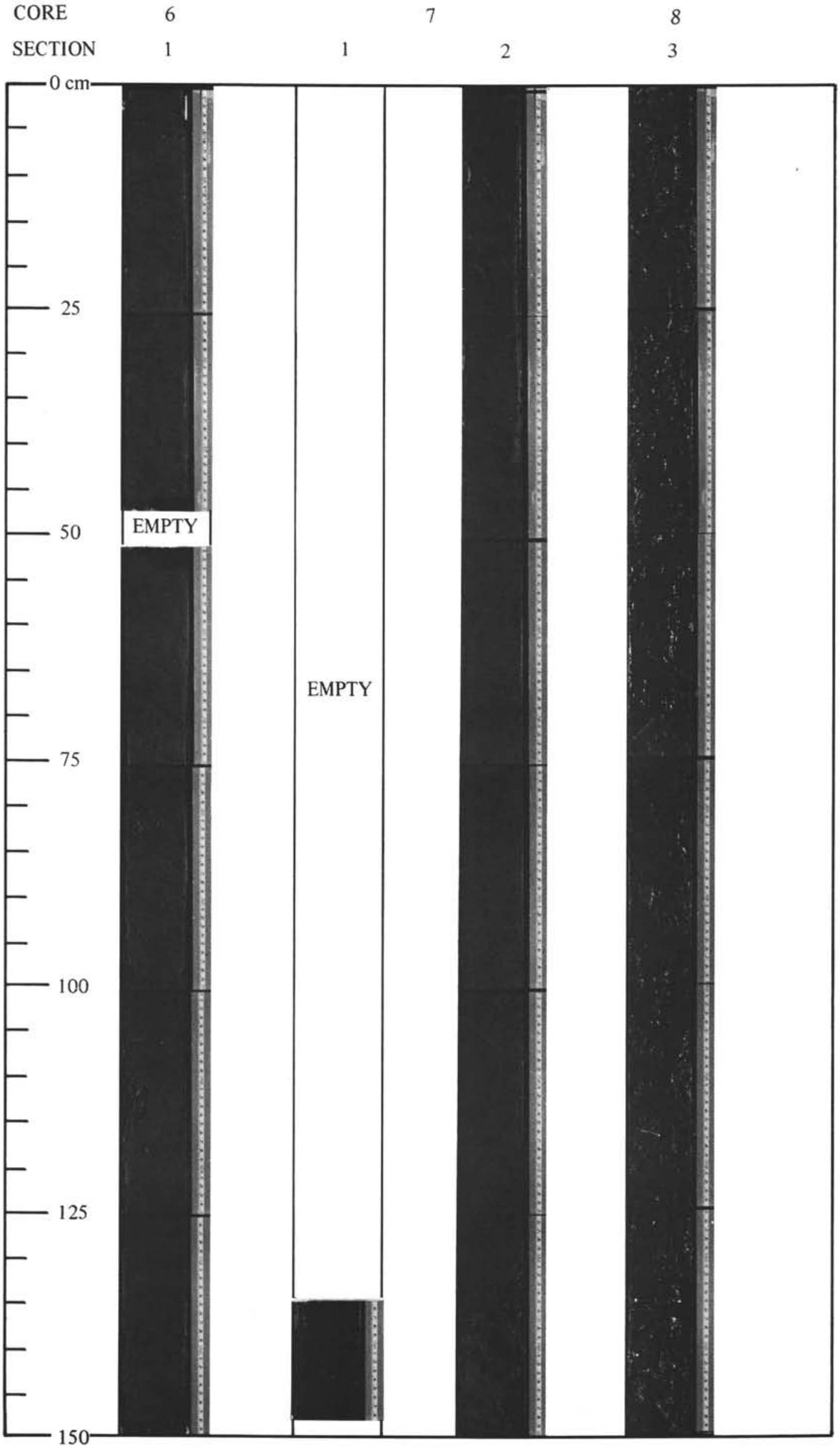
