

## 5. SITE 306: SHATSKY RISE

The Shipboard Scientific Party<sup>1</sup>

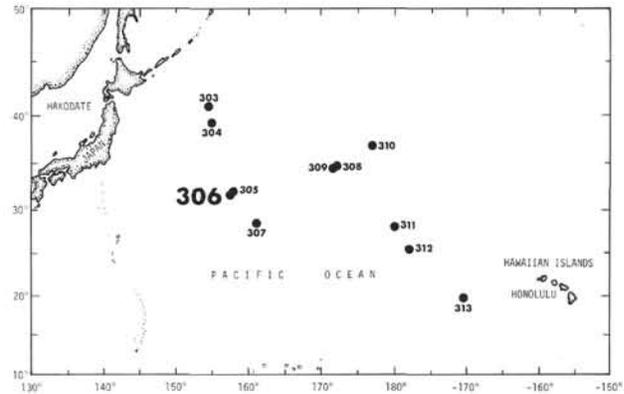
### SITE DATA

**Date Occupied:** 3 September 1973 (2315)  
**Date Departed:** 8 September 1973 (0902)  
**Time on Site:** 105 hours  
**Position:** 31°52.02'N, 157°28.71'E  
**Water Depth:** 3399 corrected meters (echo sounding)  
**Bottom Felt With Drill Pipe At:** 3416 meters  
**Penetration:** 475 meters below rig floor  
**Number of Holes:** 1  
**Number of Cores:** 42  
**Total Length of Cored Section:** 380.5 meters  
**Total Core Recovered:** 27.3 meters

### BACKGROUND AND OBJECTIVES

We were forced to abandon Site 305 near the crest of Shatsky Rise when the bit wore out at a total depth of 640 meters, of which about two-thirds was cherty. The lowest interval above acoustic basement was not penetrated. The interval is transparent on seismic reflection profiles and presumably would be easy to penetrate once any drilling had reached it. We decided therefore to select a site on the southwest flank of Shatsky Rise (Figure 1) where seismic records of other expeditions had shown that the opaque units, through which we had drilled at Site 305, were relatively thin but the lower transparent layer remained as thick as at Site 305.

Our objectives at Site 306 were the ones unfulfilled at Site 305, namely, to complete continuously coring through the sedimentary section and into basement. The specific objectives are listed in the preceding chapter (Site 305) and include the recovery of Lower Cretaceous and Upper to Middle? Jurassic rocks for biostratigraphic purposes, recovery of basement rocks to compare with basement of other rises, and samples for paleoceanographic and diagenetic studies. Furthermore, because the recovery of fossiliferous noncherty sediment was very poor in the Cretaceous part of Site



305, we hoped that the part of the section we will have to core through again in order to reach the lower transparent layer and the basement would provide additional samples of Cretaceous fossils.

### OPERATIONS

After wearing out a bit in the lower part of the section at the crest of Shatsky Rise (Site 305), we chose another site to sample the remainder of the section on the flank of the rise (Figures 2 and 3). Site 306 is 37 km west-southwest of Site 305 in slightly deeper water where the upper layers of the section were greatly thinned or removed, and the lower portion was still present at its usual thickness. The site is located at the convergence of tracks from *Vema-2110*, *Conrad-1007*, and *Scan-3*. We approached Site 306 heading west-southwest which yielded a profile (Figure 4) showing first the uppermost semitransparent layer pinching out, then a "rough ground" area where the uppermost hard reflector outcrops, then an exposed section of semitransparent material beneath the reflector outcrop, and finally the outcrop of the second hard reflector. We chose our site between the outcrops of the two reflectors, steamed across it, reversed course, approached the site heading east-northeast and dropped the beacon at 5 knots at 1311Z on 3 September 1973 in 1817 uncorrected fm (= 3409 m corrected to the rig floor). At about 1400Z we began to run in pipe.

No sonobuoy was run at Site 306 due to the surrounding irregular topography and a lack of current.

We left this site steaming slowly to the northwest, streaming the running gear, turning and coming back across the beacon headed southeast enroute to Site 307. This route provided a profile (Figure 4) that shows our location on a bench above very irregular topography and a steep scarp that forms the transition from Site 306 to the deep sea floor.

<sup>1</sup>Roger L. Larson, Lamont-Doherty Geological Observatory, Palisades, New York (Co-chief scientist); Ralph Moberly, Hawaii Institute of Geophysics, Honolulu, Hawaii (Co-chief scientist); David Bukry, U.S. Geological Survey, La Jolla, California; Helen P. Foreman, Oberlin College, Oberlin, Ohio; James V. Gardner, Scripps Institution of Oceanography, La Jolla, California; John B. Keene, Scripps Institution of Oceanography, La Jolla, California; Yves Lancelot, Lamont-Doherty Geological Observatory, Palisades, New York; Hanspeter Luterbacher, Esso Production Research—European, Begles, France; Monte C. Marshall, U. S. Geological Survey, Menlo Park, California; Albert Matter, Universitat Bern, Bern, Switzerland.

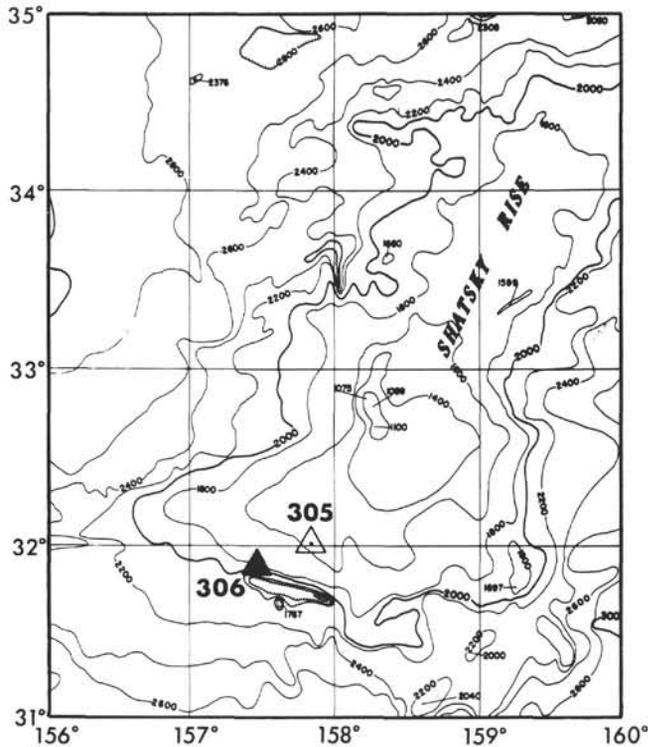


Figure 1. Bathymetry in the region of Sites 305 and 306 (after Chase et al., 1971). Contour interval 200 fm uncorrected.

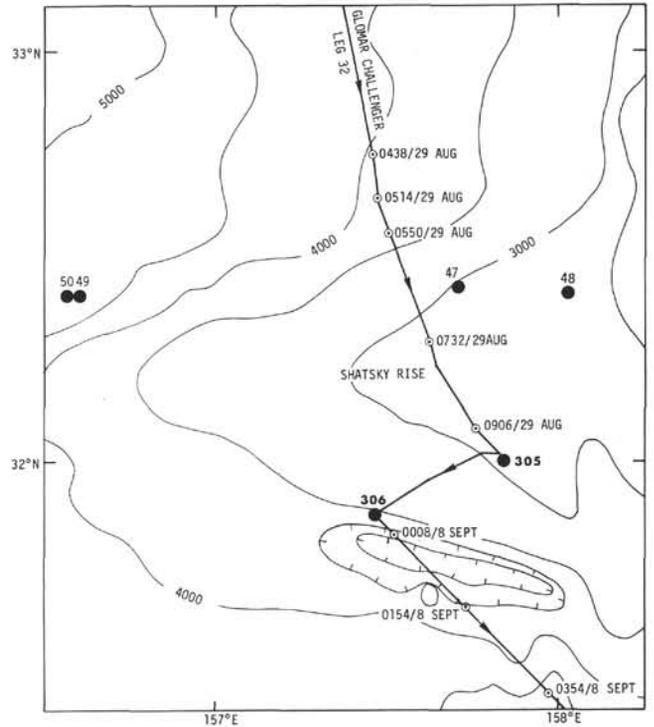


Figure 3. Bathymetry of Sites 305 and 306. Contours in corrected meters interpolated from Chase et al. (1971). Solid line marks track of Leg 32 Glomar Challenger and open circles mark navigation points with time/day-month.

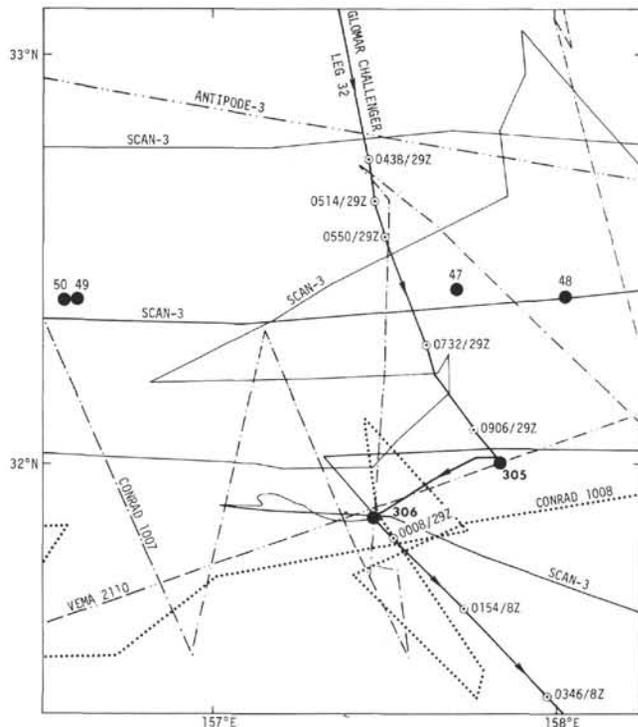


Figure 2. Track chart for Sites 305 and 306. Heavy solid track is Leg 32 Glomar Challenger; dotted track is Conrad 1008; dash-dot-dot track is Vema 2110; dash-dot track is Conrad 1007; and light solid track is Scan-3. DSDP drill sites indicated by solid circles.

A hard sea floor was encountered at 3416 meters. Rotation and circulation for 2 hr and 25 min were required to cut the first core that consisted of chert and turbidite debris ranging in age from Recent to Albian. Stiff Cretaceous sediments and interbedded cherts continued to be encountered that required about 24 hr to bury the bottom hole assembly. Throughout this period the wind speed was usually 25-30 knots with gusts to 35-40 knots during squalls that periodically buffeted the ship. A combination of constant expert attention by the drillers and precise positioning from the bridge was necessary to save the site and the bottom-hole assembly. From 28 to 207.5 meters (subbottom depth) we alternated coring one interval and drilling the next, first to bury the bottom-hole assembly as soon as possible and then to save time reaching the stratigraphic level of the bottom of Site 305.

Recovery was poor throughout Site 306 except in Cores 1, 20, 21, 22, 40, 41, and 42 because of the ubiquitous cherts present throughout the section. An attempt was made to improve recovery by dry drilling Core 31 for 2 meters. Subsequently, a flapper-type catcher was used in place of the usual soft-formation catcher. Neither attempt improved recovery. We drilled nearly the entire hole with circulation that was necessary to keep from sticking the drill string or plugging the bit with chert cuttings. Occasionally very hard sections of chert, such as Core 35, were encountered that required about 2 hr to cut.

For core recovery at this site, the alternate sand line and winch, mounted above the draw-works, were used

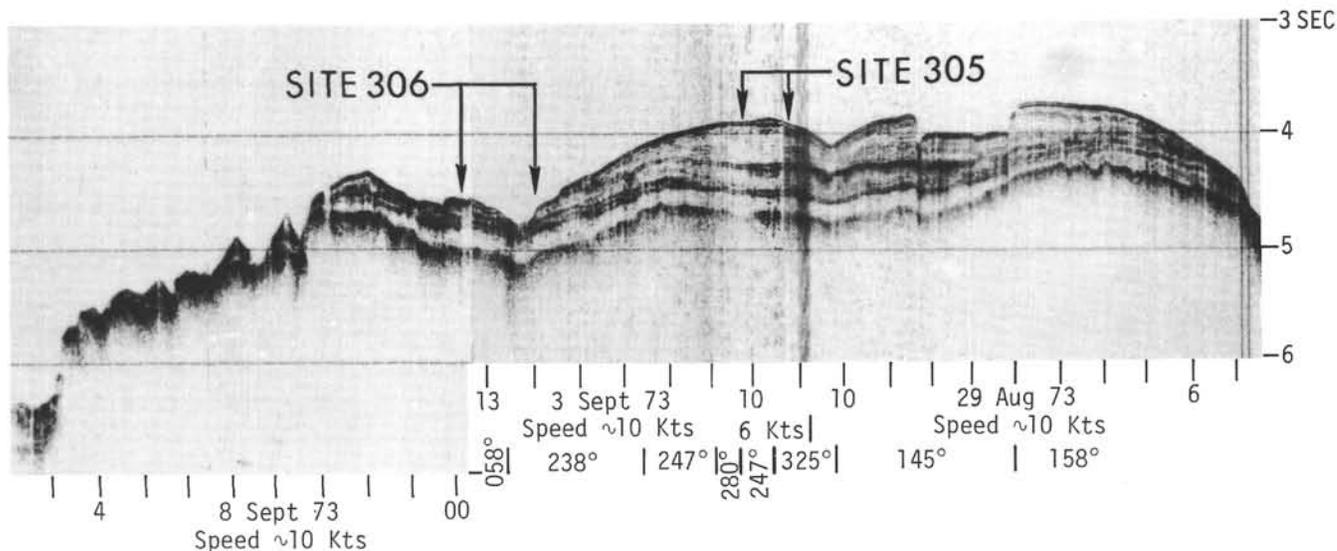


Figure 4. Seismic profiler section approaching and leaving Sites 305 and 306.

because the strands of wire in the regular sand line had unlayed. Operation of the alternate winch is not as smooth as that of the regular one, and an attempt was made to cut out the faulty section of sand line and splice it enroute to Site 307.

The drill string began to torque badly on Core 42. During the attempt to cut a 43rd core, the drill string would not rotate when large torques were applied, and there was no penetration at all. We abandoned the site at 475 meters total depth (bottom of Core 42). The bit recovered (Figure 5) was in even worse shape than the bit at Site 305. All four cones were missing, two shanks were torn off, and the circulation vents were partially plugged with abraded metal. The bit had, however, rotated in cherty sediment about 10 hr longer than had any other bit used by the Deep Sea Drilling Project. The coring at Site 306 is summarized in Table 1.

#### LITHOLOGIC SUMMARY

Drilling at Site 306 terminated in nanno chalks and cherts of Tithonian age at a depth of 475 meters. The section was alternately cored and washed at about 9-meter intervals from 28 to 207.5 meters and then continuously cored to 475 meters. The sedimentary section was incompletely sampled. Poor recovery was caused by lithified cherts alternating with less-consolidated oozes and chalks.

The relative portions of the various rock types encountered is biased in favor of the hard cherts, the softer sediments being preferentially ground up and washed away during drilling.

The smear slide composition of the sediments is shown in the smear slide summary (Table 2). No smear slides could be prepared from lithified porcellanites and from cherts, therefore their composition does not appear in the smear slide summary. The composition and textures of these rocks were examined ashore in thin sections and by X-ray diffractometry.