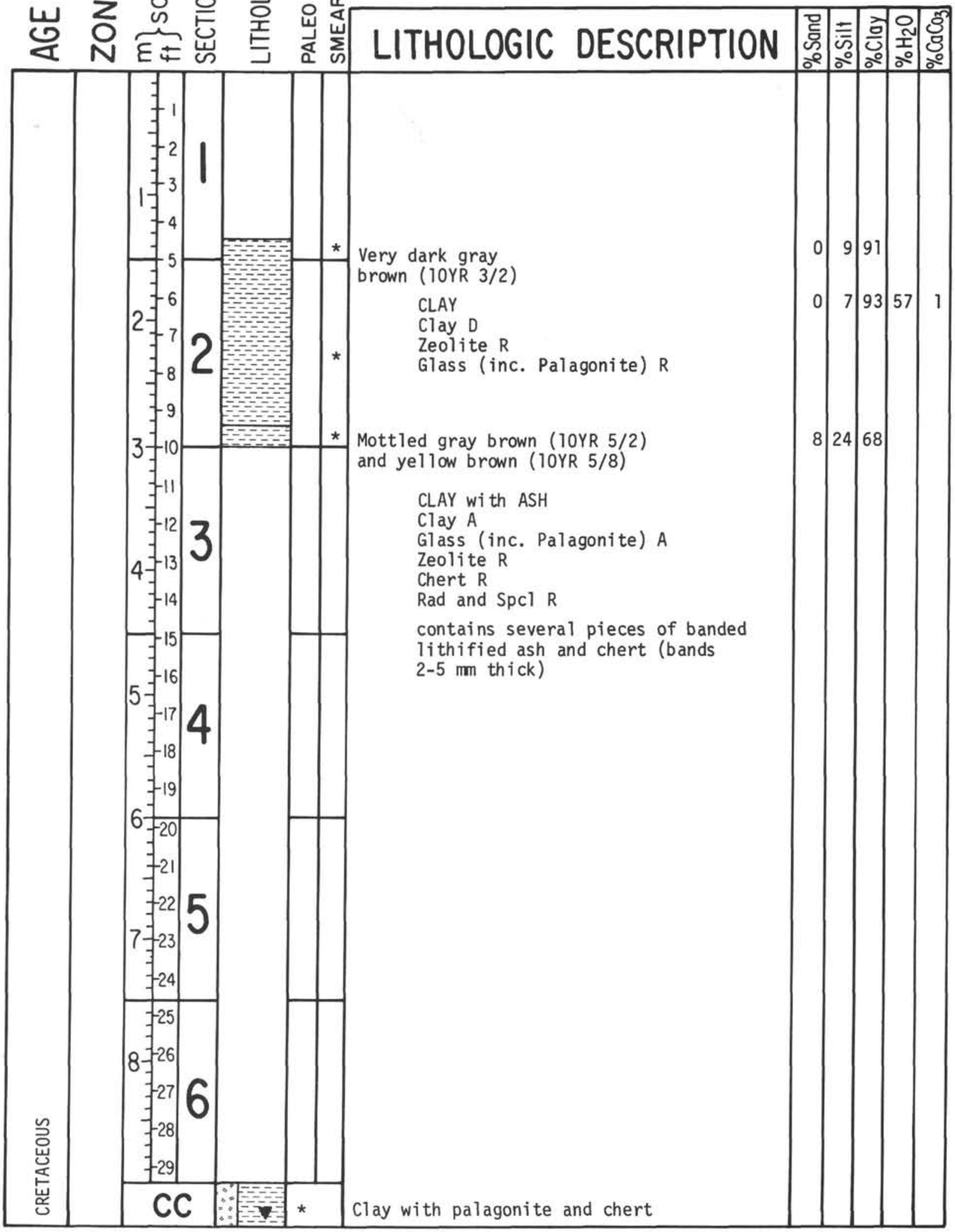