The sedimentary sequence at Site 306 can be subdivided into the following lithologic units:

Unit 1—Siliceous foram-bearing nanno ooze (0-9.5 m, Core 1).

Unit 2—Foram-bearing nanno ooze, chalk and chert (9.5-66 m, Cores 2 to 5).

Unit 3—Calcareous porcellanite and chert (75.5-262.5 m, Cores 6 to 18).

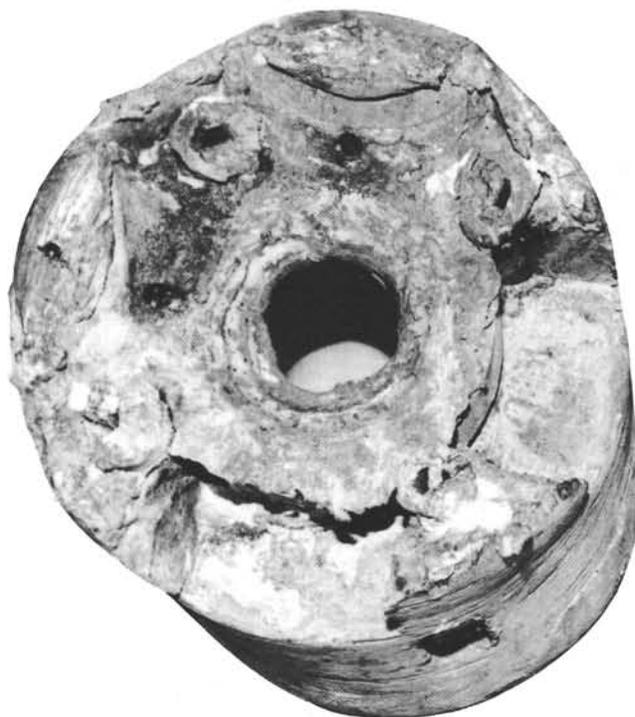


Figure 5. Drill bit recovered after termination of drilling at Site 306. Note that all four cones are missing.

TABLE 1  
Coring Summary

Core	Date (Sept. 1973)	Time	Depth From Drill Floor (m)	Depth Below Sea Floor (m)	Length Cored (m)	Length Recovered (m)	Recovery (%)
1	4	1050	3416.0-3425.5	0.0-9.5	9.5	8.9	94
2	4	1400	3425.5-3435.0	9.5-19.0	9.5	0.1	1
3	4	1615	3435.0-3444.0	19.0-28.0	9.0	0.2	2
4	4	1915	3453.5-3463.0	37.5-47.0	9.5	0.3	3
5	4	2100	3472.5-3482.0	56.5-66.0	9.5	tr	<1
6	4	2315	3491.5-3500.5	75.5-84.5	9.0	0.8	8
7	5	0330	3510.0-3519.5	94.0-103.5	9.5	0.1	1
8	5	0650	3529.0-3538.5	113.0-122.5	9.5	1.7	18
9	5	0950	3548.0-3557.5	132.0-141.5	9.5	1.7	18
10	5	1240	3567.0-3576.5	151.0-160.5	9.5	1.1	12
11	5	1450	3585.5-3595.0	169.5-179.0	9.5	1.0	11
12	5	1815	3604.5-3614.0	188.5-198.0	9.5	1.3	14
13	5	2115	3623.5-3633.0	207.5-217.0	9.5	0.1	1
14	5	2320	3633.0-3642.0	217.0-226.0	9.0	0.1	1
15	6	0025	3642.0-3651.0	226.0-235.0	9.0	tr	<1
16	6	0150	3651.0-3660.0	235.0-244.0	9.0	0.1	1
17	6	0310	3660.0-3669.0	244.0-253.0	9.0	0.1	1
18	6	0420	3669.0-3678.5	253.0-262.5	9.5	0.1	1
19	6	0530	3678.5-3687.5	262.5-271.5	9.0	tr	<1
20	6	0645	3687.5-3697.0	271.5-281.0	9.5	2.4	25
21	6	0805	3697.0-3706.5	281.0-290.5	9.5	1.3	14
22	6	0930	3706.5-3716.0	290.5-300.0	9.5	0.9	9
23	6	1150	3716.0-3725.0	300.0-309.0	9.0	0.1	1
24	6	1310	3725.0-3734.5	309.0-318.5	9.5	0.5	5
25	6	1410	3734.5-3743.5	318.5-327.5	9.0	0.1	1
26	6	1515	3743.5-3753.0	327.5-337.0	9.5	0.2	2
27	6	1610	3753.0-3762.5	337.0-346.5	9.5	0.0	0
28	6	1745	3762.5-3771.5	346.5-355.5	9.0	0.2	2
29	6	1920	3771.5-3781.0	355.5-365.0	9.5	0.1	1
30	6	2055	3781.0-3790.5	365.0-374.5	9.5	0.2	2
31	6	2235	3790.5-3792.5	374.5-376.5	2.0	0.0	0
32	7	0020	3792.5-3800.0	376.5-384.0	7.5	0.1	1
33	7	0215	3800.0-3809.0	384.0-393.0	9.0	tr	<1
34	7	0350	3809.0-3818.0	393.0-402.0	9.0	tr	<1
35	7	0640	3818.0-3827.5	402.0-411.5	9.5	0.2	2
36	7	0825	3827.5-3837.0	411.5-421.0	9.5	0.2	2
37	7	1000	3837.0-3846.5	421.0-430.5	9.5	0.2	2
38	7	1155	3846.5-3856.0	430.5-440.0	9.5	0.2	2
39	7	1345	3856.0-3865.5	440.0-449.5	9.5	0.1	1
40	7	1550	3865.5-3875.0	449.5-459.0	9.5	0.7	7
41	7	1930	3875.0-3883.5	459.0-467.5	8.5	1.3	15
42	7	2210	3883.5-3891.0	467.5-475.0	7.5	0.6	8
Total					380.5	27.3	7.2

Unit 4—Nanno ooze, chalk, and chert (262.5-475 m, Cores 19 to 42).

#### Unit 1—Siliceous Foram-bearing Nanno Ooze (Core 1)

This unit comprises only the uppermost severely disturbed core which consists of soft volcanic glass-bearing nanno-foram ooze, foram-nanno ooze, and phillipsite-bearing siliceous foram-nanno ooze, ranging in color from white to various shades of orange and brown.

The siliceous layers with total carbonate content between 60% and 70% (Table 3) consist of a few percent phillipsite and barite, about 20% foraminifera, 40% to 60% nannofossils, and 30% to 40% siliceous fossils, dominantly Radiolaria with lesser amounts of diatoms and silicoflagellates. The terrigenous component, generally less than 15%, is made up of quartz, minor feldspar, and clay minerals.

The more calcareous layers without siliceous fossils contain about 80% carbonate and consist of varying

proportions of foraminifera, nannofossils, and minor amounts of light and brown volcanic glass shards.

Pumice fragments up to 4 cm in size, small manganese nodules, and lumps of chalk and chert were also found.

Although the core was badly disturbed by drilling, two graded beds were recognized. The paleontologic data reveal a Quaternary age for the topmost few centimeters of the core and Cenozoic to Late Cretaceous ages for the chalk lumps. It is concluded that this material was derived by erosion from a nearby scarp, visible on the seismic records. The presence of graded beds also indicates resedimentation.

#### Unit 2—Foram-bearing Radiolarian Nanno Ooze, Chalk, and Chert (Cores 2 through 5)

The first appearance of chalk and chert is taken as a unit boundary at Site 306, as was done at Site 305.

Since only core-catcher samples were retrieved from Unit 2, the structural relationships of the lithologies are

TABLE 2  
Smear Slide Summary, Site 306

KEY: RARE COMMON ABUNDANT DOMINANT  
 < 5 5-25 25-75 75-100

CORE SECTION INTERVAL cm	EXOGENIC				AUTOGENIC-DIAGENETIC										BIOGENIC							
	Detrital QUARTZ	FELDSPARS	HEAVY MINERALS	DARK GLASS	CLAY MINER	PALAGONITE	ZEOLITES	HEMATITE	amorphous IRON OXIDE	MICRONODULES	PYRITE	recrystall. SILICA	recrystall. CALCITE	Dolomite rhombs	FORAMINIFERA	NA-NOS	RADIOLARIA	DIATOMS	SPONGE SPICULES	FISH DEBRIS	SILICOFLAG-ELLATES	ECHINOID SPINES
1 2 100																						
1 2 131																						
1 6 105																						
1 CC																						
2 CC																						
3 CC																						
4 CC																						
5 CC																						
6 1 116																						
7 CC																						
8 1 104																						
8 CC																						
12 CC																						
17 CC																						
18 CC																						
19 CC																						
20 1 100																						
20 1 105																						
20 CC																						
21 1 67																						
21 1 144																						
21 CC																						
23 CC																						
24 1 103																						
24 CC																						
25 CC																						
26 CC																						
29 CC																						
36 CC																						
37 CC																						
38 CC																						
40 CC																						
41 1 71																						
41 CC																						
42 1 112																						

\*minor lith

TABLE 3  
Additional Carbon-Carbonate Data

Sample (Interval in cm)	Hole Depth (m)	CaCO <sub>3</sub> (%)
1, CC	9.5	62
2, CC	19.0	57
5, CC	66.0	62
6-1, 114	76.64	42
10-1, 69	151.69	32
11, CC #1	179.0	24
11, CC #2	179.0	0
12, CC #2	198.0	14
14, CC #2	226.0	27
21-1, 62	281.62	87
21-1, 142	282.42	79
22-1, 106	291.56	76
24-1, 140	310.40	96
25, CC	327.5	93
26, CC	337.0	94
29, CC	365.0	82
36, CC	421.0	90
37, CC	430.5	96
38, CC	440.0	93
40-1, 95	450.45	42
40, CC	459.0	80
41-1, 71	459.71	70
41, CC	467.5	77

Note: Analytical method: Gasvolumetric with Scheibler apparatus.

unknown. The following sediment types were observed: white, faintly laminated foram-bearing radiolarian nanno ooze, chalk, and chert.

The white ooze and chalk are made up of 10% to 20% foraminifera, 10% to 30% Radiolaria, 35% to 60% nanofossils, minor amounts of recrystallized carbonate and recrystallized silica particles, and rare phillipsite crystals, echinoid spines, and clay minerals (Table 2).

The chert, occurring as irregularly shaped masses and thin layers of small lateral extension, is vitreous, conchoidally fractured, and commonly contains blebs and stringers of partly silicified chalk. The boundary between chert and chalk appears sharp; however, a less-silicified transition zone a few millimeters thick is frequently observed. Equant quartz and chalcedony are the dominant silica types in the chert, but the matrix in the transitional zone consists mainly of disordered cristobalite and calcitic nanofossils. The same observation was made earlier by Lancelot (1973).

Chert fragments of various colors, but dominantly of different shades of brown and gray, were observed. Mottling with lighter tones of the dominant color is common.

Lithologically, Unit 2 at Site 306 corresponds to the lower part of Unit 3 at Site 305. However, based on paleontologic data, these units are not exactly time equivalent.

#### Unit 3—Calcareous Porcellanite and Chert (Cores 6 through 18)

Unit 3 consists almost entirely of lithified, porous, more or less calcareous porcellanite, and chert. Due to fair recovery in the upper part of this unit, the structural relationships of the porcellanite and chert could be examined.

Chert is found as irregularly shaped to anastomosing nodules of various sizes ranging from 1 mm to more than the core diameter, and as blebs and small stringers in the porcellanite. The dominant colors of the chert are various shades of brown and black to greenish-gray. Mottling with lighter shades is common. White, partly silicified chalk occurs as inclusions and as lining of vugs of various sizes up to 2 cm in diameter.

The only form of silica found in the true, vitreous cherts is quartz. It occurs as equant microcrystalline grains about 1 to 2 $\mu$ m across with interlocking boundaries and undulose extinction. It appears therefore that much of the microcrystalline quartz matrix is chalcedony. Larger quartz grains, definitely fibrous chalcedony, are seen in former radiolarian molds. However, most of the Radiolaria are barely visible as "ghosts" in the microcrystalline matrix. Inclusions of calcite particles are always found in small amounts. The color of the brown chert is caused by numerous ferroan-oxide particles.

Various types of more or less calcareous porcellanites were found. They grade from white, faintly laminated calcareous porcellanites, which are still close to a radiolarian nanno limestone, to distinctly laminated dark to light gray types which contain abundant clay minerals. The carbonate content varies from about 45% in the white porcellanites to zero in the medium to dark gray ones. Radiolaria are common to abundant, foraminifera are rare.

All of the X-rayed porcellanites showed quartz and opal-CT (Jones and Segnit, 1971). Most of the quartz is present as fibrous chalcedony filling the radiolarian molds, whereas most of the opal-CT is found in the silica matrix replacing the nanofossils. This matrix is a microcrystalline aggregate of disordered cristobalite (opal-CT) and quartz. Acid treatment described earlier by Heath and Moberly (1971) reveals a spongy framework in the carbonate-bearing porcellanites formed by the silica matrix and the radiolarians.

Often the entire surface ornamentation of Radiolaria is retained although quartz may fill the interior of the test (compare Heath and Moberly, 1971, fig. 13). Between this state and the condition where only clear chalcedony fibers fill the Radiolaria, all transitional phases of decreasing amounts of cristobalite "inclusions" in chalcedony are observed.

In Core 13 a thin layer of black carbonaceous pelagic shale was found.

Lithologically, Unit 3 at Site 306 strongly resembles Unit 4 at Site 305. However, porcellanites occur more commonly at Site 306. According to biostratigraphic data, the top of these units is diachronous. However, since the lithologic boundaries are gradational and are based on poorly recovered sections, the diachronous contact might be fortuitous.

#### Unit 4—Nanno Ooze, Chalk, and Chert (Cores 19 through 42)

Unit 4 is made up dominantly of nanno chalk with radiolarian chert nodules as interpreted from core-catcher samples. The minor amounts of soft nanno ooze could be nanno chalk homogenized by drilling.

The chalk is light gray to olive-gray with wavy lamination, commonly disrupted by moderate bioturbation.

tion. The chalk is composed mainly of nannofossils and recrystallized carbonate particles of nannofossil origin and minor amounts of foraminifera, dolomite rhombs, pyrite, and clay minerals. Radiolaria are abundant in Cores 40 to 42.

Thin dark green layers in the chalk of Cores 41 and 42 are rich in celadonite and dolomite and contain some colored volcanic glass shards.

Chert is dominantly dark gray to grayish-black with mottling in light gray. Some cherts are dominantly brown with mottling and lamination in olive-black and greenish-gray. This type of chert, although showing pronounced conchoidal fracturing, lacks a bright vitreous luster and appears more like a porcellanite. It is characterized by anastomosing silicification by quartz (no cristoballite was discovered) which results in darker (carbonate poor) and lighter (carbonate rich) areas and layers that may consist of up to 80% largely biogenous carbonate. These carbonate-rich parts display the dull luster and higher porosity of porcellanites.

The irregular distribution of calcite and quartz is also responsible for the mottled, cauliflower-like structure of many of these cherts.

The cherts also contain curved fractures now filled with chalcedony and numerous vugs commonly filled with white chalk.

#### GEOCHEMICAL MEASUREMENTS

Due to poor core recovery and lithified sediments, only one interstitial water sample was taken from this site. The sample was from 6 meters below the sea floor. The pH, alkalinity, and salinity for the sample are given in Table 4.

Table 5 gives the result of an analysis for calcium carbonate in a sample from Core 11 (170 m subbottom). The sample, a calcareous porcellanite, contained 25% CaCO<sub>3</sub>.

#### PHYSICAL PROPERTIES

##### Wet Bulk Density and Porosity of Soft Sediments

Since little, if any, undisturbed sediment was recovered at this site, wet bulk density measurements using the GRAPE were confined to Core 1, Sections 2 and 6 and Core 20, Section 2. The density of the mixed, foram nanno ooze (apparently slope-wash detritus) of Core 1 ranges from 1.6 to 1.7 g/cc. The density of the nanno ooze of Core 20, which is probably a paste of chalk ground up by drilling, varies between 1.9 and 2.1 g/cc. A single syringe sample was taken, from Core 1, Section 2, and its density, 1.59 g/cc, agrees quite well with the GRAPE value (1.55 g/cc). Using the syringe

TABLE 5  
% CaCO<sub>3</sub> - "Carbonate Bomb" Method -  
Shipboard Measurement

Hole	Core	Section	Weight (g)	Pressure	CaCO <sub>3</sub> (%)
	11	1(#14)	0.99	0.45	25.0%

Note: CaCO<sub>3</sub> Standards: 0.94 g 99%CaCO<sub>3</sub> = 1.48 pressure (kp/cm)  
0.17 g 99%CaCO<sub>3</sub> = 0.33 pressure (kp/cm)

data and assuming that the wet bulk density variation is due to changes in porosity, the porosity in the foram nanno ooze of Core 1 is about 65%, whereas the porosity in the nanno ooze of Core 20 is about 47%.

##### Velocity Measurements

The compressional wave velocity,  $V_p$ , of the various rock types recovered at this site was measured on a Hamilton frame. The  $V_p$  of the nanno chalk ranges from 1.7 to 3.0 km/sec. The  $V_p$  of the calcareous porcellanites ranges from 2.4 to 3.3 km/sec, whereas that of chert is 4.8 to 5.1 km/sec. These  $V_p$  values are quite similar to those measured at the previous sites of this leg. The velocities of both the siliceous and calcareous rocks increase with lithification. Beginning with a velocity of 1.5 km/sec in the oozes,  $V_p$  increases to 2 to 3 km/sec in the chalks, limestones, and porcellanites, and then jumps to 5 km/sec in chert.

#### CORRELATION OF SEISMIC REFLECTION PROFILES WITH DRILLING RESULTS

The correlation between the "acoustic stratigraphy" and the stratigraphic section recovered from Site 306 is based mainly on the seismic profile recorded between Sites 305 and 306 (Figure 4). This record shows that Site 306 was "spudded in" below the first subbottom reflector recognized at Site 305 and which crops out on the sloping sea floor a few kilometers northeast of Site 306.

The correlation between the two sites is rather well established despite the poor recovery of sediment in the lower part of the section.

At Site 306 the reflector corresponding to the second reflector observed at Site 305 consists of a thick (0.12 sec) reflective zone and appears to be made of at least two distinct reflectors. The upper one at the top of the reflective zone lies at 0.11 sec and the second one at about 0.18 sec below the sea floor. This latter clearly correlates with the second reflector observed at 0.58 sec at Site 305. It corresponds to the same lithological

TABLE 4  
Summary of Shipboard Geochemical Data

Sample (Interval in cm)	Depth Below Sea Floor (m)	pH		Alkalinity (meq/kg)	Salinity (‰)	Remarks (Combination Electrode pH)
		Punch-in	Flow-through			
Refer to Site 305 for Surface Seawater						
1-4,144-150	6	7.59	7.78	2.53	35.2	7.67

change as at Site 305, namely the top of the porcellanite, chert, and pelagic shale section.

Although the upper section is very rich in chert and appeared as hard to drill as the corresponding interval at Site 305, the interval velocity is slightly lower (2.2 km/sec) at this site. This probably results from a lesser degree of compaction of the sediment due to shallower burial.

Basement has not been reached, therefore it is impossible to determine the interval velocity for the lowermost part of the sedimentary section. If we assume a range of velocities from 2.8 to 3.1 for this interval, the acoustic basement which is observed at 0.42 sec below the sea floor might be at subbottom depths ranging from 540 to 570 meters. The lowermost core obtained at this site might therefore come from layers situated at 65 to 95 meters above the basement.

A summary of these correlations is given in Figure 6.

### BIOSTRATIGRAPHIC SUMMARY

Most of 475-meter section penetrated at Site 306 is of Early Cretaceous age, with the exception of Core 1 (mixed assemblages of late Albian to Holocene age) (see Table 6). Cores 41 and 42 are considered early Berriasian.

The foraminifera of Cores 2 and 3 correspond fairly well to those of Cores 44 and 45 at Site 305.

Ages are assigned on the basis of coccoliths which occur throughout the entire section. Because of poor recovery, smear slides for coccoliths prepared from thin calcareous crusts scraped from the chert represent often the only possibility to obtain an age determination.

The attribution of the base of the section to the early Berriasian is based on coccoliths.

Planktonic foraminifera which could be attributed to definite zones were observed only in the uppermost 50 meters. The scattered and generally poor foraminiferal assemblages found below 50 meters are of little strati-

graphic value and allow only very broad age assignments.

Radiolaria belonging to the *Dictyomitra somphedia* Zone are found in Cores 2 to 4, the *Acaeniotyle umbilicata* Zone in Cores 5 to 12, the *Eucyrtis tenuis* Zone in Cores 14 to 19, and the *Sethocapsa trachyostraca* Zone in Core 21. In Cores 13 to 20 the Radiolaria are generally poorly represented and commonly indeterminate, from 22 to 39 they are entirely absent. In contrast, the Radiolaria in Cores 40 to 42 are common to few, and moderate to well preserved and may be assigned to the *Sphaerostylus lanecola* Zone.

### Foraminifera

Core 1 contains a mixture of late Albian to Recent foraminifera.

Cores 2 and 3 are attributed to the late Albian (or basal Cenomanian) (*Rotalipora apenninica*, *R. evoluta*).

The presence of *Ticinella primula* in Core 4 places this core in the early or middle Albian. The microfaunas of Cores 6 and 7 are too poorly preserved in order to assure the presence of representatives of the genus *Ticinella*. No planktonic foraminifera were found in place below Core 7.

The microfaunas from Cores 8 and 9 are very poor and uncharacteristic. No washed residues could be obtained from Cores 10 and 11.

Core 12 contains the first specimens of *Dorothia zedlerae*. The interval corresponding to Cores 12 through 21 is attributed to the "interval between first occurrence of *Dorothia zedlerae* and first occurrence of *Dorothia hauteriviana*" (= Barremian to early Aptian). Only chert chips or caved microfaunas were recovered from Cores 13 to 18. Cores 19 and 21 contain only poor and uncharacteristic microfaunas. In Core 20, representatives of the genus *Spirillina* are relatively common.

The first specimens of *Dorothia hauteriviana* are observed in Core 22, whereas the last representatives of

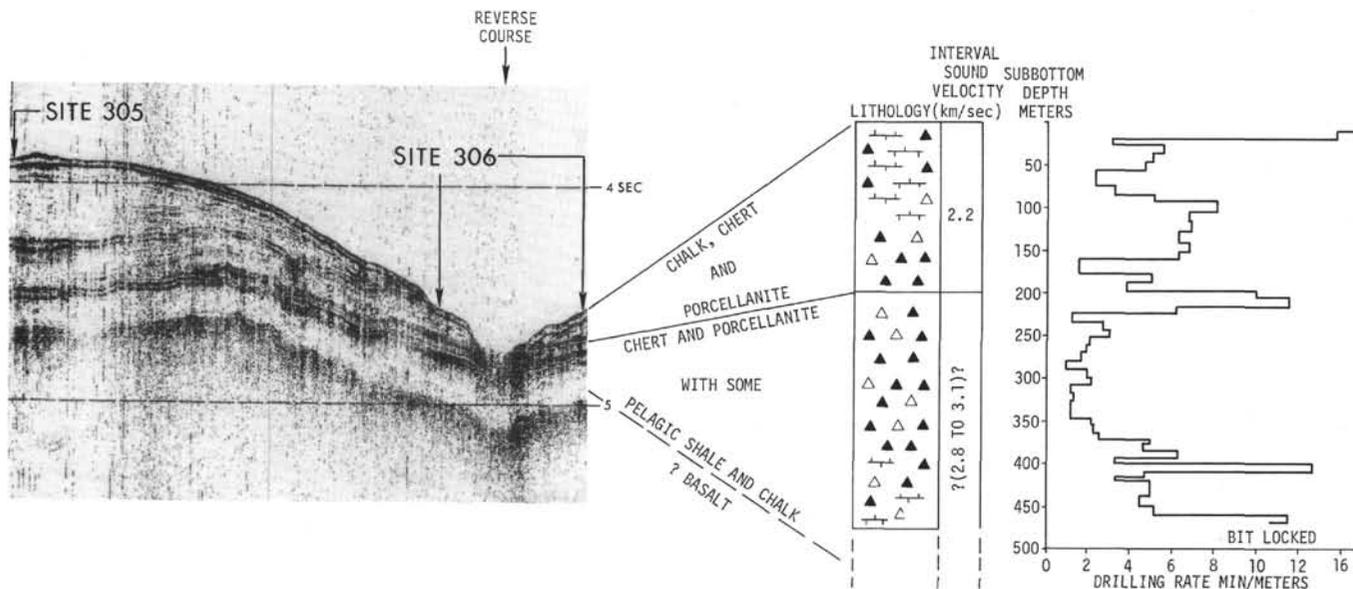


Figure 6. Correlation of seismic reflection profile with drilling results at Site 306.

TABLE 6  
Distribution, Age, and Frequency of Investigated Microfossils

Core	Depth (m)	Recovery %	Foraminifera			Calcareous Nannoplankton	Radiolaria	
			Plankt.	Benth.				
1	0.0-9.5	94	•	+	Mixed Quaternary/ late Albian	•	Quaternary	+ Late Pleistocene
2	9.5-19.0	1	*	+	Late Albian	o	Early Cenomanian/ late Albian	* -
3	19.0-28.0	2	*	+	Late Albian	•	Early Cenomanian/ late Albian	* -
4	37.5-47.0	3	*	+	Albian	o	Late Albian	* -
5	56.5-66.0	<1	+	+	-	o	Late Albian	o
6	75.5-84.5	8	+	+	Albian (?)	o	Early Albian/ late Aptian	o -
7	94.0-103.5	1	+	+	Albian (?)	•	Early Albian/ late Aptian	o -
8	113.0-122.5	18	-	+	-	•	Early Albian/ late Aptian	o -
9	132.0-141.5	18	-	+	-	•	Early Aptian/ Barremian	o -
10	151.0-160.5	12	-	-	-	•	Early Aptian/ Barremian	o -
11	169.5-179.0	11	-	-	-	o	Early Aptian/ Barremian	o -
12	188.5-198.0	14	-	+	(Aptian/ Barremian)	•	Early Aptian/ Barremian	o -
13	207.5-217.0	1	-	-	-	+	Early Aptian/ Barremian	o -
14	217.0-226.0	1	-	-	-	-	-	o Barremian to Hauterivian/ Valanginian
15	226.0-235.0	<1	-	-	-	-	-	-
16	235.0-244.0	1	-	-	-	-	-	* -
17	244.0-253.0	1	-	-	-	•	Hauterivian/ Valanginian	* -
18	253.0-262.5	1	-	-	-	•	Hauterivian/ Valanginian	* -
19	262.5-271.5	<1	-	*	(Aptian/ Barremian)	•	Hauterivian/ Valanginian	* -
20	271.5-281.0	25	-	*	(Aptian/ Barremian)	•	Hauterivian/ Valanginian	+ -
21	281.0-290.5	14	-	+	(Aptian/ Barremian)	•	Hauterivian Valanginian	* -
22	290.5-300.0	9	-	*	Barremian/ Hauterivian	•	Hauterivian/ Valanginian	+ -
23	300.0-309.0	1	-	-	-	•	Hauterivian/ Valanginian	- -
24	309.0-318.5	5	-	*	Barremian/ Hauterivian	•	Hauterivian/ Valanginian	+ -
25	318.5-327.5	1	-	*	Barremian/ Hauterivian	•	Hauterivian/ Valanginian	+ -
26	327.5-337.0	2	-	+	Barremian/ Hauterivian	•	Hauterivian/ Valanginian	- -
27	337.0-346.5	0	-	-	-	-	-	- -
28	346.5-355.5	2	-	-	-	o	Hauterivian/ Valanginian	- -
29	355.5-365.0	1	-	+	Early Cretaceous	•	Hauterivian/ Valanginian	- -
30	365.0-374.5	2	-	-	-	•	Hauterivian/ Valanginian	+ -
31	374.5-376.5	0	-	-	-	-	-	- -
32	376.5-384.0	1	-	-	-	•	Valanginian/ Berriasian	+ -

TABLE 6 – Continued

Core	Depth (m)	Recovery %	Foraminifera			Calcareous Nannoplankton	Radiolaria	
			Plankt.	Benth.				
33	384.0-393.0	<1	-	-	-	-	-	+
34	393.0-402.0	<1	-	-	-	•	Valanginian/ Berriasian	+
35	402.0-411.5	2	-	-	-	o	Valanginian/ Berriasian	+
36	411.5-421.0	2	-	-	-	•	Valanginian/ Berriasian	+
37	421.0-430.5	2	-	+	Early Cretaceous	•	Valanginian/ Berriasian	+
38	430.5-440.0	2	-	*	Early Cretaceous	+	Valanginian/ Berriasian	-
39	440.0-449.5	1	-	-	-	-	-	+
40	449.5-459.0	7	-	+	Early Cretaceous	•	Valanginian/ Berriasian	o
41	459.0-467.5	15	-	+	Early Cretaceous	•	Berriasian	o
42	467.5-475.0	8	-	+	Early Cretaceous	•	Early Berriasian	o

Note: • abundant; o common; \* frequent; + rare; - absent.

the same species occur in Core 27. A Barremian to Hauterivian age is attributed to this "interval with *Dorothia hauteriviana*." No washed residue was obtained from Core 23.

The occurrence of foraminifera below Core 26 is very patchy. The rare microfaunas are always very poor and badly preserved (Cores 29, 37, 38, and 40 to 42). Radiolaria dominate most of the washed residues. The few foraminifera (almost exclusively lagenids) allow no age determination.

### Coccoliths

Coccolith assemblages ranging in age from earliest Cretaceous to Quaternary (*Gephyrocapsa oceanica* Zone) occur in the 475-meter section (Cores 1 to 42) at Site 306.

Most of the cored section is Early Cretaceous in age and apparently represents continuous deposition. Chert layers are numerous and sediment recovery was negligible.

Core 1 (1-10 m) contains a relatively uncontaminated foraminifer-coccolith ooze of Quaternary age at the top, but the rest of the core is a mixture of species representative of most Late Cretaceous and Cenozoic zones. Fragments of chalk in the lower part of the core contain poorly preserved Albian to Turonian coccoliths.