Plate 6. *Photographs of Hole 52.0 Cores 6, 7 and 8.*

LEG 6 HOLE 52.0

CORE 7 DEPTH 54.9-64.0 m



Very dark gray brown (10YR 3/2)

CLAY
Clay D
Zeolite R
Glass (inc. Palagonite) R

Mottled gray brown (10YR 5/2) and yellow brown (10YR 5/8)

CLAY with ASH
Clay A
Glass (inc. Palagonite) A
Zeolite R
Chert R
Rad and Spcl R

contains several pieces of banded lithified ash and chert (bands 2-5 mm thick)

Clay with palagonite and chert

%Sand	%Silt	%Clay	%H2O	%CaCO3
0	9	91		
0	7	93	57	1
8	24	68		

Figure 24. *Summary of lithology in Hole 52.0 Core 7.*

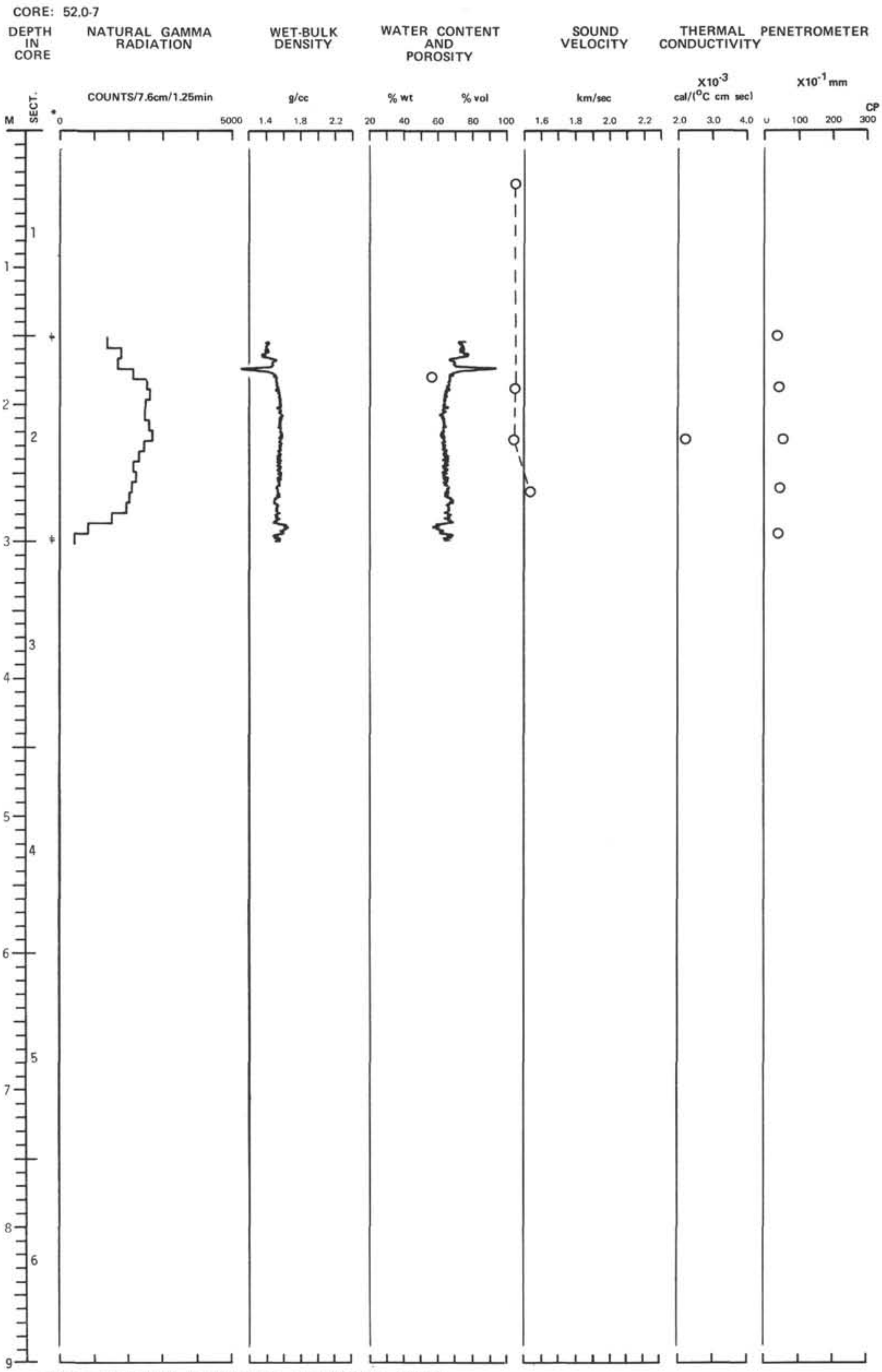


Figure 25. *Summary of physical properties in Hole 52.0 Core 7.*

LEG 6 HOLE 52.0

CORE 7 DEPTH 54.9-64.0 m

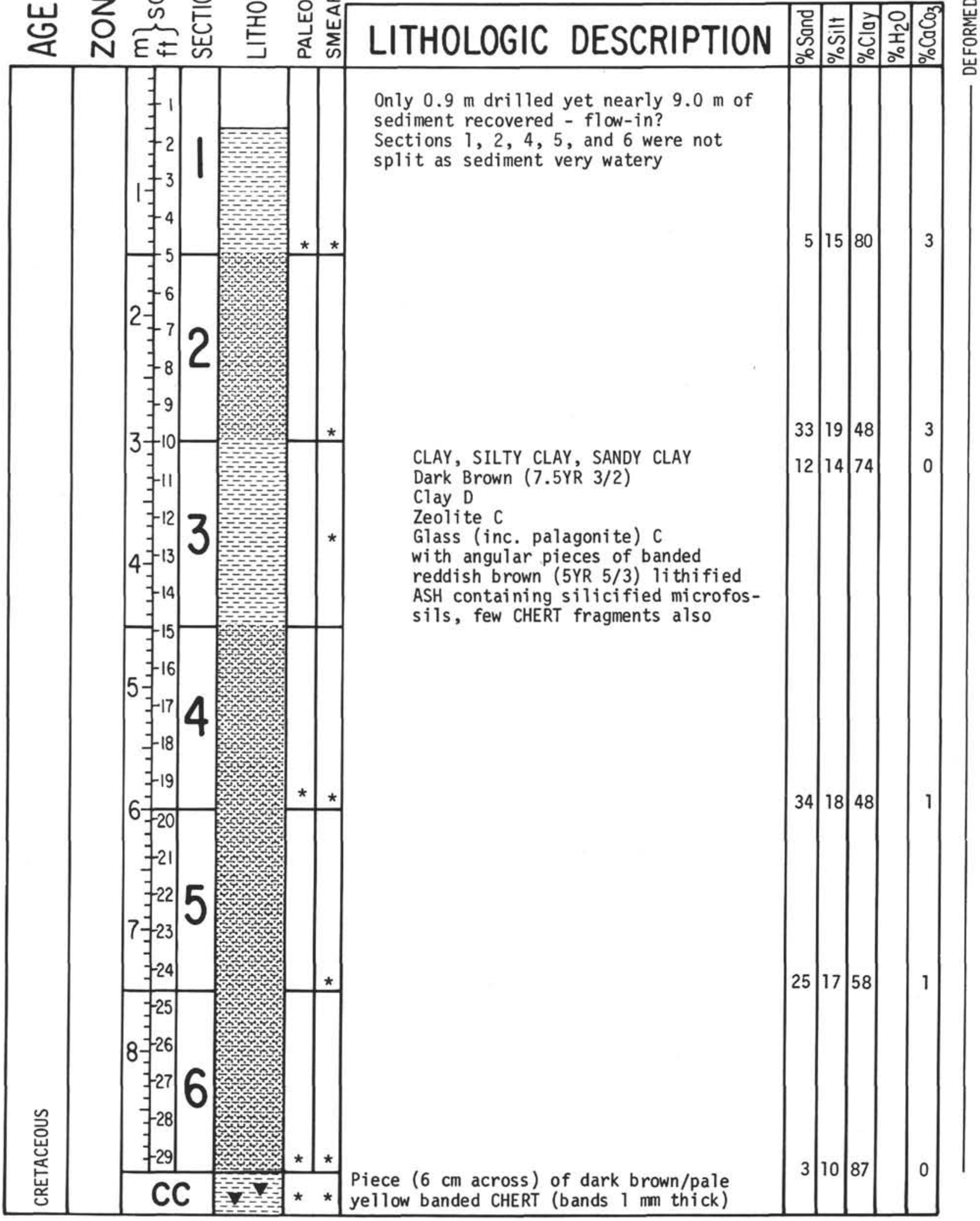
FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	The core catcher sample contains poorly preserved (quartz infilled) radiolarians of probable Cretaceous age. CORE CATCHER: *"Dictyomitra multicostata"*, *"Dictyomitra"* *spp.*, spiny-ringed saturnalins, and *"Stichocapsa"* *spp.*