The *Lithraphidites alatus* Zone, in Cores 2 to 3 (10-28 m), and the *Eiffellithus turriseiffeli* Zone, in Cores 4 to 5 (38-66 m), are both associated with Albian foraminifer assemblages (Cores 2 to 4).

Cores 6 to 8 (76-123 m) contain poorly preserved assemblages of the Aptian to Albian *Parhabdolithus angustus* Zone. The latest appearance of *Watznaueria oblonga*, here, duplicates its occurrence at Site 305 and indicates a correlation for Cores 306-6 and 305-57. Cores 6 to 8 at Site 306 correspond to Cores 55 to 57 at Site 305.

### Radiolaria

This site was drilled to continue the sequence of continuous coring at Site 305. All the cores recovered are Mesozoic, except the first which is a mixture of sediments of Neogene and Cretaceous age.

Radiolaria are few and poorly preserved in Cores 2 to 4, common, moderately to poorly preserved in Cores 5 to 14 and few and poorly preserved in Cores 16 to 19. Radiolarian abundance and preservation are very rare and very poor from Cores 20 through 39, with the exception of Core 21 where they are few and moderate. In Core 40 they are common and moderate; Core 41, abundant and moderate; and Core 42, few and moderate.

Samples of the hard flint-like chert were prepared from the core catchers of Cores 28, 30, and 32 through 35. As at Site 305, they contained only very rare, very poor, unidentifiable Radiolaria. Generally only recrystallized fragments were recovered.

Cores 2 to 4 (9.5-47 m) belong to the *Dictyomitra somphedia* Zone. Cores 5 through 12 at a depth of 47 to 160.5 meters *Acaeniotyle umbilicata* Zone contain a fauna which with further study may prove to be related to some of the forms described by Aliev (1965) from the late Early Cretaceous of Azerbaïdzhân. Cores 14 to 19 (217-271 m) belong to the *Eucyrtis tenuis* Zone, and Core 21 (281-290 m) to the *Sethocapsa trachyostraca* Zone. The Radiolaria in Cores 20 and 22 to 39 are either missing or are too poor to give an age assignment. Cores 40 to 42 are below the oldest core (Site 196, Core 4) of Leg 20, which could be dated on the basis of nanofossils. It was considered to be Valanginian-early Hauterivian in age. The fauna in Cores 40 and 42 is very similar to the next-older core recovered (Core 196-5). It had no co-occurring calcareous fossils and on the basis of the Radiolaria was considered to be Neocomian-?Late Jurassic in age. This fauna is now considered to be Valanginian-Berriasian on the basis of the associated

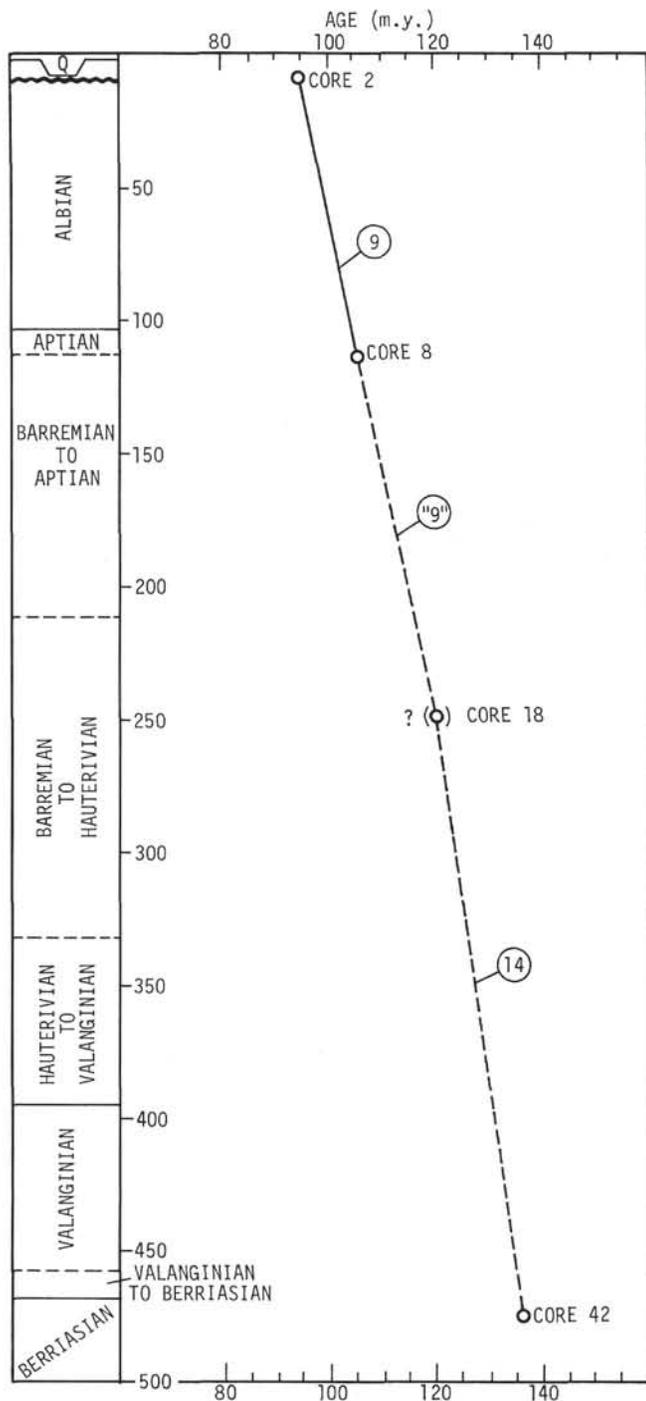


Figure 7. Accumulation rate curve calculated for Site 306. Circled numbers give accumulation rate in m/m.y. for each segment.

nannofossils in Cores 40 to 42 and belongs to the *Sphaerostylus lanceola* Zone.

#### SEDIMENTATION RATES

The Berriasian to Albian section in Cores 1 to 42 (10-475 m) accumulated at an average rate of 11 m/m.y. As stage boundaries are only approximately located because of poor assemblages or limited recovery,

sedimentation rates for smaller intervals are less reliable (Figure 7).

A comparison of the interval from the top of Albian to the top of the Hauterivian at Sites 305 and 306 shows sedimentation average rates of about 10 m/m.y. (305, Cores 42 to 67; 306, Cores 1 to 13). Shorter intervals show more variation. The lack of well-established data points in the Early Cretaceous results in only approximate sedimentation rates.

#### SUMMARY AND CONCLUSIONS

The principal result of drilling at Site 306 was the penetration of nearly a half kilometer of cherts and carbonate rocks, mainly of Early Cretaceous age. Even though the button-toothed cone bit with sealed journal bearings was able to drill in these hard rocks for a record length of time, we were not able to complete our primary objective of coring the complete sedimentary section and into basement.

It had not been expected that the lower transparent layer of the reflection profiles would turn out to be so cherty. Much of it was impure, with clay and carbonate admixtures, typical of many porcellanites, but nevertheless resisted drilling.

Like Site 305, a sufficient amount of fossil material was recovered at Site 306 that the progress of the hole could be followed, and a correlation with Site 305 could be made. Also, like Site 305, there was not sufficient material for wide distribution of samples. In several instances nearly all the meager scrappings of chalk from crusts and vugs in the chert were used for smear slides and a search for fossils. Coccoliths were most useful for dating the rocks.

The nature and age of basement remain unknown. As estimated from the reflection record, the 475-meter total depth of the hole probably was about 80 meters above basement. The increase in volcanogenic components in the lowest few cores suggests some proximity to basement, by analogy with the base of the sedimentary section on the Ontong-Java and Magellan plateaus. Figure 8 is a summary of Site 306 results.

#### REFERENCES

- Aliev, Kh. Sh., 1965. Radiolarians of the Lower Cretaceous deposits of northeastern Azerbaidzhan and their stratigraphic significance: *Izd. Akad. Nauk. Az. SSR, Baku*.
- Chase, T. E., Menard, H. W., and Mammerickx, J., 1971. *Topography of the North Pacific*: Institute of Marine Resources, University of California, San Diego.
- Heath, G. R. and Moberly, R., 1971. Cherts from the western Pacific. *In* Winterer, E. L., Riedel, W. R., et al., *Initial Reports of the Deep Sea Drilling Project, Volume 7*: Washington (U. S. Government Printing Office), p. 991-1007.
- Jones, J. B. and Segnit, E. R., 1971. The nature of opal. I. Nomenclature and constituent phases: *J. Geol. Soc. Australia*, v. 18, p. 57-68.
- Lancelot, Y., 1973. Chert and silica diagenesis in sediments from the Central Pacific. *In* Winterer, E. L., Ewing, J. I., et al., *Initial Reports of the Deep Sea Drilling Project, Volume 17*: Washington (U. S. Government Printing Office), p. 377-405.

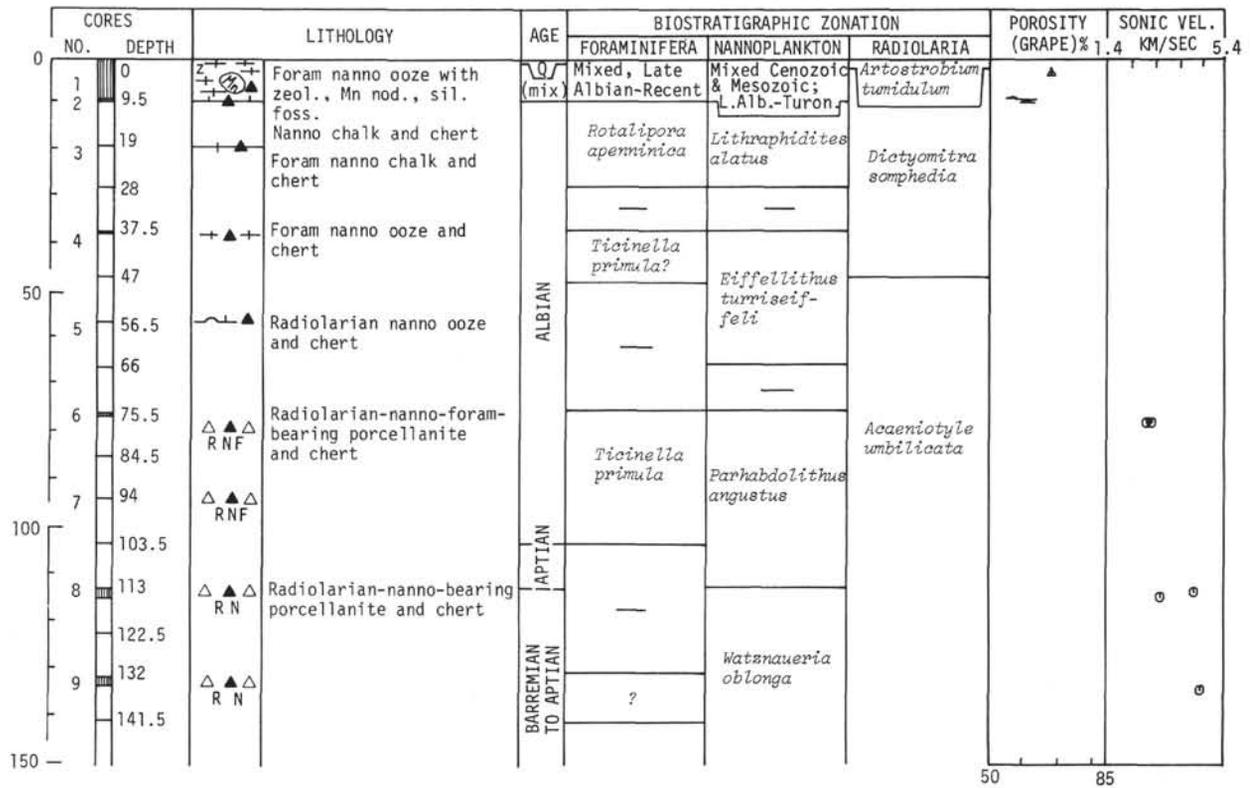


Figure 8. Summary of coring, lithology, biostratigraphy, and physical properties at Site 306.

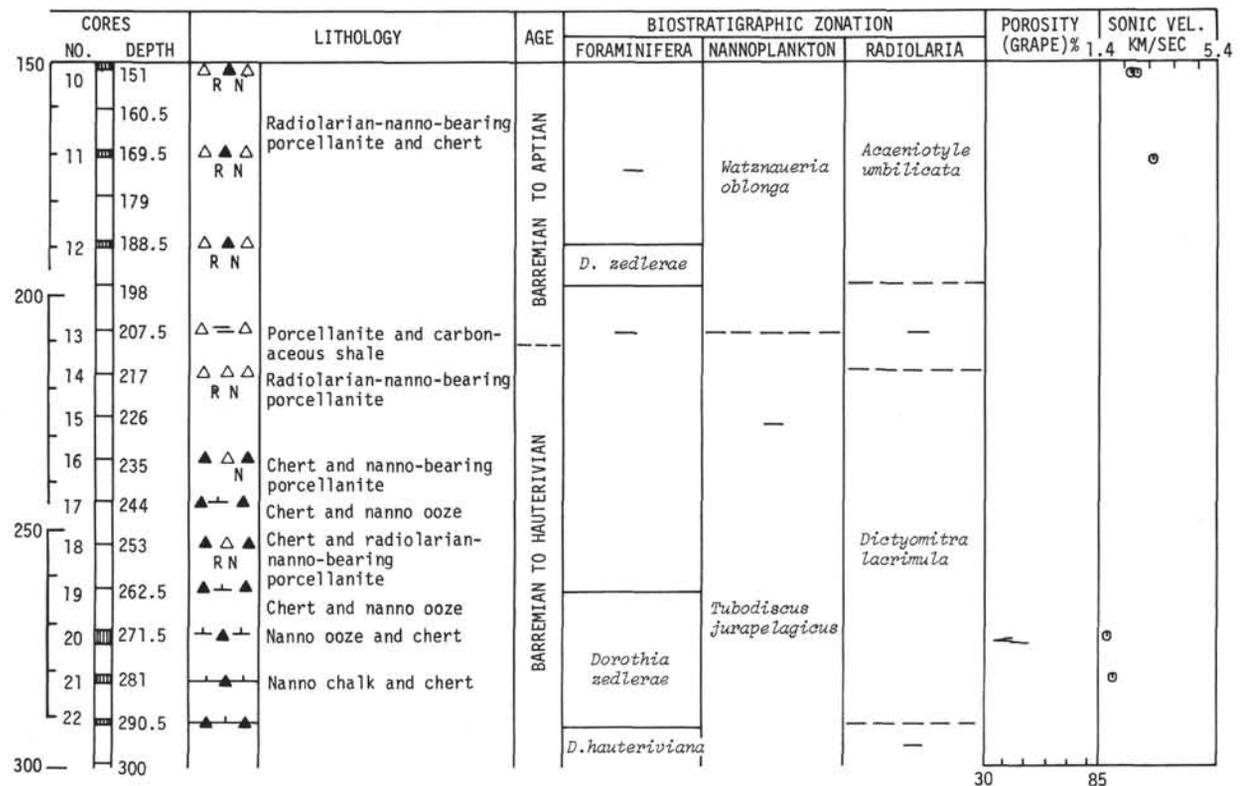


Figure 8. (Continued).









Site 306 Hole Core 16 Cored Interval: 235.0-244.0 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	ANNOS FORAMS RADS	FOSSIL	ABUND.	PRES.						
					0					
	Eucyrtis tenuis		R	F	P	Core Catcher	▲ ▲	bx		CHERT, grayish black (N2) with minor mottling of medium gray (N5). Thin crust of CALCAREOUS PORCELLANITE, very light gray (N8) on chert fragments.  Broken up by drilling.

Site 306 Hole Core 17 Cored Interval: 244.0-253.0 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	ANNOS FORAMS RADS	FOSSIL	ABUND.	PRES.						
					0					
	HAUTERIVIAN TO VALANGINIAN Tubodiscus Jurapeiagicus Eucyrtis tenuis		N R	A F	M P	Core Catcher	▲ ▲	bx	* CC	CHERT grayish black (N2) with moderate mottling of medium gray (N5) with minor NANNO OOZE, yellowish gray (5Y 8/1).  Smear Slide at CC Composition Nannos                   D Rads                     R Dolomite               R Recrystallized calcite   R

Site 306 Hole Core 18 Cored Interval: 253.0-262.5 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	ANNOS FORAMS RADS	FOSSIL	ABUND.	PRES.						
					0					
	HAUTERIVIAN TO VALANGINIAN Tubodiscus Jurapeiagicus Eucyrtis tenuis		N R	A F	M P	Core Catcher	▲ ▲	bx	*	Pieces of CHERT and CALCAREOUS PORCELLANITE.  CHERT is grayish black (N2) with moderate mottling of gray (N5). It contains vugs filled with silicified NANNO CHALK.  Color of PORCELLANITE is light gray (N8).  Minor lithology NANNO CHALK.  Smear Slide at CC Composition Nannos                   D Recrystallized calcite   R Recrystallized silica     R

Site 306 Hole Core 19 Cored Interval: 262.5-271.5 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	ANNOS FORAMS RADS	FOSSIL	ABUND.	PRES.						
					0					
	APTIAN TO VALANGINIAN Tubodiscus Jurapeiagicus Dorobthia zedtarae Eucyrtis tenuis		N F	A R	M G	Core Catcher	▲ ▲		* CC	CHERT grayish black (N2) with moderate mottling of gray (N5). Rare vugs filled with silicified chalk.  CLAYEY NANNO OOZE, dusky yellowish green (5Y 5/2).  Fragmented by drilling.

Site 306 Hole Core 20 Cored Interval: 271.5-281.0 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	ANNOS FORAMS RADS	FOSSIL	ABUND.	PRES.						
					0					
	APTIAN TO VALANGINIAN Tubodiscus Jurapeiagicus Dorobthia zedtarae		N F	C R	P G P	Core Catcher			* CC	Core is deformed throughout. Originally it was a CHALK which was completely broken up to soft OOZE by drilling. Lumps of CHALK and chips of CHERT are dispersed throughout the core. Colors of ooze are white (N9), dusky yellow (5Y 6/2) and yellowish gray (5Y 7/2).  Smear Slide at 1-105 Composition Nannos                   D Recrystallized calcite   C Dolomite                 R Clay                       R

Explanatory notes in Chapter 1

Site 306 Hole Core 21 Cored Interval: 281.0-290.5 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.						
TO VALANGINIAN	Tubodiscus Jurapelagicus Dorothia zedlariae Sethocapsa trachyostraca	N R	A R	M P	0					Core is moderately deformed.
					1	VOID				NANNO CHALK alternating with CHERT nodules.
					1.0					CHALK is faintly laminated with numerous small burrows. Its colors are light olive gray (5Y 5/2) and yellowish gray (5Y 7/2).
										CHERT nodules are grayish black (N2) or dark gray (N3).
										Smear Slide at 1-67 Composition Nannos D Recrystallized calcite R Pyrite R Amorphous iron oxide R Clay R
										Minor lithology: RAD-BEARING NANNO CHALK.
										Smear Slide at CC Composition Nannos D Rads C Forams R Recrystallized silica R Pyrite R Amorphous iron oxide R Detrital clay R
										Carbon-Carbonate 1-67 (10.3-0.2-84) 1-144 (10.7-1.2-79)
										X-ray Calc 93% 91% Quar 6% 7% Mica 0% 1% Bari 1% 1% Amor 31.0% 33.1%

Site 306 Hole Core 22 Cored Interval: 290.5-300.0 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.						
BARREMIAN TO VALANGINIAN	Tubodiscus Jurapelagicus Dorothia hauteriviana	N R	A R	M P	0					CHERT mainly with some NANNO CHALK. CHERT is intensely mottled dark gray (N3) and medium gray (N5).
					1	VOID				CHALK laminated light olive gray (5Y 5/2) and yellowish gray (5Y 7/2), bioturbated. Generally disturbed by drilling.

Site 306 Hole Core 23 Cored Interval: 300.0-309.0 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.						
HAUTERIVIAN TO VALANGINIAN	Tubodiscus Jurapelagicus	N R	A R	M P	0					CHERT, intensely mottled dark gray (N3) and medium gray (N5), irregular shape, with minor NANNO CHALK with thin lamination largely disturbed by bioturbation. Light olive gray (5Y 5/2) and yellowish gray (5Y 7/2) mottling.
										Smear Slide at CC Composition Nannos D Recrystallized calcite C Pyrite R Dark glass R

Site 306 Hole Core 24 Cored Interval: 309.0-218.5 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.						
BARREMIAN TO VALANGINIAN	Tubodiscus Jurapelagicus Dorothia hauteriviana	N R	A R	M P	0					Core brecciated by drilling.
					1	VOID				CHERT, intensely mottled olive gray (5Y 4/1), olive black (5Y 2/1) and dark gray (N3) and NANNO CHALK with wavy lamination and burrows. Dominantly light olive gray (5Y 5/2) and yellowish gray (5Y 7/2).
										Smear Slide at 1-103 Composition Nannos D Recrystallized calcite C Pyrite R Dark glass R
										Carbon-Carbonate 1-102 (11.5-0.2-95)

Site 306 Hole Core 25 Cored Interval: 318.5-327.5 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.	FOSSIL ABUND. PRES.						
BARREMIAN TO VALANGINIAN	Tubodiscus Jurapelagicus Dorothia hauteriviana	N R	A R	M P	0					Brecciated by drilling.
										CHERT, mottled olive gray (5Y 4/1), olive black (5Y 2/1) and dark gray (N3), and NANNO CHALK, light olive gray (5Y 5/2).
										Smear Slide at CC Composition Nannos D Recrystallized calcite R Clay R
										Carbonate CC (93%)

Explanatory notes in Chapter 1

Site 306 Hole Core 26 Cored Interval: 327.5-337.0 m

AGE	ZONE	FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
		FOSSIL	ABUND.						
	NANNOS FORAMS RADS								
				0					
BARREMIAN TO VALANGINIAN	Tubodiscus Jurapeiagticus Dorothis hauteriviana	N R	A F R	M M P	Core Catcher	⊙ ⊙ ⊙	bx	* CC	<p>Brecciated by drilling.</p> <p>CHERT, mottled olive gray (5Y 4/1), olive black (5Y 2/1) and dark gray (N3) and pieces of NANNO CHALK, light olive gray (5Y 5/2).</p> <p>Smear Slide at CC</p> <p>Composition Nannos D Recrystallized calcite C</p> <p>Carbonate CC (94%)</p>

Site 306, Core 27, 337.0-346m: NO RECOVERY

Site 306 Hole Core 28 Cored Interval: 346.5-355.5 m

AGE	ZONE	FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
		FOSSIL	ABUND.						
	NANNOS FORAMS RADS								
				0					
	Tubodiscus Jurapeiagticus	N R	C R	P	Core Catcher	⊙ ⊙			<p>CHERT, intensely mottled olive black (5Y 2/1) and olive gray (5Y 4/1) with some fractures filled with chaledony.</p> <p>NANNO CHALK, thin layer on chert light gray (5Y 7/1).</p> <p>Broken up by drilling.</p>

Site 306 Hole Core 29 Cored Interval: 335.5-365.0 m

AGE	ZONE	FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
		FOSSIL	ABUND.						
	NANNOS FORAMS RADS								
				0					
EARLY CRETACEOUS	Tubodiscus Jurapeiagticus	N F	A F	M G	Core Catcher	⊙ ⊙ ⊙	bx	* CC	<p>Pieces of NANNO CHALK and CHERT.</p> <p>CHALK is light gray (5Y 7/1) and strongly bioturbated.</p> <p>CHERT is intensely and irregularly mottled olive black (5Y 2/1) and olive gray (5Y 4/1). The lighter lithology is a CALCAREOUS PORCELLANITE. Because of the very irregular silicification the chert shows a rather dull luster, typical of porcellanite. Microcrystalline quartz and some chaledony are the only silica phases present in the chert.</p> <p>Smear Slide at CC</p> <p>Composition Nannos D Recrystallized calcite R Pyrite R Clay R</p> <p>Carbon-Carbonate CC (11.5-0.1-95)</p> <p>X-ray CC Calc 86% Quar 14% Amor 37.4%</p>

Site 306 Hole Core 30 Cored Interval: 365.0-374.5 m

AGE	ZONE	FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
		FOSSIL	ABUND.						
	NANNOS FORAMS RADS								
				0					
	Tubodiscus Jurapeiagticus	N R	A R	P	Core Catcher	⊙ ⊙ ⊙			<p>CHERT intensely mottled olive black (5Y 2/1), olive gray (5Y 4/1) and medium light gray (N6). Relic burrow structures and abundant Radiolaria. Crust of partly silicified NANNO CHALK, white (N9) on chert fragments.</p>

Explanatory notes in Chapter 1

Site 306, Core 31, 374.5-376m: NO RECOVERY

Site 306 Hole Core 32 Cored Interval: 376.5-384.0 m

AGE	ZONE		FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS		FOSSIL	ABUND.	PRES.						
VALANGINIAN TO BERRIASIAN			N	A	P	0					CHERT, olive black (5Y 2/1) and olive gray (5Y 4/1) mottling with irregular patches of very light gray (N8) PORCELLANITE.  Broken up by drilling.
			R	R	P		Core Catcher	▲ ▲			

Site 306 Hole Core 33 Cored Interval: 384.0-393.0 m

AGE	ZONE		FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS		FOSSIL	ABUND.	PRES.						
VALANGINIAN TO BERRIASIAN			R	R	P	0					CHERT (2 pieces), intensely mottled medium gray (N5) and light olive gray (5Y 6/1), containing irregular layers of white (N9) to light olive gray (5Y 6/1) PORCELLANITE.
							Core Catcher	▲ ▲			

Site 306 Hole Core 34 Cored Interval: 393.0-402.0 m

AGE	ZONE		FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS		FOSSIL	ABUND.	PRES.						
VALANGINIAN TO BERRIASIAN			N	C	P	0					CHERT, olive black (5Y 2/1) with moderate mottling of olive gray (5Y 4/1) and crust of light gray (N8) PORCELLANITE.  Broken up by drilling.
			R	R	P		Core Catcher	▲ ▲			

Site 306 Hole Core 35 Cored Interval: 402.0-411.5 m

AGE	ZONE		FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS		FOSSIL	ABUND.	PRES.						
VALANGINIAN TO BERRIASIAN			N	O	P	0					Few CHERT pieces which were fragmented by drilling.  CHERT is intensely mottled medium gray (N5) and light olive gray (5Y 6/1). It contains irregular, less silicified layers and patches of white (N9) to light olive gray (5Y 6/1) CALCAREOUS PORCELLANITE. The chert shows rather porcellanite-like dull luster.  Curved fractures in the chert are filled with chalcedony.
			R	R	P		Core Catcher	▲ ▲	bx		

Site 306 Hole Core 36 Cored Interval: 411.5-421.0 m

AGE	ZONE		FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS RADS		FOSSIL	ABUND.	PRES.						
VALANGINIAN TO BERRIASIAN			N	A	P	0					Pieces of NANNO CHALK and CHERT.  NANNO CHALK is light olive gray (5Y 6/1) with irregular lamination, partly disrupted by bioturbation structures.  CHERT is olive black (5Y 2/1), moderately mottled with olive gray (5Y 4/2). It contains layers, laminae and rounded patches of light gray (N7) to light olive gray (5Y 6/1) CALCAREOUS PORCELLANITE. The chert appears more dull than vitreous, although it shows conchoidal features.
			R	R	P		Core Catcher	▲ ▲	bx	* CC	

Smear Slide at CC

Composition	
Nannos	D
Recrystallized calcite	C
Pyrite	R

Carbon-Carbonate  
CC (10.6-0.2-86)

X-ray CC

Calc	97.5%	Bari	1.5%
Pyri	0.5%	Amor	30.1%

Explanatory notes in Chapter 1

Site 306 Hole Core 37 Cored Interval: 421.0-430.5 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION										
	NANNOS FORAMS	RAIDS	FOSSIL	ABUND. PRES.																
					0															
VALANGINIAN TO BERRIASIAN			Matznerella britannica																	
	N	A	P	P	Core Catcher			bx	* CC	<p>Pieces of NANNO CHALK and CHERT.</p> <p>NANNO CHALK is light olive gray (5Y 6/1). Its irregular lamination is partly disturbed by bioturbation structures.</p> <p>CHERT is olive black (5Y 2/1) and moderately mottled with olive gray (5Y 4/2). It contains irregular layers and patches of light gray (N7) to light olive gray (5Y 6/1) CALCAREOUS PORCELLANITE.</p> <p>The chert shows rather a dull luster. It fractures conchoidally.</p> <p>NANNO CHALK.</p> <p>Smear Slide at CC</p> <table border="0"> <tr><td>Composition</td><td></td></tr> <tr><td>Nannos</td><td>D</td></tr> <tr><td>Rads</td><td>R</td></tr> <tr><td>Recrystallized calcite</td><td>R</td></tr> <tr><td>Pyrite</td><td>R</td></tr> </table> <p>Carbonate CC (96%)</p>	Composition		Nannos	D	Rads	R	Recrystallized calcite	R	Pyrite	R
Composition																				
Nannos	D																			
Rads	R																			
Recrystallized calcite	R																			
Pyrite	R																			

Site 306 Hole Core 39 Cored Interval: 440.0-449.5 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NANNOS FORAMS	RAIDS	FOSSIL	ABUND. PRES.						
					0					
			R	R	P	Core Catcher		bx		<p>Few CHERT pieces only.</p> <p>CHERT is olive black (5Y 2/1) and mottled with olive gray (5Y 4/2). It contains light gray (N7) to light olive gray (5Y 6/1) layers and irregular patches of less silicified CALCAREOUS PORCELLANITE. Chert shows dull, porcellanite-like luster.</p>

Site 306 Hole Core 38 Cored Interval: 430.5-440.0 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION										
	NANNOS FORAMS	RAIDS	FOSSIL	ABUND. PRES.																
					0															
VALANGINIAN TO BERRIASIAN			Matznerella britannica																	
	N	O	P	P	Core Catcher			bx	* CC	<p>Pieces of NANNO CHALK and CHERT.</p> <p>NANNO CHALK is light olive gray (5Y 6/1). It is irregularly laminated and slightly bioturbated.</p> <p>CHERT is olive black (5Y 2/1) with moderate mottling of olive gray (5Y 4/2). It contains irregular layers and patches of light gray (N7) to light olive gray CALCAREOUS PORCELLANITE giving the whole rock a rather dull luster.</p> <p>Smear Slide at CC</p> <table border="0"> <tr><td>Composition</td><td></td></tr> <tr><td>Nannos</td><td>A</td></tr> <tr><td>Recrystallized calcite</td><td>C</td></tr> <tr><td>Pyrite</td><td>R</td></tr> <tr><td>Dark glass</td><td>R</td></tr> </table> <p>Carbonate CC (93%)</p>	Composition		Nannos	A	Recrystallized calcite	C	Pyrite	R	Dark glass	R
Composition																				
Nannos	A																			
Recrystallized calcite	C																			
Pyrite	R																			
Dark glass	R																			