Figure 26. *Summary of biostratigraphy in Hole 52.0 Core 7.*

SEE PLATE 6 FOR PHOTOGRAPHS OF HOLE 52.0 CORE 7.

LEG 6 HOLE 52.0

CORE 8 DEPTH 64.0-64.9 m



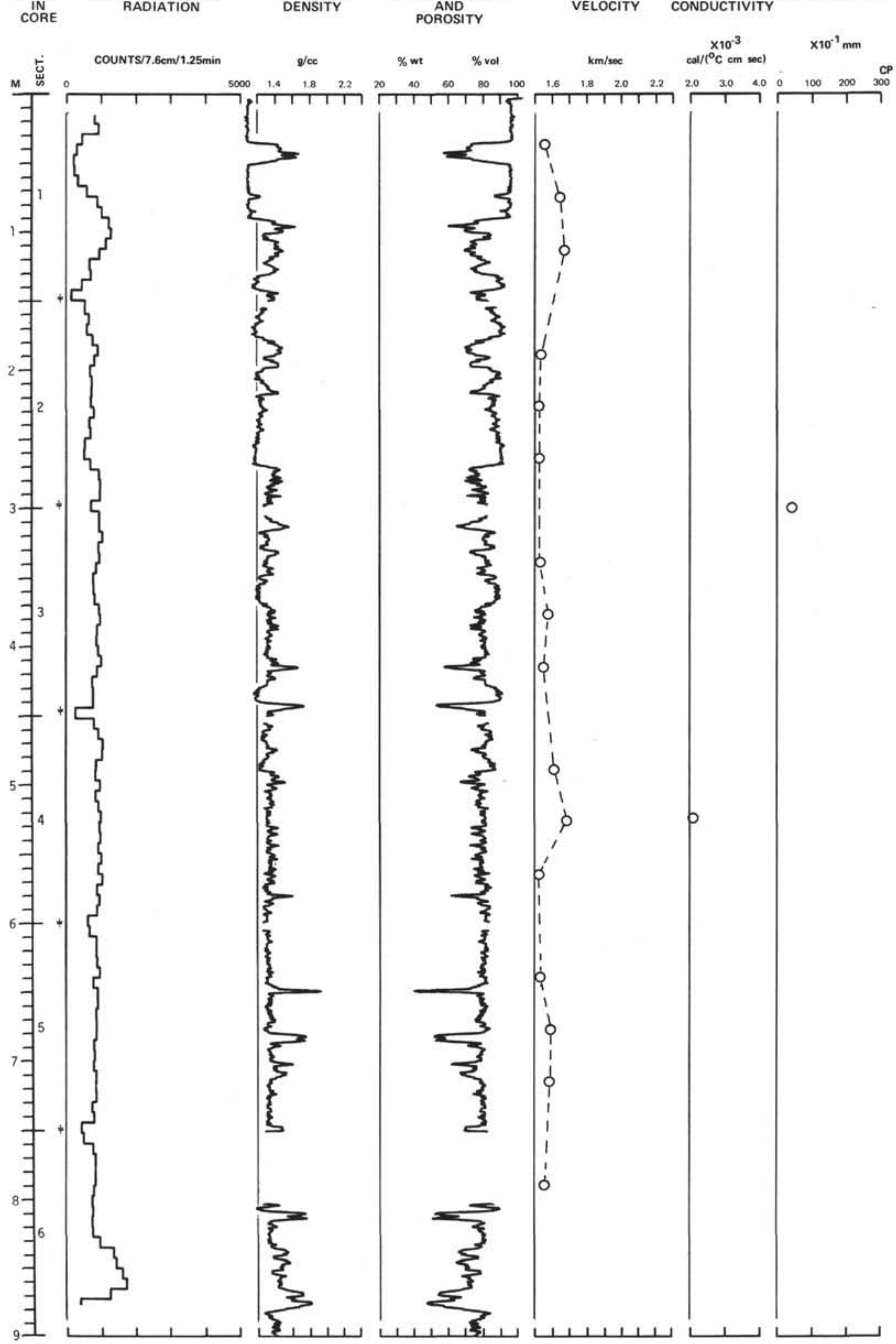
Only 0.9 m drilled yet nearly 9.0 m of sediment recovered - flow-in? Sections 1, 2, 4, 5, and 6 were not split as sediment very watery