Site 306 Hole Core 40 Cored Interval: 449.5-459.0 m

AGE	ZONE		FOSSIL CHARACTER		SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION										
	NANNOS FORAMS	RAIDS	FOSSIL	ABUND. PRES.																
					0															
VALANGINIAN TO BERRIASIAN			Matznerella britannica																	
	R	C	Sphaerostylus lanceola	M																
	N	A	P	P	Core Catcher			bx	* CC	<p>Intensely disturbed to brecciated CHERT and CHALK.</p> <p>CHERT is dominantly grayish brown (5YR 5/2) mottled with patches and discontinuous laminae of dark greenish gray (5GY 4/1) PORCELLANITE and olive black (5Y 2/1) CHERT.</p> <p>NANNO CHALK with some Radiolaria is thinly laminated grayish green (5G 5/2) and light olive gray (5Y 6/1).</p> <p>Smear Slide at CC</p> <table border="0"> <tr><td>Composition</td><td></td></tr> <tr><td>Nannos</td><td>A</td></tr> <tr><td>Rads</td><td>R</td></tr> <tr><td>Dolomite</td><td>R</td></tr> <tr><td>Pyrite</td><td>R</td></tr> </table> <p>Carbon-Carbonate T-110 (10.5-0.2-86) 1-95 (0-0.42) CC (0-0.80)</p> <p>X-ray 1-135 Calc 96.5% Bari 3.0% Quar 0.5% Amor 43.5%</p>	Composition		Nannos	A	Rads	R	Dolomite	R	Pyrite	R
Composition																				
Nannos	A																			
Rads	R																			
Dolomite	R																			
Pyrite	R																			

Explanatory notes in Chapter 1

Site 306 Hole Core 41 Cored Interval: 459.0-467.5 m

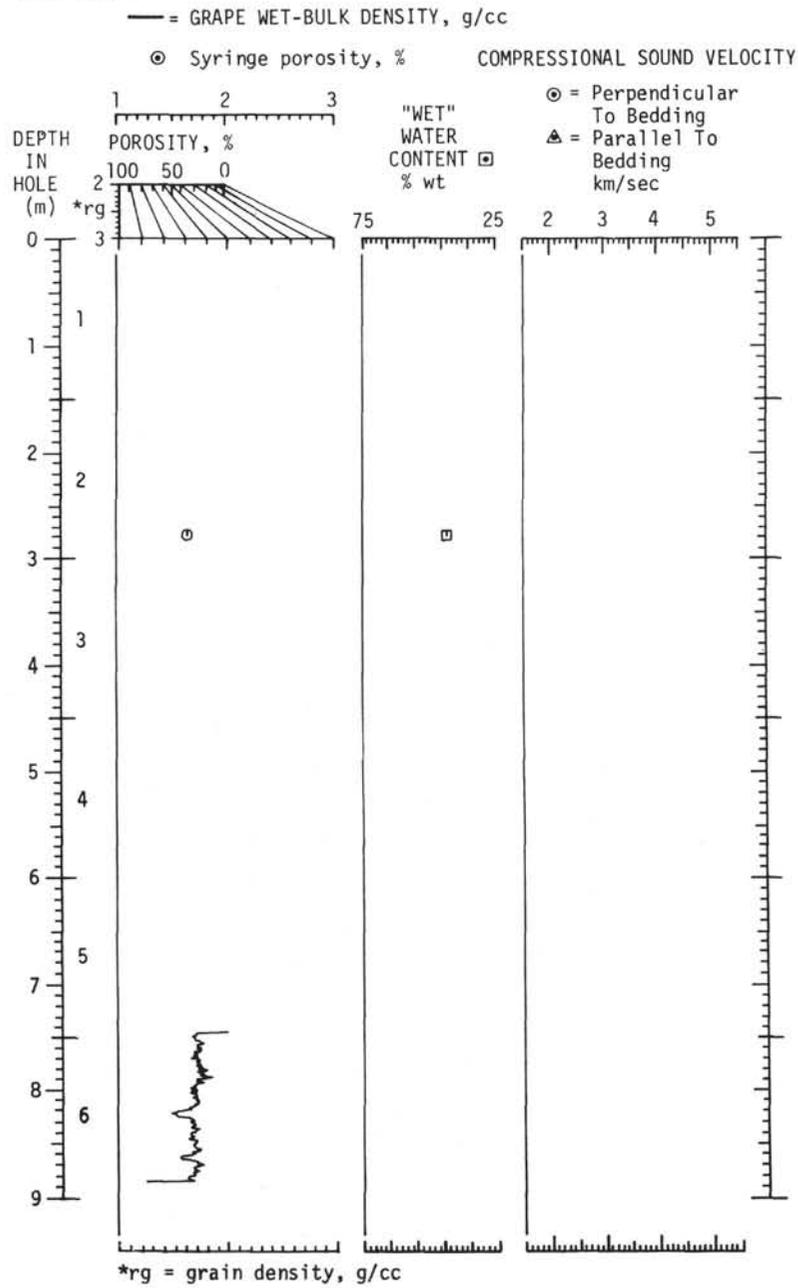
AGE	ZONE		FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION										
	NANNOS FORAMS RADS	FOSSIL	ABUND.	PRES.																	
BERRIASIAN	Nannoconus colomii	Sphaerostylus lanceola	N F R	A A	M G	0 0.5 1.0					<p>Core is severely deformed. Dominant lithologies are silicified NANNO CHALK and CHERT with minor RAD NANNO CHALK.</p> <p>CHERT is laminated moderate brown (5YR 3/4), olive black (5Y 2/1) and dark greenish gray (5GY 4/1) with well preserved burrows. Chert grades into slightly CALCAREOUS PORCELLANITE of grayish green (5GY 5/2) color. CHERT is interbedded with CHALK.</p> <p>SILICIFIED CHALK is thinly laminated with grayish green (5G 5/2) and light olive gray (5Y 6/1). It contains laminae rich in celadonite, dolomite and colored glass.</p> <p>Minor lithology in core catcher silicified RAD-BEARING NANNO CHALK.</p> <p>Smear Slide at CC</p> <table border="0"> <tr><td>Composition</td><td></td></tr> <tr><td>Nannos</td><td>C</td></tr> <tr><td>Rads</td><td>C</td></tr> <tr><td>Recrystallized calcite</td><td>R</td></tr> <tr><td>Recrystallized silica</td><td>C</td></tr> </table> <p>Carbon-Carbonate 1-76 (6.5-0.2-53) 1-71 (0-0-70) CC (0-0-77)</p>	Composition		Nannos	C	Rads	C	Recrystallized calcite	R	Recrystallized silica	C
Composition																					
Nannos	C																				
Rads	C																				
Recrystallized calcite	R																				
Recrystallized silica	C																				

Site 306 Hole Core 42 Cored Interval: 467.5-475.0 m

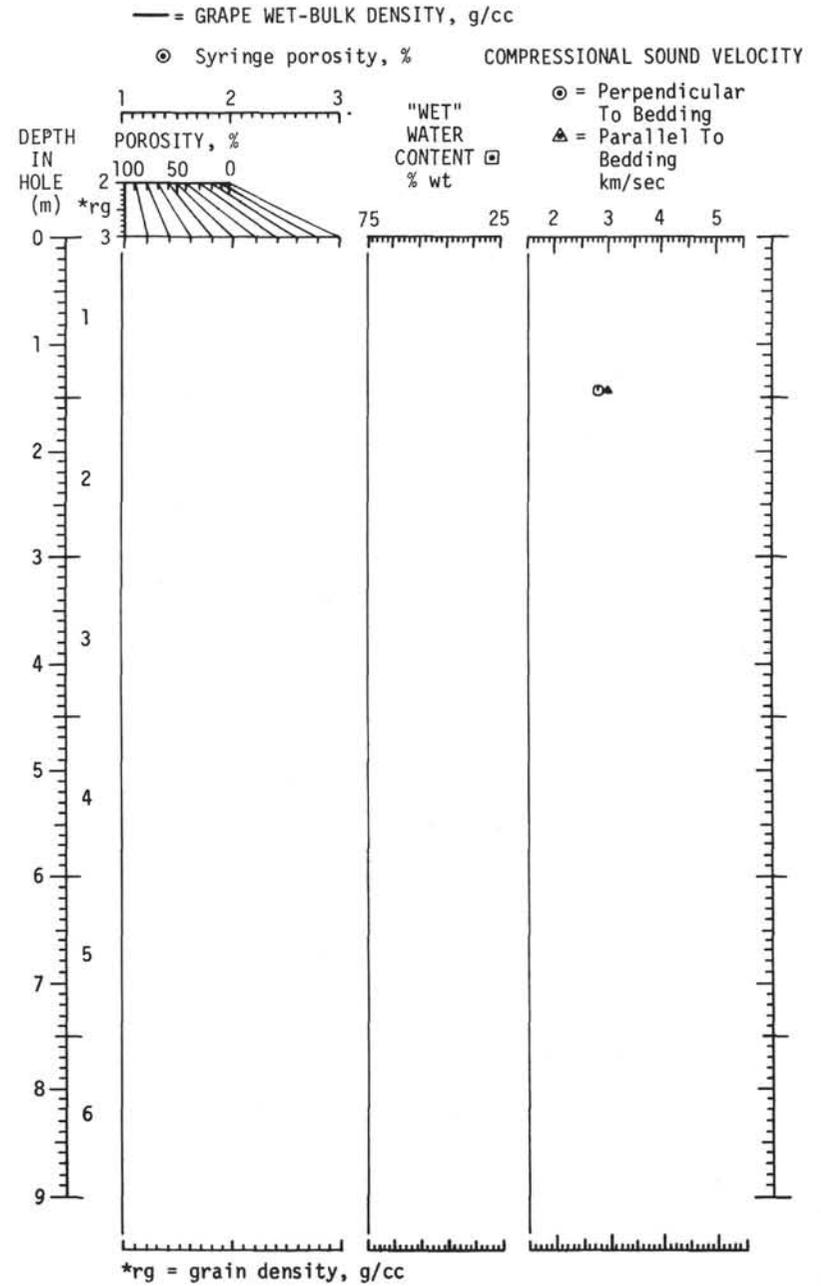
AGE	ZONE		FOSSIL CHARACTER			SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION												
	NANNOS FORAMS RADS	FOSSIL	ABUND.	PRES.																			
EARLY BERRIASIAN	Nannoconus colomii	Sphaerostylus lanceola	N F R	A R F	P P C	0 0.5 1.0					<p>Core severely disturbed. CHERT interbedded with NANNO CHALK.</p> <p>CHERT is dominantly olive black (5Y 2/1) with mottling of olive gray (5Y 4/1) and dusky brown (5YR 2/2). Veins filled with chalcedony are common.</p> <p>NANNO CHALK is laminated grayish green (5GY 5/2) and light olive gray (5Y 6/1). Greenish laminae contain abundant celadonite, dolomite rhombs and some colored volcanic glass.</p> <p>Smear Slide at 1-112</p> <table border="0"> <tr><td>Composition</td><td></td></tr> <tr><td>Nannos</td><td>A</td></tr> <tr><td>Recrystallized calcite</td><td>C</td></tr> <tr><td>Recrystallized silica</td><td>C</td></tr> <tr><td>Pyrite</td><td>R</td></tr> <tr><td>Clay</td><td>R</td></tr> </table>	Composition		Nannos	A	Recrystallized calcite	C	Recrystallized silica	C	Pyrite	R	Clay	R
Composition																							
Nannos	A																						
Recrystallized calcite	C																						
Recrystallized silica	C																						
Pyrite	R																						
Clay	R																						