CLAY, SILTY CLAY, SANDY CLAY
Dark Brown (7.5YR 3/2)
Clay D
Zeolite C
Glass (inc. palagonite) C
with angular pieces of banded reddish brown (5YR 5/3) lithified ASH containing silicified microfossils, few CHERT fragments also

Piece (6 cm across) of dark brown/pale yellow banded CHERT (bands 1 mm thick)

%Sand	%Silt	%Clay	%H_2O	%$CaCO_3$
5	15	80		3
33	19	48		3
12	14	74		0
34	18	48		1
25	17	58		1
3	10	87		0

Figure 27. *Summary of lithology in Hole 52.0 Core 8.*



*O = LABORATORY–ATMOSPHERIC BACKGROUND COUNT.

Figure 28. *Summary of physical properties in Hole 52.0 Core 8.*

LEG 6 HOLE 52.0
CORE 8 DEPTH 64.0-64.9 m

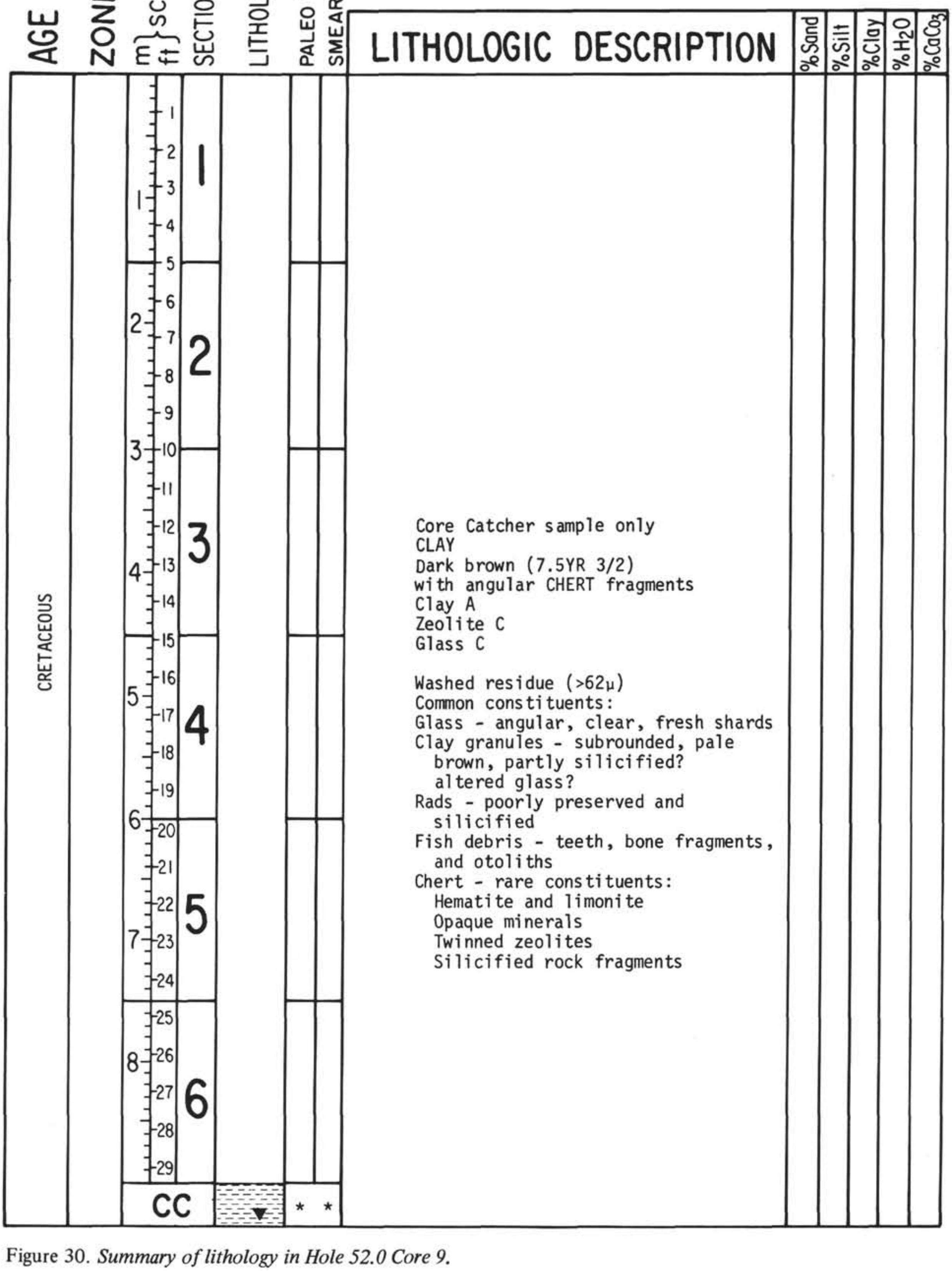
FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	The core catcher sample contains poorly preserved (quartz infilled) radiolarians of probable Cretaceous age. CORE CATCHER: *"Dictyomitra" spp.* and *"Stichocapsa" spp.*

Figure 29. *Summary of biostratigraphy in Hole 52.0 Core 8.*

SEE PLATE 6 FOR PHOTOGRAPHS OF HOLE 52.0 CORE 8

LEG 6 HOLE 52.0

CORE 9 DEPTH 64.9-66.4 m



LITHOLOGIC DESCRIPTION

Core Catcher sample only
CLAY
Dark brown (7.5YR 3/2)
with angular CHERT fragments
Clay A
Zeolite C
Glass C

Washed residue (>62μ)
Common constituents:
Glass - angular, clear, fresh shards
Clay granules - subrounded, pale
  brown, partly silicified?
  altered glass?
Rads - poorly preserved and
  silicified
Fish debris - teeth, bone fragments,
  and otoliths
Chert - rare constituents:
  Hematite and limonite
  Opaque minerals
  Twinned zeolites
  Silicified rock fragments