Explanatory notes in Chapter 1

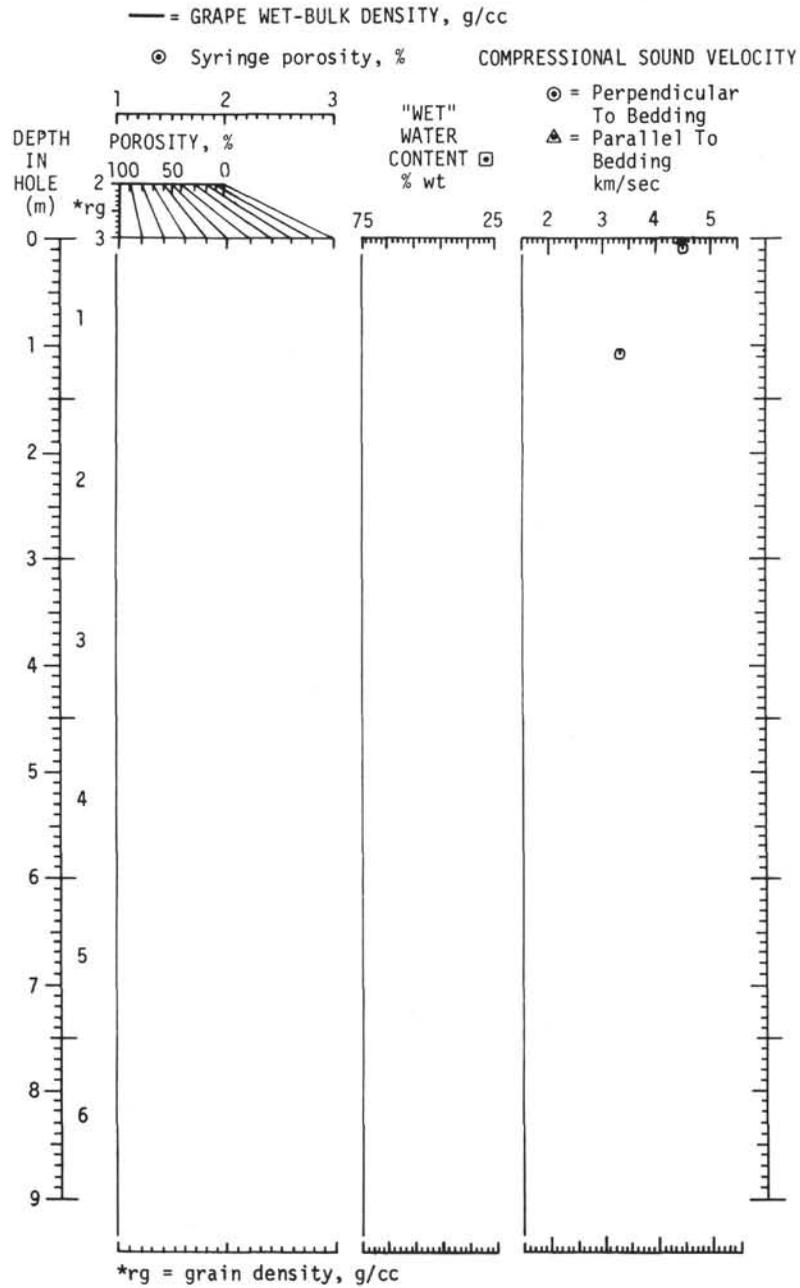
CORE 306-1



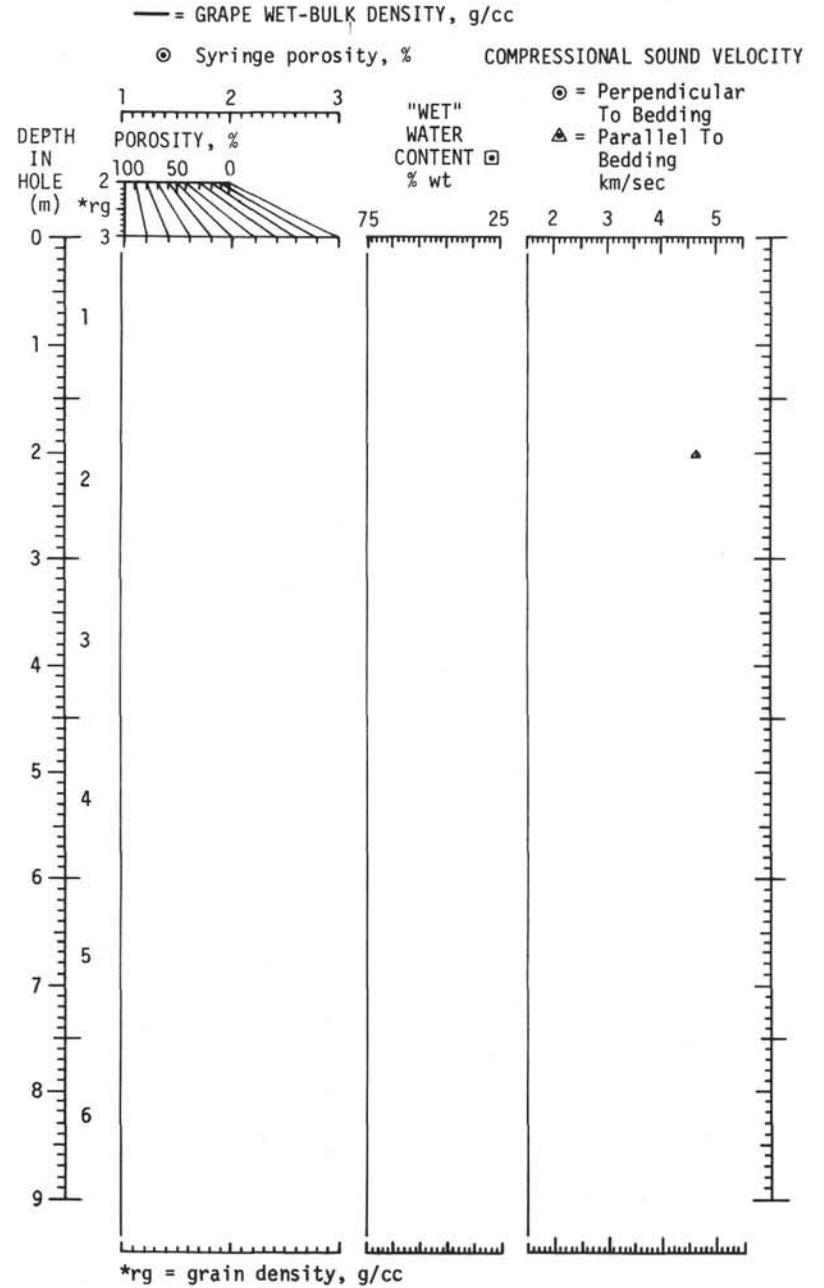
CORE 306-6



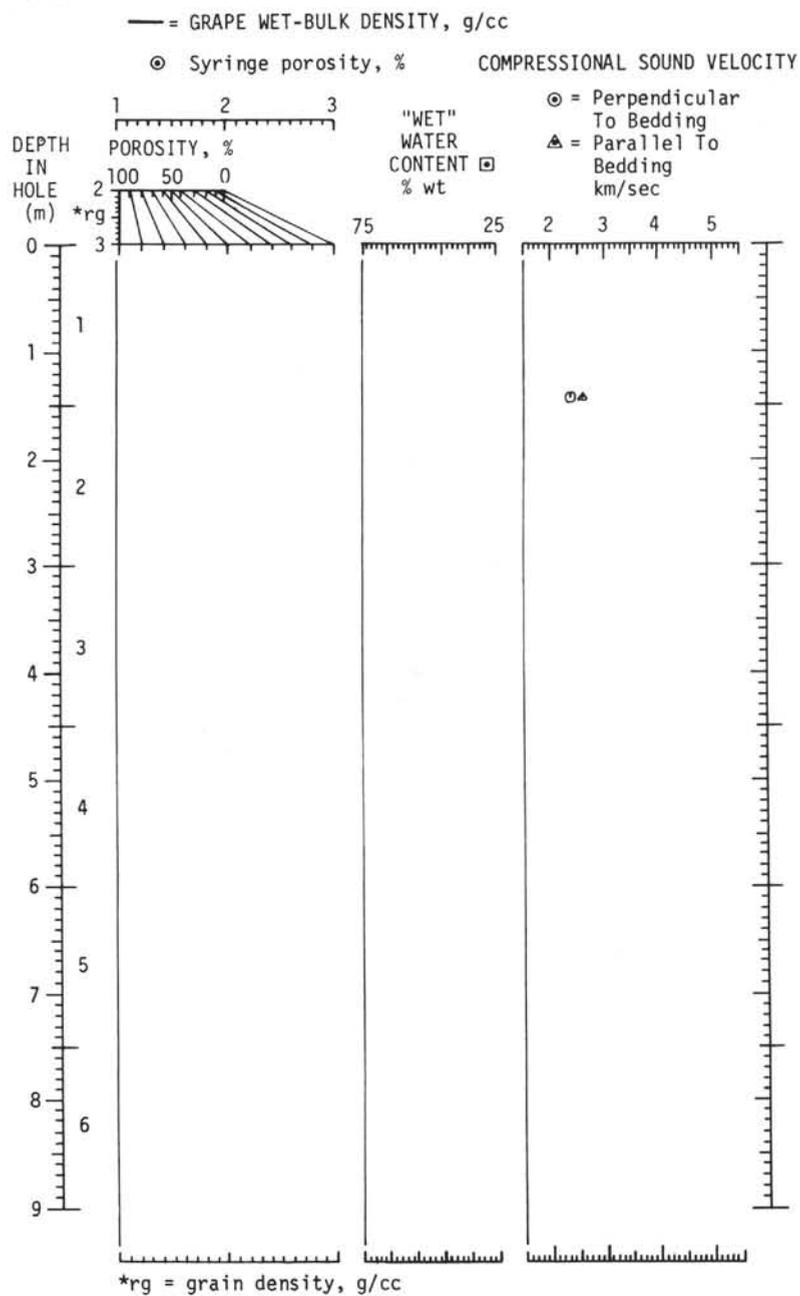
CORE 306-8



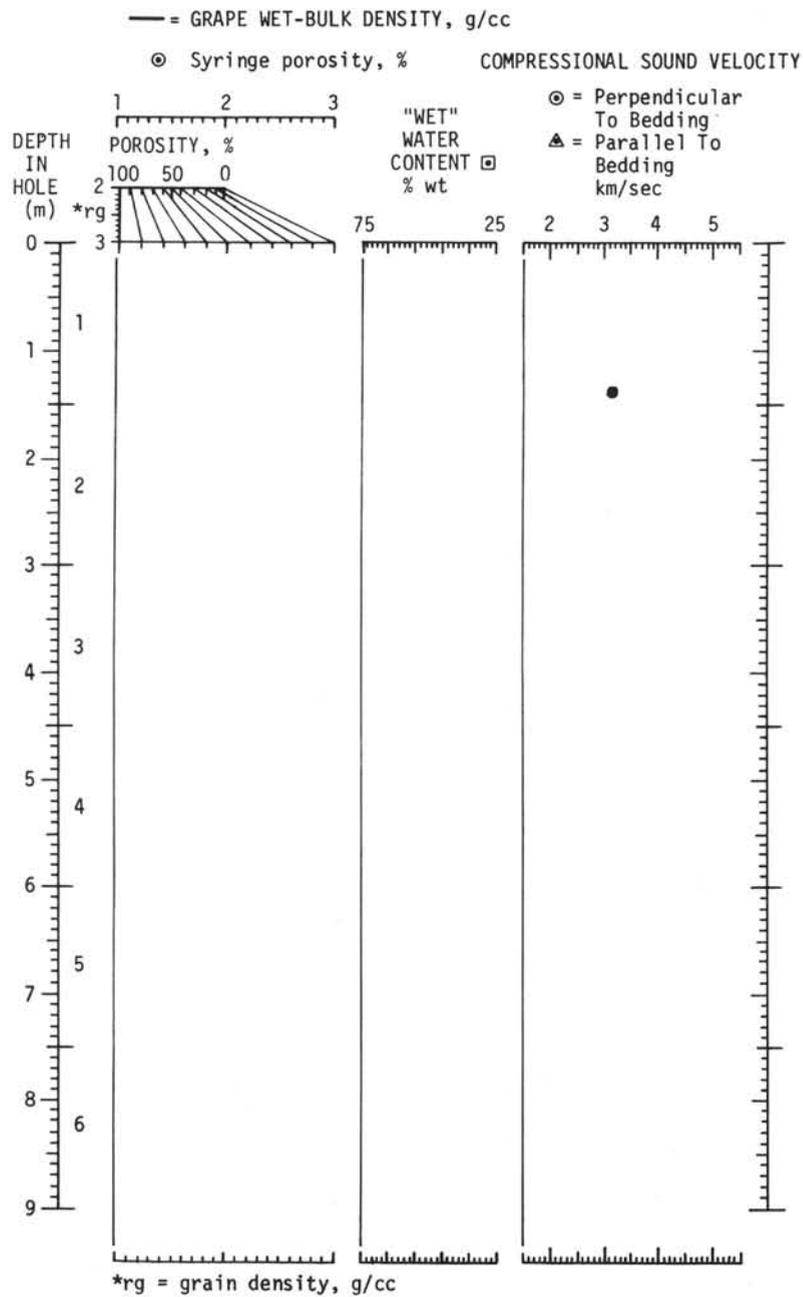
CORE 306-9



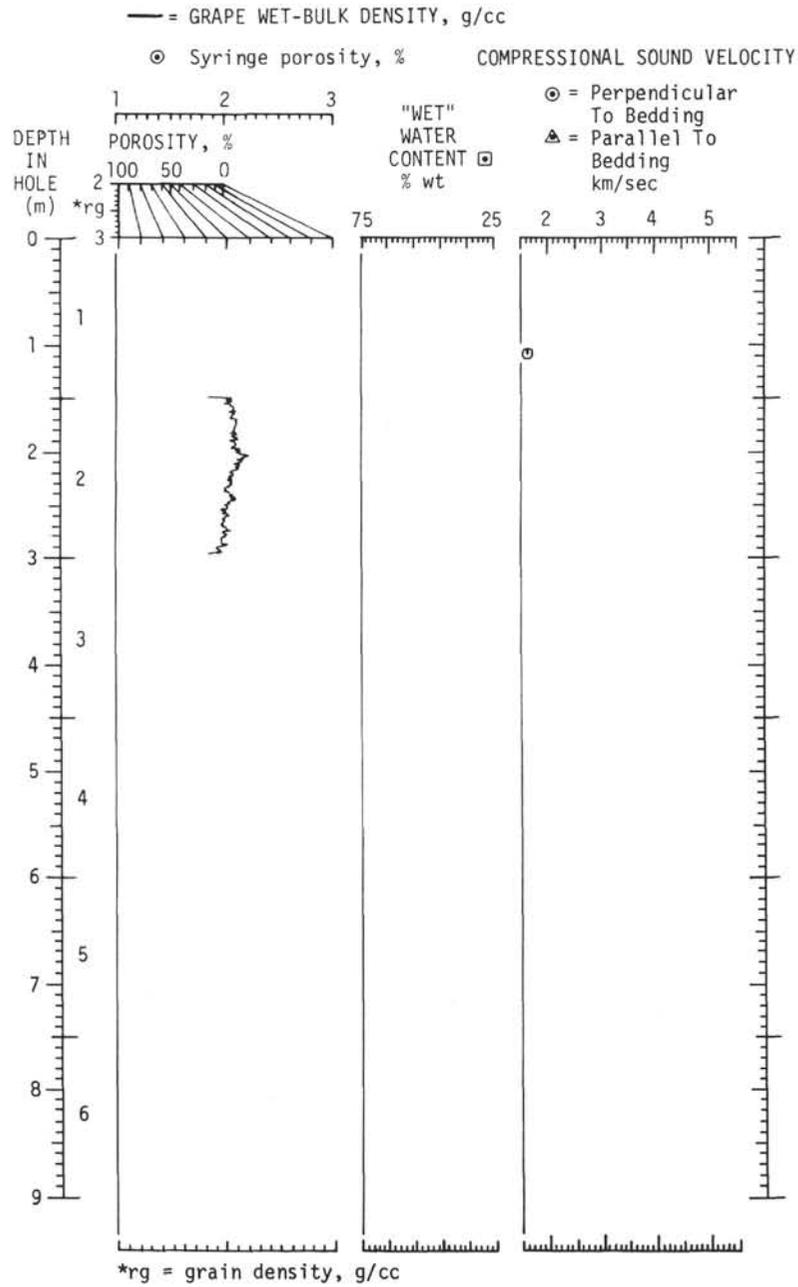
CORE 306-10



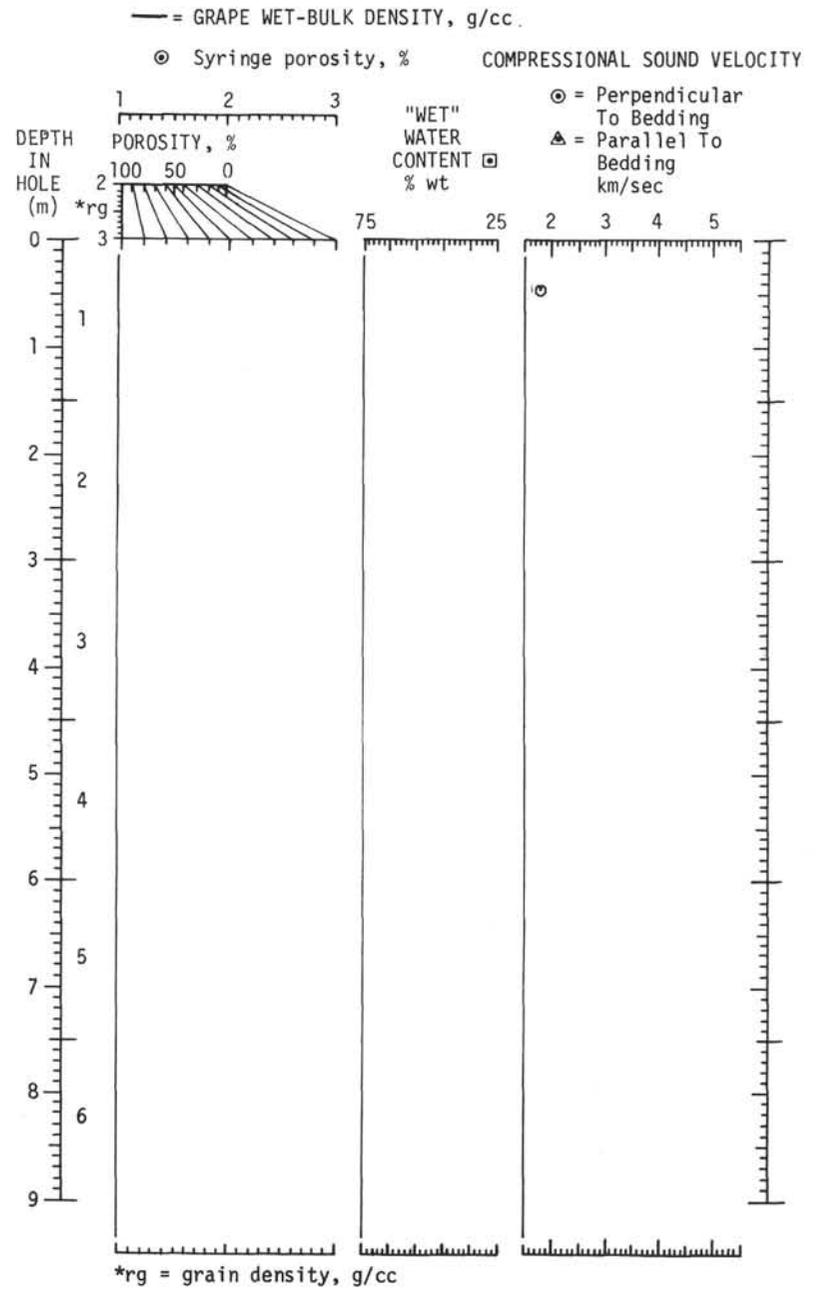
CORE 306-11



CORE 306-20



CORE 306-21

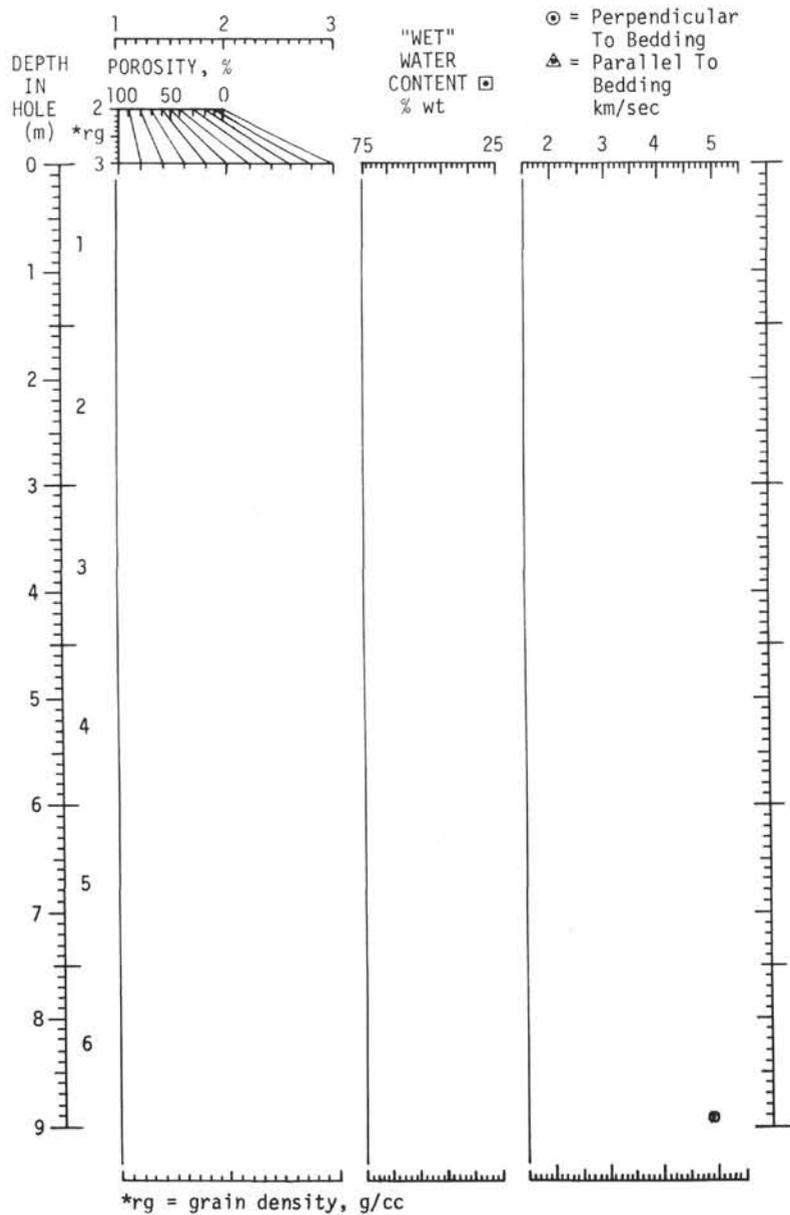


CORE 306-33