Figure 30. *Summary of lithology in Hole 52.0 Core 9.*

LEG 6 HOLE 52.0

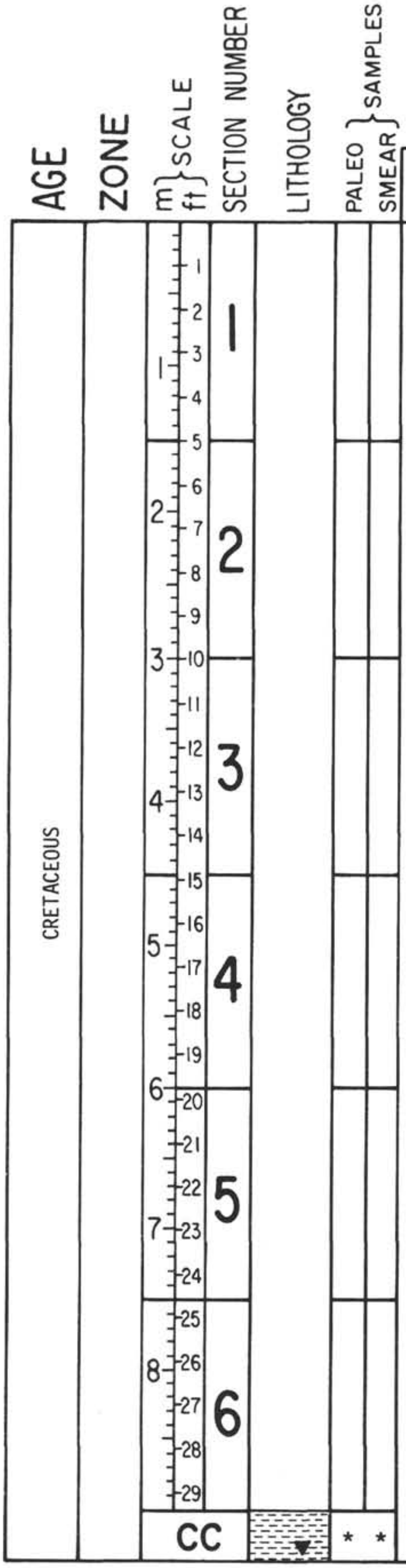
CORE 9 DEPTH 64.9-66.4 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	The core catcher sample contains poorly preserved (quartz infilled) radiolarians of probable Cretaceous aqe. CORE CATCHER: *"Dictyomitra" spp.*

Figure 31. *Summary of biostratigraphy in Hole 52.0 Core 9.*

LEG 6 HOLE 52.0

CORE 10 DEPTH 66.4-68.9 m



LITHOLOGIC DESCRIPTION

%Sand	%Silt	%Clay	%H_2O	%$CaCO_3$

Core Catcher sample only
CLAY
Dark brown (7.5YR 3/2)
with angular fragments of lithified
ASH with thin dark CHERT bands
Clay D
Glass C
Zeolite R

Washed residue (>62μ)
Common:
Fresh and weathered glass
Palagonite
Clay granules
Fish teeth, bone, otoliths
Rads - strongly altered
Chert
Rare:
Iron oxides
Opaque minerals
Twinned zeolite
Foram (fallen down hole?)
Zircon

Figure 32. *Summary of lithology in Hole 52.0 Core 10.*

LEG 6 **HOLE** 52.0

CORE 10 **DEPTH** 66.4-68.9 m

FORAMINIFERA	NANNOPLANKTON	RADIOLARIA
None.	None.	The core catcher sample contains poorly preserved (quartz infilled) radiolarians of probable Cretaceous mixed with rare Tertiary species. CORE CATCHER: *"Dictyomitra multicostata"* and *"Stichocapsa" spp.*

Figure 33. *Summary of biostratigraphy in Hole 52.0 Core 10.*