— = GRAPE WET-BULK DENSITY, g/cc

⊙ = Syringe porosity, %

COMPRESSIONAL SOUND VELOCITY

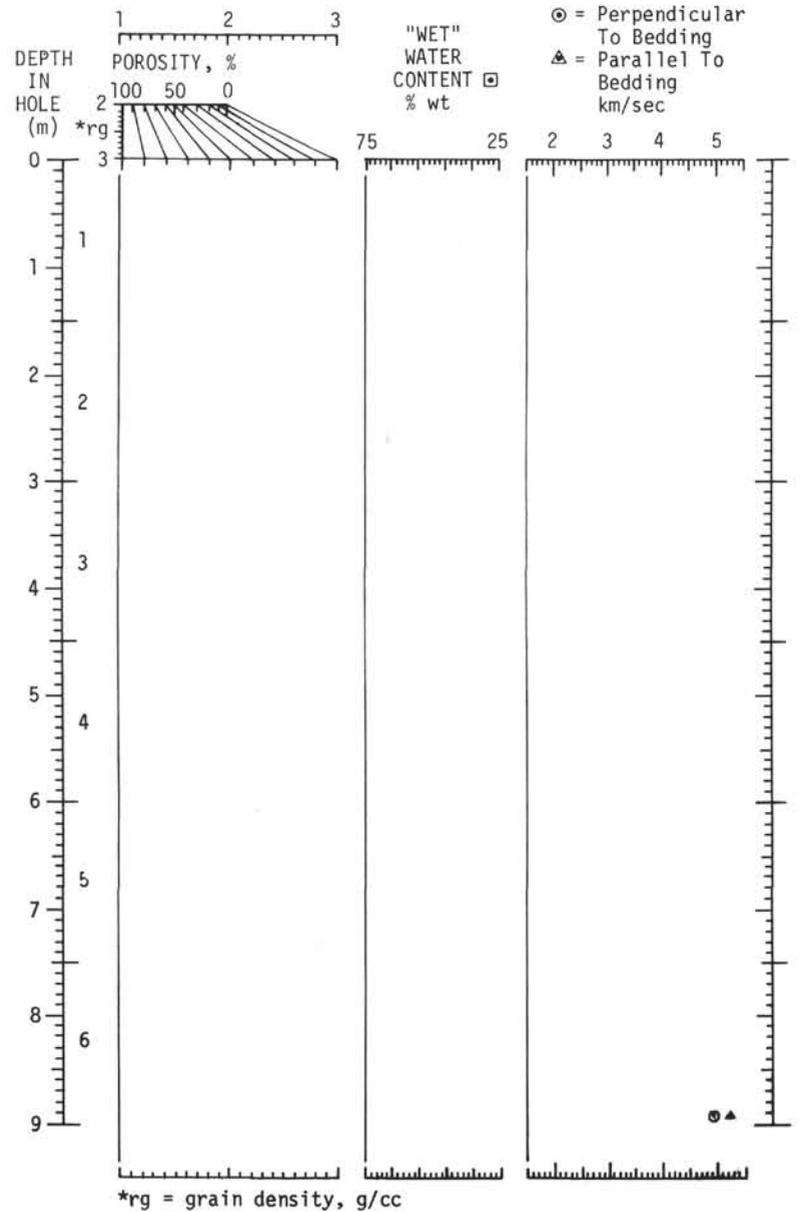


CORE 306-35

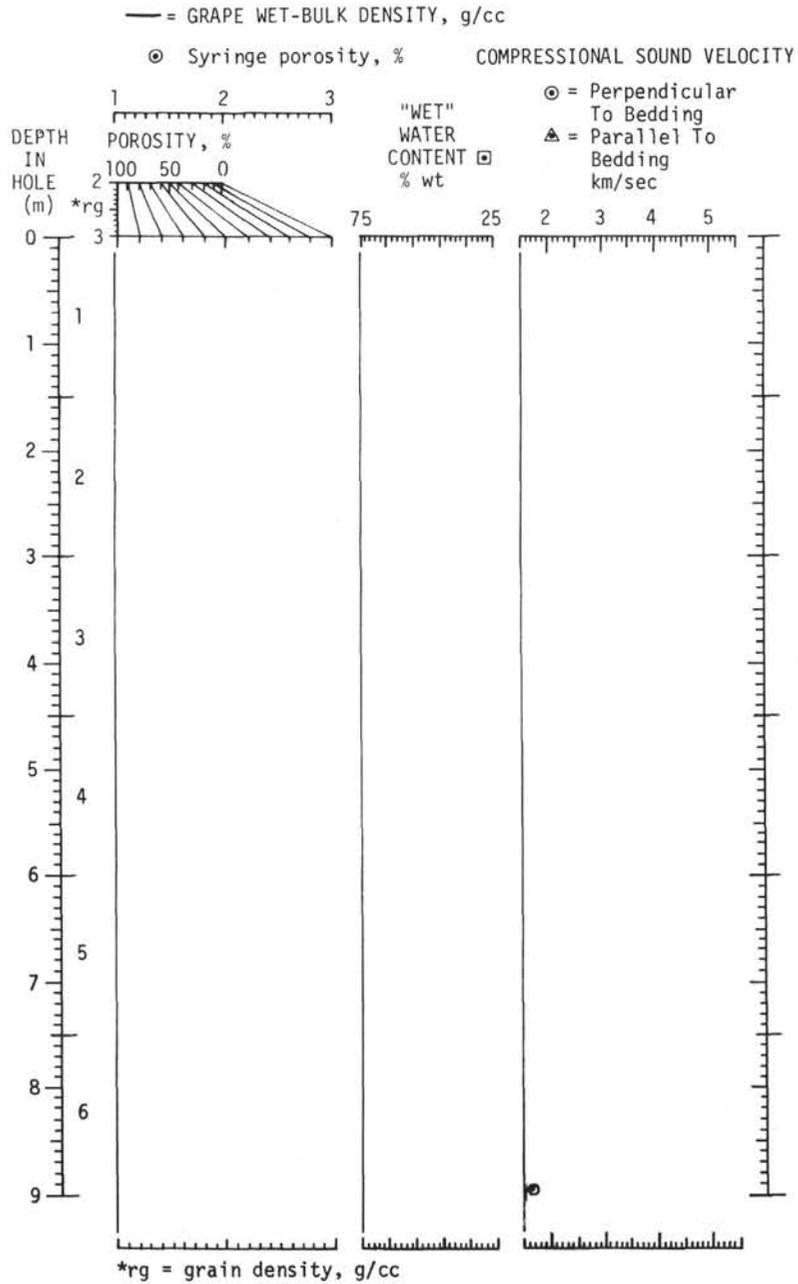
— = GRAPE WET-BULK DENSITY, g/cc

⊙ = Syringe porosity, %

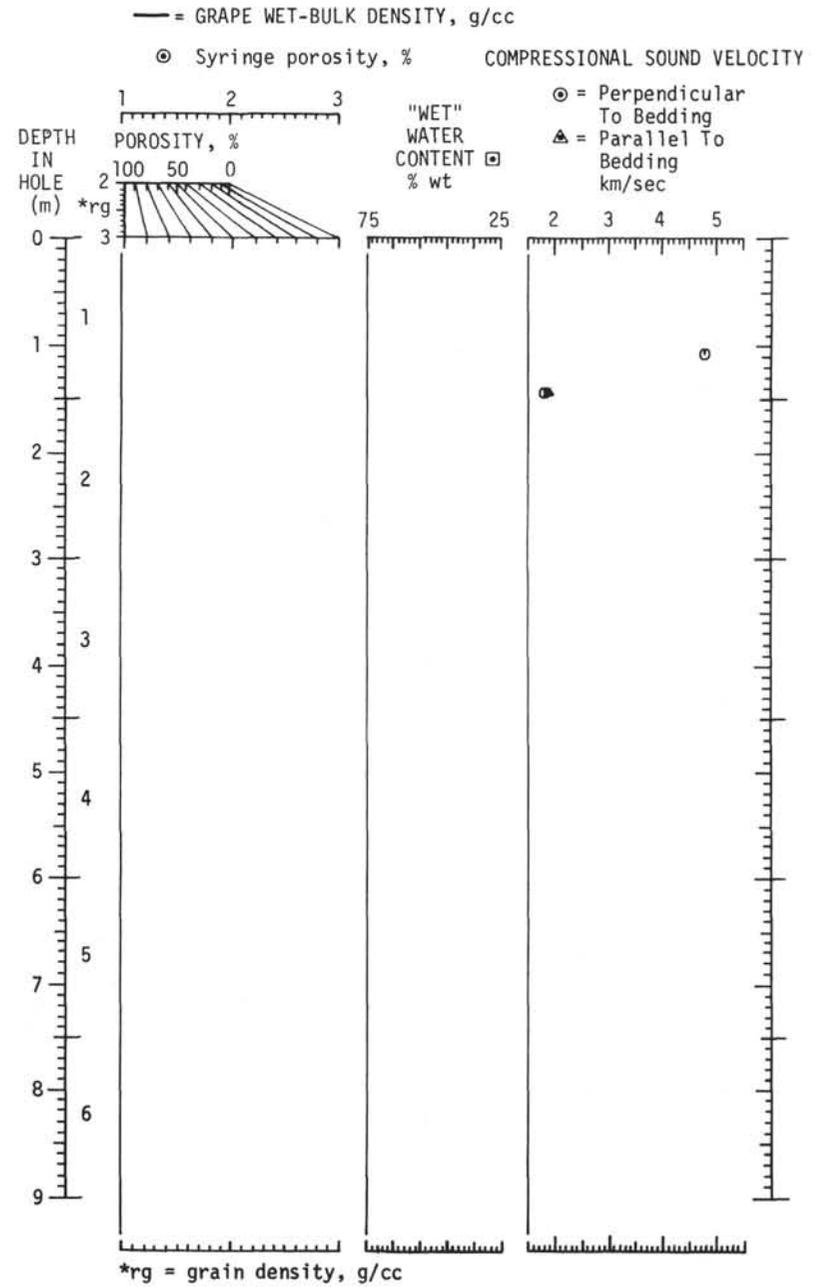
COMPRESSIONAL SOUND VELOCITY



CORE 306-38



CORE 306-40



CORE 306-41

— = GRAPE WET-BULK DENSITY, g/cc

⊙ = Syringe porosity, %

COMPRESSIONAL SOUND VELOCITY

